ABB INDUSTRIAL DRIVES

DCS880 drives

Firmware manual

DCS880 Drive Manuals

General	**Publication number**	EN	DE	IT	ES	FR	PL	ZH	RU
DCS880 Quick guide	3ADW000545	EN	DE	IT	ES	FR			
Safety instructions all languages	3ADW000481	EN	DE	IT	ES	FR	PL	ZH	RU
DCS880 Manual set	DCS880 Manual set	EN							
DCS880 Units									
DCS880 Flyer	3ADW000475	EN	DE	IT	ES	FR		ZH	RU
DCS880 Technical catalog	3ADW000465	EN	DE	IT	ES	FR	PL	ZH	RU
DCS880 Hardware manual	3ADW000462	EN	DE	IT	ES	FR	PL		RU
DCS880 Firmware manual	3ADW000474	EN	DE	IT	ES	FR	PL		RU
DCS880 Service manual	3ADW000488	EN							
DCS880 Hardparallel manual (on request only)	3ADW000530	EN							
DCS880 12-pulse manual	3ADW000533	EN							
Instructions for mounting the SDCS-CMA-2	3ADW000396	EN							
ACS-AP-x assistant control panels user's manual	3AUA0000085685	EN							
DCS Thyristor power converter – Technical guide	3ADW000163	EN							
Functional safety									
Supplement for functional safety	3ADW000452	EN		IT	ES	FR	PL		RU
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Tool and maintenance manuals and guides									
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DDCS branching unit NDBU-95 user's manual	3BFE64285513	EN							
Extension modules									
FIO-11 Analog extension module	3AFE68784930	EN	DE	IT					
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FEN-01 TTL encoder interface	3AFE68784603	EN	DE	IT				ZH	
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FEA-03 F series extension adapter	3AUA0000115811	EN							
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Fault tracing 470

Fieldbus control via embedded fieldbus (EFB) 555

Safety instructions

What this chapter contains

This chapter contains the safety instructions you must follow when installing, operating and servicing the drive.

If ignored, physical injury or death may follow, or damage may occur to the drive, the motor or driven equipment. Read the safety instructions before you work on the unit.

To which products this chapter applies

The information is valid for the whole range of the product DCS880, the converter modules DCS880-S0x size H1 … H8, field exciter units DCF80x, etc. like the Rebuild Kit DCS880-R00.

Usage of warnings and notes

There are two types of safety instructions throughout this manual: warnings and notes. Warnings caution you about conditions which can result in serious injury or death and/or damage to the equipment, and advice on how to avoid the danger. Notes draw attention to a particular condition or fact or give information on a subject.

The warning symbols are used as follows:

Dangerous voltage warning warns of high voltage which can cause physical injury or death and/or damage to the equipment.

General danger warning warns about conditions, other than those caused by electricity, which can result in physical injury or death and/or damage to the equipment.

Electrostatic sensitive devices warning warns of electrostatic discharge which can damage the equipment.

Installation and maintenance work

These warnings are intended for all who work on the drive, motor cable or motor. Ignoring the instructions can cause physical injury or death and/or damage to the equipment.

WARNING

- **Only qualified electricians are allowed to install and maintain the drive!**
- Never work on the drive, motor cable or motor when main power is applied.
- Always ensure by measuring with a multimeter (impedance at least 1 MΩ) that:
  - 1. Voltage between drive input phases U1, V1 and W1 and the frame is close to 0 V.
  - 2. Voltage between terminals C+ and D- and the frame is close to 0 V.
- Do not work on the control cables when power is applied to the drive or to the external control circuits. Externally supplied control circuits may cause dangerous voltages inside the drive even when the main power on the drive is switched off.
- Do not make any insulation resistance or voltage withstand tests on the drive or drive modules.
- Isolate the motor cables from the drive when testing the insulation resistance or voltage withstand of the cables or the motor.
- When reconnecting the motor cable, always check that the C+ and D- cables are connected with the proper terminal.

Notes:

- The motor cable terminals on the drive are at a dangerously high voltage when the main power is on, regardless of whether the motor is running or not.
- Depending on the external wiring, dangerous voltages (115 V, 220 V or 230 V) may be present on the relay outputs of the drive system (e.g. XRO1 … XRO3).

- DCS880 with enclosure extension: Before working on the drive, isolate the whole drive system from the supply.

Grounding

These instructions are intended for all who are responsible for the grounding of the drive. Incorrect grounding can cause physical injury, death and/or equipment malfunction and increase electromagnetic interference.

WARNING

- Ground the drive, motor and adjoining equipment to ensure personnel safety in all circumstances, and to reduce electromagnetic emission and pick-up.
- Make sure that grounding conductors are adequately sized and marked as required by safety regulations.
- In a multiple-drive installation, connect each drive separately to protective earth (PE ⏚).
- Minimize EMC emission and make a 360° high frequency grounding (e.g. conductive sleeves) of screened cable entries at the cabinet lead-through plate.
- Do not install a drive equipped with an EMC filter to an ungrounded power system or a high resistance-grounded (> 30 Ω) power system.

Notes:

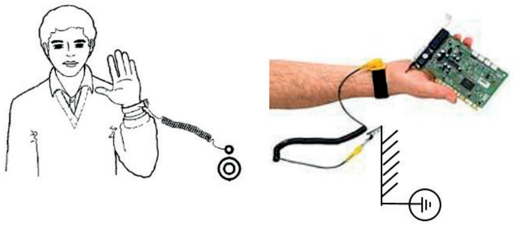
- Power cable shields are suitable as equipment grounding conductors only when adequately sized to meet safety regulations.
- As the normal leakage current of the drive is higher than 3.5 mA_{AC} or 10 mA_{DC} a fixed protective earth connection is required.
- This product can cause a DC current in the protective earthing conductor. Where a residual current-operated protective (RCD) or monitoring (RCM) device is used for protection in case of direct or indirect contact, only an RCD or RCM of Type B is allowed on the supply side of this product.

Printed circuit boards and fiber optic cables

These instructions are intended for all who handle the circuit boards and fiber optic cables. Ignoring the following instructions can cause damage to the equipment.

WARNING

- The printed circuit boards contain components sensitive to electrostatic discharge. Wear a grounding wrist band when handling the boards. Do not touch the boards unnecessarily.
- Use grounding strip:



- ABB order no.: 3ADV050035P0001

WARNING

- Handle the fiber optic cables with care.
- When unplugging optic cables, always grab the connector, not the cable itself.
- Do not touch the ends of the fibers with bare hands as the fiber is extremely sensitive to dirt.
- The minimum allowed bend radius is 35 mm (1.38 in.).

Mechanical installation

These notes are intended for all who install the drive. Handle the unit carefully to avoid damage and injury.

WARNING

- DCS880 sizes H4 ... H8:
  - The drive is heavy. Lift the drive by lifting lugs only.
  - The drive's center of gravity is high. Do not tilt the drive. The drive will overturn from a tilt of about 6 degrees. An overturning drive can cause physical injury.
  - Do not lift the drive by the front cover.
  - Place drives H4 … H6 only on their back.
- Make sure that dust from drilling does not enter the drive when installing. Electrically conductive dust inside the unit may cause damage or lead to malfunction.
- Ensure sufficient cooling.
- Do not fasten the drive by riveting or welding.

Operation

These warnings are intended for all who plan the operation of the drive or operate the drive. Ignoring the instructions can cause physical injury or death and/or damage to the equipment.

WARNING

- Before adjusting the drive and putting it into service, make sure that the motor and all driven equipment are suitable for operation throughout the speed range provided by the drive. The drive can be adjusted to operate the motor at speeds above and below the base speed.
- Do not control the motor with the disconnecting device (disconnecting mains); instead, use the control panel keys ▽ and ◇, or commands via the I/O board of the drive.
- Mains connection:
  You can use a disconnect switch (with fuses) to disconnect the electrical components of the drive from the mains for installation and maintenance work. The type of disconnect switch used must be as per EN 60947-3, Class B, so as to comply with EU regulations, or a circuit-breaker type which switches off the load circuit by means of an auxiliary contact causing the breaker's main contacts to open. The mains disconnect must be locked in its "OPEN" position during any installation and maintenance work.
- EMERGENCY STOP buttons must be installed at each control desk and at all other control panels requiring an emergency stop function. Pressing the STOP button on the control panel of the drive will neither cause an emergency stop of the motor, nor will the drive be disconnected from any dangerous potential.
- To avoid unintentional operating states, or to shut the unit down in case of any imminent danger according to the standards in the safety instructions it is not sufficient to merely shut down the drive via signals "RUN", "drive OFF" or "Emergency Stop" respectively "control panel" or "PC tool".
- Intended use:
  The operating instructions cannot take into consideration every possible case of configuration, operation or maintenance. Thus, they mainly give such advice only, which is required by qualified personnel for normal operation of the machines and devices in industrial installations.
  If in special cases the electrical machines and devices are intended for use in non-industrial installations - which may require stricter safety regulations (e.g. protection against contact by children or similar) - these additional safety measures for the installation must be provided by the customer during assembly.

Note:

- When the control location is not set to Local (Local not shown in the status row of the display), the stop key on the control panel will not stop the drive. To stop the drive using the control panel, press the Loc/Rem key and then the stop key ▽.

Introduction to this manual

What this chapter contains

This chapter describes the purpose, contents and the intended use of this manual.

Before You Start

The purpose of this manual is to provide you with the information necessary to control and program the drive.

Study carefully the Safety instructions at the beginning of this manual before attempting any work on or with the drive. Read through this manual before starting-up the drive. The installation and commissioning instructions given in the DCS880 Hardware manual (3ADW000462) and DCS880 Quick guide (3ADW000480) must also be read before proceeding.

This manual describes the **standard** DCS880 firmware.

What this manual contains

The Safety instructions can be found at the beginning of this manual.

Introduction to this manual, the chapter you are currently reading, introduces you to this manual.

Start-up, this chapter describes the basic start-up procedure of the drive.

Using the control panel, this chapter describes the handling of the control panel.

Firmware description, this chapter describes how to control the drive with standard firmware. Including the I/O configuration of digital and analog inputs and outputs with different hardware possibilities.

Communication, this chapter describes the communication capabilities of the drive.

Macros, this chapter contains a short description of each macro together with a connection diagram. Macros are pre-defined applications which will save the user time when configuring the drive.

Parameters, this chapter contains all signals and parameters.

Fault Tracing, this chapter describes the protections and fault tracing of the drive.

Fieldbus control via embedded fieldbus (EFB), this chapter describes the communication to and from a fieldbus network using the embedded fieldbus of the drive.

Fieldbus control via fieldbus adapter, this chapter describes the communication to and from a fieldbus network using an optional fieldbus adapter.

Firmware structure diagram, this chapter shows the parameter structure within the firmware.

Related documents

A list of related manuals is shown on the inside of the front cover under DCS880 Drive Manuals.

Terms and abbreviations

Term/Abbreviation	Definition
AC 800M	Type of programmable controller manufactured by ABB.
ACS-AP-I	Types of control panel used with DCS880 drives.
ACS-AP-W	
AI	Analog input; interface for analog input signals.

Term/Abbreviation	Definition
AO	Analog output; interface for analog output signals.
Automation Builder	Tool to write application programs. See Drive (IEC61131-3) application programming manual (3AUA0000127808).
Control unit	Contains the electronics and I/O connections of the drive. The control unit is connected to the power unit.
D2D	Drive-to-drive; communication link between drives.
DCS880	A product family of ABB drives.
DCSLink	Communication between the armature converter and the field exciters or 12-pulse communication.
DDCS	Distributed drives communication system; a protocol used in communication between ABB drive equipment.
DI	Digital input; interface for digital input signals.
DIO	Digital input/output; interface that can be used as a digital input or output.
DO	Digital output; interface for digital output signals.
Drive	Converter to control DC motors.
DriveBus	A communication link used by, for example, ABB controllers. DCS880 drives can be connected to the DriveBus link of the controller.
DriveAP	Adaptive Programming of the drive. See Adaptive programming, Application guide (3AXD50000028574).
Drive composer	PC tool for commissioning and maintenance of ABB drives.
EFB	Embedded fieldbus.
FAIO-01	Optional analog I/O extension module.
FBA	Fieldbus adapter.
FCAN-01	Optional CANopen adapter.
FCNA-01	Optional ControlNet adapter.
FDCO-0x	Optional DDCS communication module.
FDIO-01	Optional digital I/O extension module.
FDNA-01	Optional DeviceNet adapter.
FEA-03	Optional I/O extension module.
FECA-01	Optional EtherCAT® adapter.
FEN-01	Optional TTL encoder interface module.
FEN-11	Optional absolute encoder interface module.
FEN-21	Optional resolver interface module.
FEN-31	Optional HTL encoder interface module.
FENA-11	Optional Ethernet/IP, Modbus/TCP and PROFINET IO adapter.
FENA-21	Optional dual-port Ethernet/IP, Modbus/TCP and PROFINET IO adapter.
FEPL-02	Optional POWERLINK adapter.
FIO-01	Optional digital I/O extension module.
FIO-11	Optional analog I/O extension module.
FPBA-01	Optional PROFIBUS DP adapter.
FPTC-01	Optional thermistor protection module.
FPTC-02	Optional ATEX-certified thermistor protection module for potentially explosive atmospheres.
FSCA-01	Optional Modbus/RTU adapter.

Term/Abbreviation	Definition
FSO-21	Optional safety functions module.
FSPS-21	Optional PROFIsafe safety functions module.
HTL	High-threshold logic.
I/O	Input/Output.
ModuleBus	A communication link used by, for example, ABB controllers. DCS880 drives can be connected to the optical ModuleBus link of the controller.
Network control	With fieldbus protocols based on the Common Industrial Protocol (CIP^{TM}), such as DeviceNet and Ethernet/IP, denotes the control of the drive using the Net Ctrl and Net Ref objects of the ODVA AC/DC Drive Profile. For more information, see www.odva.org, and the following manuals: – FDNA-01 DeviceNet adapter module User's manual (3AFE68573360). – FENA-11/-21 Ethernet adapter module User's manual (3AUA0000093568).
Off3 (emergency stop)	Function in Drive: Off3 (emergency stop) with configurable deceleration time according to cat. 1.
OPL	Optical power link. Protocol used in communication between the control unit and the power unit.
Parameter	User-adjustable operation instruction to the drive.
PID controller	Proportional-integral-derivative controller. The speed control is based on a PID algorithm.
PLC	Programmable logic controller.
Power unit	Contains the power electronics and power connections of the drive. The control unit is connected to the power unit.
PTC	Positive temperature coefficient.
PU	See power unit.
RDCO-0x	DDCS communication module.
RFG	Ramp function generator.
RO	Relay output; interface for a digital output signal. Implemented with a relay.
Signal	Value measured or calculated by the drive. It can also contain status information. Most signals are read-only, but some (especially counter-type signals) can be reset.
SS1	Safe stop 1.
SSI	Synchronous serial interface.
STO	Safe torque off.
TTL	Transistor-transistor logic.
UPS	Uninterruptible power supply; power supply equipment with battery to maintain output voltage during power failure.

Cybersecurity disclaimer

This product is designed to be connected to and to communicate information and data via a network interface. It is the customer's sole responsibility to provide and continuously ensure a secure connection between the product and the customer network or any other network (as the case may be). The customer shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc.) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information. See also chapter User lock.

Start-up

What this chapter contains

This chapter describes the basic start-up procedure of the drive. A more detailed description of the signals and parameters involved in the procedure can be found in section Parameters.

General

The drive can be operated:

- In local via the Drive composer or the control panel.
- In remote via local I/O or overriding control.

The following start-up procedure uses Drive composer pro (for further information about Drive composer pro, consult its online help). However, parameters can also be changed with Drive composer entry or the control panel.

The start-up procedure includes actions that need only be taken when powering up the drive for the first time in a new installation (e.g. entering the motor data). After the start-up, the drive can be powered up without using these start-up functions again. The start-up procedure can be repeated later if the start-up data needs to be altered.

Refer to section Fault tracing in case problems should arise. In case of a major problem, disconnect mains and wait for 5 minutes before attempting any work on the drive, the motor, or the motor cables.

Start-up procedure

- The Safety instructions at the beginning of this manual must be observed with extreme care during the start-up procedure!
- The start-up procedure should only be carried out by a qualified electrician.
- Check the mechanical and electrical installation the drive according to the DCS880 Hardware manual (3ADW000462).

Tools

For drive commissioning following software tools are mandatory:

- Drive composer pro including commissioning wizard and DriveAP for fast drive signal monitoring.

For drive commissioning following tools are mandatory in addition to standard tools:

- An oscilloscope including memory function with either galvanically isolating transformer or isolating amplifier for safe measurements.
- A clamp on current probe. In case the scaling of the DC load current needs to be checked it must be a DC clamp on current probe.
- A voltmeter.

Make sure that all equipment in use is suitable for the voltage level applied to the power part!

Checking with the power switched off

Check the settings of:

- The mains breaker (e.g. overcurrent = $1.6 * I_n$, short circuit current = $10 * I_n$, time for thermal tripping = 10 s).
- Time, overcurrent, thermal and voltage relays.
- The earth fault protection (e.g. Bender relay).

Check the insulation of the mains voltage cables or busbars between the secondary side of the dedicated transformer and the drive:

- Disconnect the dedicated transformer from its incoming voltage.
- Check that all circuits between the mains and the drive (e.g. control/auxiliary voltage) are disconnected.
- Measure the insulation resistance between L1 - L2, L1 - L3, L2 - L3, L1 -PE, L2 - PE, L3 - PE. The result should be MΩs.

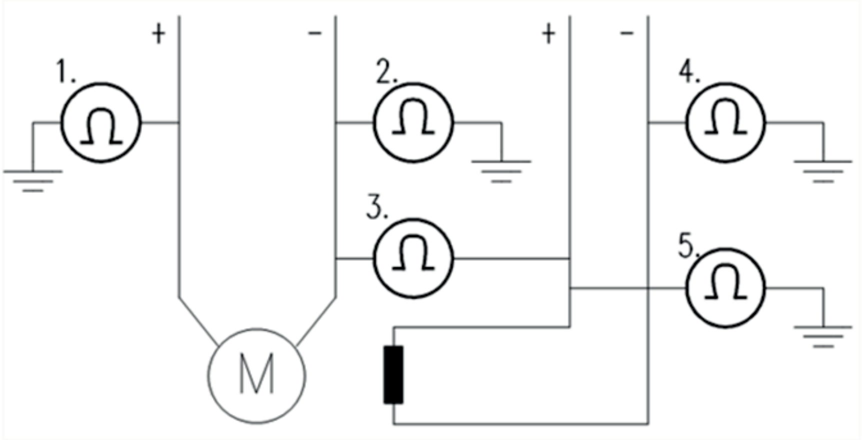
Check the installation:

- Crosscheck the wiring with the drawings.
- Check the mechanical mounting of the motor and pulse encoder and/or analog tacho.

- Make sure that the motor is connected in a correct way (armature, field, serial windings and cable shields).
- Check the connections of the motor fan, if existing.
- Make sure that the converter fan is connected correctly especially in modules size H7 and H8 were star or delta connection is possible.
- If a pulse encoder is used make sure that pulse encoder's auxiliary voltage connection corresponds to its voltage and that the channel connection corresponds to correct direction of rotation.
- Check that the shielding of the pulse encoder's cable is connected to the TE bar of the DCS880.
- If an analog tacho is used make sure that it is connected to the proper input at the SDCS-CON-H01 (AITAC:1 and 2).
- For all other cables make sure that both ends of the cables are connected and they do not cause any damage or danger when power is being switched on.

Measuring the insulation resistance of the motor cables and the motor:

- Isolate the motor cables from the drive before testing the insulation resistance or voltage withstand of the cables or the motor.



- Measure the insulation resistance between:
  1. Armature + cables and PE.
  2. Armature - cables and PE.
  3. Armature cables and field cables.
  4. Field - cable and PE.
  5. Field + cable and PE.
- The result should be MΩs

Setting of Jumpers:

- The boards of the DCS880 include jumpers to adapt the boards to different applications. The position of the jumpers must be checked before connecting voltage.
- For specific jumper settings consult the DCS880 Hardware manual (3ADW000462).

Drive data, check following items for each drive and mark the differences in the delivery documents:

- Motor, analog tacho or pulse encoder and cooling fans rating plate data.
- Direction of motor rotation.
- Maximum and minimum speed and if fixed speeds are used.
- Speed scaling factors:
- E.g. gear ratio, roll diameter.
- Acceleration and deceleration times.
- Operating modes:
- E.g. stop mode, E-stop mode.
- The amount of motors connected.

Checking with the power switched on

- The Safety instructions at the beginning of this manual must be observed with extreme care during the start-up procedure!
- The start-up procedure should only be carried out by a qualified electrician.

WARNING

- There is dangerous voltage inside the cabinet!

Switching the power on:

- Prior to connecting the voltage proceed as follows:
  1. Ensure that all the cable connections are checked and that the connections cannot cause any danger.
  2. Close all doors of enclosed converter before switching power on.
  3. Be ready to trip the supply transformer if anything abnormal occurs.
  4. Switch the power on.

Measurements made with power on:

- Check the operation of the auxiliary equipment.
- Check the circuits for external interfaces on site:
  1. Safety circuits, like Safe Torque Off (STO), Off2 (emergency off/electrical disconnect/fast current off) and Off3 (emergency stop).
  2. Remote control of the mains breaker.
  3. Signals connected to the control system.
  4. Other signals which remain to be checked.

Connecting voltage to the drive:

- Check from the delivery diagrams the type of boards and converters which are used in the system.
- Check all time relay and breaker settings.
- Close the supply disconnecting device (check the connection from the delivery diagrams).
- Close all protection switches one at a time and measure for proper voltage.

Commissioning a DCS880

Nominal values of the converter can be found in group 07 System info, check following signals:

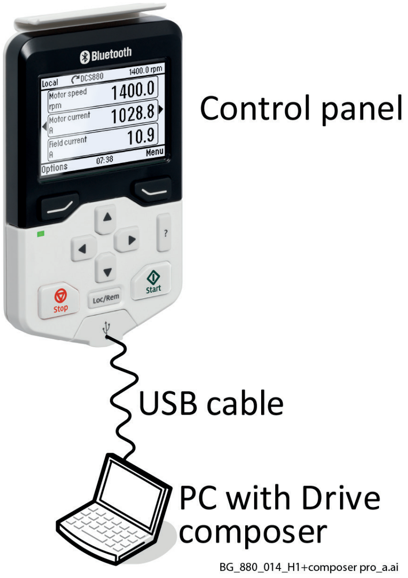
- 07.60 Drive size, recognized converter type read from 07.03 Drive rating ID set or 95.25 Set: Type code.
- 07.61 Drive block bridge 2 set, recognized converter quadrant type read from 07.03 Drive rating ID set or 95.26 Set: Drive block bridge 2.
- 07.62 Drive DC current scaling set, nominal converter DC current in A read from 07.03 Drive rating ID set or 95.27 Set: Drive DC current scaling.
- 07.64 Drive AC voltage scaling set, nominal AC converter voltage in V read from 07.03 Drive rating ID set or 95.28 Set: Drive AC voltage scaling.
- 07.65 Drive max bridge temperature set, maximum bridge temperature in degree centigrade read from 07.03 Drive rating ID set or 95.29 Set: Drive max bridge temperature.
- If signals are not correct adapt them, see group 95 HW configuration in this manual.

Connect a DCS880 and a PC running Drive composer

Via control panel

To establish a connection between Drive composer and drive, connect a USB type A (PC) type mini B (control panel) cable to the USB port of the PC and the USB port of the control panel. The maximum length of the USB cable should be 3 m.

Drive composer Start-up and maintenance PC tool User's manual (3AUA0000094606).



Via an Ethernet network (FENA-x1)

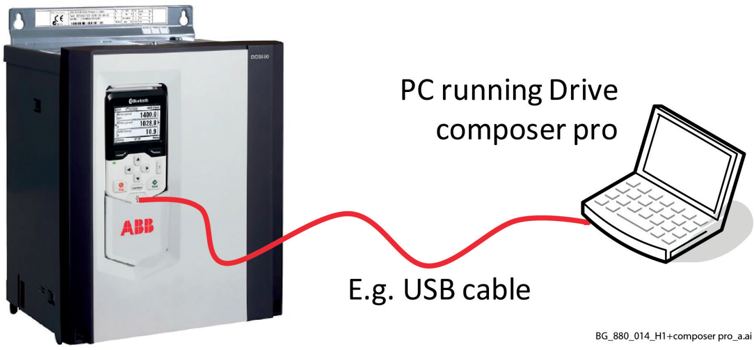
The Ethernet connection is made using FENA-x1 Ethernet adapter modules. For the installation of the adapter module, see FENA-11/-21 Ethernet adapter module user's manual (3AUA0000093568). Additional information (e.g. parameter settings) can be found in the Drive composer Start-up and maintenance PC tool User's manual (3AUA0000094606).

Attention: Please consider the following, when connecting Drive composer pro via an Ethernet network.

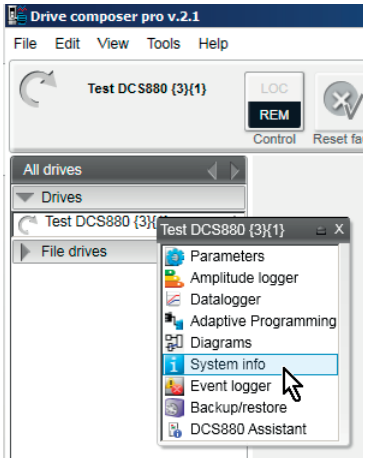
- The communication supervision is not made in group 50 Fieldbus adapter (FBA), but in group 49 Panel port communication.
- To have communication supervision at all, 49.05 Communication loss action must **not** be set to No action.
- The timeout is set with 49.04 Communication loss time. Time outs of 2000 ms (default is 1000 ms) are sufficient.
- Any changed parameters must be validated by means of 49.06 Refresh settings = Refresh.

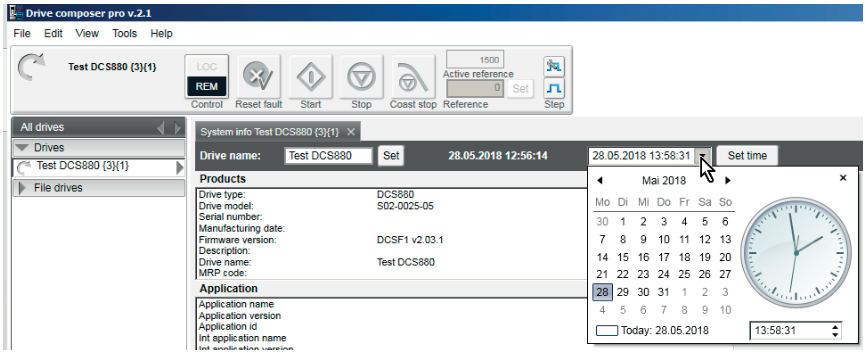
Commissioning a DCS880 using the DCS880 Assistant

The DCS880 Assistant works only in a single drive point-to-point connection.



Start Drive composer pro and choose System info and set date and time.





Drive name: Test DCS880

28.05.2018 12:56:14

28.05.2018 13:58:31

Products

Drive type: DCS880
Drive model: S02-0025-05
Serial number:
Manufacturing date:
Firmware version: DCSF1 v2.03.1
Description:
Drive name: Test DCS880
MRP code:

Application

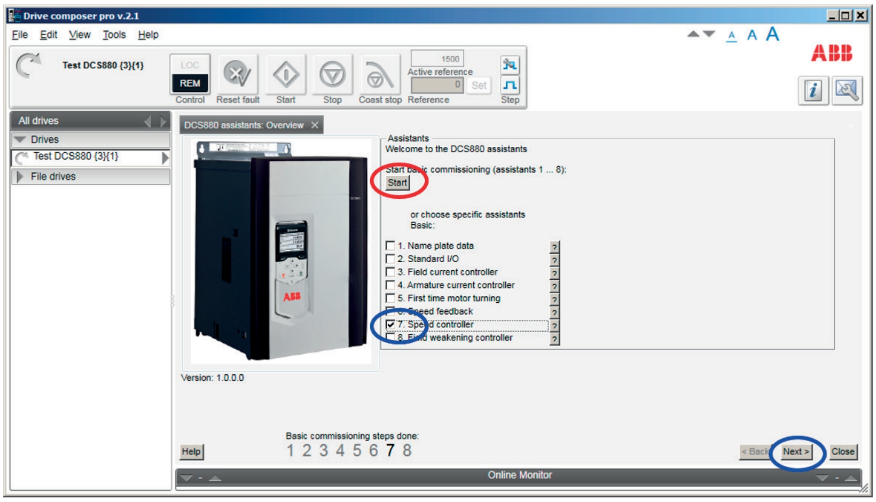
Application name
Application version
Application id
Int application name

Today: 28.05.2018

13:58:31

Then choose DCS880 Assistant.

For basic commissioning press the Start button or select a specific assistant and press Next.

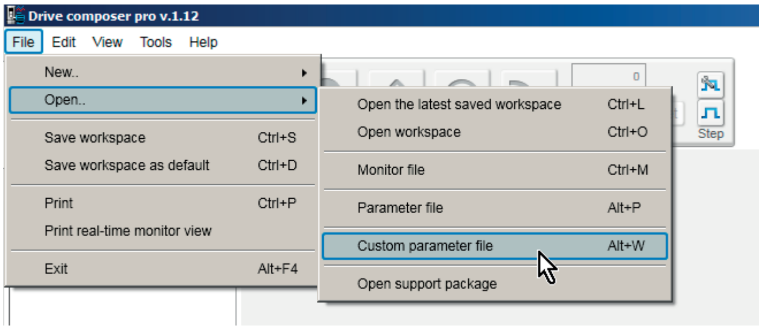


Commissioning a DCS880 using custom parameter files

Requirements

Before starting the commissioning, connect one drive (via control panel) with the Drive composer. Make sure, that you have the custom parameter files available. The custom parameter files are available from your local ABB agent.

How to open a custom parameter file in Drive composer pro:



01 Name plate data

Open the custom parameter set named:

- 01 Name plate data.dccustparams.
- Set all parameters to default by means of:
- 96.15 Parameter restore = Default.
- Check with 96.11 Macro active.

Enter the motor data, the mains (supply) data and the most important protections:

- 96.01 Language.
- 99.11 M1 nominal current.
- 99.12 M1 nominal voltage.
- 99.14 M1 nominal (base) speed.
- 30.11 M1 minimum speed.
- 30.12 M1 maximum speed.
- 99.13 M1 nominal field current.
- 31.30 M1 overspeed trip margin.
- 31.44 Armature overcurrent level.
- 99.10 Nominal mains voltage.

02 Standard I/O

Set the I/O according to need using parameters in groups 10 … 13.

03 Field current controller

Open the custom parameter set named:
- 03 Field current controller.dccustparams.

Set the field exciter type by means of:
- 99.07 M1 used field exciter type.
- Check with 7.41 M1 field exciter type.

Enter the field circuit data:
- 99.13 M1 nominal field current.
- 28.17 M1 EMF/field control mode.

Switch the drive to local mode (Drive composer or local I/O).

Start the autotuning by means of:
- 99.20 Tuning request = Field current autotuning.
- Set On within 20 s.

During the autotuning the mains or field contactor will be closed. The field circuit is measured by means of increasing the field current to nominal field current and the field current control parameters are set. The armature current is not released while the autotuning is active and thus the motor should not turn.

When the autotuning is finished successfully, check the parameters set by the autotuning:
- 28.44 M1 field control voltage limit, typical values around 4.
- 28.45 M1 field current proportional gain, typical values around 66 ms.
- 28.46 M1 field current integration time.

Remove Run and On.

If the autotuning fails, warning AF90 Autotuning is generated. For more details check the AUX code of AF90 Autotuning and repeat the autotuning.

04 Armature current controller

Open the custom parameter set named:
- 04 Armature current controller.dccustparams.

Enter the motor nominal current and the basic current limitations:
- 99.11 M1 nominal current.
- 30.19 Minimum torque 1.
- 30.20 Maximum torque 1.
- 30.34 M1 current limit bridge 2.
- 30.35 M1 current limit bridge 1.

Attention: Do not manually change the default values of 27.32 M1 armature resistance and 27.33 M1 armature inductance. Changing them will falsify the results of the autotuning.

Switch the drive to local mode (Drive composer or local I/O).

Start the autotuning by means of:
- 99.20 Tuning request = Armature current autotuning.
- Set On and Run within 20 s.

During the autotuning the mains contactor will be closed, the armature circuit is measured by means of armature current bursts and the armature current control parameters are set. The field current is not released while the autotuning is active and thus the motor should not turn, but due to remanence in the field circuit about 40 % of all motors will turn (create torque). These motors must be locked.

When the autotuning is finished successfully, check the parameters set by the autotuning:
- 27.29 M1 current proportional gain, typical values around 0.2.
- 27.30 M1 current integration time, typical values 25 … 50 ms.
- 27.31 M1 discontinuous current limit, typical values 20 … 60 %.
- 27.32 M1 armature resistance.
- 27.33 M1 armature inductance.

Remove Run and On.

If the autotuning fails, warning AF90 Autotuning is generated. For more details check the AUX code of AF90 Autotuning and repeat the autotuning.

05 First time motor turning

Open the custom parameter set named:

- 05 First time motor turning.dccustparams.

Make sure, the speed feedback is set to EMF and check minimum- and maximum speed:

- 90.41 M1 feedback selection = EMF.
- 30.11 M1 minimum speed.
- 30.12 M1 maximum speed.

Switch the drive to local mode (Drive composer or local I/O). Set On, Run. Begin with a small speed reference from about 10 % of maximum speed. Then slowly increase to maximum speed.

The mains contactor and the field contactor, if existing, will be closed and the motor will run up to the requested speed reference.

Check following parameters if applicable:

- 01.21 Armature voltage in V.
- 01.29 M1 field current in A.
- 94.01 EMF speed.
- 94.03 Tacho speed.
- 94.04 OnBoard encoder speed.
- 25.02 Speed proportional gain 1.
- 25.03 Speed integration time 1.

To stop remove Run and On.

06 Speed feedback

Open the custom parameter set named:

- 06 Speed feedback.dccustparams.

Enter the EMF speed feedback parameters and, if applicable, the parameters for the OnBoard encoder or the analog tacho:

- 90.41 M1 feedback selection.
- 30.11 M1 minimum speed.
- 30.12 M1 maximum speed.
- 99.12 M1 nominal voltage.
- 99.14 M1 nominal (base) speed.
- 94.24 OnBoard encoder type.
- 94.25 OnBoard encoder speed calculation mode.
- 94.23 OnBoard encoder pulses/revolution.
- 94.08 M1 tacho voltage at 1000 rpm.

Switch the drive to local mode (Drive composer or local I/O).

Start the autotuning by means of:

- 99.20 Tuning request = Speed feedback assistant.
- Set On and Run within 20 s.

The speed feedback assistant detects the kind of speed feedback - EMF, OnBoard encoder or analog tacho - the drive is using.

During the autotuning the mains contactor and the field contactor, if existing, will be closed and the motor might run up to base speed. See 99.14 M1 nominal (base) speed. During the whole procedure the drive will be in EMF speed control despite the setting of 90.41 M1 feedback selection.

When the autotuning is finished successfully, check the parameter set by the autotuning:

- 90.41 M1 feedback selection.

Remove Run and On.

If the autotuning fails, warning AF90 Autotuning is generated. For more details check the AUX code of AF90 Autotuning and repeat the autotuning.

Analog tacho fine tune procedure

In case an analog tacho is detected, 90.41 M1 feedback selection = Tacho, it is recommended to fine tune the analog tacho.

Switch the drive to local mode (Drive composer or local I/O).

Start the autotuning by means of:

- 99.20 Tuning request = Tacho fine-tuning.

- Set On and Run within 20 s.

Measure the motor speed with a handheld tacho and write the value into:
- 94.11 M1 tacho fine-tuning adjust.

Check for proper speed feedback by means of:
- 94.03 Tacho speed.
- 24.01 Used speed reference.

To stop remove Run and On.

07 Speed controller

Open the custom parameter set named:
- 07 Speed controller.dccustparams.

Enter the basic speed parameters, ramp times, torque and current limits and the speed filter times:
- 99.14 M1 nominal (base) speed.
- 30.11 M1 minimum speed.
- 30.12 M1 maximum speed.
- 23.12 Acceleration time 1.
- 23.13 Deceleration time 1.
- 21.08 M1 zero speed level.
- 30.19 Minimum torque 1.
- 30.20 Maximum torque 1.
- 30.34 M1 current limit bridge 2.
- 30.35 M1 current limit bridge 1.
- 24.18 Speed error filter time 1.
- 24.19 Speed error filter time 2.
- 90.42 Motor speed filter time.

Attention: For better results set the filters, especially when using EMF speed feedback.

Switch the drive to local mode (Drive composer or local I/O).

Start the autotuning by means of:
- 99.20 Tuning request = Speed controller autotuning.
- Set On and Run within 20 s.

During the autotuning the mains contactor and the field contactor, if existing, will be closed, the ramp is bypassed, and torque respectively current limits are valid. The speed controller is tuned by means of speed bursts up to base speed, see 99.14 M1 nominal (base) speed, and the speed controller parameters are set.

Attention: During the autotuning the torque and/or current limits will be reached.

When the autotuning is finished successfully, check the parameter set by the autotuning:
- 25.02 Speed proportional gain 1.
- 25.03 Speed integration time 1.

Remove Run and On.

If the autotuning fails, warning AF90 Autotuning is generated. For more details check the AUX code of AF90 Autotuning and repeat the autotuning.

Attention: The assistant is using the setting of 90.41 M1 feedback selection. If using setting OnBoard encoder, Encoder 1, Encoder 2 or Tacho make sure the speed feedback is working properly!

08 Field weakening

Open the custom parameter set named:
- 08 Field weakening.dccustparams.

Enter the motor data and the field circuit data:
- 99.12 M1 nominal voltage.
- 99.14 M1 nominal (base) speed.
- 30.11 M1 minimum speed.
- 30.12 M1 maximum speed.
- 99.13 M1 nominal field current.
- 31.58 M1 field current low level.
- 28.17 M1 EMF/field control mode.

Switch the drive to local mode (Drive composer or local I/O).
Start the autotuning by means of:
- 99.20 Tuning request = Flux linearization autotuning.
- Set On and Run within 20 s.

During the autotuning the mains contactor and the field contactor, if existing, will be closed and the motor will run up to base speed. See 99.14 M1 nominal (base) speed. The flux linearization is tuned by means of a constant speed while decreasing the field current and the flux linearization parameters are set.
When the autotuning is finished successfully, check the parameter set by the autotuning:
- 28.31 Field current at 40 % flux.
- 28.32 Field current at 70 % flux.
- 28.33 Field current at 90 % flux.

Remove Run and On.
If the autotuning fails, warning AF90 Autotuning is generated. For more details check the AUX code of AF90 Autotuning and repeat the autotuning.

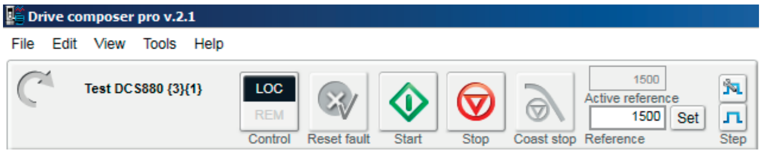
Commissioning a DCS880 manually

I/O configuration

To set the in- and outputs see chapter I/O configuration.

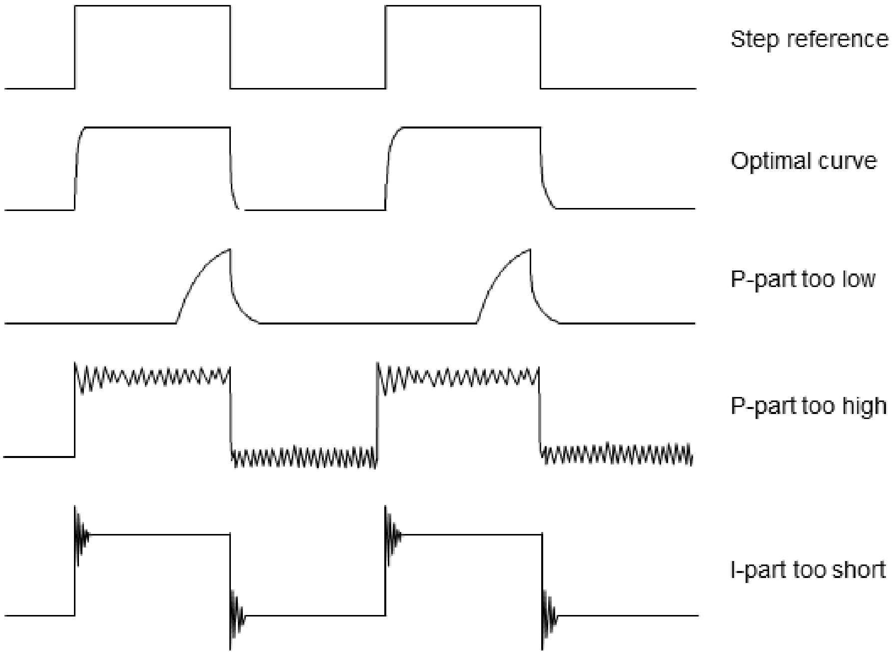
Field current controller

Drive composer information:

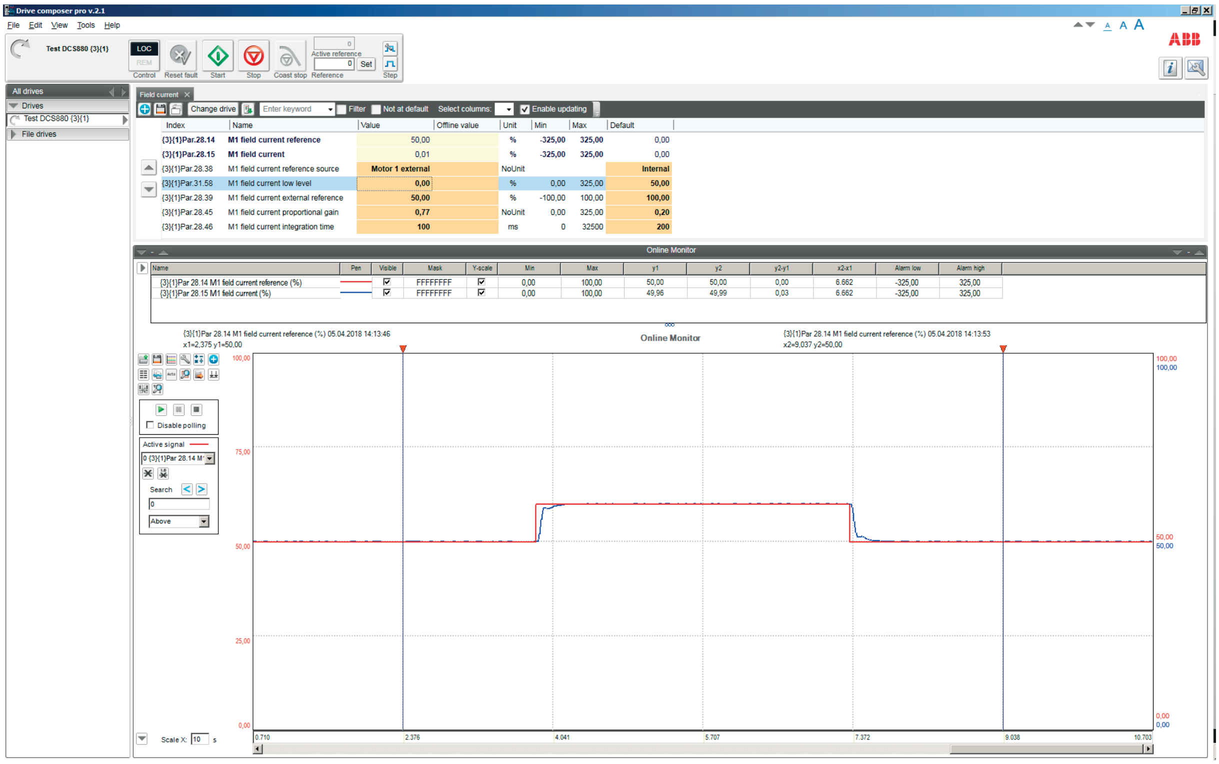


Manual tuning of the field current controller:
- Connect Drive composer to the drive and choose local mode.
- Monitor 28.14 M1 field current reference and 28.15 M1 field current.
- Set 28.38 M1 field current reference source = Motor 1 external.
- Set 31.58 M1 field current low level = 0.00 %.
- Start the drive via Drive composer.
- Use 28.39 M1 field current external reference to step the field current controller.
- Tune the field current controller by means of 28.45 M1 field current proportional gain and 28.46 M1 field current integration time.
  - Step size: about 2 % … 5 % of nominal field current (do not hit any limits during stepping, e.g. maximum field current, α or supply voltage).
  - Step response time: 50 ms … 60 ms (count only from 10 % … 90 %).
  - Where to step: 30 %, 60 % and 80 % of nominal field current.

Field current controller step responses:



Drive composer manual tuning of the field current controller:



Index	Name	Value	Offline value	Unit	Min	Max	Default
{3}{1}Par.28.14	M1 field current reference	50,00		%	-325,00	325,00	0,00
{3}{1}Par.28.15	M1 field current	0,01		%	-325,00	325,00	0,00
{3}{1}Par.28.38	M1 field current reference source	Motor 1 external		NoUnit			Internal
{3}{1}Par.31.58	M1 field current low level	0,00		%	0,00	325,00	50,00
{3}{1}Par.28.39	M1 field current external reference	50,00		%	-100,00	100,00	100,00
{3}{1}Par.28.45	M1 field current proportional gain	0,77		NoUnit	0,00	325,00	0,20
{3}{1}Par.28.46	M1 field current integration time	100		ms	0	32500	200

Name	Pen	Visible	Mask	Y-scale	Min	Max	y1	y2	y2-y1	x2-x1	Alarm low	Alarm high
{3}{1}Par 28.14 M1 field current reference (%)	🟥	☑	FFFFFFFF	☑	0,00	100,00	50,00	50,00	0,00	6.662	-325,00	325,00
{3}{1}Par 28.15 M1 field current (%)	🟦	☑	FFFFFFFF	☑	0,00	100,00	49,96	49,99	0,03	6.662	-325,00	325,00

{3}{1}Par 28.14 M1 field current reference (%) 05.04.2018 14:13:46
x1=2,375 y1=50,00

{3}{1}Par 28.14 M1 field current reference (%) 05.04.2018 14:13:53
x2=9,037 y2=50,00

- Set 28.39 M1 field current external reference = 0.00 %.
- Stop the drive via Drive composer.
- Set 31.58 M1 field current low level and 28.38 M1 field current reference source back to their original settings.

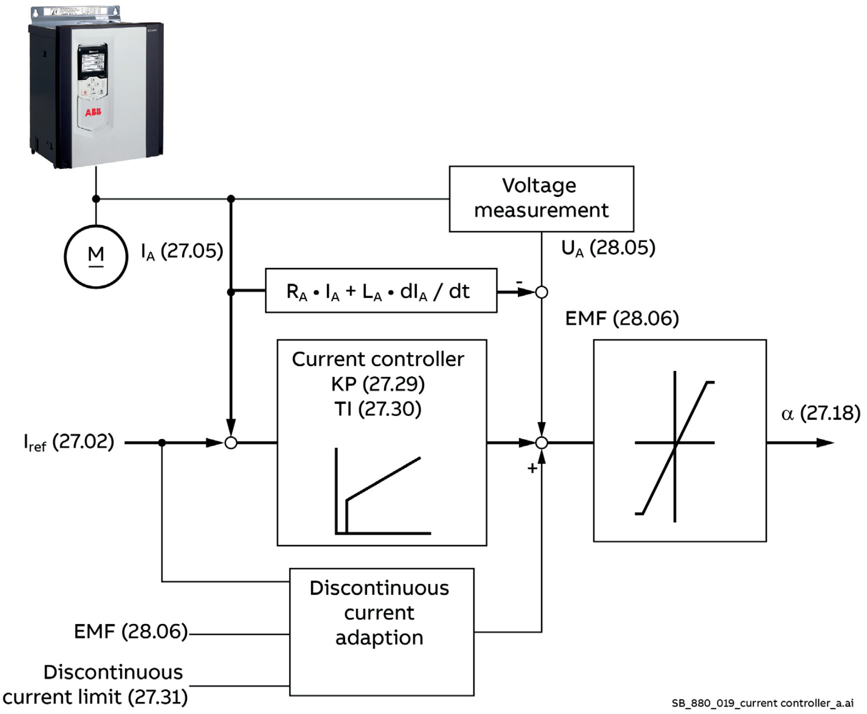
Armature current controller

To keep a PI-controller as fast as possible idealistically the integral part should stay at zero. The worst case is that the integral part is running into the limits and thus needs a long time to recover. To prevent this and to achieve an integral part as small as possible two feed forwards are used for the current controller:

1. During discontinuous current the signal from the current controller is boosted by means of the discontinuous current adaptation, depending on discontinuous current limit, current reference and EMF. The discontinuous current limit must be determined during the commissioning.
2. Additionally, the EMF itself is used as feed forward. Unfortunately, it is not possible to measure the EMF directly. It must be calculated by means of following formula:

$$EMF = U_A - R_A \times I_A - L_A \times \frac{dI_A}{dt}.$$

The value for the resistance (R_A) of the motor must be determined during the commissioning. The resistance is needed for the EMF controller and the speed calculated from the EMF. Control principle armature current controller:



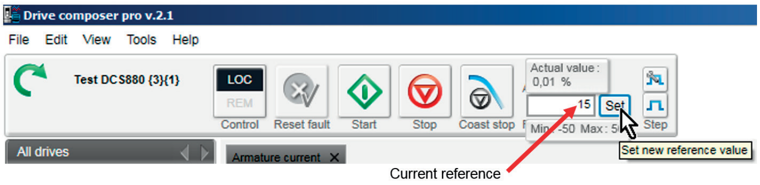
SB_880_019_current controller_a.ai

Manual tuning:

Thus, the manual tuning of the armature current controller is divided into three parts:

1. Determine the resistance of the motor.
2. Determine the discontinuous current limit of the motor.
3. Manual tuning of the armature current controller (p- and i-part).

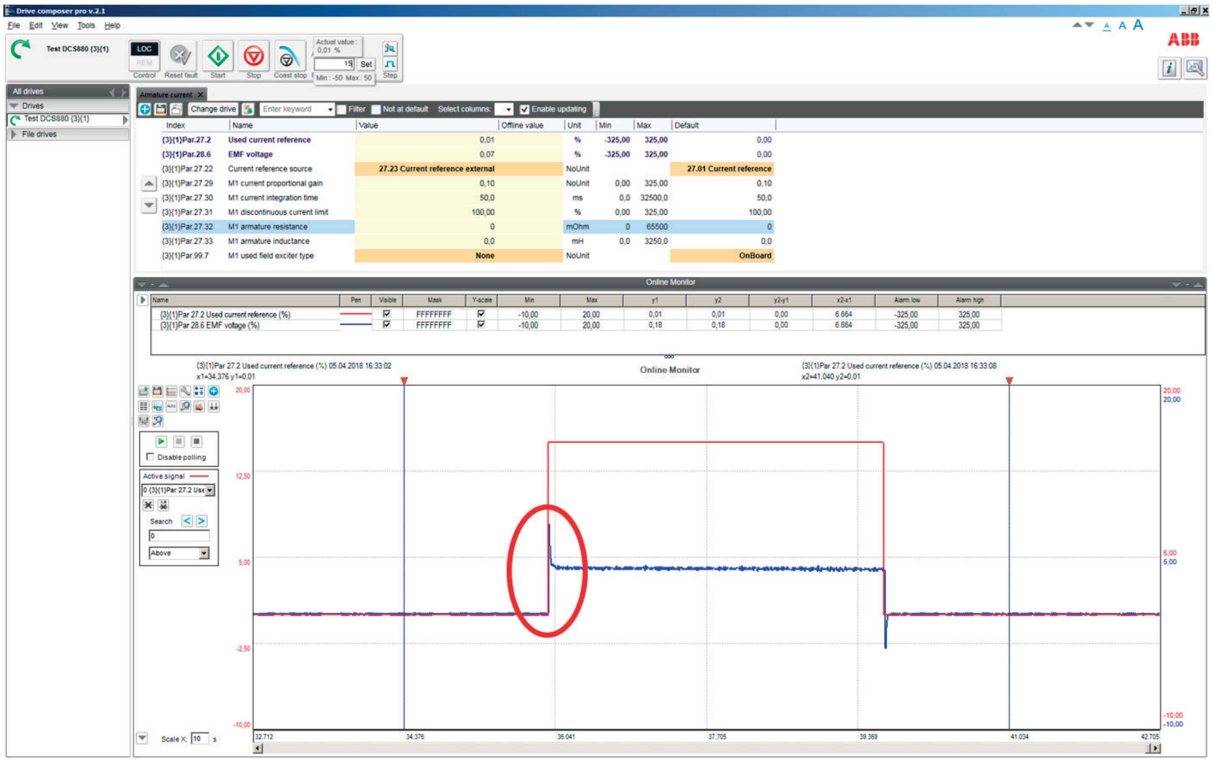
Drive composer information:



Part 1, determine the resistance of the motor:

- Connect Drive composer to the drive and choose local mode.
- Monitor 27.02 Used current reference and 28.06 EMF voltage.
- Set 27.22 Current reference source = 27.23 Current reference external.
- Set 27.29 M1 current proportional gain, 27.30 M1 current integration time, 27.31 M1 discontinuous current limit, 27.32 M1 armature resistance and 27.33 M1 armature inductance to default.
- Set 99.07 M1 used field exciter type = None.
- Start the drive via Drive composer.
- Use Drive composer to set the current reference and step the armature current controller.
- Watch the EMF.
- Make sure the motor is not turning (**Attention:** let the drive run only for a short time).

Before tuning of 27.32 M1 armature resistance:



Index	Name	Value	Offline value	Unit	Min	Max	Default
{3}{1}Par.27.2	**Used current reference**	0,01		%	-325,00	325,00	0,00
{3}{1}Par.28.6	**EMF voltage**	0,07		%	-325,00	325,00	0,00
{3}{1}Par.27.22	Current reference source	**27.23 Current reference external**		NoUnit			**27.01 Current reference**
{3}{1}Par.27.29	M1 current proportional gain	0,10		NoUnit	0,00	325,00	0,10
{3}{1}Par.27.30	M1 current integration time	50,0		ms	0,0	32500,0	50,0
{3}{1}Par.27.31	M1 discontinuous current limit	100,00		%	0,00	325,00	100,00
{3}{1}Par.27.32	M1 armature resistance	0		mOhm	0	65500	0
{3}{1}Par.27.33	M1 armature inductance	0,0		mH	0,0	3250,0	0,0
{3}{1}Par.99.7	M1 used field exciter type	**None**		NoUnit			**OnBoard**

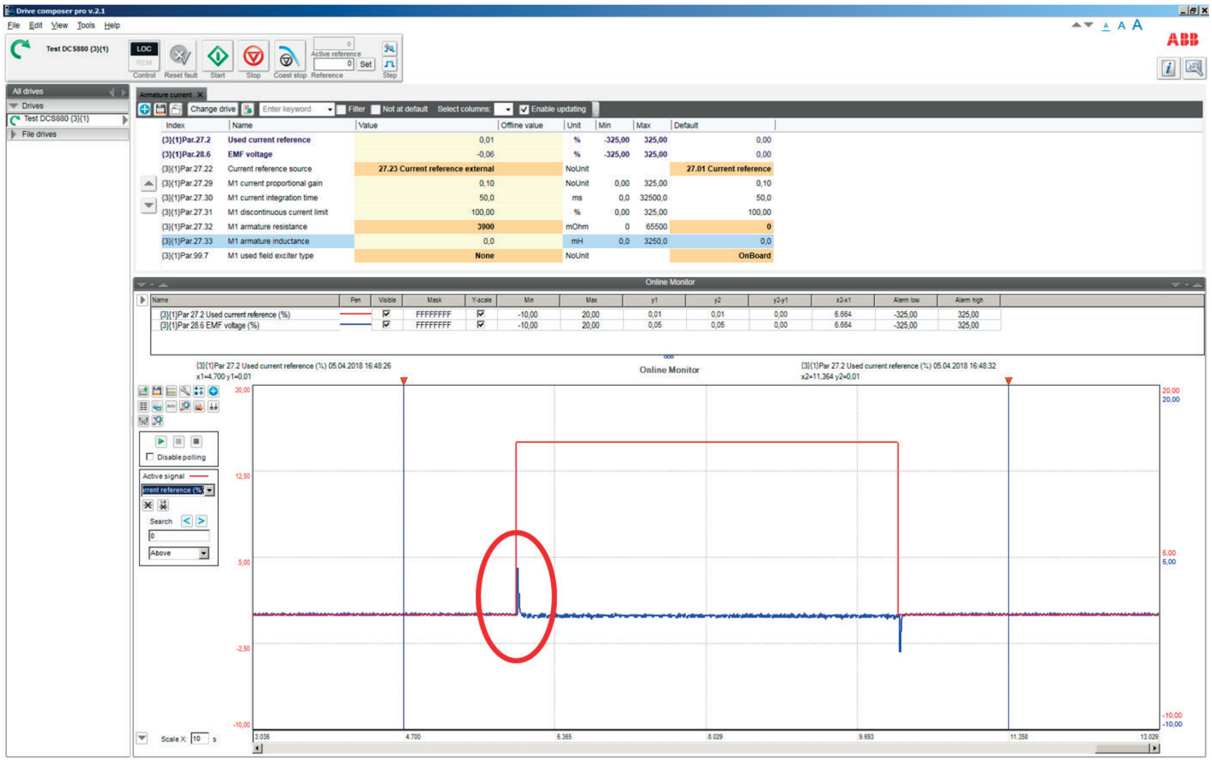
Name	Pen	Visible	Mask	Y-scale	Min	Max	y1	y2	y2-y1	x2-x1	Alarm low	Alarm high
{3}{1}Par 27.2 Used current reference (%)	🟥	☑	FFFFFFFF	☑	-10,00	20,00	0,01	0,01	0,00	6.664	-325,00	325,00
{3}{1}Par 28.6 EMF voltage (%)	🟦	☑	FFFFFFFF	☑	-10,00	20,00	0,18	0,18	0,00	6.664	-325,00	325,00

{3}{1}Par 27.2 Used current reference (%) 05.04.2018 16:33:02
x1=34,376 y1=0,01

{3}{1}Par 27.2 Used current reference (%) 05.04.2018 16:33:08
x2=41,040 y2=0,01

- In this example 27.32 M1 armature resistance is too low. Tune 27.32 M1 armature resistance until the EMF is as close as possible to zero and does not change its value during the current step.

After tuning of 27.32 M1 armature resistance:



Index	Name	Value	Offline value	Unit	Min	Max	Default
{3}{1}Par.27.2	Used current reference	0,01		%	-325,00	325,00	0,00
{3}{1}Par.28.6	EMF voltage	-0,06		%	-325,00	325,00	0,00
{3}{1}Par.27.22	Current reference source	27.23 Current reference external		NoUnit			27.01 Current reference
{3}{1}Par.27.29	M1 current proportional gain	0,10		NoUnit	0,00	325,00	0,10
{3}{1}Par.27.30	M1 current integration time	50,0		ms	0,0	32500,0	50,0
{3}{1}Par.27.31	M1 discontinuous current limit	100,00		%	0,00	325,00	100,00
{3}{1}Par.27.32	M1 armature resistance	3900		mOhm	0	65500	0
{3}{1}Par.27.33	M1 armature inductance	0,0		mH	0,0	3250,0	0,0
{3}{1}Par.99.7	M1 used field exciter type	None		NoUnit			OnBoard

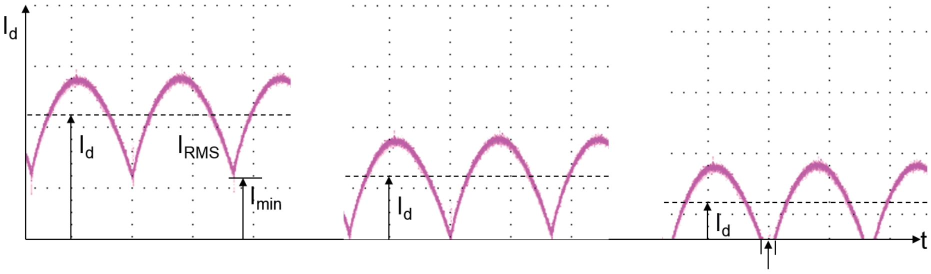
Name	Pen	Visible	Mask	Y-scale	Min	Max	y1	y2	y2-y1	x2-x1	Alarm low	Alarm high
{3}{1}Par 27.2 Used current reference (%)	🟥	☑	FFFFFFFF	☑	-10,00	20,00	0,01	0,01	0,00	6.664	-325,00	325,00
{3}{1}Par 28.6 EMF voltage (%)	🟦	☑	FFFFFFFF	☑	-10,00	20,00	0,05	0,05	0,00	6.664	-325,00	325,00

{3}{1}Par 27.2 Used current reference (%) 05.04.2018 16:48:26
x1=4,700 y1=0,01

{3}{1}Par 27.2 Used current reference (%) 05.04.2018 16:48:32
x2=11,364 y2=0,01

- It is not possible to tune 27.33 M1 armature inductance manually. Thus, leave 27.33 M1 armature inductance at default.
- Stop the drive via Drive composer.
- Set 27.22 Current reference source and 99.07 M1 used field exciter type back to their original settings.

Part 2, determine discontinuous current limit of the motor:



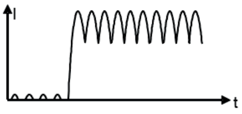
Continuous current Discontinuous current limit Discontinuous current

- Connect an oscilloscope at the fixed AO named IACT (XAO:4/5 on the SDCS-CON-H01).
- Connect Drive composer to the drive and choose local mode.
- Set 27.22 Current reference source = 27.23 Current reference external.
- Set 27.31 M1 discontinuous current limit to default.
- Set 99.07 M1 used field exciter type = None.
- Start the drive via Drive composer.
- Use Drive composer to increase the armature current reference.
- Make sure the motor is not turning (**Attention:** let the drive run only for a short time).
- Watch the current bubbles and increase the current reference until the current is continuous. See recordings above.
- Stop the drive via Drive composer.
- Set 27.22 Current reference source and 99.07 M1 used field exciter type back to their original settings.
- Copy the current reference used in Drive composer and paste it into 27.31 M1 discontinuous current limit.

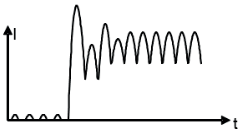
Part 3, manual tuning of the armature current controller:

- Connect an oscilloscope at the fixed AO named IACT (XAO:4/5 on the SDCS-CON-H01).
- Connect Drive composer to the drive and choose local mode.
- Set 27.22 Current reference source = 27.23 Current reference external.
- Set 99.07 M1 used field exciter type = None.
- Start the drive via Drive composer.
- Use Drive composer to set the current reference (must be higher than 27.31 M1 discontinuous current limit) and step the armature current controller.
- Make sure the motor is not turning (**Attention:** let the drive run only for a short time).
- Tune the armature current controller by means of 27.29 M1 current proportional gain and 27.30 M1 current integration time.

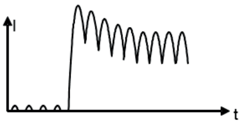
Armature current controller step responses:



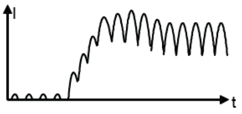
Optimal



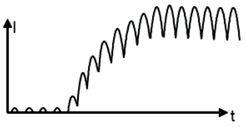
P-part too high



I-part too short



I-part too long

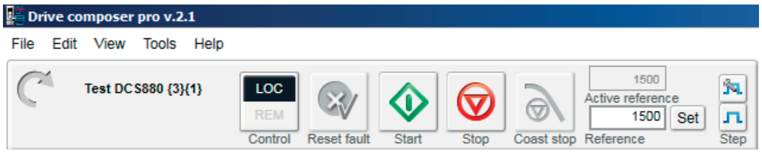


P-part too low and
i-part too long

- Stop the drive via Drive composer.
- Set 27.22 Current reference source and 99.07 M1 used field exciter type back to their original settings.

Analog tacho

In case an analog tacho is used for speed feedback it must be tuned.
Drive composer information:



Manual tuning of the analog tacho:

- Set speed and analog tacho parameters:
    - 30.11 M1 minimum speed.
    - 30.12 M1 maximum speed.
    - 31.30 M1 overspeed trip margin.
    - 94.08 M1 tacho voltage at 1000 rpm.
    - 99.14 M1 nominal (base) speed.
- The maximum tacho speed is calculated automatically and shown in 94.09 M1 tacho max displayable speed.

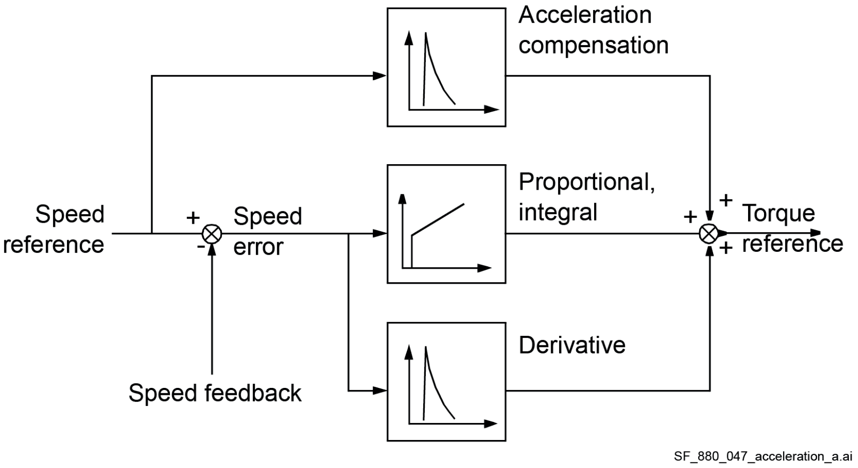
Analog tacho connections:

XTAC	Analog tacho	
1	AITACH+	±8 … 270 V_{DC}
2	AITACH-	

- Set 94.12 M1 tacho fine-tuning factor to default.
- Make sure that the drive is in EMF control, 90.41 M1 feedback selection = EMF.
- Start the drive via Drive composer.
- Use Drive composer to set a constant speed reference.
- Measure the speed feedback at the motor shaft using a handheld tacho.
- Rescale 94.12 M1 tacho fine-tuning factor in small steps, e.g. ± 0.01 until the measured speed feedback at the shaft and the measured speed feedback with the analog tacho match, see 94.03 Tacho speed.
- Stop the drive via Drive composer.

Speed controller

The figure below shows a simplified block diagram of the speed controller. The controller output is a torque reference.



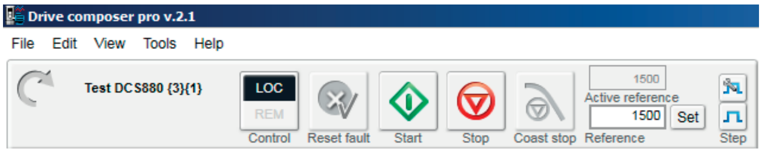
When tuning the drive, change one parameter at a time, then monitor the effect on the step response and possible oscillations. The effect of each parameter change must be checked over a wide speed range and not just at one point. The set speed controller values mainly depend on:

- The relationship between the motor power and the attached masses.
- Backlashes and natural frequencies of the attached mechanics (filtering).

The step response tests must be carried out at different speeds, from minimum up to maximum speed, at several different points. The whole speed range must also be tested carefully, e.g. at 25 % … 30 % of maximum speed (step must be in base speed range) and 80 % of maximum speed (step must be in field weakening area) to find any oscillation points.

A suitable speed step is about 2 % of maximum speed. A too large step reference or incorrect values of the speed controller might force the drives into torque/current limits, damage the mechanical parts (e.g. gear boxes) or cause tripping of the drive.

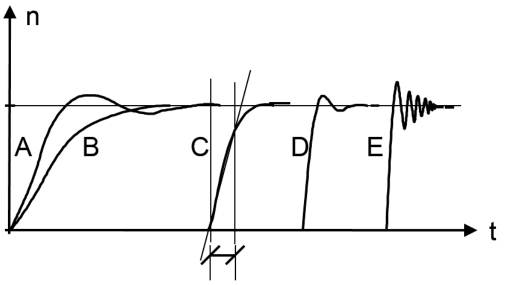
Drive composer information:



Manual tuning of the speed controller:

- Connect Drive composer to the drive and choose local mode.
- Monitor 24.01 Used speed reference and 24.02 Used speed feedback.
- Start the drive via Drive composer.
- Use Drive composer to set a constant speed reference.
- The step must bypass the ramp. Thus, use 24.11 Speed correction to step the speed controller.
- Tune the speed controller by means of 25.02 Speed proportional gain 1 and 25.03 Speed integration time 1.
  - Step size: 2 % of maximum speed (do not hit any torque or current limits during stepping).
  - Disable the i-part by setting 25.03 Speed integration time 1 = 0 ms.
  - Increase 25.02 Speed proportional gain 1 until the step response shows an overshoot.
  - Decrease 25.02 Speed proportional gain 1 by about 30 %.
  - Adjust 25.03 Speed integration time 1 in such a way, that there is no overshoot or only a slight overshoot, depending on the application (the function of the i-part is to reduce the difference between speed reference and speed feedback as quickly as possible).
  - Step response time: 100 ms (count only from 10 % … 90 %) in cold mills and 60 ms in rod and bar mills.
  - Where to step: 25 % … 30 % of maximum speed (step must be in base speed range) and 80 % of maximum speed (step must be in field weakening area).
  - Filter time ∆n: Above 30 ms. See 24.18 Speed error filter time 1 and 24.19 Speed error filter time 2.
  - Filter time speed feedback: E.g. 5 ms … 10 ms. See 90.42 Motor speed filter time.

Speed controller step responses:



A: Undercompensated, p-part too small and i-part too short
B: Undercompensated, p-part too small
C: Normal
D: Normal, when a low impact speed drop is required
E: Overcompensated, p-part too large and i-part too short

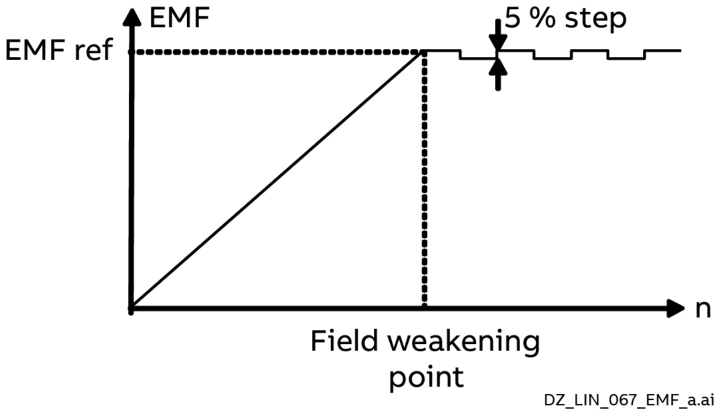
- Set 24.11 Speed correction = 0.00 rpm.
- Stop the drive via Drive composer.

EMF controller

The EMF controller must be tuned in case the motor needs to be used in the field weakening area and the drive trips on F503 Armature overvoltage during acceleration. The EMF controller needs to have a quick response. Usually 2 … 3 times slower than the field current controller.

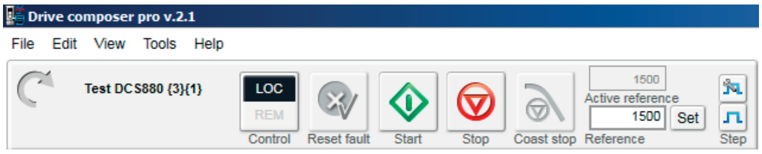
The tuning must be done in the field weakening area, because the EMF controller is blocked in the base speed range.

EMF reference for manual tuning EMF controller:



DZ_LIN_067_EMF_a.ai

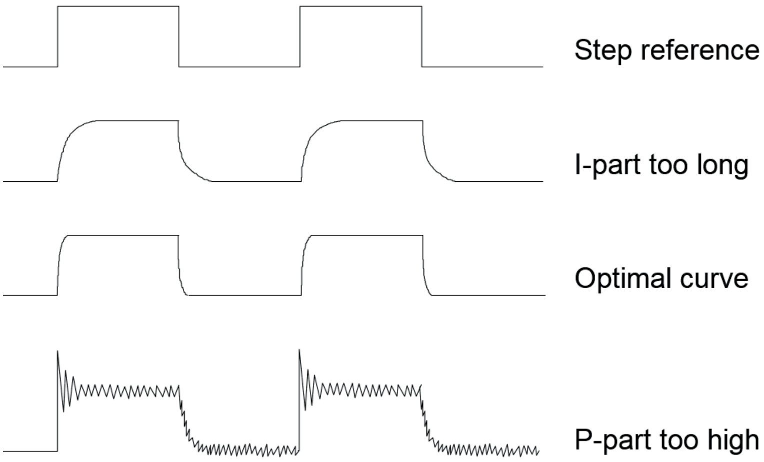
Drive composer information:



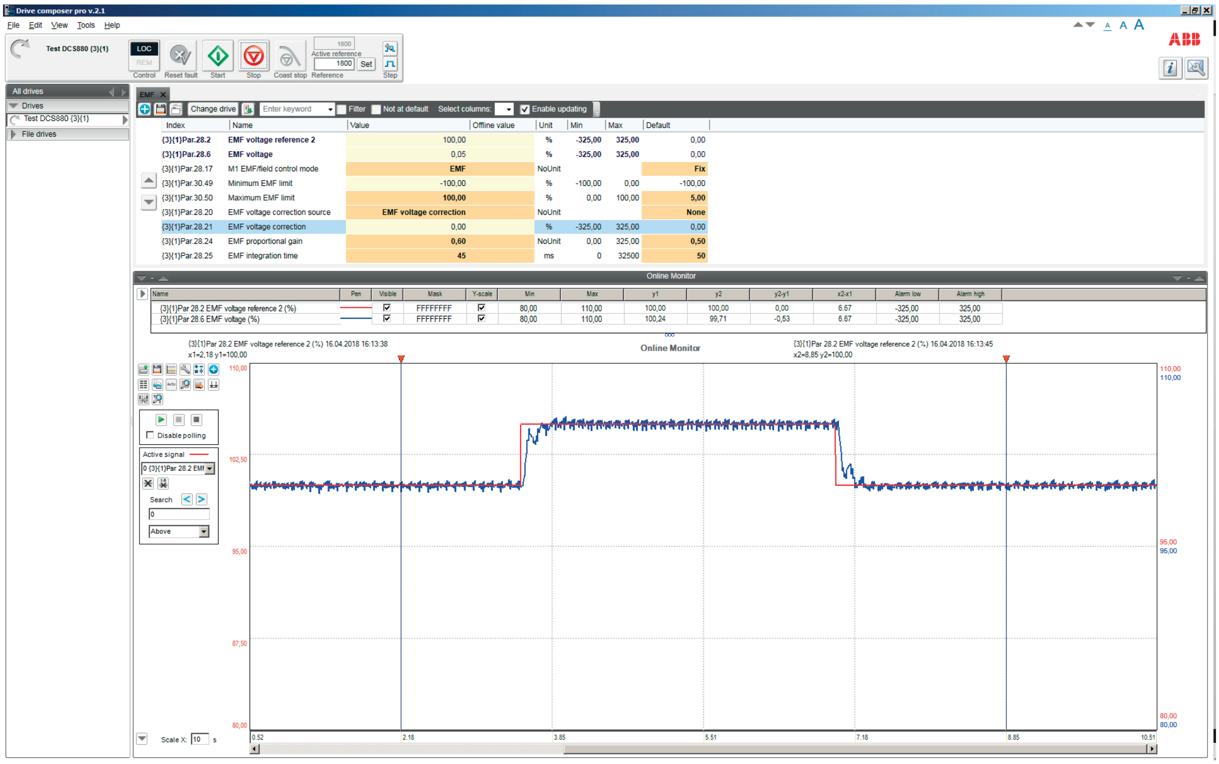
Manual tuning of the EMF controller:

- Connect Drive composer to the drive and choose local mode.
- Monitor 28.02 EMF voltage reference and 28.06 EMF voltage.
- Set 28.17 M1 EMF/field control mode = EMF.
- Set 28.20 EMF voltage correction source = EMF voltage correction.
- Set 30.49 Minimum EMF limit = -100.00 %.
- Set 30.50 Maximum EMF limit = 100.00 %.
- Start the drive via Drive composer.
- Use Drive composer to set a constant speed reference in the field weakening area.
- Use 28.21 EMF voltage correction to step the EMF controller.
- Tune the EMF controller by means of 28.24 EMF proportional gain and 28.25 EMF integration time.
  - Step size: 2 % … 5 % (do not hit any limits during stepping).
  - Step response time: 2 … 3 times slower than the field current controller.
  - Where to step: in the field weakening area.

EMF controller step responses:



Drive composer manual tuning of the EMF controller:



Active reference 1800

Index	Name	Value	Offline value	Unit	Min	Max	Default
{3}{1}Par.28.2	EMF voltage reference 2	100,00		%	-325,00	325,00	0,00
{3}{1}Par.28.6	EMF voltage	0,05		%	-325,00	325,00	0,00
{3}{1}Par.28.17	M1 EMF/field control mode	EMF		NoUnit			Fix
{3}{1}Par.30.49	Minimum EMF limit	-100,00		%	-100,00	0,00	-100,00
{3}{1}Par.30.50	Maximum EMF limit	100,00		%	0,00	100,00	5,00
{3}{1}Par.28.20	EMF voltage correction source	EMF voltage correction		NoUnit			None
{3}{1}Par.28.21	EMF voltage correction	0,00		%	-325,00	325,00	0,00
{3}{1}Par.28.24	EMF proportional gain	0,60		NoUnit	0,00	325,00	0,50
{3}{1}Par.28.25	EMF integration time	45		ms	0	32500	50

Name	Pen	Visible	Mask	Y-scale	Min	Max	y1	y2	y2-y1	x2-x1	Alarm low	Alarm high
{3}{1}Par 28.2 EMF voltage reference 2 (%)		☑	FFFFFFFF	☑	80,00	110,00	100,00	100,00	0,00	6.67	-325,00	325,00
{3}{1}Par 28.6 EMF voltage (%)		☑	FFFFFFFF	☑	80,00	110,00	100,24	99,71	-0,53	6.67	-325,00	325,00

{3}{1}Par 28.2 EMF voltage reference 2 (%) 16.04.2018 16:13:38
x1=2,18 y1=100,00

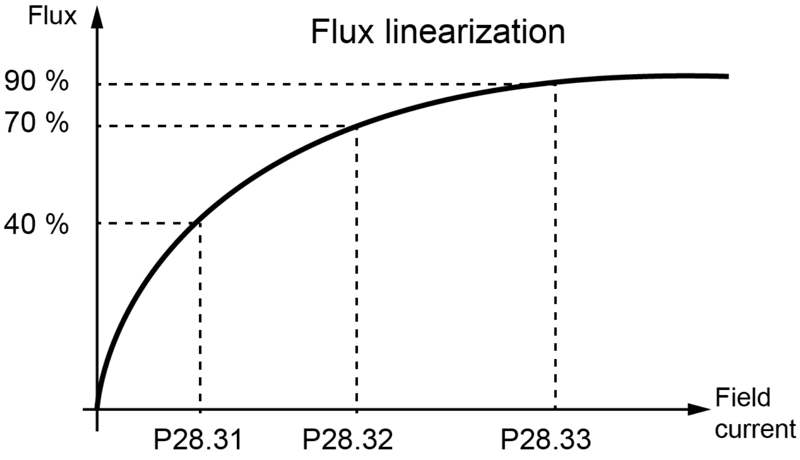
{3}{1}Par 28.2 EMF voltage reference 2 (%) 16.04.2018 16:13:45
x2=8,85 y2=100,00

- Set 28.20 EMF voltage correction source = Zero.
- Set 28.21 EMF voltage correction = 0.00 %,
- Stop the drive via Drive composer.
- Set 28.17 M1 EMF/field control mode, 30.49 Minimum EMF limit and 30.50 Maximum EMF limit back to their original settings.

Flux linearization

In case the motor needs to be used in the field weakening area the flux linearization must be set. The flux linearization is needed because of the non-linear relation of flux and field current due to saturation effects of the field winding.

Flux of DC-motor versus field current:



DZ_LIN_044_Flux linear_b.ai

The magnetization of the motor starts to saturate at a certain field current and thus the flux does not increase linearly. For this reason, the field current cannot be directly used to calculate the flux inside the motor.

In base speed area EMF and speed are directly proportional because the flux is kept constant:

$$n = \frac{k * EMF}{\Phi}$$

k = constant

Φ = Flux

Example: If the nominal armature voltage is 440 V_{DC} and the motor is running at half speed with full flux, then the armature voltage is about 220 V_{DC}. Now the flux is reduced to 50 % at constant speed, then the armature voltage drops to about 110 V_{DC}.

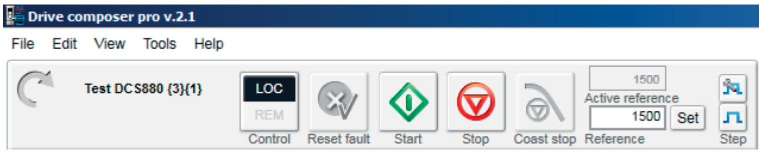
Since the EMF is directly proportional to the flux it is possible to define a relationship between the field current and the flux by means of measuring the armature voltage without load (= EMF).

Thus, the main idea of the flux linearization is to find field currents which produces desired EMF-voltage at a certain speed. The flux linearization is done by means of a function block defined by 3 values:

- 28.31 Field current at 40 % flux.
- 28.32 Field current at 70 % flux.
- 28.33 Field current at 90 % flux.

The intermediate values are interpolated. During commissioning all 3 parameters must be set, if the flux linearization is needed.

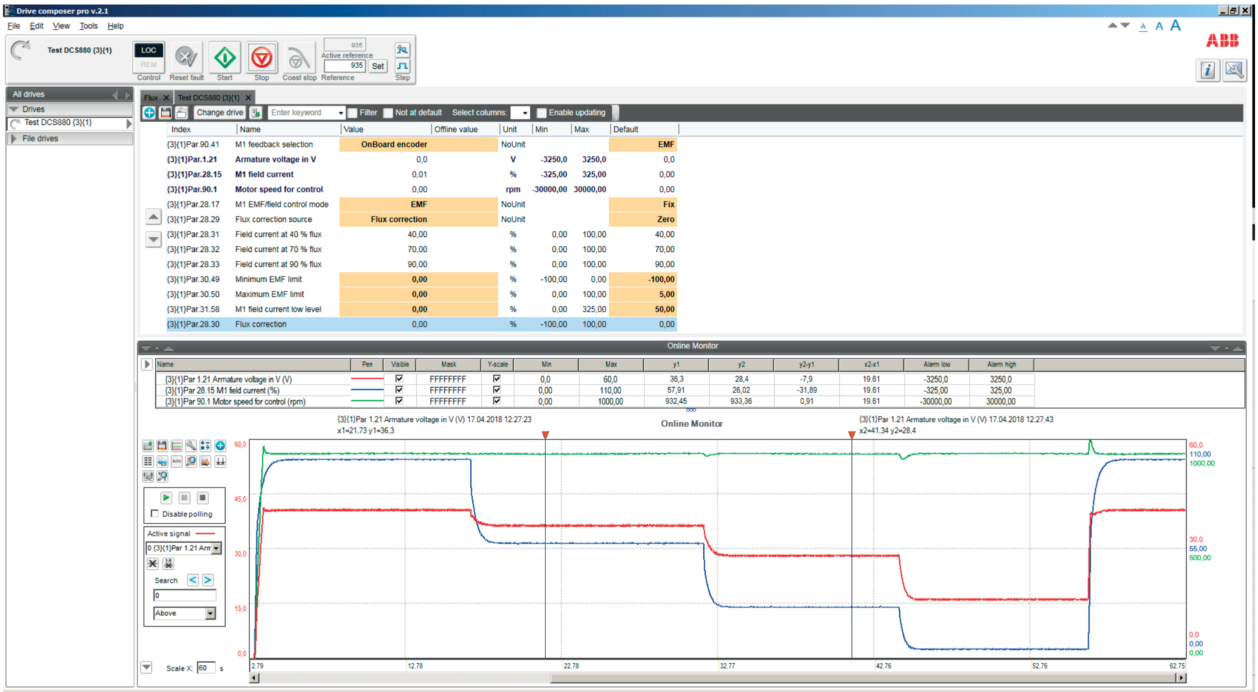
Drive composer information:



Manual tuning of the flux linearization:

- Connect Drive composer to the drive and choose local mode.
- Make sure the speed feedback is encoder or analog tacho, 90.41 M1 feedback selection = OnBoard encoder, Encoder 1, Encoder 2 or Tacho and not EMF or EMF voltage!
- Monitor 01.21 Armature voltage in V, 28.15 M1 field current and 90.01 Motor speed for control.
- Set 28.17 M1 EMF/field control mode = EMF.
- Set 28.29 Flux correction source = Flux correction.
- Set 28.31 Field current at 40 % flux, 28.32 Field current at 70 % flux and 28.33 Field current at 90 % flux to default.
- Set 30.49 Minimum EMF limit = 0.00 %.
- Set 30.50 Maximum EMF limit = 0.00 %.
- Set 31.58 M1 field current low level = 10.00 % or lower.
- Start the drive via Drive composer.
- Use Drive composer to run the motor at e.g. half base speed.
- Make sure, that the motor is running without load.
- Read 01.21 Armature voltage in V, e.g. the measured value is 220 V_{DC} (this is the 1st measurement).
- Reduce the flux with 28.30 Flux correction (negative value) until 01.21 Armature voltage in V reaches 90 % of the 1st measurement.
- Read the value of 28.15 M1 field current, keep it in mind and write it into 28.33 Field current at 90 % flux after this procedure is finished.
- Reduce the flux with 28.30 Flux correction (negative value) until 01.21 Armature voltage in V reaches 70 % of the 1st measurement.
- Read the value of 28.15 M1 field current, keep it in mind and write it into 28.32 Field current at 70 % flux after this procedure is finished.
- Reduce the flux with 28.30 Flux correction (negative value) until 01.21 Armature voltage in V reaches 40 % of the 1st measurement.
- Read the value of 28.15 M1 field current, keep it in mind and write it into 28.31 Field current at 40 % flux after this procedure is finished.

Drive composer manual tuning of the flux linearization:



Index	Name	Value	Offline value	Unit	Min	Max	Default
{3}{1}Par.90.41	M1 feedback selection	OnBoard encoder		NoUnit			EMF
{3}{1}Par.1.21	**Armature voltage in V**	0,0		**V**	**-3250,0**	**3250,0**	0,0
{3}{1}Par.28.15	**M1 field current**	0,01		**%**	**-325,00**	**325,00**	0,00
{3}{1}Par.90.1	**Motor speed for control**	0,00		**rpm**	**-30000,00**	**30000,00**	0,00
{3}{1}Par.28.17	M1 EMF/field control mode	EMF		NoUnit			Fix
{3}{1}Par.28.29	Flux correction source	Flux correction		NoUnit			Zero
{3}{1}Par.28.31	Field current at 40 % flux	40,00		%	0,00	100,00	40,00
{3}{1}Par.28.32	Field current at 70 % flux	70,00		%	0,00	100,00	70,00
{3}{1}Par.28.33	Field current at 90 % flux	90,00		%	0,00	100,00	90,00
{3}{1}Par.30.49	Minimum EMF limit	0,00		%	-100,00	0,00	-100,00
{3}{1}Par.30.50	Maximum EMF limit	0,00		%	0,00	100,00	5,00
{3}{1}Par.31.58	M1 field current low level	0,00		%	0,00	325,00	50,00
{3}{1}Par.28.30	Flux correction	0,00		%	-100,00	100,00	0,00

Name	Pen	Visible	Mask	Y-scale	Min	Max	y1	y2	y2-y1	x2-x1	Alarm low	Alarm high
{3}{1}Par 1.21 Armature voltage in V (V)	—	☑	FFFFFFFF	☑	0,0	60,0	36,3	28,4	-7,9	19.61	-3250,0	3250,0
{3}{1}Par 28.15 M1 field current (%)	—	☑	FFFFFFFF	☑	0,00	110,00	57,91	26,02	-31,89	19.61	-325,00	325,00
{3}{1}Par 90.1 Motor speed for control (rpm)	—	☑	FFFFFFFF	☑	0,00	1000,00	932,45	933,36	0,91	19.61	-30000,00	30000,00

{3}{1}Par 1.21 Armature voltage in V (V) 17.04.2018 12:27:23
x1=21,73 y1=36,3

{3}{1}Par 1.21 Armature voltage in V (V) 17.04.2018 12:27:43
x2=41,34 y2=28,4

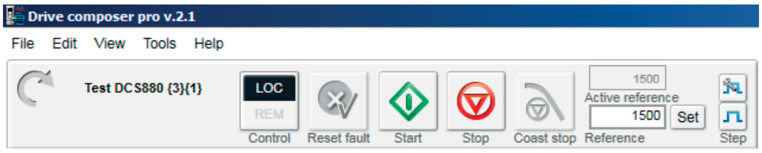
- Set 28.29 Flux correction source = Zero.
- Set 28.30 Flux correction = 0.00 %.
- Stop the drive via Drive composer.
- Set 28.31 Field current at 40 % flux, 28.32 Field current at 70 % flux and 28.33 Field current at 90 % flux to the determined values.
- Set 28.17 M1 EMF/field control mode, 30.49 Minimum EMF limit, 30.50 Maximum EMF limit and 31.58 M1 field current low level back to their original settings.

Thyristor test

Thyristor diagnosis basically provides two possibilities:

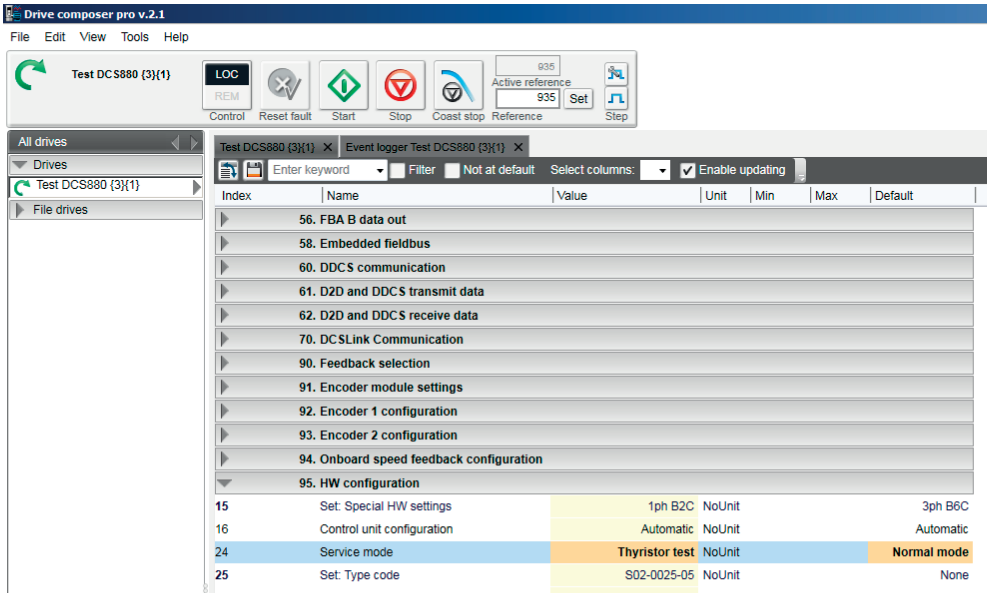
- Check all thyristors of the drive for proper function.
- Check individual firing pulses.

Drive composer information:



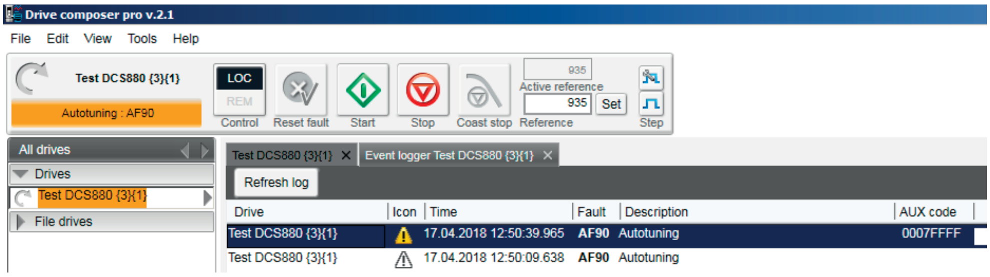
Check all thyristors of the drive for proper function:

- Connect Drive composer to the drive and choose local mode.
- For drives size H5 … H8 make sure, that 99.11 M1 nominal current is set to 50 A or higher.
- Set 95.24 Service mode = Thyristor test.
- Start the drive via Drive composer.



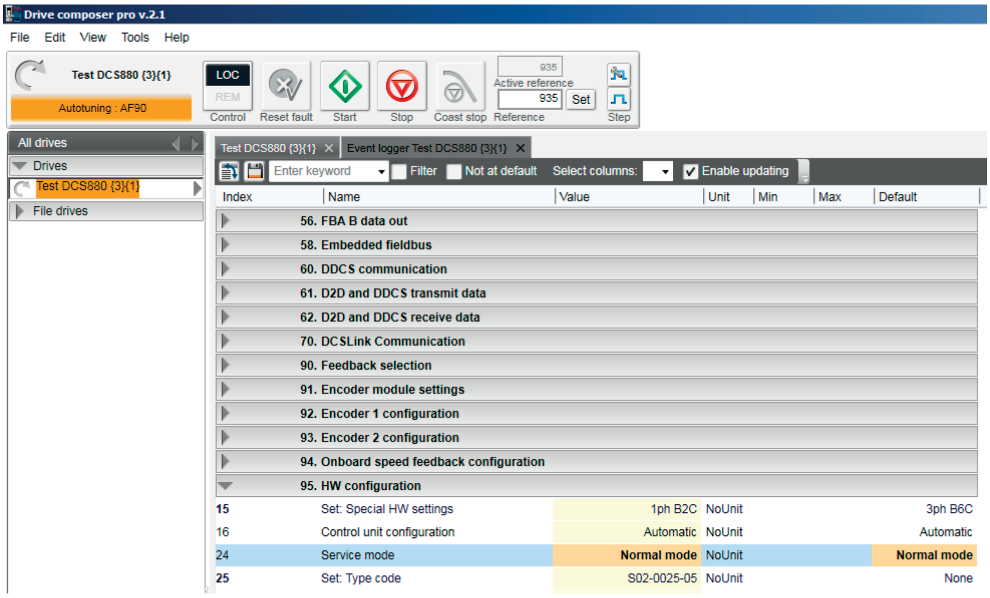
Index	Name	Value	Unit	Min	Max	Default
	56. FBA B data out					
	58. Embedded fieldbus					
	60. DDCS communication					
	61. D2D and DDCS transmit data					
	62. D2D and DDCS receive data					
	70. DCSLink Communication					
	90. Feedback selection					
	91. Encoder module settings					
	92. Encoder 1 configuration					
	93. Encoder 2 configuration					
	94. Onboard speed feedback configuration					
	95. HW configuration					
15	Set: Special HW settings	1ph B2C	NoUnit			3ph B6C
16	Control unit configuration	Automatic	NoUnit			Automatic
24	Service mode	Thyristor test	NoUnit			Normal mode
25	Set: Type code	S02-0025-05	NoUnit			None

- The mains contactor is closed, and the thyristor test is started.
- The result is written into the AUX code of warning AF90 Autotuning after the thyristor test is finished.



Drive	Icon	Time	Fault	Description	AUX code
Test DCS880 {3}{1}	⚠	17.04.2018 12:50:39.965	AF90	Autotuning	0007FFFF
Test DCS880 {3}{1}	⚠	17.04.2018 12:50:09.638	AF90	Autotuning	

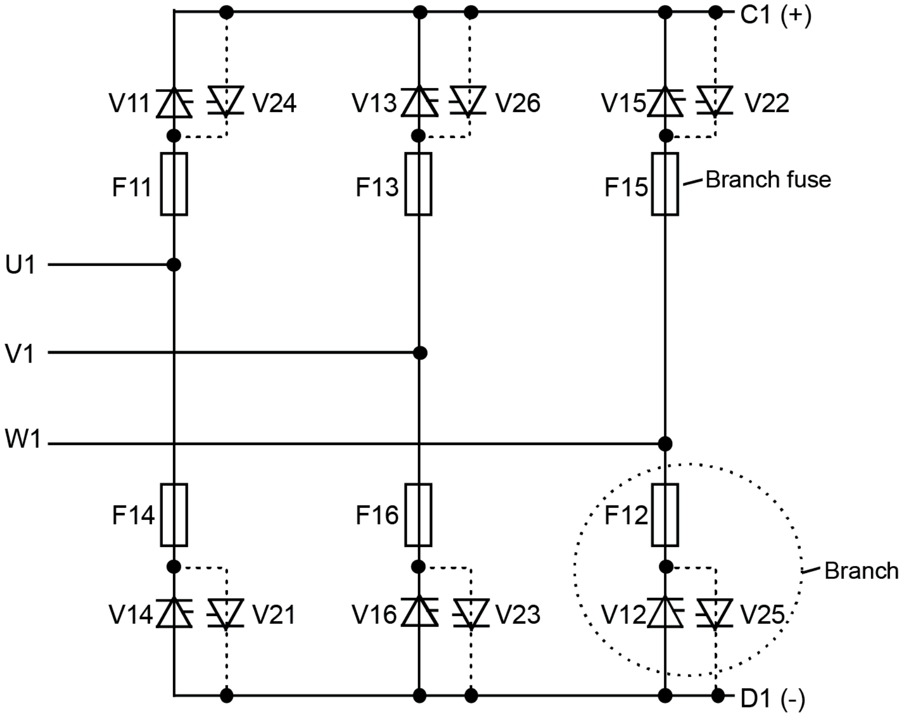
- The 95.24 Service mode is automatically set back to Normal mode.
- The drive is automatically switched off.



Index	Name	Value	Unit	Min	Max	Default
	56. FBA B data out					
	58. Embedded fieldbus					
	60. DDCS communication					
	61. D2D and DDCS transmit data					
	62. D2D and DDCS receive data					
	70. DCSLink Communication					
	90. Feedback selection					
	91. Encoder module settings					
	92. Encoder 1 configuration					
	93. Encoder 2 configuration					
	94. Onboard speed feedback configuration					
	95. HW configuration					
15	Set: Special HW settings	1ph B2C	NoUnit			3ph B6C
16	Control unit configuration	Automatic	NoUnit			Automatic
24	Service mode	Normal mode	NoUnit			Normal mode
25	Set: Type code	S02-0025-05	NoUnit			None

Check individual firing pulses:

- Make sure, that the mains contactor cannot close (e.g. disconnect the digital output controlling the mains contactor) or that the mains voltage is off (e.g. high voltage breaker is open).
- Connect a current clamp to one of the firing pulse cables.
- Connect Drive composer to the drive and choose local mode.
- For drives size H5 ... H8 make sure, that 99.11 M1 nominal current is set to 50 A or higher.
- Set 95.24 Service mode = Firing pulses V11 … Firing pulses V26 depending individual firing pulse to be checked.



SF_DCS_003_principle_b.ai

- Make sure, that the mains voltage is zero.
- Check the firing pulse with the current clamp.
- Set 95.24 Service mode back to Normal mode.
- Cycle power, otherwise, the drive will not start after checking individual firing pulses.

Using the control panel

Refer to the ACX-AP-x assistant control panel's user's manual (3AUA0000085685).

Firmware description

What this chapter contains

This chapter describes how to control the drive with standard firmware.

Identification of the firmware versions

The DCS880 is controlled by an electronic unit (3ADT220166R0002). This electronic unit includes the SCDS-CON-H01. The firmware version details of the armature converter can be checked from:

- 07.02 Power unit set.
- 07.05 Firmware version.
- 07.04 Firmware name.

The firmware version details of the field exciters can be checked from:

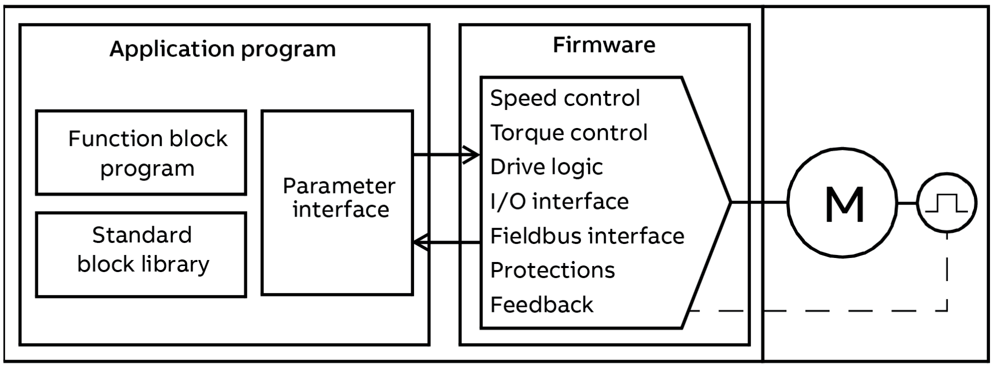
- 07.68 M1 field exciter type.
- 07.69 M1 field exciter firmware version.
- 07.72 M2 field exciter type.
- 07.73 M2 field exciter firmware version.

Drive configuration and programming

The drive control program is divided into two parts:

- Firmware.
- Application program.

Drive control program



SB_880_023_application_a.ai

The firmware performs the main control functions, including speed- and torque control, drive logic (start/stop), I/O- and fieldbus interface, protection and feedback. Firmware functions are configured and programmed using parameters and can be extended by application programming.

Parameters

Parameters configure all standard drive operations and can be set via control panel, Drive composer or, fieldbus interface.
All parameter settings are stored automatically to the flash memory of the drive.
Additionally, they can be manually saved using 96.16 Parameter save manually.
The default parameter values can be restored using 96.15 Parameter restore.

Adaptive Program

Conventionally, the user can control the operation of the drive by parameters. However, the standard parameters have a fixed set of choices or a setting range. To further customize the operation of the drive, an Adaptive Program can be constructed out of a set of function blocks.
Drive composer includes the Adaptive Program using a graphical user interface for building the custom program. The function blocks include the usual arithmetic and logical functions, as well as e.g. selection,

comparison and timer blocks. The program can contain a up to 20 blocks. The Adaptive Program is executed on a 10 ms time level.

To connect inputs to the program, the user interface has pre-selections for the physical inputs, common actual values, and other status information of the drive. Parameter values as well as constants can be defined as inputs. The output of the program can be used e.g. as a start signal, external event, reference or connected to the drive outputs.

Note: Connecting an output of the Adaptive Program to a selection parameter will write-protect the parameter.

The status of the Adaptive Program is shown in 07.30 Adaptive program status. The Adaptive Program can be disabled by 96.70 Disable adaptive program.

For more information, see manual Adaptive programming application guide (3AXD50000028574).

Application program

The functions of the firmware can be extended with an application program. The memory unit for the application program is available as option using +S551.

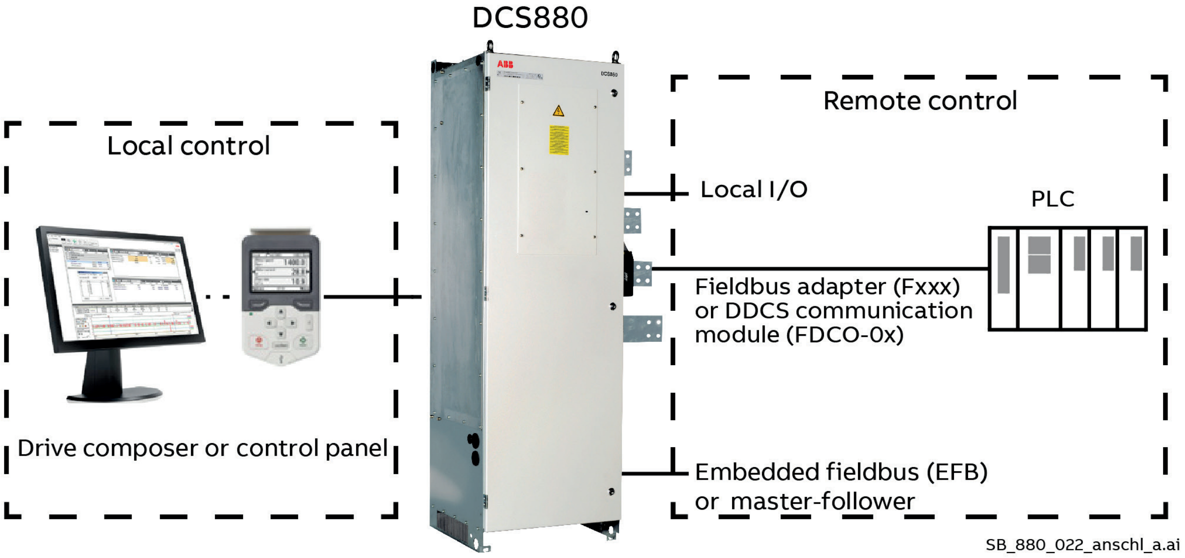
Application programs can be built out of function blocks based on the IEC 61131-3 standard using a PC tool available separately.

For more information, see manual Programming manual: Drive application programming (IEC 61131-3) (3AUA0000127808).

Control locations and operating modes

Local control versus remote control

The DCS880 has two main control locations. They are remote control and local control. The control location is selected with the Loc/Rem key on the control panel or in the PC tool.



SB_880_022_anschl_a.ai

Local control

When the drive is set to local control the control commands are given from:

- The control panel, see groups 19 Operation mode and 49 Panel port communication.
- A PC equipped with Drive composer, see chapter Connect a DCS880 and a PC running Drive composer.

Speed and torque control modes are available for local control, see 19.16 Local control mode.

Local control is mainly used during commissioning and maintenance. The control panel always overrides the remote control signal sources when used in local control. Changing the control location to local can be prevented by 96.08 Local control.

The user can select by 49.05 Communication loss action how the drive reacts to a control panel or Drive composer communication break.

Note: 49.05 Communication loss action has no effect in remote control.

Remote control

When the drive is in remote control, control commands are given through:

- Hardware signals, see 20.01 Command location = Local I/O.
- Serial communication via the embedded fieldbus (EFB), chapter Fieldbus control via embedded fieldbus (EFB).
- Serial communication via fieldbus adapter A, see chapter Fieldbus control via a fieldbus adapter.
- Serial communication via fieldbus adapter B, see chapter Fieldbus control via a fieldbus adapter.
- Adaptive Program or application program, see chapter Drive configuration and programming.
- Master-follower link communication, see chapter Master-follower link.
- DDCS communication to e.g. AC 800M, see chapter DDCS controller interface.
- 12-pulse, see chapter 12-pulse.

Two remote control locations, EXT1 and EXT2, are available. The operating mode can be selected separately for each location, see group 19 Operation mode, which enables quick switching between different operating modes, for example speed and torque control. Selection between EXT1 and EXT2 is done via a digital input, see 19.11 Ext1/Ext2 selection.

The control location selection is checked on a 2 ms time level.

Operating modes of the drive

The drive can operate in several operating modes with different types of reference. The mode is selectable for each control location individually, see group 19 Operation mode.

Speed control mode

The motor follows a speed reference given to the drive. This mode can be used either with EMF speed feedback or with analog tacho, encoder or resolver for better speed control accuracy.

Speed control mode is available in both local- and remote control.

Torque control mode

Motor torque follows a torque reference given to the drive, e.g. as a follower in the Master-follower link.

Torque control mode is available in both local- and remote control.

Current control mode

Motor current follows a current reference given to the drive, see 27.22 Current reference source.

If current control mode is chosen by 27.22 Current reference source, it is available in both local- and remote control.

Start/Stop sequences

General

The drive is controlled by 06.09 Used main control word. 06.15 Main status word provides the handshake and interlocking for the overriding control.

To command the drive, the overriding control uses either hardware signals or serial communication. The drive provides several different control words for different serial communication. These control words are chosen by 06.08 Main control word source. The actual status of the drive is displayed in 06.15 Main status word.

The marks (e.g. ❶) describe the order of the commands according to Profibus standard. The overriding control can be:

- Hardware signals, see 20.01 Command location = Local I/O.
- Serial communication via the embedded fieldbus (EFB), chapter Fieldbus control via embedded fieldbus (EFB).
- Serial communication via fieldbus adapter A, see chapter Fieldbus control via a fieldbus adapter.
- Serial communication via fieldbus adapter B, see chapter Fieldbus control via a fieldbus adapter.
- Adaptive Program or application program, see chapter Drive configuration and programming.
- Master-follower link communication, see chapter Master-follower link.
- DDCS communication to e.g. AC 800M, see chapter DDCS controller interface.
- 12-pulse, see chapter 12-pulse.

Switch on sequence

Examples for 06.09 Used main control word:

		Remote command	Inching 2	Inching 1	Reset	Ramp in zero	Ramp halt	Ramp out zero	Run	Off3 control	Off2 control	Off2 control		
06.09 Used main control bit:	15 ... 11	10	09	08	07	06	05	04	03	02	01	00	Dec.	Hex.
Reset		1	x	x	1	x	x	x	x	x	x	x	1270	04F6
Off (before On)		1	0	0	0	x	x	x	0	1	1	0	1142	0476
On (mains contactor on)		1	0	0	0	x	x	x	0	1	1	1	1143	0477
Run (with reference)		1	0	0	0	1	1	1	1	1	1	1	1151	047F
Emercency stop		1	x	x	x	1	1	1	1	0	1	1	1147	047B
Emercency off		1	x	x	x	x	x	x	x	x	0	x	1140	0474

TG_001_880_sequence_a.ai

Start the drive

The start sequence given below is only valid for 20.33 Mains contactor control mode = On.
Attention: All signals must be maintained. On and Run commands are only taken over with their rising edges.

Overriding Control **06.09 Used main control word**		**Drive** **06.15 Main status word**
		When the drive is ready to close the mains contactor Ready on state is set.
	➊	⇐ Ready on = 1; (bit 0).
The overriding control gives an On command. On = 1; (bit 0) ⟹	➋	
		The drive closes the mains contactor, the field contactor and the contactors for converter and motor fans. After the mains voltage and all acknowledges are checked and the field current is established, the drive sets state Ready run.
	➌	⇐ Ready run = 1; (bit 1)
The overriding control gives a Run command. Run = 1; (bit 3) ⟹	➍	
		The drive releases the ramp, all references, all controllers and sets state Ready reference.
	➎	⇐ Ready reference = 1; (bit 2)
Now the drive follows the speed or torque references.		

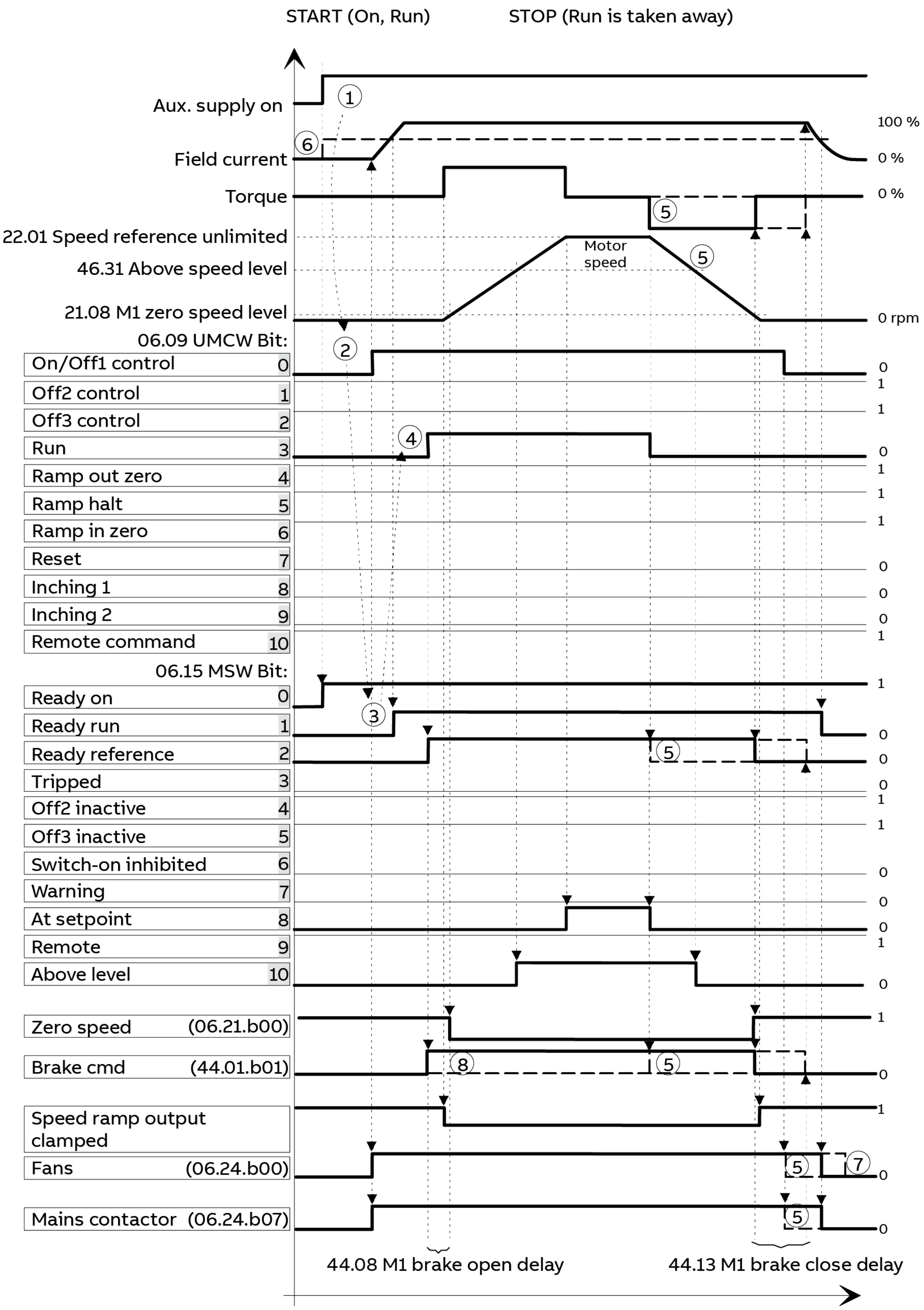
Note: To give On and Run commands at the same time set 20.02 On/Off1 source = 20.06 Run/Stop source.

Stop the drive

The drive can be stopped in two ways, either by taking away the On command directly which opens all contactors as fast as possible after stopping the drive according to 21.02 Off1 Mode or by means of the following sequence.

Overriding Control **06.09 Used main control word**		**Drive** **06.15 Main status word**
The overriding control removes the Run command.		
Run = 0; (bit 3) ⟹	❶	
		In speed control mode, the drive stops according to 21.04 Stop mode. In torque control mode, the torque reference is reduced to zero according to 26.19 Torque ramp down time. When zero speed or zero torque is reached the state Ready reference is removed.
	❷	⟸ Ready reference = 0; (bit 2)
The overriding control can keep the On command if the drive must be started up again.		
The overriding control removes On		
On = 0; (bit 0) ⟹	❸	
		All contactors are opened, the fan contactors stay in according to 20.40 Drive/Motor fan delay time, and the state Ready run is removed.
	❹	⟸ Ready run = 0; (bit 1)

Besides in 06.15 Main status word, the drive’s state is shown in 06.16 Drive status word 1, 06.17 Drive status word 2 and 06.18 Drive status word 3.



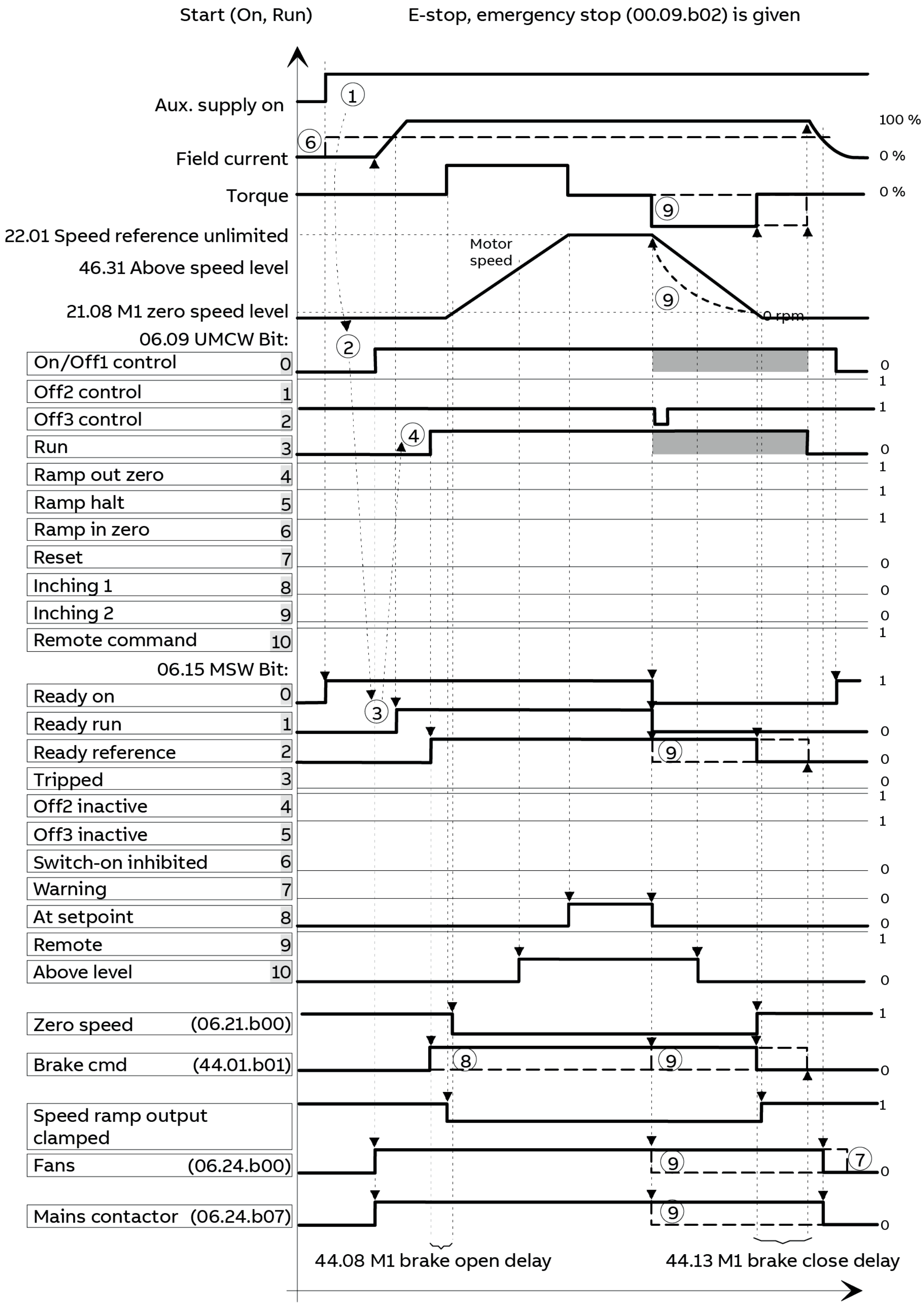
⑤ Behavior depends on 21.02 Off1 mode and 21.04 Stop mode.

⑥ Behavior depends on 28.36 M1 field heating source and 31.58 M1 field current low level.

⑦ Behavior depends on 20.40 Drive/Motor fan delay time.

⑧ Behavior depends on 44.06 M1 brake control enable.

DZ_LIN_66_start stop seq_b.ai



⑤ Behavior depends on 21.02 Off1 mode and 21.04 Stop mode.

⑥ Behavior depends on 28.36 M1 field heating source and 31.58 M1 field current low level.

⑦ Behavior depends on 20.40 Drive/Motor fan delay time.

⑧ Behavior depends on 44.12 M1 brake close request.

⑨ Behavior depends on 21.03 Emergency stop mode (e.g. coast stop, dynamic braking).

▨ Don't care.

DZ_LIN_66_start stop seq_b.ai

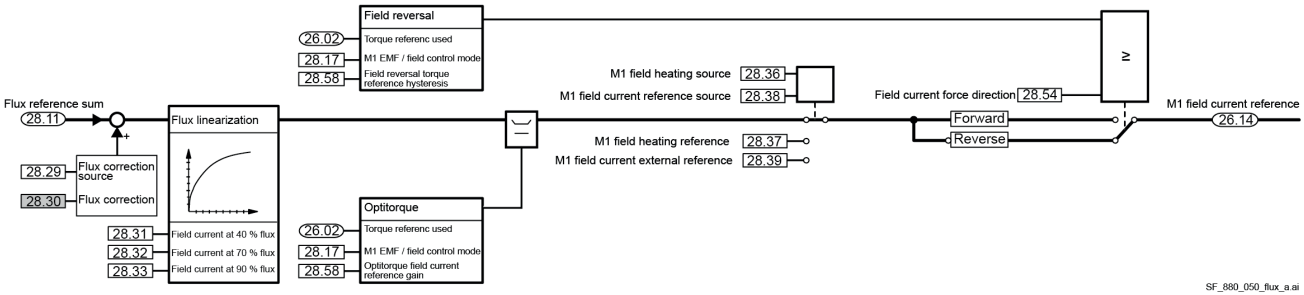
Field excitation

General

Depending on the application the DCS880 has the capability to use several different kinds of field exciters or combinations of them. The differences of the field exciters and their functions are explained here.
The field current controller is in the field exciters and the EMF controller resided in the armature converter.

Field Reversal

Changing the field current direction and torque direction might be needed when the armature converter has only one bridge (2-Q). Field reversal is changing the field current direction and the torque direction. Also, the speed feedback monitoring functions are adapted. Thus, it is possible to regenerate energy back into the mains.
To initiate the field reversal the sign of 26.02 Torque reference used is taken and defines the desired direction of the field current. The change of the field current direction and torque direction is time consuming. It takes 0.5 … 3 seconds. Thus, field reversal is too slow for high performance applications. It is typical used for propulsion, pumps, E-stop or other low performance applications.
Armature converters with two anti-parallel bridges (4-Q) do not require field reversal.
Attention: Field reversal for motor 2 is possible using the field current reference of motor 1.



Field control

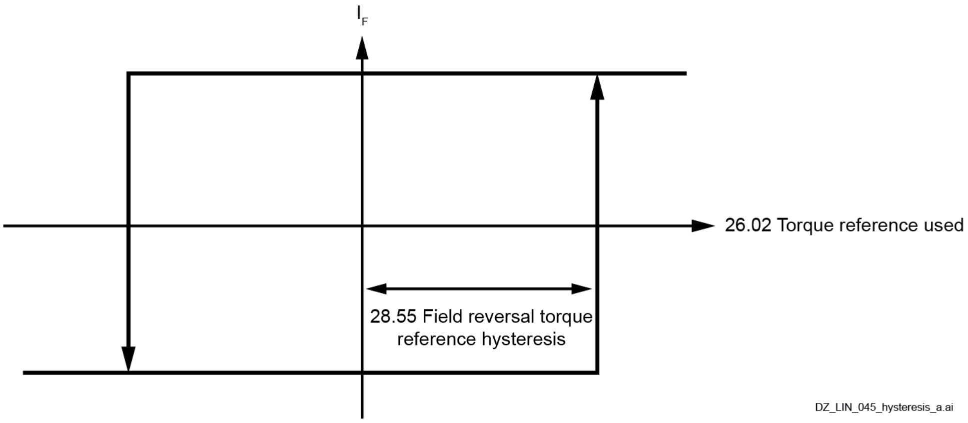
Field reversal is activated by means of 28.17 M1 EMF/field control mode:

Mode	**Functionality**	**Armature converter**	**EMF speed feedback possible**
0: **Fix**	Constant field (no field weakening), EMF controller blocked, field reversal blocked, optitorque blocked.	2-Q or 4-Q	Yes
1: **EMF**	Field weakening active, EMF controller released, field reversal blocked, optitorque blocked.	2-Q or 4-Q	No
2: **Fix/reversal**	Constant field (no field weakening), EMF controller blocked, field reversal active, optitorque blocked.	2-Q	Yes
3: **EMF/reversal**	Field weakening active, EMF controller released, field reversal active, optitorque blocked.	2-Q	No
4: **Fix/optitorque**	Constant field (no field weakening), EMF controller blocked, field reversal blocked, optitorque active.	2-Q or 4-Q	No

5: **EMF/optitorque**	Field weakening active, EMF controller released, field reversal blocked, optitorque active.	2-Q or 4-Q	No
6: **Fix/reversal/optitorque**	Constant field (no field weakening), EMF controller blocked, field reversal active, optitorque active.	2-Q	No
7: **EMF/reversal/optitorque**	Field weakening active, EMF controller released, field reversal active, optitorque active.	2-Q	No

Field reference hysteresis

To prevent field reversal from continuous toggling due to a too small torque reference, a torque reference hysteresis is available. The hysteresis is symmetrical and is set by 28.55 Field reversal torque reference hysteresis:



Force field current direction

With 28.54 Field current force direction it is possible to force and clamp the field current direction. This gives the user the possibility to control the field current direction or change it in case of need. Thus, unnecessary field current changes at low torque are prevented and it is also possible to release field reversal for certain occasions, e.g. jogging or E-stop.

Time for field reversal

The time for field reversal can be reduced by increasing the input voltage of the field exciter and/or using Optitorque.

Please note that the output voltage of the field exciter is limited by means of 28.44 M1 field control voltage limit or 42.59 M2 field control voltage limit (only valid for DCF804-0050/0060). This can also increase the time for field reversal.

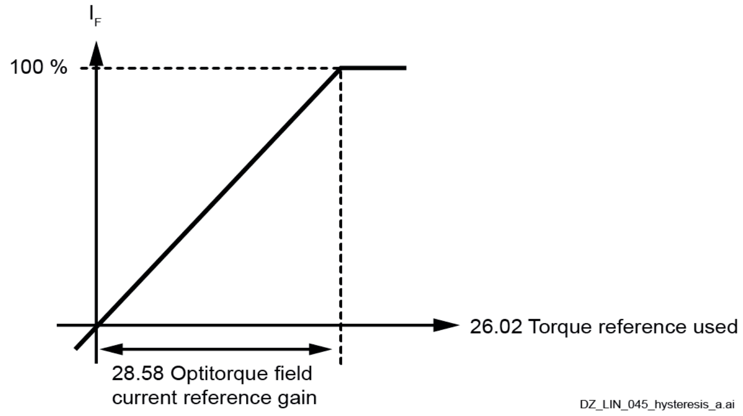
Bump-less transition

The output of the speed ramp is updated by means of the actual speed to ensure a bump-less transition (no speed steps), when 27.38 Reversal delay is longer than 25 ms and 27.41 Reversal mode = Soft.

Optitorque

Due to high inductances of motor fields, the field reversal takes a relatively long time. In certain cases, this time can be reduced by means of optitorque. See 28.17 M1 EMF/field control mode. In case the process requires only a small torque during field reversal, the field current is decreased, and the armature current is increased prior to the field current change. This quickens the field reversal. The rate of the field current reduction depends on the process. E.g. if the speed direction is changed rather slowly, the required torque may also be quite small. This allows the reduction of the field current. Thus, by means of optitorque it is possible to shorten the field reversal time.

Field current reference gain
In optitorque mode the field current will be reduced proportionally to 26.02 Torque reference used. The relation between 26.02 Torque reference used and field current is defined by 28.58 Optitorque field current reference gain:



For example, with 28.58 Optitorque field current reference gain = 20 %, 100 % field current is generated at 26.02 Torque reference used = 20 %.

Field current monitoring

Field minimum trip
During normal operation the field current is compared with 31.58 M1 field current low level. The drive generates fault F541 M1 field exciter low current if the field current drops below this limit and is still undershot when 31.57 Minimum field current trip delay is elapsed.
During field reversal the situation is different. 31.58 M1 field current low level is disabled for 28.17 M1 EMF/field control mode = Fix/optitorque, EMF/optitorque, Fix/reversal/optitorque or EMF/reversal/optitorque. In this case the trip level is automatically set to 50 % of 28.14 M1 field current reference. The drive generates fault F541 M1 field exciter low current if 50 % of 28.14 M1 field current reference is still undershot when 31.57 Minimum field current trip delay is elapsed.

Flux reversal
If actual flux and armature voltage of the motor cannot follow the field current during field reversal it is necessary to delay the active field direction. 28.57 Field reversal flux monitoring delay is the maximum allowed time within 28.15 M1 field current and the internal motor flux do not correspond to each other during field reversal. During this time faults 7301 Motor speed feedback and 73A1 Load speed feedback are disabled.

Field reversal hysteresis
The sign of 28.15 M1 field current is used to generate the field reversal acknowledge. To avoid signal noise problems a small hysteresis, defined by means of 28.56 Field reversal field current hysteresis, is needed.

Field reversal active
While the field reversal is in progress, see 06.25.b11 Current controller status word 2, following is valid:
- The current controller is blocked.
- The I-part of the speed controller frozen.
- The output of the speed ramp is updated by means of the actual speed, when 27.38 Reversal delay is longer than 25 ms and 27.41 Reversal mode = Soft.

Field heating/reducing

Overview

Field heating/Field economy (also referred to as “field warming”) is used for a couple of reasons.

- Keep moisture out of the motor. The moisture could reduce the isolation resistance.
- To reduce field losses. Decreasing the field current saves energy during no running operation. It can be applied for all motors where a field current ramp up is acceptable.
- To reduce the temperature increase of the motor if the torque is not needed.
- For all motors with reduced cooling capacities and a short duty cycle (e.g. gantry motors without cooling fans).
- Is typically for shared motion.

During field heating the cooling fans are off. As soon as full field current is applied the cooling fans are switched on. Following parameters are used to turn on and control field heating:

- 28.36 M1 field heating source.
- 28.37 M1 field heating reference.

Modes of operation for field heating

There are basically three modes of operation. In all modes, the field current will be at a reduced level, determined by 28.37 M1 field heating reference.

28.36 M1 field heating source = Enable field heating

- Field heating is on, if On = 0, Off2 (emergency off/fast current off) is inactive and Off3 (emergency stop) is inactive.
  In general, field heating will be on as long as no On command is given and no emergency off/fast current off or emergency stop is pending.

Condition	**06.09.b00 Used main control word (On)**	**06.09.b01 Used main control word* (Off2)**	**Result**
Power up	0	1	Reduced field current** (cooling fans are off).
Start drive, On command is given	1	1	Normal field current (cooling fans are on).
Normal stop, On command is removed	1 → 0	1	Normal field current, then reduced** after stop (cooling fans are off).
Emergency off/fast current off while running	1	1 → 0	Field is turned off as motor coasts to stop and cannot turned back on again as long as emergency off/fast current off is pending (cooling fans are off).

*See 20.04 Off2 source 1 (emergency off).

**The field current will be at the level set by means of 28.37 M1 field heating reference while motor is stopped.

28.36 M1 field heating source = Enable with On

- Field heating is on as long as On = 1, Run = 0, Off2 (emergency off/fast current off) is inactive and Off3 (emergency stop) is inactive.
  In general, field heating will be on as long as the On command is given, no Run command is given and no emergency off/fast current off or emergency stop is pending.

06.09.b00 Used main control word (On)	06.09.b03 Used main control word (Run)	06.09.b01 Used main control word* (Off2)	Result
0	d	d	Field is turned off (cooling fans are off).
1	0	1	Reduced field current** (cooling fans are off).
1	1	1	Normal field current (cooling fans are on).
1	1 → 0	1	Normal field current, then reduced** after stop (cooling fans are off).
1	d	1 → 0	Field is turned off as motor coasts to stop and cannot turned back on again as long as emergency off/fast current off is pending (cooling fans are off).

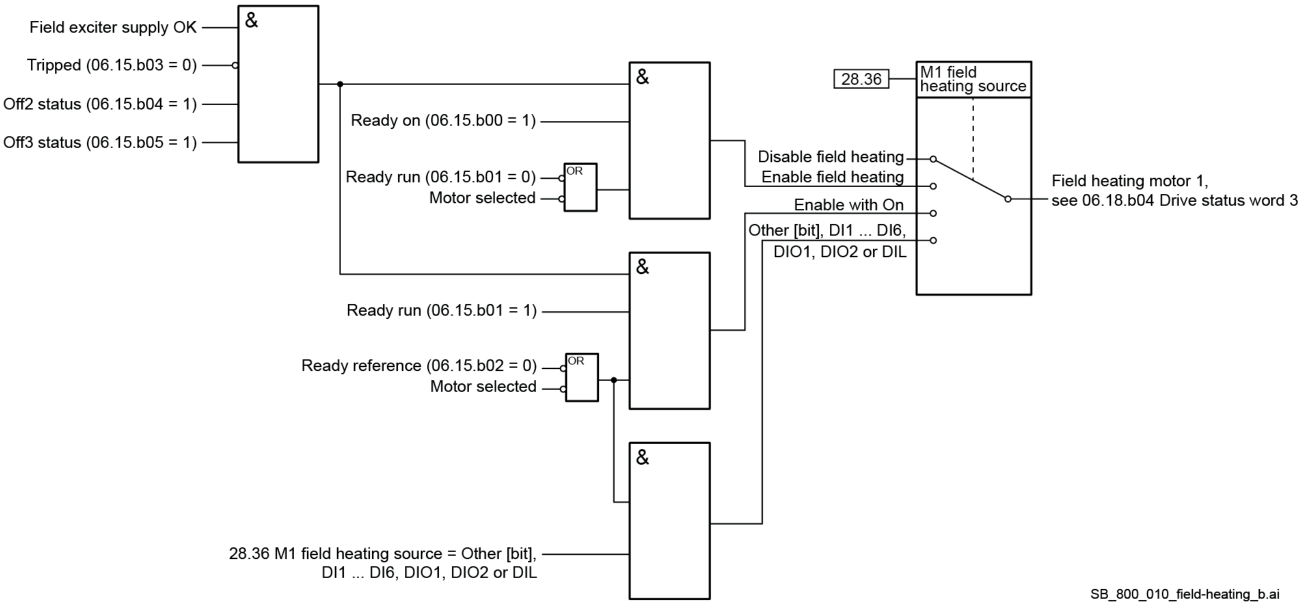
*See 20.04 Off2 source 1 (emergency off).
**The field current will be at the level set by means of 28.37 M1 field heating reference while motor is stopped.

Emergency stop
In the above modes of operation, the field will be turned off, if an emergency stop, see 20.05 Off3 source (emergency stop), is pending. It cannot be turned back on again as long as the emergency stop is pending. If the emergency stop is cleared while the motor is in motion, the motor will be stopped according to 21.03 Emergency stop mode and then field and drive will be turned off.

Emergency off/Fast current off
In the above modes of operation, the field will be turned off, if an emergency off/fast current off, see 20.04 Off2 source 1 (emergency off), is pending. It cannot be turned back on again as long as the emergency off/fast current off is pending.

28.36 M1 field heating source = Other [bit], DI1 … DI6, DIO1, DIO2 or DIL

- Field heating is on, if Other [bit], DI1 … DI6, DIO1, DIO2 or DIL = 1 and Run = 0.
  In general, field heating will be on as long as Other [bit], DI1 … DI6, DIO1, DIO2 or DIL = 1 and no Run command is given. Neither emergency off/fast current off nor emergency stop has an influence.



Mode of operation for field economy

Field economy is only available when 2 motors with 2 independent field exciters are connected to the drive. The field current will be at a reduced level, determined by 28.37 M1 field heating reference and 42.54 M2 field heating reference.

Following conditions apply for motor 1:

- Field economy for motor 1 is enabled, if:
  - 28.37 M1 field heating reference < 100 %.
  - 28.36 M1 field heating source = Disable field heating or Enable field heating.
- Field economy for motor 1 is activated, if:
  - The On command is given for longer than 10 s.
  - Motor 2 is selected via 42.01 Motor 1/2 selection.
  - Motor 2 is active. See 06.18.b05 Drive status word 3.
  - 28.38 M1 field current reference source = 42.55 M2 field current reference source = Internal.

Following conditions apply for motor 2:

- Field economy for motor 2 is enabled, if:
  - 42.54 M2 field heating reference < 100 %.
  - 28.36 M1 field heating source = Disable field heating or Enable field heating.
- Field economy for motor 2 is activated, if:
  - The On command is given for longer than 10 s.
  - Motor 1 is selected via 42.01 Motor 1/2 selection.
  - Motor 1 is active. See 06.18.b04 Drive status word 3.
  - 28.38 M1 field current reference source = 42.55 M2 field current reference source = Internal.

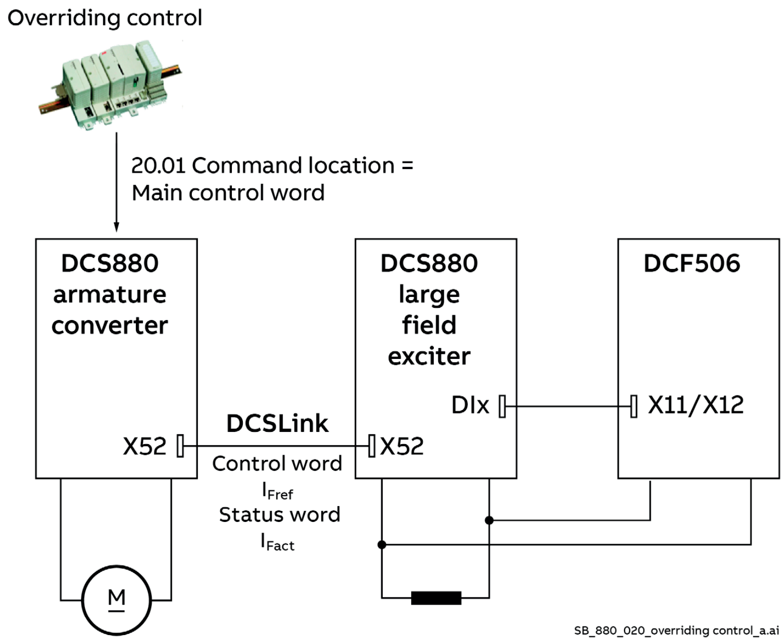
Field exciter mode (for large field exciters)

General

The standard DCS880-S0x module can be operated as large field exciter by simply setting parameters. It is either controlled by a DCS880 armature converter or can be configured as stand-alone field exciter.
Note: The module is selected according to the supply voltage and not according to the field voltage.
The field exciter mode uses the standard armature current controller as field current controller. Thus, the current of the converter equals the field current of the motor. See 01.10 Motor current in A. For these configurations an overvoltage protection (DCF505 or DCF506) is mandatory.
Attention: Connector XSTO including the Save Torque Off function is not to be used. Using this feature will seriously damage the large field exciter.

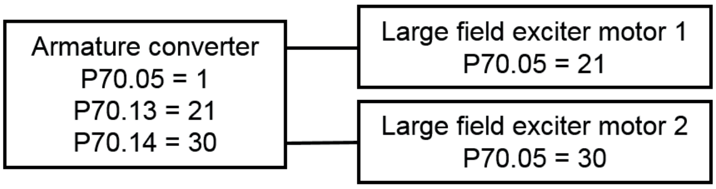
DCS880-S0b large field exciter controlled by a DCS880 armature converter

Communication in field exciter mode:



DCSLink

Armature converter with one or two large field exciters:



Parameter	**Armature converter**	**Large field exciter**	**Comments**
70.05 DCSLink node ID	1.	21, default. 30, default.	Large field exciter motor 1. Large field exciter motor 2.
70.12 Field exciter timeout	100 ms, default.	-	Generates either F516 M1 field exciter communication and/or F519 M2 field exciter communication.
70.13 M1 field exciter node ID	21, default.	-	

70.14 M2 field exciter node ID	30, default.	-	Use the same node number as in 70.05 DCSLink node ID of the large field exciter.

Armature converter (DCS880)
Before starting with the commissioning set all parameters to default by means of 96.15 Parameter restore = Default. Check with 96.11 Macro active.
In the armature converter set:

Parameter	Armature converter	Comments
10.30 RO3 source	31: Field exciter on.	If the mains contactor of the field exciter is controlled by the armature converter.
28.17 M1 EMF/field control mode	1: EMF.	EMF controller released, field weakening active, depending on the application.
31.57 Minimum field current trip delay	2000 ms, default.	Delays fault F541 M1 field exciter low current.
31.58 M1 field current low level	xxx %.	Sets level for fault F541 M1 field exciter low current.
70.05 DCSLink node ID	1.	
70.12 Field exciter timeout	100 ms, default.	Generates F516 M1 field exciter communication.
70.13 M1 field exciter node ID	21, default.	Use the same node number as in 70.05 DCSLink node ID of the large field exciter.
99.07 M1 used field exciter type	10: DCS880-S01. 11: DCS880-S02.	
99.13 M1 nominal field current	xxx A.	I_{FN} = xxx A, rated field current.

Large field exciter (DCS880-S0b)
Before starting with the commissioning set all parameters to default by means of 96.15 Parameter restore = Default. Check with 96.11 Macro active.
Attention: Connector XSTO including the Save Torque Off function is not to be used. Check before commissioning that 31.91.b02 STO status word = 31.91.b03 STO status word = 1.
In the large field exciter set:

Parameter	Large field exciter	Comments
-	XSMC: 1/2.	Use one of the two relay outputs, if the mains contactor of the field exciter is controlled by the field converter itself.
10.30 RO3 source	Other: 06.24.b07 Mains contactor.	
20.01 Command location	4: Field exciter link.	Control from the armature converter. Source for the control word (On/Off1, Run/Stop and Reset).
20.47 Overvoltage protection trigger source	3: DI1 … 8: DI6. 11: DIO1. 12: DIO2. 19: DIL.	Depending on the hardware connection to the DCF506.

27.22 Current reference source	30: FieldRef via DCSLink.	Field current reference from the armature converter.
27.31 M1 discontinuous current limit	0.00 %.	
27.38 Reversal delay	50.0 ms.	
27.40 Zero current timeout	500 ms.	To be set longer than 27.38 Reversal delay.
28.17 M1 EMF/field control mode	0: Fix, default.	
31.50 Armature overvoltage level	1000.0 %.	Disables the overvoltage supervision.
70.05 DCSLink node ID	21, default.	Large field exciter motor 1. Use the same node number as in 70.05 DCSLink node ID of the armature unit.
95.44 PLL deviation level	20.00°.	More robust against F514 Mains synchronization lost.
99.06 Operation mode	1: Large field exciter.	
99.07 M1 used field exciter type	0: None.	
99.10 Nominal mains voltage	xxx V.	U_{NetN} = xxx V; nominal mains voltage (AC).
99.11 M1 nominal current	xxx A.	I_{FN} = xxx A, rated field current.
99.12 M1 nominal voltage	xxx V.	U_{FN} = xxx V, rated field voltage.
Use XSMC:1/2 to close the field contactor. Alternatively, it is also possible to use 06.24.b07 Current controller status word 1 via a relay output (RO).		

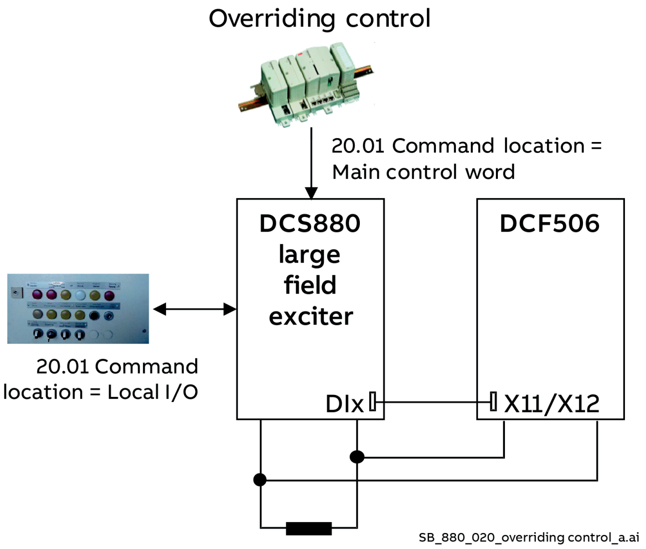
Field current autotuning **must** be started **directly** in the large field exciter:

Parameter	**Large field exciter**	**Comments**
99.20 Tuning request	1: Field current autotuning.	Give the On and Run commands within 20 s.
27.29 M1 current proportional gain	xxx	Is set by the field current autotuning. Typical p-part values are around 4.
27.30 M1 current integration time	xxx	Is set by the field current autotuning.
27.31 M1 discontinuous current limit	0.00 %.	Is set to zero by the field current autotuning.

Note:
This autotuning does not work when started from the Drive composer pro DCS880 Assistant.

DCS880-S0b as stand-alone field exciter

Communication in field exciter mode:



Note: Only field current control possible.

Large field exciter (DCS880-S0b)

Before starting with the commissioning set all parameters to default by means of 96.15 Parameter restore = Default. Check with 96.11 Macro active.

In the large field exciter set:

Parameter	Large field exciter	Comments
20.01 Command location	0: Local I/O, default. 1: Main control word.	Control from local I/O or overriding control system. Source for the control word (On/Off1, Run/Stop and Reset).
20.47 Overvoltage protection trigger source	3: DI1 … 8: DI6. 11: DIO1. 12: DIO2. 19: DIL.	Depending on the hardware connection to the DCF506.
27.22 Current reference source	2: 27.23 Current reference external. 4: AI1 scaled. 5: AI2 scaled. 6: AI3 scaled.	Field current reference from overriding control system or local I/O.
27.23 Current reference external	xxx %	E.g. written to by overriding control.
27.31 M1 discontinuous current limit	0.00 %.	
27.38 Reversal delay	50.0 ms.	
27.40 Zero current timeout	500 ms.	To be set longer than 27.38 Reversal delay.
28.17 M1 EMF/field control mode	0: Fix, default.	
31.50 Armature overvoltage level	1000.0 %.	Inactivates the overvoltage supervision.

95.44 PLL deviation level	20.00°.	To suppress F514 Mains synchronization lost.
99.06 Operation mode	1: Large field exciter.	
99.07 M1 used field exciter type	0: None.	
99.10 Nominal mains voltage	xxx V.	U_{NetN} = xxx V; nominal supply voltage (AC).
99.11 M1 nominal current	xxx A.	I_{FN} = xxx A, rated field current.
99.12 M1 nominal voltage	xxx V.	U_{FN} = xxx V, rated field voltage.
Use XSMC:1/2 to close the field contactor. Alternatively, it is also possible to use 06.24.b07 Current controller status word 1 via a relay output (RO).		

Field current autotuning **must** be started **directly** in the large field exciter:

Parameter	**Large field exciter**	**Comments**
99.20 Tuning request	1: Field current autotuning.	Give the On and Run commands within 20 s.
27.29 M1 current proportional gain	xxx	Is set by the field current autotuning. Typical p-part values are around 4.
27.30 M1 current integration time	xxx	Is set by the field current autotuning.
27.31 M1 discontinuous current limit	0.00 %.	Is set to zero by the field current autotuning.

Note:
This autotuning does not work when started from the Drive composer pro DCS880 Assistant.

DC-breaker, DC-contactor

General

The DC-breaker is used to protect the DC-motor, not the DC drive. Thus, their use increases the availability of the whole installation. In case of an overcurrent, e.g. due to a commutation fault, the DC-breaker is forced open by its own tripping coil.

DC-breakers have different control inputs and trip devices.

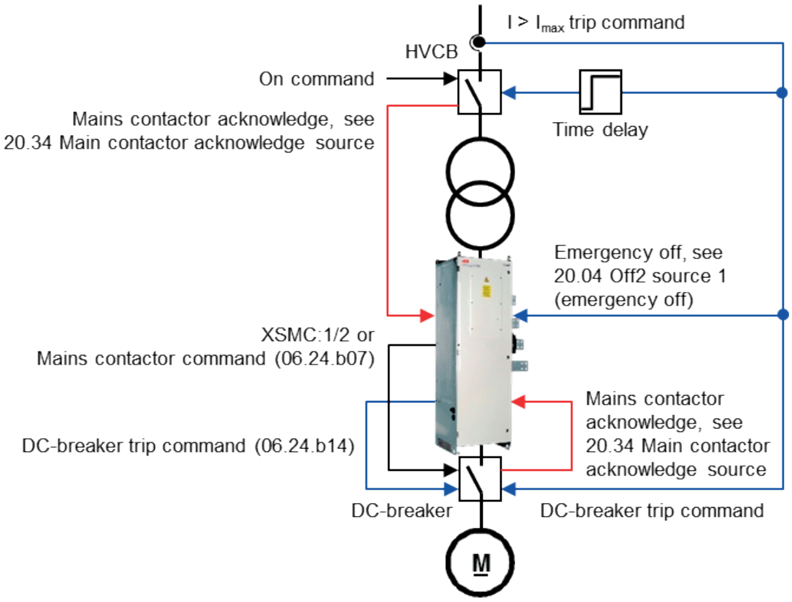
- An On/Off coil with a typical time delay of 100 … 200 ms.
- A high-speed tripping coil (e.g. Secheron = CID) to trip the DC-breaker within 2 ms e.g. using a signal from the drive.
- An internal tripping coil which is released by overcurrent and set mechanically.

There are different ways how to control the DC-breaker depending on the available hardware and the customers on/off philosophy. Following are the most common examples.

Attention:

- If a DC-breaker is used and the DC voltage measurement is taken inside the converter module (H1 … H8 modules in default configuration) do the following:
  - Set 20.33 Mains contactor control mode = DC-contactor.
  - Set 95.37 DC voltage measurement mode = DC-contactor.
  - Balance 01.21 Armature voltage in V by means of 95.35 DC voltage measurement offset.
  - Use XSMC:1/2 to close the DC-breaker. Alternatively, it is also possible to use 06.24.b07 Current controller status word 1 via a relay output (RO).
- If a DC-breaker is used and the DC voltage measurement is located at the motor terminals (modified H6 … H8 modules) do the following:
  - Set 20.33 Mains contactor control mode = On, default.
  - Set 95.37 DC voltage measurement mode = Manual, default.
  - Set 95.35 DC voltage measurement offset = 0, default.
  - Use XSMC:1/2 to close the DC-breaker. Alternatively, it is also possible to use 06.24.b07 Current controller status word 1 via a relay output (RO).

HVCB controlled externally, DC-breaker controlled by the drive



In the above example the High Voltage Circuit Breaker (HVCB) is controlled externally, e.g. by the operator. The status is checked by means of 20.34 Mains contactor acknowledge source. In case the mains contactor acknowledge is missing fault F524 Mains contactor acknowledge is generated.

Usually HVCB are equipped with an overcurrent relay, which can trip the HVCB. To protect the drive a 50 … 100 ms pre-triggered trip command must be connected to the Off2 command (emergency off/fast current off). Additionally, the trip command from the HVCB should also trip the DC-breaker.

Attention: Do not switch the HVCB if DC current is flowing.
The DC-breaker is controlled by the drive. The drive closes and opens the DC-breaker with the command Mains contactor. Use XSMC:1/2 to close the DC-breaker. Alternatively, it is also possible to use 06.24.b07 Current controller status word 1 via a relay output (RO). The status is checked by means of 20.34 Mains contactor acknowledge source. In case the mains contactor acknowledge is missing fault F524 Mains contactor acknowledge is generated.
The DC-breaker can be tripped actively by the DC-breaker trip command.

US style DC-contactor

The US style DC-contactor K1.1 is a special designed DC-contactor with one normally closed contact for the dynamic braking resistor R_B and two normally open contacts for C1 and D1.
Set all following parameters **after** macros are loaded but **before** the drive is commissioned.

General settings

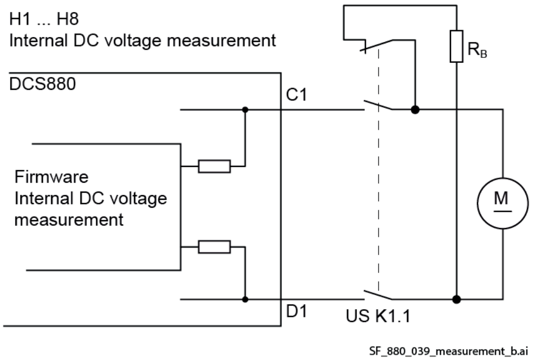
The US style DC-contactor is controlled by the drive.

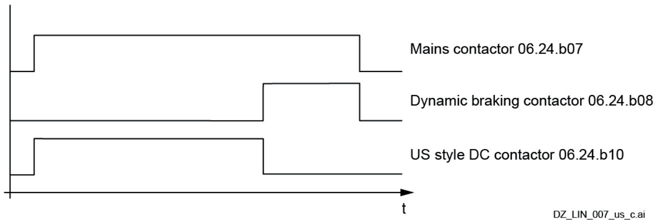
- Set 20.33 Mains contactor control mode = DC-contactor.

The drive closes and opens the US style DC-breaker with the command US style DC-contactor. Thus, use either 06.24.b10 Current controller status word 1 via a relay output (RO) or one of the following settings:

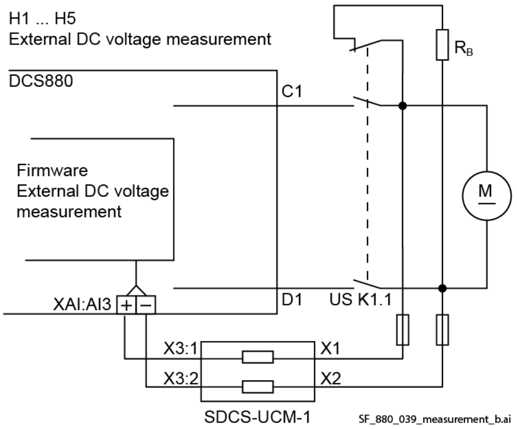
- 10.24 RO1 source = Close US style DC-contactor.
- 10.27 RO2 source = Close US style DC-contactor.
- 10.30 RO3 source = Close US style DC-contactor.

The status is checked by means of 20.34 Mains contactor acknowledge source or 20.35 DC breaker acknowledge source. In case the mains contactor acknowledge is missing fault F524 Mains contactor acknowledge or warning A103 DC-breaker acknowledge is generated.





Set 95.37 DC voltage measurement mode = DC-contactor.



	Internal DC voltage measurement	External DC voltage measurement
Without field weakening	20.44 Dynamic braking delay ≥ 0.1 s.	20.44 Dynamic braking delay ≤ -0.1 s.
With field weakening	Not allowed.	

Set 95.37 DC voltage measurement mode = AI3 scaled.

See also DCS880 External DC voltage measurement H1 ... H5 (3ADW000601).

Internal DC voltage measurement

For units H1 … H8 in default configuration the DC voltage measurement is located inside the unit.

- Set 95.37 DC voltage measurement mode = DC-contactor.
- Balance 01.21 Armature voltage by means of 95.35 DC voltage measurement offset.

External DC voltage measurement (at the motor terminals)

In case field weakening is used, external DC voltage measurement at the motor terminals is mandatory.
For units H1 … H5 in default configuration and the DC voltage measurement is located at the motor terminals via SDCS-UCM-01 and AI3.

- Set 95.37 DC voltage measurement mode = AI3 scaled.
- Set 95.35 DC voltage measurement offset = 0, default.

For re-wired units H6 … H8 and the DC voltage measurement is located at the motor terminals.

- Set 95.37 DC voltage measurement mode = Manual, default.
- Set 95.35 DC voltage measurement offset = 0, default.

Dynamic braking

If using dynamic braking, the drive allows you to select the stopping method under three different situations. 21.02 Off1 mode, 21.03 Emergency stop mode and 21.04 Stop mode select the stopping method for loss of the On command (On/Off), Off3 command (emergency stop) and Run command (Start/Stop, jogging, inching, etc.).
Each can be set to:

- Coast stop.
- Ramp stop.
- Torque limit.
- Dynamic braking.

To command the drive to perform a dynamic braking stop, one or more of these parameters must be set to Dynamic braking. Most users will want the drive to ramp stop when an On command (On/Off) or Run command (Start/Stop, jogging, inching, etc.) is cleared and use dynamic braking when the Off3 command (emergency stop) is cleared.
In that case, use the following settings:

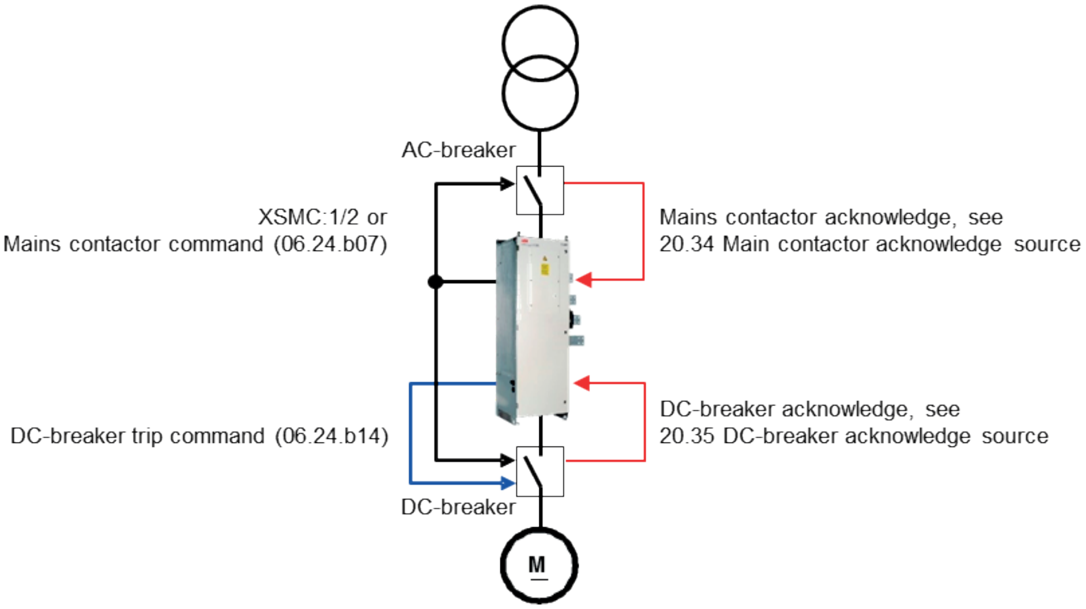
- 21.02 Off1 mode = Ramp stop.
- 21.03 Emergency stop mode = Dynamic braking.
- 21.04 Stop mode = Ramp stop.

However, any case is allowed, and the final decision is left to the user.
Other parameters which control stops during faults are.

- 31.13 Fault stop mode communication.
- 31.14 Fault stop mode fault level 3.
- 31.15 Fault stop mode fault level 4.

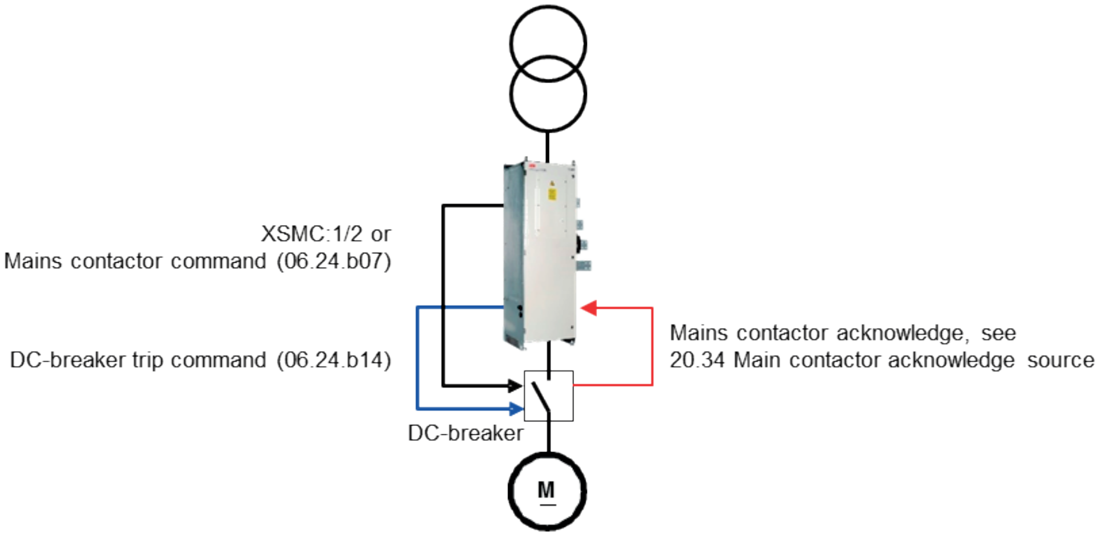
If using EMF feedback with dynamic braking, set 20.44 Dynamic braking delay = t. Thus, during dynamic braking, a zero-speed signal is generated after the programmed time t is elapsed. t is the time it normally takes the motor to stop during dynamic braking. Additional information see table above.

AC- and DC-breaker controlled by the drive



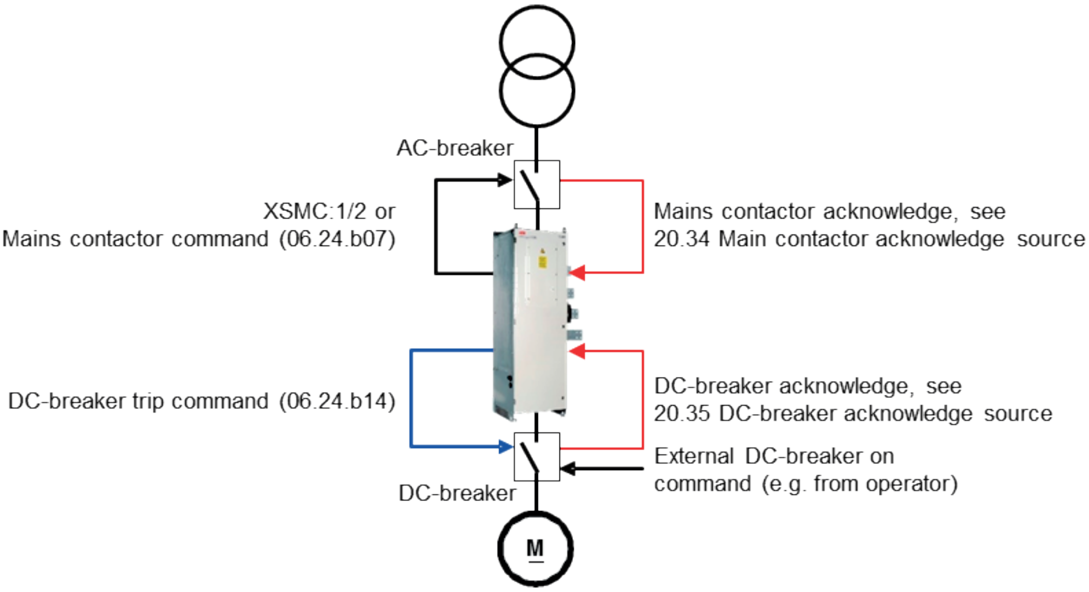
In the above example both, the AC- and the DC-breaker are controlled by the drive. The drive closes and opens both breakers with the command Mains contactor. Use XSMC:1/2 to close both breakers. Alternatively, it is also possible to use 06.24.b07 Current controller status word 1 via a relay output (RO). For the AC-breaker the status is checked by means of 20.34 Mains contactor acknowledge source. In case the AC-breaker acknowledge is missing fault F524 Mains contactor acknowledge is generated. For the DC-breaker the status is checked by means of 20.35 DC-breaker acknowledge source. In case the DC-breaker acknowledge is missing warning A103 DC-breaker acknowledge is generated.
The DC-breaker can be tripped actively by the DC-breaker trip command.

No AC-breaker, DC-breaker controlled by the drive



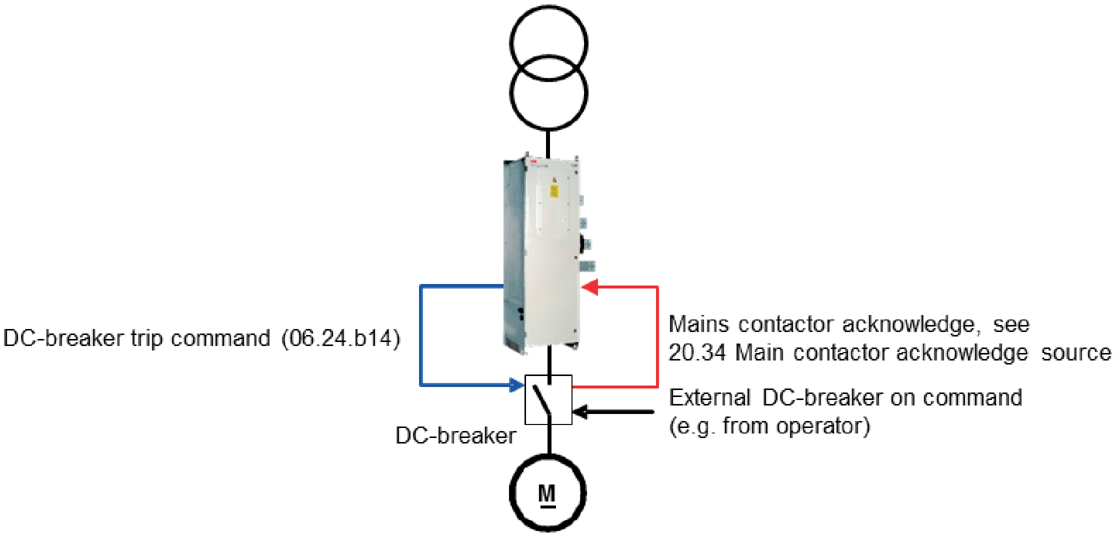
In the above example no AC-breaker is used, and the DC-breaker is controlled by the drive. The drive closes and opens the DC-breaker with the command Mains contactor. Use XSMC:1/2 to close the DC-breaker. Alternatively, it is also possible to use 06.24.b07 Current controller status word 1 via a relay output (RO). The status is checked by means of 20.34 Mains contactor acknowledge source. In case the mains contactor acknowledge is missing fault F524 Mains contactor acknowledge is generated.
The DC-breaker can be tripped actively by the DC-breaker trip command.

AC-breaker controlled by the drive, DC-breaker controlled externally



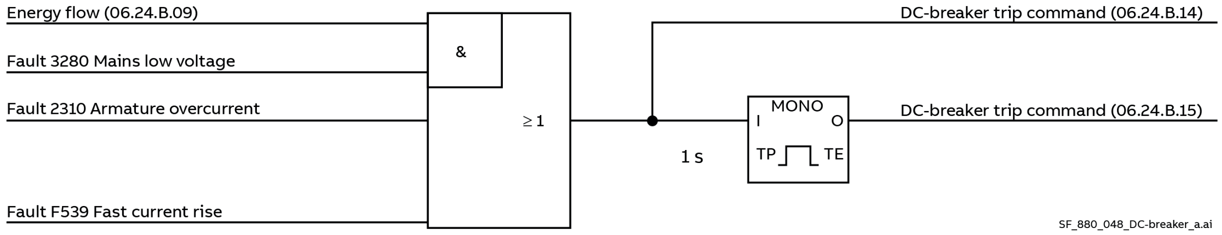
In the above example the AC-breaker is controlled by the drive. The drive closes and opens the AC-breaker with the command Mains contactor. Use XSMC:1/2 to close the AC-breaker. Alternatively, it is also possible to use 06.24.b07 Current controller status word 1 via a relay output (RO). The status is checked by means of 20.34 Mains contactor acknowledge source. In case the mains contactor acknowledge is missing fault F524 Mains contactor acknowledge is generated.
The DC-breaker is controlled externally, e.g. by the operator. The status is checked by means of 20.35 DC-breaker acknowledge source. In case the DC-breaker acknowledge is missing warning A103 DC-breaker acknowledge is generated.
The DC-breaker can be tripped actively by the DC-breaker trip command.

No AC-breaker, DC-breaker controlled externally



In the above example no AC-breaker is used, and the DC-breaker is controlled externally, e.g. by the operator. The status is checked by means of 20.34 Mains contactor acknowledge source. In case the mains contactor acknowledge is missing fault F524 Mains contactor acknowledge is generated.
The DC-breaker can be tripped actively by the DC-breaker trip command.

DC-breaker trip command



The firmware sets the:

- DC-breaker trip command (continuous signal) (06.24.b14).
- DC-breaker trip command (1 s pulse signal) (06.24.b15).

By means of:

- Fault 3280 Mains low voltage in regenerative mode.
- Fault 2310 Armature over current.
- Fault F539 Fast current rise.

In case a digital output, see group 10 Standard DI, RO, is assigned to one of the two DC-breaker trip commands, it is updated immediately after detecting a fault and thus actively tripping the DC-breaker.

Dynamic braking

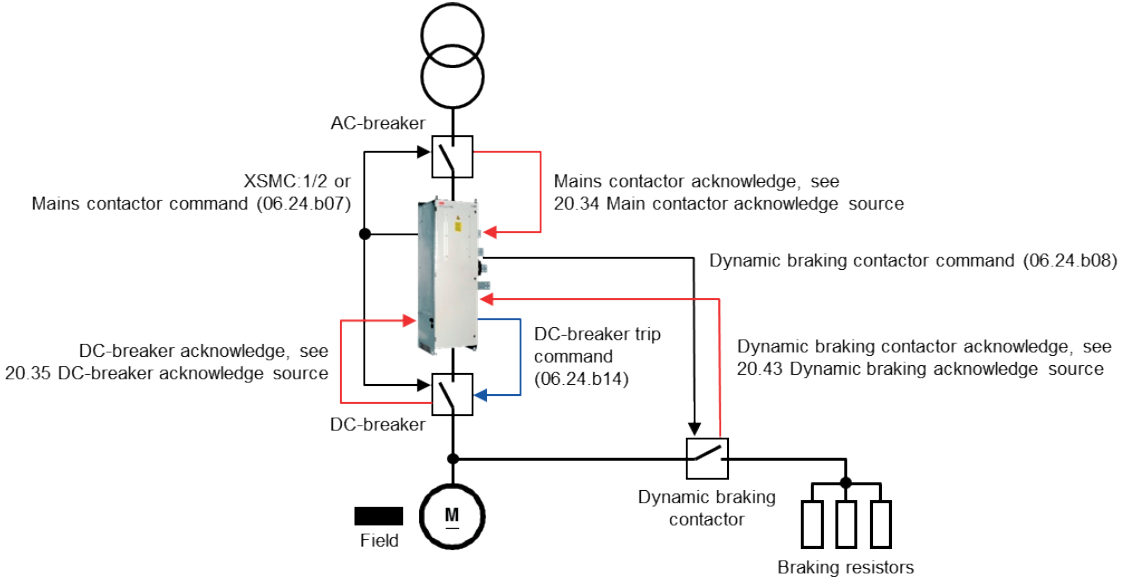
General

The drive can be stopped by dynamic braking. The principle is to transfer the rotary energy of the machine inertia into a braking resistor. Therefore, the armature circuit must be switched over from the drive to a braking resistor. Additionally, flux and field current must be maintained.

Activation

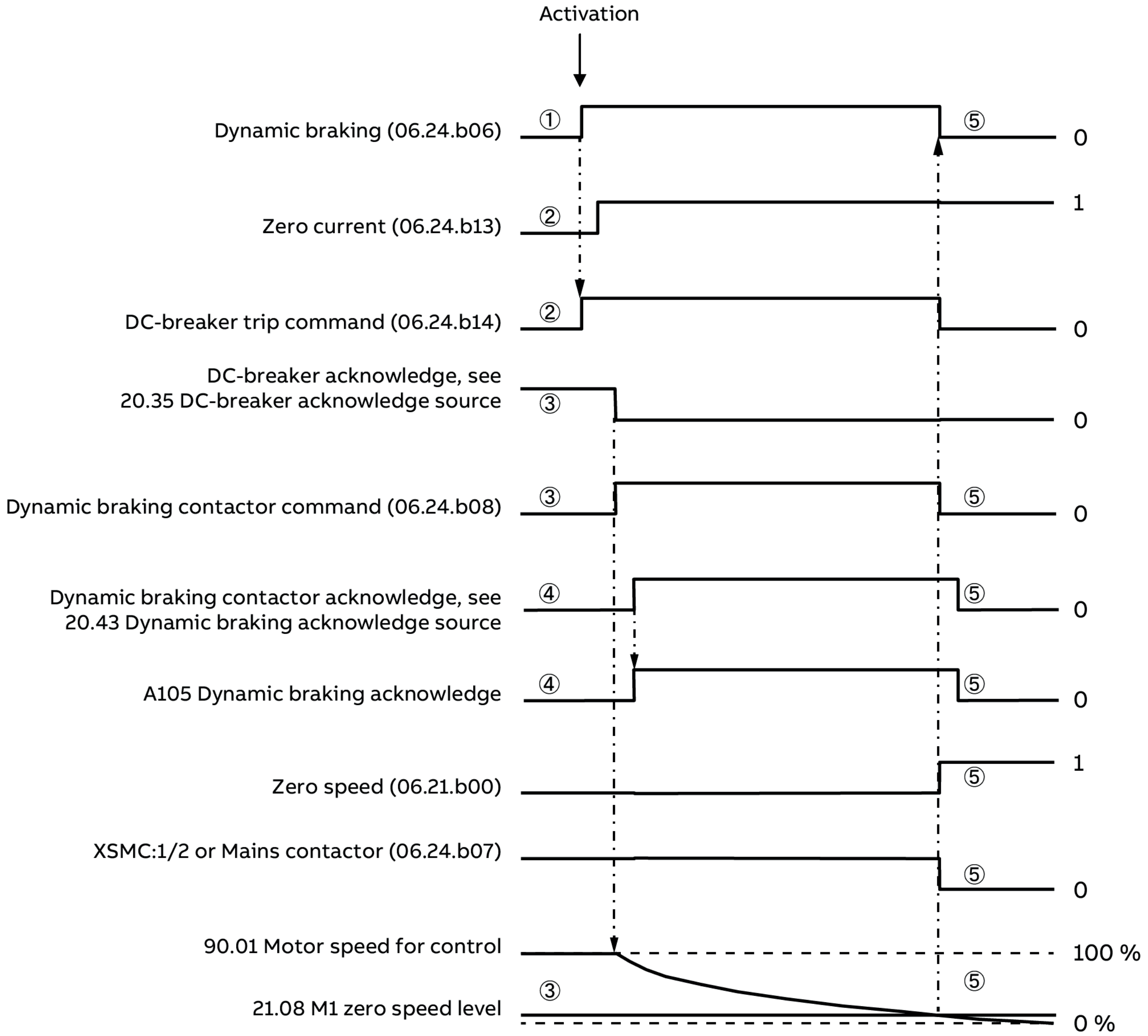
Dynamic braking can be activated by all stop modes, in cases of a fault or due to communication breaks.

- 21.02 Off1 mode, when the On command (06.09.b00) is set to low.
- 21.03 Emergency stop mode, when the Off3 command (emergency stop) (06.09.b02) is set to low.
- 21.04 Stop mode, when the Run command (06.09.b03) is set to low.
- 31.13 Fault stop mode communication, when communication is lost.
- 31.14 Fault stop mode fault level 3, in case of a fault of fault level 3.
- 31.15 Fault stop mode fault level 4, in case of a fault of fault level 4.
- Dynamic braking can be forced by setting 06.11.b00 Auxiliary control word 2 to high. At the same time the Run command (06.09.b03) must be set to low.



Function

During dynamic braking the field current is maintained by keeping the field exciter activated. It is recommended to supply external/internal field exciters via an UPS to make sure that the field is maintained during mains failure. In case of field weakening external DC voltage measurement at the motor terminals is required. Additionally, the EMF controller must continue to operate.
OnBoard field exciters (H1 … H4) will be supplied via the mains contactor, thus Mains contactor (XSMC: 1/2 or 06.24.b07) stays on/high until zero speed is reached.
① The activation of dynamic braking immediately sets Dynamic braking (06.24.b06) to high. Dynamic braking is active.
② Dynamic braking forces the armature current to zero and opens the DC-breaker by setting DC-breaker trip command (06.24.b14) to high. Thus, the DC-breaker is opened.
③ After the armature current is zero and the DC-breaker acknowledge is gone Dynamic braking contactor command (06.24.b08) is set to high. This signal is connected to a digital output, see group 10 Standard DI, RO, and used to close the dynamic braking contactor. As soon as the dynamic braking contactor is closed dynamic braking starts and decreases the speed.
④ With 20.43 Dynamic braking acknowledge source it is possible to select a digital input for the dynamic braking resistor acknowledge. This input sets warning A105 Dynamic braking acknowledge as long as the acknowledge is present. Thus, the drive cannot be started or re-started while dynamic braking is active, except 21.01 Start mode = Flying start dynamic braking.



DZ_LIN_068_dyn braking seq_a.ai

Deactivation

⑤ Dynamic braking is deactivated as soon as zero-speed is reached and Zero speed (06.21.b00) is set to high.

In case of dynamic braking with EMF feedback there is no valid information about the motor speed and thus no zero-speed information. To prevent an interlocking of the drive after dynamic braking the speed is assumed zero after 20.44 Dynamic braking delay is elapsed.

For usage of US style DC-contactors see chapter US style DC-contactor.

I/O configuration

Analog inputs (AI)

The control board has 3 analog inputs.

Two of the inputs can be independently set as a voltage (0/2… 10 V, ±10 V) or current (0/4 … 20 mA, ±20 mA) input using jumper J1 and J2. The 3rd input is a voltage (0/2 … 10 V, ±10 V) input only. Each input can be filtered, inverted and scaled. The analog inputs on the control board are read on a 0.5 ms time level.

The number of analog inputs can be increased by installing FIO-11 or FAIO-01 I/O extensions, see I/O extensions below. The analog inputs on extension modules are read on a 2 ms time level. Delay times see table Switch on/off delays.

The drive can be set to perform an action, e.g. to generate a warning or fault, if the value of an analog input moves out of a predefined range.

Settings see group 12 Standard AI.

Analog outputs (AO)

The control board has 3 analog outputs.

The 1st output can be set as a voltage (0/2 … 10 V, ±10 V) or current (0/4 … 20 mA, ±20 mA) input using jumper J5. The 2nd output is a voltage (0//2 … 10 V, ±10 V) output only. Each of the two outputs can be filtered, inverted and scaled. The first 2 analog outputs on the control board are updated on a 0.5 ms time level.

Output IACT is used as a connection point for a scope to measure the current directly over the burden resistor (H1 ... H6 only). It is scaled automatically.

The number of analog outputs can be increased by installing FIO-11 or FAIO-01 I/O extensions, see I/O extensions below. The analog outputs on extension modules are updated on a 2 ms time level. Delay times see table Switch on/off delays.

Settings see group 13 Standard AO.

Digital inputs and outputs (DI, DIO)

The control board has 7 digital inputs and two digital input/outputs, DIOs can be set as either an input or an output. The digital inputs on the control board are read on a 0.5 ms time level.

One digital input (DI6) doubles as a PTC sensor input. See group 35 Motor thermal protection.

Digital input/output DIO1 can be used as a frequency input, DIO2 as a frequency output.

The number of digital inputs/outputs can be increased by installing FIO-01, FIO-11 or FDIO-01 I/O extensions, see I/O extensions below. The digital inputs on extension modules are read on a 2 ms time level. Delay times see table Switch on/off delays.

Settings see groups 10 Standard DI, RO and 11 Standard DIO, FI, FO.

Relay outputs (RO)

The control board has 5 relay outputs. The signal to be indicated by the first 3 outputs can be selected by parameters. Additionally, there are 2 fixed outputs, see XSMC: 1 … 4. One is for the mains contactor and the other is used for the safe torque off (STO) zero current monitor. The relay outputs on the control board are updated on a 0.5 ms time level.

The number of relay outputs can be increased by installing FIO-01 or FDIO-01 I/O extensions, see I/O extensions below. The relay outputs on extension modules are updated on a 2 ms time level. Delay times see table Switch on/off delays.

Settings see group 10 Standard DI, RO.

I/O extensions

Inputs and outputs can be added by using I/O extension modules. One to three modules can be mounted on the slots of the control board. Slots can be added by connecting an FEA-03 I/O extension adapter. The table below shows the number of I/O on the control board as well as optional I/O extension modules.

Location	**Analog inputs (AI)**	**Analog outputs (AO)**	**Digital inputs (DI)**	**Digital inputs/outputs (DIO)**	**Relay outputs (RO)**
Control board	3	2 + IACT	7	2	3 + XSMC: 1 … 4
FAIO-01	2	2	-	-	-
FDIO-01	-	-	3	-	2
FIO-01	-	-	-	4	2
FIO-11	3	1	-	2	-

A maximum of 3 I/O extension modules can be activated and configured using parameter groups 14 … 16.
Settings see groups 14 I/O extension module 1, 15 I/O extension module 2, 16 I/O extension module 3 and 60.41 Extension adapter com port.

Switch on/off delays (reaction times)

Via FEA-03	**Hardware**	**Type**	**Delay**		**DIP switch**
-	SDCS-CON-H01	DI, DIO	Switch on delay	2 ms	-
			Switch off delay	1 ms	-
No	FDIO-01	DI	Switch on delay	15 ms	1 ms
				26 ms	10 ms
			Switch off delay	13 ms	1 ms
				21 ms	10 ms
	FIO-01	DIO	Switch on delay	3 ms	-
			Switch off delay	1 ms	-
	FIO-11	DIO	Switch on delay	5 ms	-
			Switch off delay	3 ms	-
Yes	FDIO-01	DI	Switch on delay	16 ms	1 ms
				26 ms	10 ms
			Switch off delay	15 ms	1 ms
				21 ms	10 ms
	FIO-01	DIO	Switch on delay	3 ms	-
			Switch off delay	1 ms	-
	FIO-11	DIO	Switch on delay	5 ms	-
			Switch off delay	3 ms	-

The given values are approximate values which were measured using a drive. Please consider, that for some operations e.g. starting and stopping, thyristor based drives cannot react before a full mains cycle has passed (worst-case scenario).

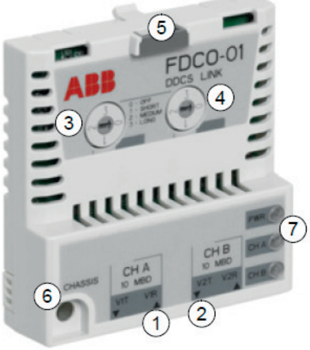
FEA-03 I/O extension adapter

Attention: Not to be used for fieldbus adapters.

Hardware

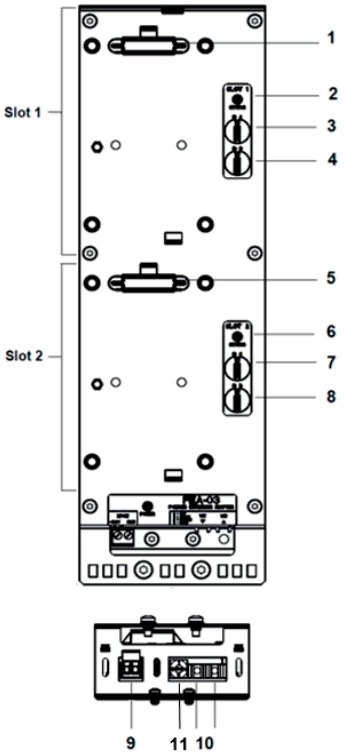
Following hardware is needed:

- FDCO-0x DDCS communication module. See FDCO-01/02 DDCS communication modules (3AUA0000114058):



Item	Description
1	Connector for Ch A.
2	Connector for Ch B.
3	Selector for Ch A.
4	Selector for Ch B.
5	Lock.
6	Mounting screw.
7	LEDs.

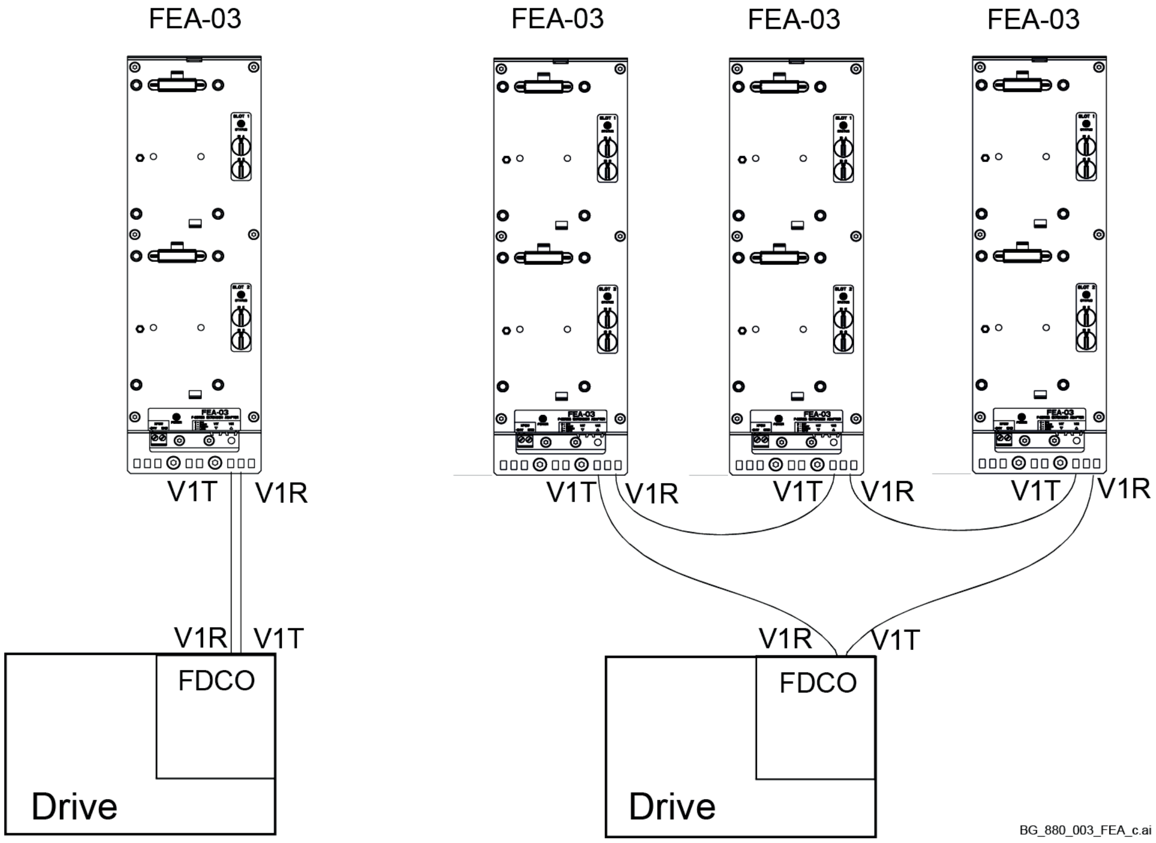
- A pair of fiber optic cables.
- FEA-03 I/O extension adapter. See FEA-03 F series extension adapter (3AUA0000115811):



Item	Description
1	Module connector 1
2	Status LED for Slot 1
3	Node address switch A (digit 10)
4	Node address switch B (digit 0)
5	Module connector 2
6	Status LED for Slot 2
7	Node address switch C (digit 10)
8	Node address switch D (digit 0)
9	Power supply connector (XPOW: +24 V/GND, 100 mA plus current for option modules)
10	Transmitter V1T and receiver V1R
11	Selector for V1T and V1R

Electrical installation

This connection diagram shows how to connect the FEA-03 to the drive:



Attention: Do not mix 10 MBd and 5 MBd channels. Thus, allowed channels for interconnection of FDCO-0x and FEA-03 are:

Module type	Channel A (Ch A)	Channel B (Ch B)
FDCO-01	OK (10 MBd)	OK (10 MBd)
FDCO-02	Not allowed (5 MBd)	OK (10 MBd)

Diagnostics

FDCO -0x LEDs:

Label	Color	Description
PWR OK	Green	Power/Internal 3.3 V OK.
Ch A Rx/Tx	Green/Red	DDCS channel A data activity.
Ch B Rx/Tx	Green/Red	DDCS channel B data activity.

FEA-03 LEDs:

Label	Color	Description
PWR OK	Green	Power 24 V OK.
SLOT 1 STATUS	Green	Initialization of the option module connected to Slot 1 OK.
SLOT 2 STATUS	Green	Initialization of the option module connected to Slot 2 OK.

Commissioning

- Set the selectors of all modules (FEA-03, FDC-0x) according to the used fiber optic cable type and length:

Switch position	**Cable length**	
	POF, 1 mm	**HCS, 200 µm**
0 - OFF	Disabled	
1 - SHORT	0.1 … 20 m	0.1 … 50 m
2 - MEDIUM	20 … 25 m	50 … 100 m
3 - LONG	25 … 30 m	100 … 200 m

- The slot/channel number that is used to connect the FEA-03 must be set in 60.41 Extension adapter com port.
- For each slot on a FEA-03 a unique node ID must be defined. That node ID must be matched by the option module connected to it.
  The node ID is a two-digit decimal number. It is possible to use node ID numbers from 04 ... 99. Values 00, 01, 02, and 03 are reserved.
- On a FEA-03 a node IDs are defined using switches A (digit 10), B (digit 1) for slot 1 and C (digit 10), D (digit 1) for slot 2.
- The node IDs of the option module must be set using following parameters.
  For I/O extension modules:
  - 14.02 Module 1 location.
  - 15.02 Module 2 location.
  - 16.02 Module 3 location.

  For FEN-x1 encoder interface modules:
  - 91.12 Module 1 location.
  - 91.14 Module 2 location.
- Connect the 24 V_{DC} to XPOW at the base of the FEA-03.
- Check the diagnostics LEDs.
- For I/O extension modules check:
  - 14.03 Module 1 status.
  - 15.03 Module 2 status.
  - 16.03 Module 3 status.
- For FEN-x1 encoder interface modules check:
  - 91.02 Module 1 status.
  - 91.03 Module 2 status.

Reference ramps

Speed reference ramp

The acceleration/deceleration times for the speed reference can be defined separately. The ramps are defined as the time it takes the drive to accelerate or decelerate between zero speed and the value defined by 46.02 Speed scaling actual. The user can switch between two preset ramp sets using a binary source such as a digital input. Additionally, the shape of the ramp can be controlled.
The speed reference ramp times can be set using parameters 23.11 … 23.19 and 46.01 M1 speed scaling.

Jogging ramp

The acceleration/deceleration times for jogging can be defined separately, see chapter Jog function.
The jogging ramp times can be set using 23.20 Acceleration time jogging, 23.21 Deceleration time jogging and 46.01 M1 speed scaling.

Emergency stop ramp

A deceleration ramp for the Off3 (emergency stop) command can be defined. The ramp is defined as the time it takes the drive to decelerate between the value defined by 46.02 Speed scaling actual and zero speed.

The emergency stop ramp time can be set using 23.23 Emergency stop time and 46.01 M1 speed scaling.

Torque reference ramp

The acceleration/deceleration times for the torque reference can be defined separately. The ramps are defined as the time it takes the reference to change between zero and nominal motor torque. See 46.04 M1 torque scaling actual and 99.02 M1 nominal torque.

The torque reference ramp times can be set using, 26.18 Torque ramp up time, 26.19 Torque ramp down time and 46.03 M1 torque scaling.

Motor potentiometer ramp

The change rate of the motor potentiometer is adjustable. The same rate applies in both directions, see chapter Motor potentiometer.

The motor potentiometer ramp times can be set using 22.75 Motor potentiometer ramp time, 22.76 Motor potentiometer min value and 22.77 Motor potentiometer max value.

Constant speeds

Constant speeds, see group 22 Speed reference selection, are predefined references that can be quickly activated, for example, through digital inputs. It is possible to define up to 7 constant speeds.

The constant speeds operate on a 2 ms time level.

Speed feedback devices

As standard the drive supports one OnBoard encoder, either differential or single ended, and one analog tacho. For further information consult the DCS880 Hardware manual (3ADW000462).

Additionally, the drive supports two more encoders/resolvers. The following optional interface modules are available:

- TTL encoder interface FEN-01 with two TTL inputs, one TTL output for encoder emulation with echo/splitter and two digital inputs.
- Absolute encoder interface FEN-11 with one absolute encoder input, one TTL input, one TTL output for encoder emulation with echo/splitter and two digital inputs. Not supported at the time of publication.
- Resolver interface FEN-21 with one resolver input, one TTL input, one TTL output for encoder emulation with echo/splitter and two digital inputs.
- HTL encoder interface FEN-31 with one HTL encoder input, one TTL output for encoder emulation with echo/splitter and two digital inputs.
- HTL/TTL encoder interface FSE-31 for use with an FSO-xx safety functions module with two HTL/TTL encoder inputs. Not supported at the time of publication.

The interface modules are to be installed onto one of the option slots of the drive. All modules, except the FSE-31, can also be installed onto an FEA-03 I/O extension adapter.

Encoder echo/splitter and emulation

Both encoder echo/splitter and emulation are supported by the above-mentioned FEN-xx interfaces.

Encoder echo/splitter is available with TTL, TTL+ and HTL encoders. The signal received from the encoder is relayed to the TTL output unchanged. This enables the connection of one encoder to several drives.

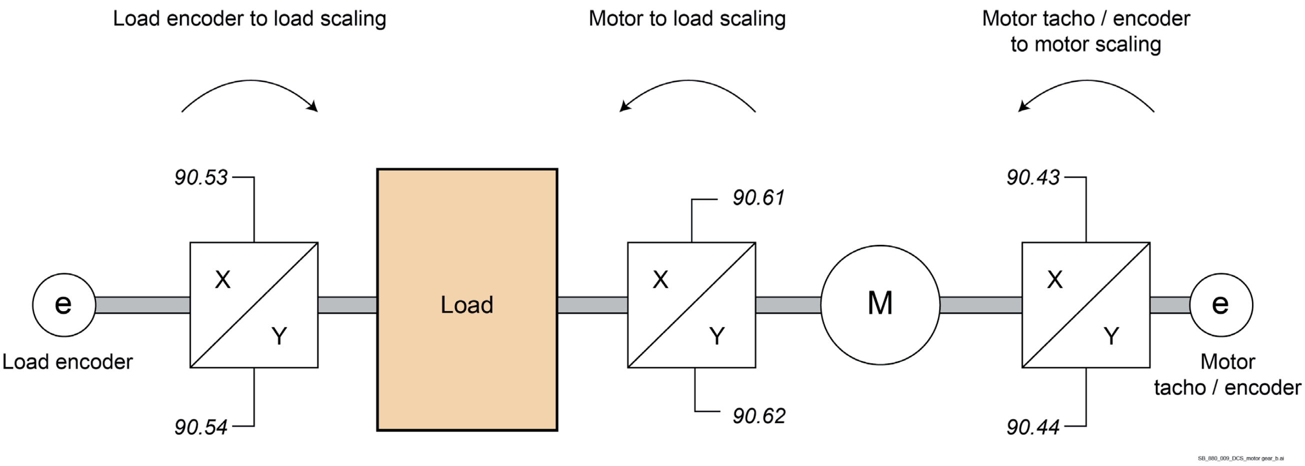
Encoder emulation also relays the encoder signal to the output, but the signal is either scaled, or position data converted to pulses. Emulation can be used when absolute encoder or resolver position needs to be converted to TTL pulses, or when the signal must be converted to a different pulse number than the original.

Motor and load feedback

Three different sources can be used as speed and position feedback, the OnBoard encoder, encoder 1 or encoder 2. Any of these can be used for load position calculation or motor control. The load position calculation makes it possible, for example, to determine the position of a conveyor belt or the height of the load on a crane. The feedback sources are selected by 90.41 M1 feedback selection and 90.51 Load feedback selection.

For detailed parameter connections of the motor- and load feedback functions, see chapter Firmware structure diagrams. For more information on load position calculation, see chapter Position counter.

Any mechanical gear ratios between the components like motor, motor encoder and load, load encoder is specified using the gear parameters shown in the diagram below.



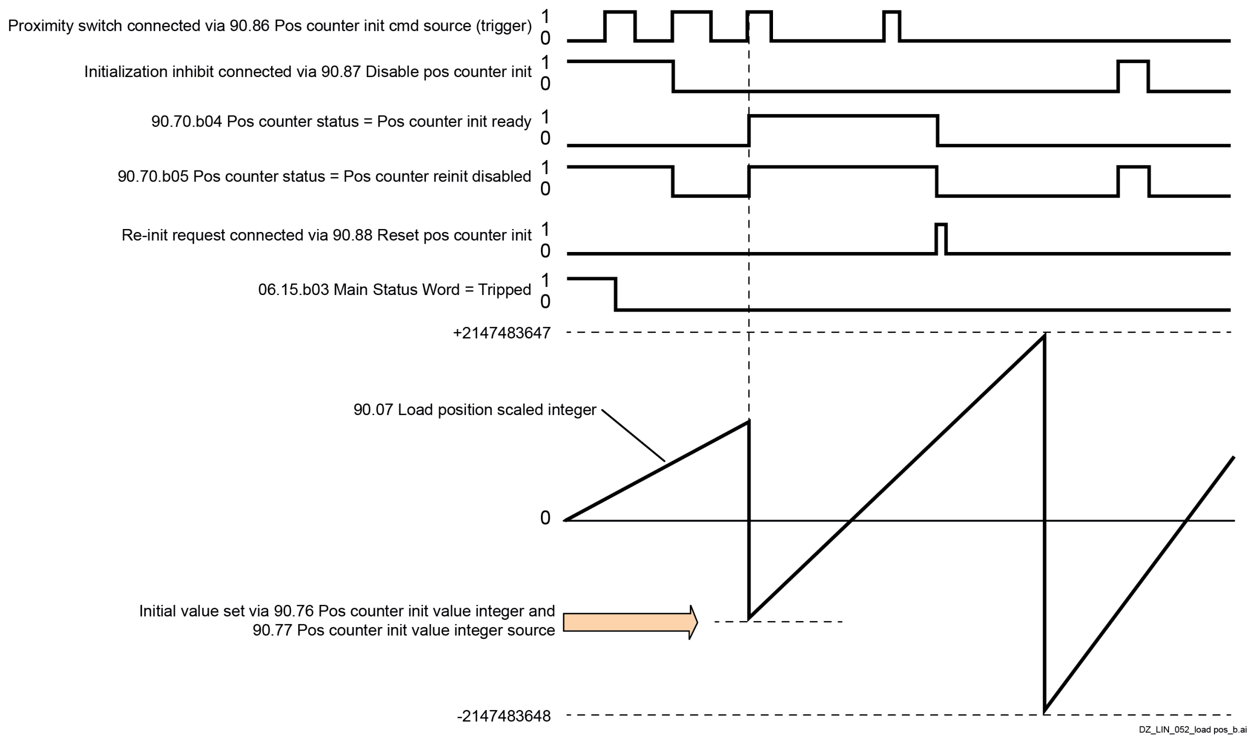
Any gear ratio between the load encoder and the load is defined by 90.53 Load gear numerator and 90.54 Load gear denominator. Any gear ratio between the motor encoder and the motor is defined by 90.43 Motor gear numerator and 90.44 Motor gear denominator. Any gear ratio between the motor and load can be defined by 90.61 Gear numerator and 90.62 Gear denominator. By default, all the ratios mentioned above are 1:1. The ratios can only be changed with the drive stopped.

Position counter

The firmware contains a position counter that can be used to indicate the position of the motor/load. The output of the position counter function, 90.07 Load position scaled integer, indicates the scaled number of revolutions read from the selected source, see chapter Load and motor feedback.

The relation between revolutions of the motor shaft and the translatory movement of the load in any given unit of distance is defined in 90.63 Feed constant numerator and 90.64 Feed constant denominator. This gear function can be changed without the need of a parameter refresh or position counter reinitialization. However, the counter output is only updated after new position input data is received.

For detailed parameter connections see chapter Firmware structure diagrams.



The position counter is initialized by setting a known physical position of the motor/load into the Firmware. The initial position, for example the home/zero position or the distance from it, can be set in 90.76 Pos counter init value integer, or taken from another parameter. This position is set as the initial value of the position counter 90.07 Load position scaled integer when the source selected by 90.86 Pos counter init cmd source (trigger), such as a proximity switch connected to a digital input, is activated. A successful initialization is indicated by 90.70.b04 Pos counter status. Any subsequent initialization of the counter must first be enabled by 90.88 Reset pos counter init. To define a time window for initializations, 90.87 Disable pos counter init can be used to inhibit the signal from the proximity switch. An active fault in the drive will also prevent the counter initialization.

Encoder error handling

When an encoder is used for motor/load feedback, the action taken in case of an encoder error is specified in 31.35 Motor feedback fault/31.38 Load feedback fault. If either parameter is set to Encoder/Warning, the calculation will continue smoothly using the second encoder. If the first encoder recovers from the error, the calculation will smoothly switch back to it. The motor/load position signals 90.02, 90.04, 90.05,90.06 and 90.07 will continue to be updated all the time, but 90.70.b06 Pos counter status will be set to indicate potentially inaccurate position data. In addition, 90.70.b04 Pos counter status will be cleared upon the next stop as a recommendation to reinitialize the position counter.
90.73 Pos counter error and boot action defines whether position calculation resumes from the previous value over an encoder error or to reinitialize the position counter. By default, 90.70.b04 Pos counter status is cleared after an error, indicating that reinitialization is needed. With 90.73 Pos counter error and boot action set to Continue from previous value, the position values are retained over an error or reboot. However, 90.70.b06 Pos counter status is set to indicate that an error occurred.
Note: With a multiturn absolute encoder, 90.70.b06 Pos counter status is cleared at the next stop of the drive if the encoder has recovered from the error. 90.70.b04 Pos counter status is not cleared. The status of the position counter is retained over a drive reboot, after which position calculation resumes from the absolute position given by the encoder, considering the initial position specified by 90.76 Pos counter init value integer.

WARNING
If the drive is stopped when an encoder error occurs or if the drive is not powered, the motor/load position signals 90.02, 90.04, 90.05,90.06, 90.07 and 90.70 are not updated, because no movement of the motor/load can be detected. When using previous position values, 90.73 Pos counter error and boot action is set to Continue from previous value, be aware that the position data is unreliable if the motor/load can move.

Reading/writing position counter values via a fieldbus

The parameters of the position counter, such as 90.07 Load position scaled integer and 90.76 Pos counter init value integer, can be accessed from an overriding control system in the following formats:

- 16-bit integer, if 16 bits are sufficient for the application.
- 32-bit integer, can be accessed as two consecutive 16-bit words.

For example, to read 90.07 Load position scaled integer via a fieldbus, set the selection parameter of the desired data set in group 52 to Other - 90.07 and select the format. If you select a 32-bit format, the subsequent data word is automatically reserved.

Configuration of the OnBoard encoder feedback

1. Set the number of pulses according to encoder nameplate in 94.23 OnBoard encoder pulses/revolution.
2. Select the type in 94.24 OnBoard encoder type.
3. Select the speed calculation mode in 94.25 OnBoard encoder speed calculation mode.
4. If the encoder rotates at a different speed to the motor e.g. is not mounted directly on the motor shaft, enter the gear ratio in 90.43 Motor gear numerator and 90.44 Motor gear denominator.
5. Set 90.41 M1 feedback selection to EMF.
6. Start the motor with a reference of e.g. 400 rpm.
7. Compare 01.02 EMF speed filtered with 01.04 OnBoard encoder speed filtered. If the values are the same, set the encoder as the feedback source, 90.41 Motor feedback selection = OnBoard encoder.
8. Specify the action taken in case the feedback signal is lost, see 31.35 Motor feedback fault.

Example 1: Using the same encoder for both load and motor speed feedback

The drive controls a motor used for lifting a load in a crane. An encoder attached to the motor shaft is used as feedback. The same encoder is also used for calculating the height of the load in the desired unit. A gear exists between the motor shaft and the cable drum. Following settings are made.

- 90.51 Load feedback selection = OnBoard encoder.
- The encoder is mounted directly on the motor shaft.
  - 90.43 Motor gear numerator = 1.
  - 90.44 Motor gear denominator = 1.
- The cable drum turns one revolution per 50 revolutions of the motor shaft.
  - 90.53 Load gear numerator = 1.
  - 90.54 Load gear denominator = 50.
- The load moves 70 centimeters, this equals 7/10 of a meter, per one revolution of the cable drum.
  - 90.63 Feed constant numerator = 7.
  - 90.64 Feed constant denominator = 10.

Now the load height in meters can be read from 90.07 Load position scaled integer, while 90.03 Load speed displays the rotational speed of the cable drum and 90.01 Motor speed for control displays the rotational speed of the shaft.

Example 2: Using two encoders

One encoder, e.g. OnBoard encoder, is used as motor feedback. The encoder is connected to the motor shaft through a gear. Another encoder, e.g. Encoder 2, measures the line speed elsewhere in the machine. Following settings are made.

- 90.41 Motor feedback selection = OnBoard encoder.
- The encoder turns three revolutions per one revolution of the motor shaft.
  - 90.43 Motor gear numerator = 1.
  - 90.44 Motor gear denominator = 3.
- 90.51 Load feedback selection = Encoder 2.

  - The line speed measured by Encoder 2 can be read from 90.03 Load speed. This value is in rpm. It can be converted into another unit by 90.53 Load gear numerator and 90.54 Load gear denominator.

Note: The feed constant gear cannot be used in this conversion because it does not affect 90.03 Load speed.

Jog function

The jog function enables the use of a push button to briefly rotate the motor. The jog function is typically used during service or commissioning to control the machinery locally.

Two jog functions, jogging 1 and jogging 2, are available. Each has its own activation sources and references. The sources are selected by 20.26 Jogging 1 start source and 20.27 Jogging 2 start source.

When jogging is activated, the drive starts and accelerates to the defined jogging speed, see 22.42 Jogging 1 ref or 22.43 Jogging 2 ref. The jogging acceleration ramp is set using 23.20 Acc time jogging.

After the activation signal switches off, the drive decelerates to a stop. The jogging deceleration ramp is set using 23.21 Dec time jogging.

For more information see chapter Firmware structure diagrams.

Notes:

- The jogging operates on a 2 ms time level.
- Jogging is not available when the drive is in local control.
- Jogging cannot be enabled when the drive Start command is active. The drive cannot be started when jogging is enabled. Starting the drive after jog enable is switched off, requires a fresh start command.
- If both jogging functions are activated, the one that was activated first has priority.
- Jogging uses the speed control mode.
- Ramp shape times, parameters 23.16 … 23.19, do not apply to the jogging acceleration/deceleration ramp.
- The inching functions activated via a fieldbus, see 06.09.b08/09 Used main control word, use the references and ramp times defined for jogging, but do not require the jog enable signal.

WARNING

If jogging is enabled and activated while the start command is active, jogging will activate as soon as the start command switches off.

Process PID control

See group 40.

Motor potentiometer

The motor potentiometer is a counter whose value can be adjusted up and down using two digital signals selected by 22.73 Motor potentiometer up source and 22.74 Motor potentiometer down source.

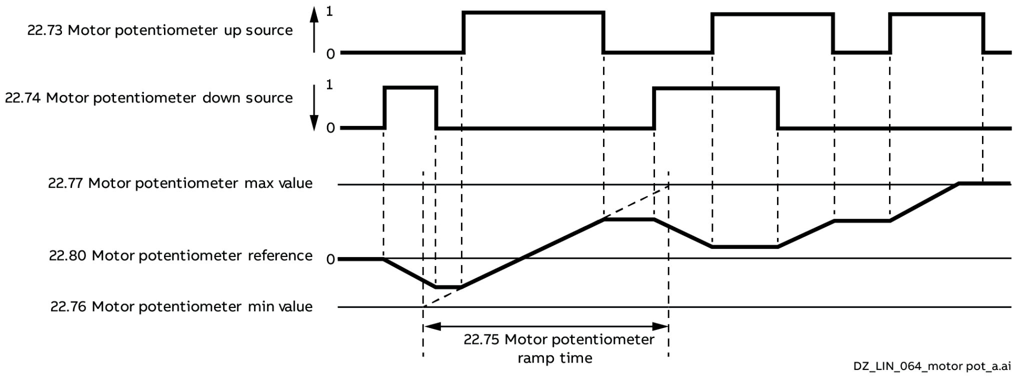
Note: These signals have no effect when the drive is stopped.

When enabled in 22.71 Motor potentiometer function, the motor potentiometer takes over the value set in 22.72 Motor potentiometer initial value. Depending on the mode selected in 22.71 Motor potentiometer function, the motor potentiometer value is either retained or reset over a stop or a power cycle.

The change rate is defined in 22.75 Motor potentiometer ramp time as the time it would take for the value to change from 22.76 Motor potentiometer min value to 22.77 Motor potentiometer max value or vice versa. If the up and down signals are simultaneously on, the motor potentiometer value does not change.

The output of the function is shown in 22.80 Motor potentiometer reference, which can directly be set as the source of any selector parameter such as 22.11 Speed ref1 source.

The following example shows the behavior of the motor potentiometer value.



Mechanical brake control

See group 44.

User load curve

Not yet part of the manual.

Diagnostics

Signal supervision

Not yet part of the manual.

Maintenance timers and counters

Not yet part of the manual.

Energy saving calculators

Not yet part of the manual.

Load analyzer

Not yet part of the manual.

Miscellaneous

User parameter sets

The drive supports four user parameter sets that can be saved to the flash memory and recalled using 96.22 User set save/load. It is also possible to use digital inputs to switch between user parameter sets, see 96.23 User set I/O mode in1 and 96.24 User set I/O mode in2. User parameter sets are typically used to change parameters to emergency configurations and only switched during standstill.

A user parameter set contains all editable values in parameter groups 10 … 99 except:

- Forced I/O values such as 10.03 DI force selection and 10.04 DI force data.
- I/O extension module settings, see groups 14 … 16.
- Fieldbus communication enable parameters, see 50.01 FBA A enable and 50.31 FBA B enable.
- Other fieldbus communication settings, see groups 51 … 56 and 58.
- Encoder configuration settings, see groups 92 and 93.
- Some hardware settings in group 95 HW configuration.

As the motor settings are included in the user parameter sets, make sure the settings correspond to the motor used in the application before recalling a user set.

User lock

For better cybersecurity a master pass code can be set to prevent e.g. the changing of parameter values and/or the loading of firmware and other files.

WARNING

ABB will not be liable for damages or losses caused by the failure to activate the user lock using a new pass code. See chapter Cybersecurity disclaimer.

To activate the user lock for the first time:

- Set 96.07 Pass code = 10,000,000. This will make parameters 96.100 … 96.102 visible.
- Enter a new pass code into 96.100 Change user pass code. Always use eight digits; if using Drive composer, finish with Enter.
- Confirm the new pass code in 96.101 Confirm user pass code.

  WARNING

  Store the pass code in a safe place! The user lock cannot be opened, even by ABB, if the pass code is lost.
- In 96.102 User lock functionality, define the actions that you want to prevent. Our recommendation is to select all the actions unless otherwise required by the application.
- Enter an invalid (random) pass code into 96.07 Pass code.
- Use 96.27 Control board boot or cycle the auxiliary power.
- Check that parameters 96.100 … 96.102 are hidden. If they are not, enter another random pass code into 96.07 Pass code.

To reopen the lock, enter the pass code into 96.07 Pass code. This will again make parameters 96.100 … 96.102 visible.

Data storage parameters

Twenty-four, sixteen 32-bit and eight 16-bit parameters, are reserved for data storage.

These parameters are unconnected by default and can be used for e.g. linking, testing and commissioning purposes. They can be written to and read from using other parameters' source or target selections.

Note: Only 32-bit floating point, type real32, parameters can be selected as the source of another parameter value. In other words, parameters 47.01 … 47.08 can be used as value sources of other parameters while 47.11 … 47.28 cannot.

To use a 16-bit integer, received in DDCS data sets, as the source of another parameter, write the value into one of the real32 type storage parameters 47.01 … 47.08. Select the storage parameter as the source and define a suitable scaling method between the 16-bit and 32-bit values in parameters 47.31 … 47.38.

Communication

What this chapter contains

This chapter describes the communication capabilities of the drive.

Commissioning and maintenance tools

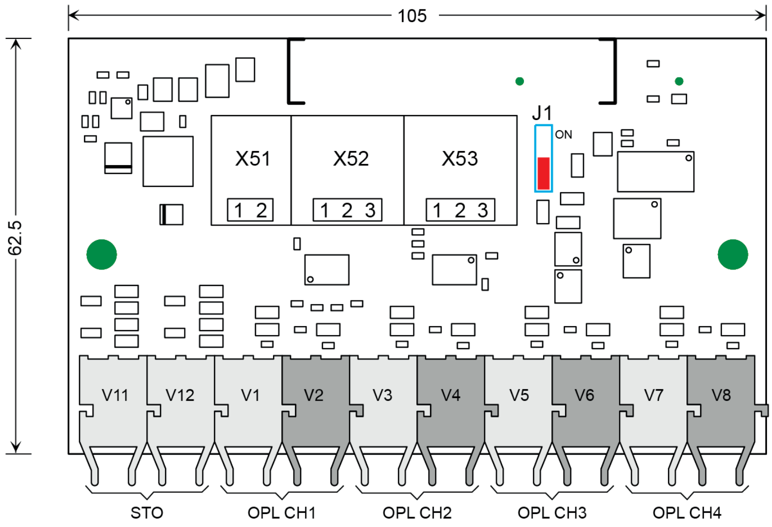
See chapter Connect a DCS880 and a PC running Drive composer.

DCSLink using SDCS-DSL-H1x

General

The DCSLink is a multi-purpose twisted pair bus for the DCS880. All functions using the same hardware and can be used at the same time. The DCSLink can be used for excitation and 12-pulse.

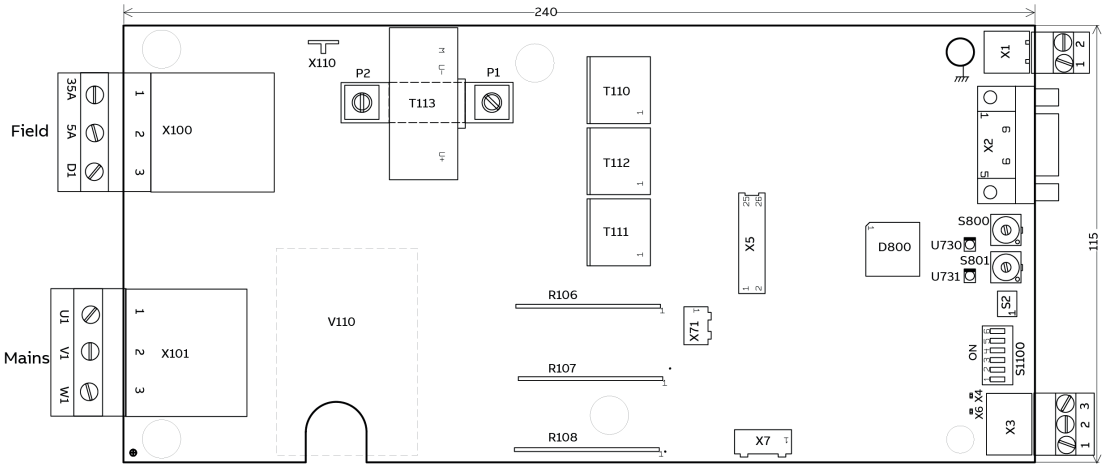
Layout of a SDCS-DSL-H1x



BL_DSLH1x_001_+Tab_b.ai

Excitation, commissioning a DCF803-0016, FEX-425-Int or DCF803-0035

Layout of the field exciter electronics (FEX-4)



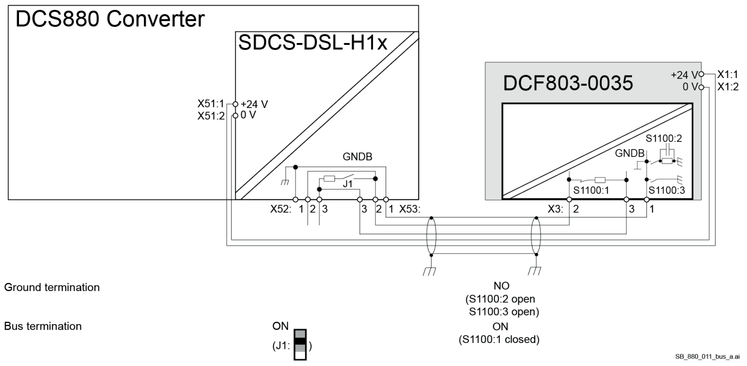
BL_FEX4_001_b.ai

X1:	24 V supply
X1:1	$24\ \text{V}_{\text{DC}}$
X1:2	$0\ \text{V}_{\text{DC}}$

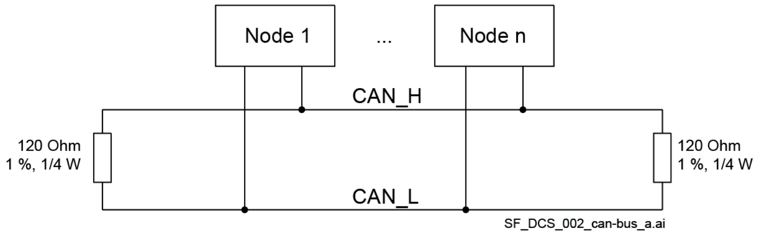
X3:	DCSLink
X3:1	GND B
X3:2	CAN L
X3:3	CAN H

DCSLink cabling and jumper/switch settings

Example for a cable connection.



The DCSLink is a bus system using twisted pair cables. Therefore, bus termination is mandatory at the two physical ends of the bus.



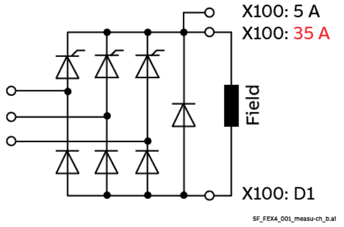
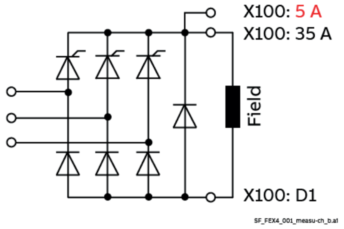
Hardware (SDCS-DSL-H1x)	Hardware (FEX-4)
Jumper J1 = ON if bus termination is needed.	Switch S1100:1 = ON if bus termination is needed.
-	Switches S1100:2 and S1100:3 set the ground termination.

Set the field exciter type

The FEX-4 can be used for 4 different applications:

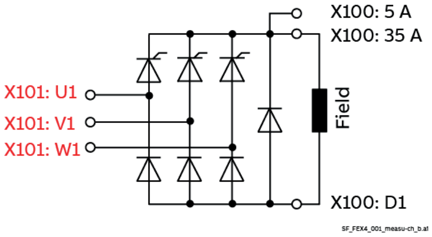
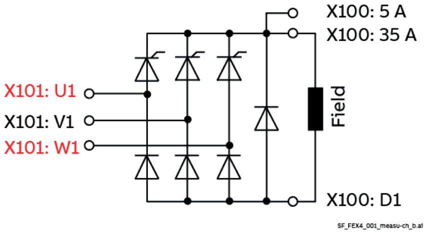
- DCF803-0016 (as external field exciter, up to 16 A).
- FEX-425-Int (as internal field exciter for a H5 and H6, up to 25 A).
- DCF803-0035 (as external field exciter, up to 35 A).
- DCF803 terminal 5 A (as internal or external field exciter, max. 5 A).

Attention: Make sure, that the hardware connection of the field circuit does fit to the setting of 99.07 M1 used field exciter type. If this is not the case, the actual field current is wrong. This leads to a wrong EMF and thus to a wrong EMF speed feedback. Thus, the motor might turn much faster as set in the speed reference.
Always check for correct field current, using a current clamp, before turning the motor with EMF speed feedback.

Firmware (armature converter)	**Hardware (FEX-4)**
99.07 M1 used field exciter type = DCF803-0016, FEX-425-Int or DCF803-0035.	
99.07 M1 used field exciter type = DCF803 terminal 5 A.	

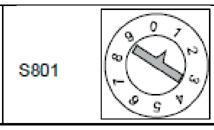
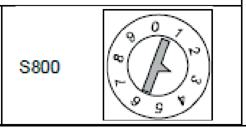
Set the supply of the FEX-4

The FEX-4 can be either supplied by 1-phase or by 3-phases.

Firmware (armature converter)	**Hardware (FEX-4)**
28.63 M1 field exciter operation mode = 3-phase.	
28.63 M1 field exciter operation mode = 1-phase.	

Set the node numbers, transmission speed and the communication supervision

In all bus systems unique node ID numbers are required and must be set in the armature converter and the field exciter. Two stations with the same node ID number are not allowed.
For example, set the armature converter node ID number to 1 and the FEX-4 node ID number to 13.
The communication supervision is activated in the armature converter.
Also, the transmission speed of all units must match.

<table>
<tr><th>Firmware (armature converter)</th><th>Hardware (FEX-4)</th></tr>
<tr><td>70.05 DCSLink node ID = 1.</td><td>-</td></tr>
<tr><td>70.06 Baud rate = 500 kBit/s.</td><td><table><tr><td>S1100:4</td><td>S1100:5</td><td>S1100:6</td><td>kBit/s</td></tr><tr><td>OFF</td><td>OFF</td><td>ON</td><td>500</td></tr></table></td></tr>
<tr><td>70.12 Field exciter timeout = 100 ms.</td><td>-</td></tr>
<tr><td>70.13 M1 field exciter node ID = 13.</td><td><table><tr><td colspan="2">S801</td><td colspan="2">S800</td></tr><tr><td>1</td><td> </td><td>3</td><td> </td></tr></table></td></tr>
</table>

Checking the FEX-4

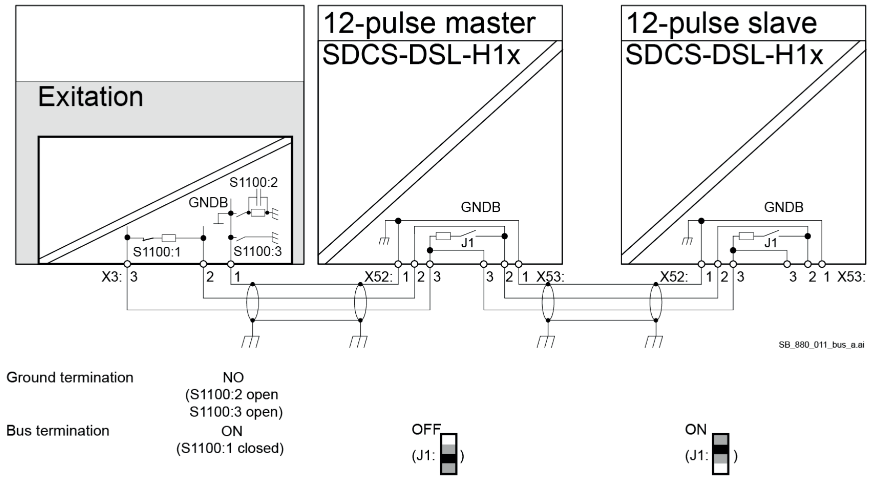
There are several signals to check the FEX-4 installation.

Firmware (armature converter)		**Hardware (FEX-4)**	
07.68 M1 field exciter type.	Shows the FEX-4 type as chosen with 99.07 M1 used field exciter type.	Yellow (U731) or green (U730) LED is blinking.	Waiting for DCSLink communication.
70.01 DCSLink status 1, 70.02 DCSLink status 2.	Show the status of the field exciter node as chosen with 70.13 M1 field exciter node ID.	Yellow (U731) or green (U730) LED is steady.	DCSLink communication is OK.

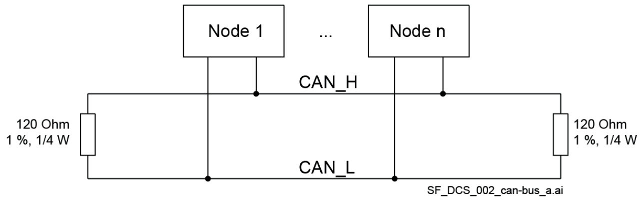
For further information consult the DCS880 Hardware manual (3ADW000462).

12-pulse

Example for a cable connection.



The DCSLink is a bus system using twisted pair cables. Therefore, bus termination is mandatory at the two physical ends of the bus.



Hardware (SDCS-DSL-H1x)	**Hardware (FEX-4)**
Jumper J1 = ON if bus termination is needed.	Switch S1100:1 = ON if bus termination is needed.
-	Switches S1100:2 and S1100:3 set the ground termination.

Set the node numbers, transmission speed and the communication supervision

In all bus systems unique node ID numbers are required and must be set in the 12-pulse master, 12-pulse slave and the excitation. Two stations with the same node ID number are not allowed.

For example, set the 12-pulse master node ID number to 1, the 12-pulse slave node ID number to 31 and the excitation node ID number to 21.

The 12-pulse and excitation communication supervision are activated in the 12-pulse master.

Also, the transmission speed of all converters must match.

Firmware 12-pulse master	**Firmware 12-pulse slave**	**Firmware excitation**
70.05 DCSLink node ID = 1.	70.05 DCSLink node ID = 31.	70.05 DCSLink node ID = 21.
70.06 Baud rate = 500 kBit/s.	70.06 Baud rate = 500 kBit/s.	70.06 Baud rate = 500 kBit/s.
70.08 12-pulse timeout = 100 ms.	-	-
70.09 12-pulse slave node ID = 31.	-	-
70.12 Field exciter timeout = 100 ms.	-	-
70.13 M1 field exciter node ID = 21.	-	-

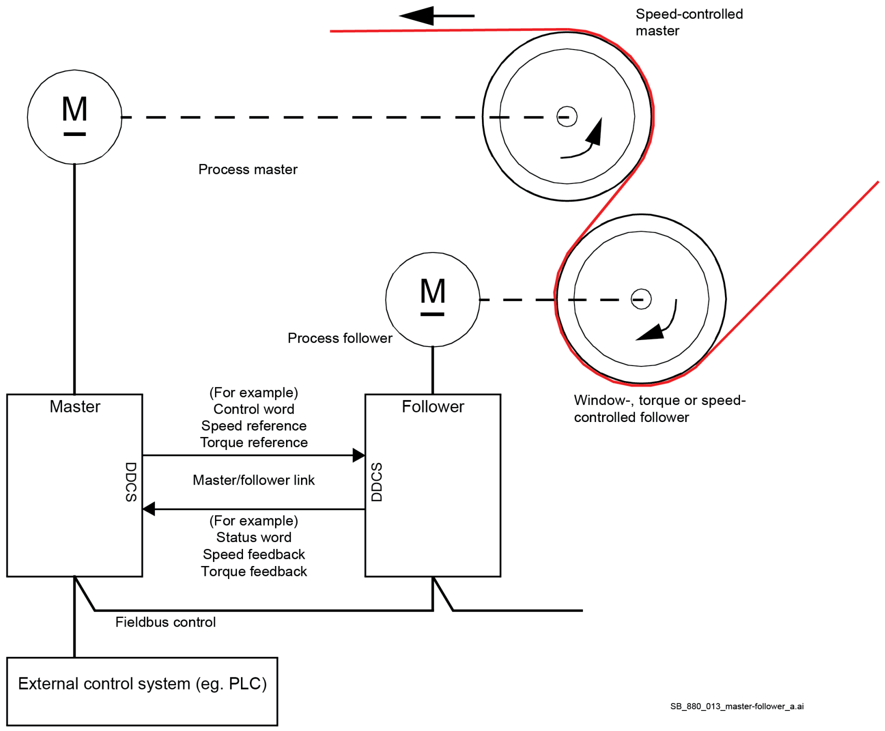
For further information consult the DCS880 12-pulse manual (3ADW000533).

Master-follower link

General

The master-follower link can be used to connect several drives, so that the load can be evenly distributed between the drives. This is ideal in applications where the motors are coupled to each other via gearing, chain, belt, etc.

The external control signals are typically connected to one drive only which acts as the master. The master controls up to 10 followers by sending broadcast messages over an electrical cable or fiber optic link. The master can read feedback signals from up to 3 selected followers.



The master is typically speed-controlled, and the followers follow its torque or speed reference. In general, a follower should be:

- Window- or torque-controlled when the motor shafts of the master and the followers are rigidly coupled by gearing, chain etc. so that no speed difference between the drives is possible.
- Window- or speed-controlled when the motor shafts of the master and the follower are flexibly coupled so that a slight speed difference is possible.
- To switch dynamically between speed control and torque control use 19.11 Ext1/Ext2 selection.

Communication

A master-follower link can be built by connecting the drives together with fiber optic cables (requires a FDCO-0x DDCS communication module per drive) or by wiring together the XD2D connectors of the drives. The medium is selected by 60.01 M/F communication port.

60.03 M/F mode defines whether the drive is the master or a follower on the master-follower link. Typically, the speed-controlled process master drive is also configured as the master in the link.

The communication on the master-follower link is based on the DDCS protocol, which employs data sets (specifically, data set 41). One data set contains three 16-bit words. The contents of the data sets are freely configurable using parameters 61.01 … 61.03. The data set broadcast by the master typically contains its control word, speed reference and torque reference, while the followers typically return their status word (06.15 Main status word) for monitor purposes.

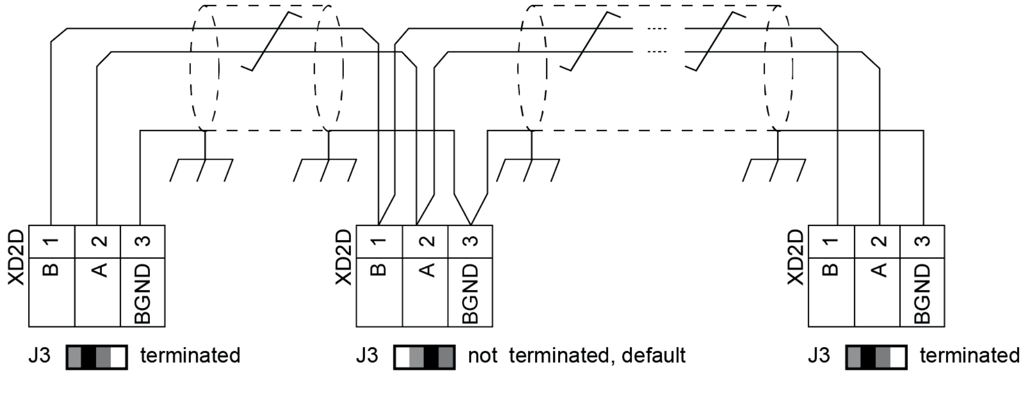
The default setting of 61.01 M/F data 1 selection is 06.06 Follower CW. With this setting in the master, 06.06 Follower control word, is broadcasted to all followers.

However, bit 3 (Run command) of the follower control word is modified so that it becomes zero when the master trips.
Three words of data can be read from followers with the node addresses 2, 3 and 4 (see 60.02 M/F node address). The followers from which data is read are selected by 60.14 M/F follower selection in the master. In each follower, the data to be sent are selected by parameters 61.01 … 61.03. The data is transferred in integer format over the link and displayed by parameters 62.28 … 62.36 in the master. The data can then be forwarded using parameters 62.04…62.12.
To indicate faults in the followers, each follower must be configured to transmit its status word (06.15 Main status word) in one of the above-mentioned data words. In the master, the corresponding target parameter must be set to Follower SW node x. The follower status words can be seen in parameters 06.122 … 06.124. The action to be taken when a follower is faulted is selected by 60.17 Follower fault action. External events (see group 31 Fault functions and fault levels) can be used to indicate the status of other bits of any follower status word.

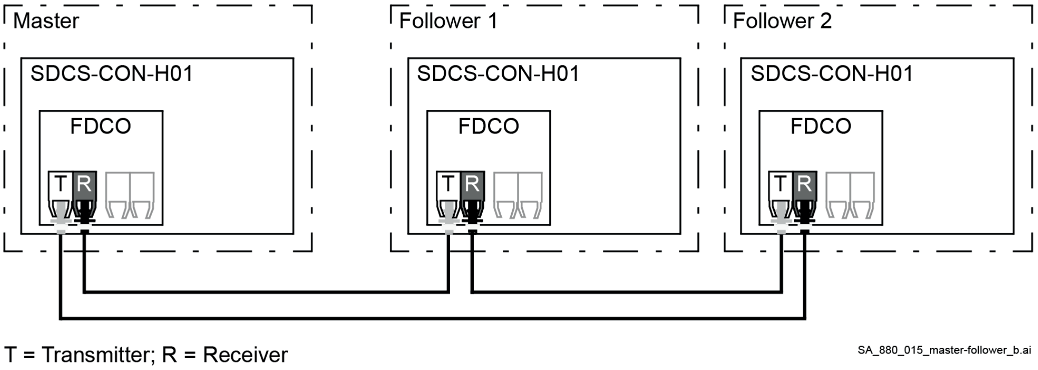
Configuration of the master-follower link

The master-follower link is formed by connecting the drives together using:
- Shielded twisted-pair cables between the XD2D terminals of the drives.
- Fiber optic cables. An additional FDCO-0x DDCS communication module per drive is needed.

Connection examples are shown below.

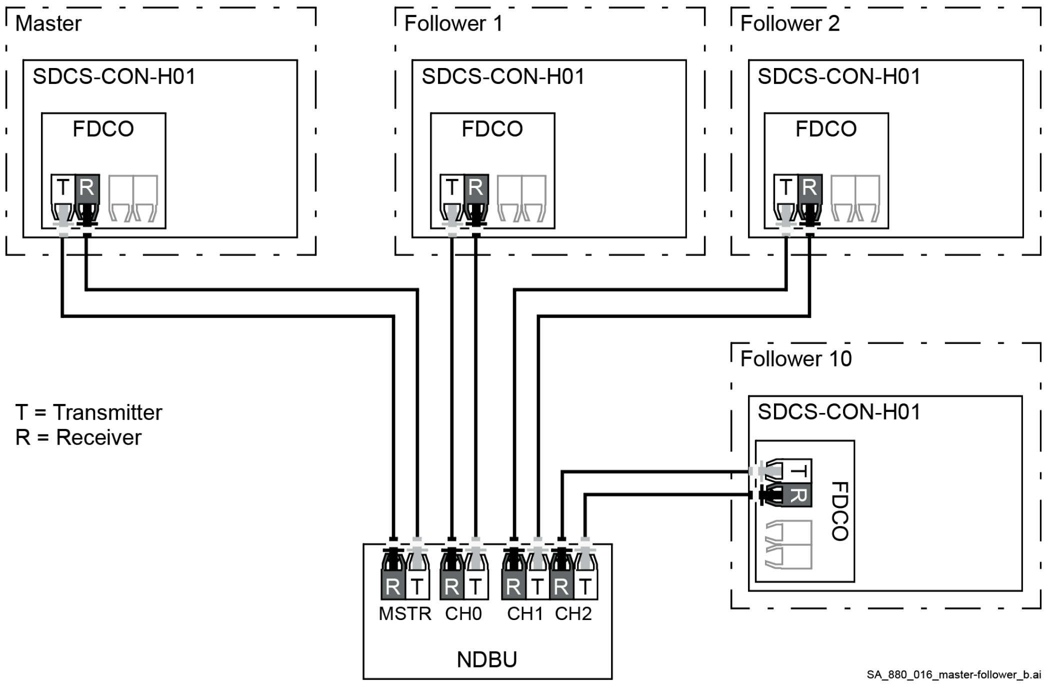


Master-follower link wiring with electrical cables.



Ring configuration with fiber optic cables.

Notes:
- A maximum of 2 followers is possible.
- Both 5 MBd or 10 MBd channels are possible. Do not mix.



Star configuration with fiber optic cables.

Notes:

- A star configuration using fiber optic cables requires an NDBU-95C DDCS branching unit. See DDCS branching unit NDBU-95 user's manual (3BFE64285513).
- Both 5 MBd or 10 MBd channels are possible. Do not mix.

Example parameter settings

The following is a checklist of parameters that need to be set when configuring the master-follower link. In this example, the master broadcasts the follower control word, a speed reference and a torque reference. The followers return their status words and two actual values (this is not compulsory but is shown for clarity).

Master settings

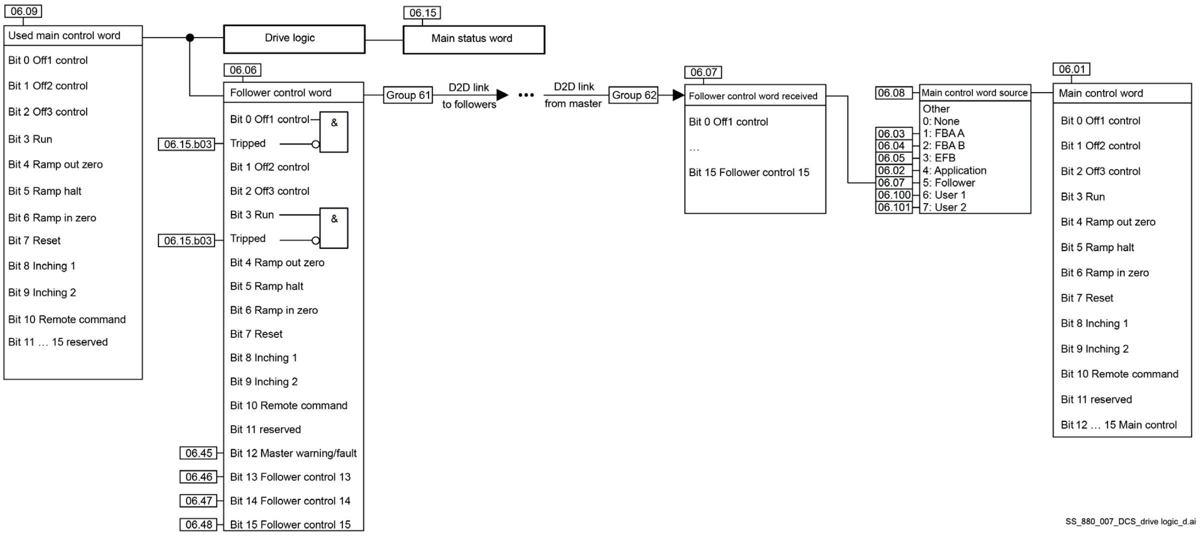
Master-follower link activation:

- 60.01 M/F communication port. The communication port setting depends on the used hardware and its location.
- 60.02 M/F node address = 1. The allowable address for the master is 1.
- 60.03 M/F mode = FDCO-XD2D Master. For both fiber optic and wire connection.
- 60.05 M/F HW connection = Ring or Star for fiber optic. Always Star for wire.

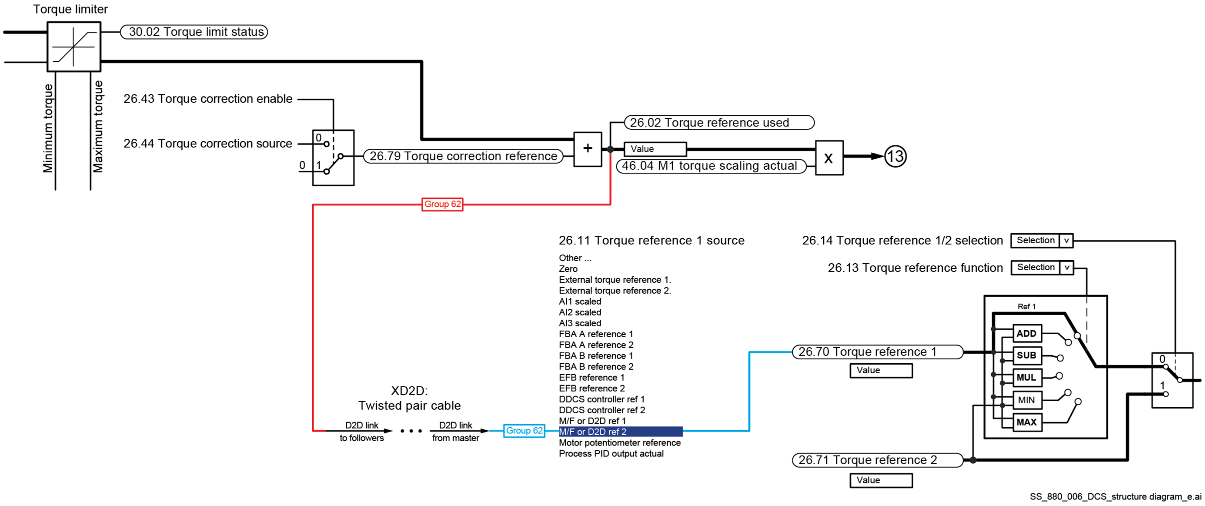
Time synchronization:

- 96.35 Time sync primary source = DDCS controller. The master needs the primary source for the time synchronization.
- 96.36 M/F and D2D clock synchronization = Active. The time synchronization must be activated in all units.

Overview for the control word:



Overview for torque reference (Ref2):



Data to be sent from the master to the followers:

- 61.01 M/F data 1 selection = 06.06 Follower control word.
- 61.02 M/F data 2 selection = 23.03 Speed reference 7.
- 61.03 M/F data 3 selection = 26.02 Torque reference used.

Data to be read by the master from followers with node addresses 2, 3 and 4 (optional):

- 60.14 M/F follower selection. The selection of followers that data is read from.
  60.17 Follower fault action = Fault. Selects how the master reacts to a faulty follower. To indicate faults in the followers, each follower must be configured to transmit its status word. In the master, the corresponding target parameter must be set to Follower SW node x. Example:

Follower		Master
61.01 M/F data 1 selection = 06.15 Main status word	⇒	62.04 Follower node 2 data 1 sel = 06.122 Follower status word node 2

- 62.04 Follower node 2 data 1 sel … 62.12 Follower node 4 data 3 sel are used for mapping of data received from the followers.

Follower settings

Master-follower link activation:

- 60.01 M/F communication port. The communication port setting depends on the used hardware and its location.
- 60.02 M/F node address = 2 … 254. Only followers with node addresses 2, 3 or 4 can be supervised by the master.
- 60.03 M/F mode = FDCO-XD2D Master. For both fiber optic and wire connection.
- 60.05 M/F HW connection = Ring or Star for fiber optic. Always Star for wire.

Time synchronization:

- 96.35 Time sync primary source = D2D or M/F. All followers must be set to D2D or M/F.
- 96.36 M/F and D2D clock synchronization = Active. The time synchronization must be activated in all units.

Mapping of data received from the master:

- 62.01 M/F data 1 selection = CW 16bit.
- 62.02 M/F data 2 selection = Ref1 16bit.
- 62.03 M/F data 3 selection = Ref2 16bit.

Scaling of the references:

- 60.10 M/F ref1 type = Speed.
- 60.11 M/F ref2 type = Torque.

Selection of reference sources:

- 06.08 Main control word source = Follower.
- 22.11 Speed reference 1 source = M/F or D2D ref1.
- 26.11 Torque reference 1 source = M/F or D2D ref2.

Selection of operating mode:

- 19.12 Ext1 control mode = Add, Torque or Speed.
- 20.01 Command location = Main control word.

Data to be sent from the followers with node addresses 2, 3 and 4 to the master (optional):

- 61.01 M/F data 1 selection = 06.15 Main SW. For proper follower supervision in the master the main status word of each follower must be send to the master.
- 61.02 M/F data 2 selection = Other, freely chosen.
- 61.03 M/F data 3 selection = Other, freely chosen.

Additional settings

Field weakening

In case of field weakening all followers must have a speed feedback via encoder or tacho.

Note: When connecting the output of one encoder to two units a splitter must be used.

Connection to overriding control

In case followers are connected to an overriding control make sure, that the overriding control is not writing on the same signals (via groups 50 … 58 and/or groups 60 … 62) as the master (via the master-follower link). There is always a problem when two sources write on one sink. Be very carefully with e.g. 06.06 Follower control word, 23.03 Speed reference 7, 26.02 Torque reference used, ...

E-stop

In case of an E-stop the master must be in control of all followers. Thus, set in all followers:

- 20.05 Off3 source (emergency stop) = Off3 inactive.
- 19.20 Follower force ramp stop = Keep control mode.

Specifications of the master-follower link

Maximum cable length:

- FDCO-0x with POF (Plastic Optic Fiber): 30 m.
- FDCO-0x with HCS (Hard-Clad Silica Fiber): 200 m.
- Maximum shielded twisted-pair cable length: 50 m.

Transmission rate: 4 Mbit/s.

Total performance of the link: < 5 ms to transfer references between master and followers.

Protocol: DDCS (Distributed Drives Communication System).

Settings and diagnostics

Parameter groups 60 DDCS communication, 61 D2D and DDCS transmit data and 62 D2D and DDCS receive data.

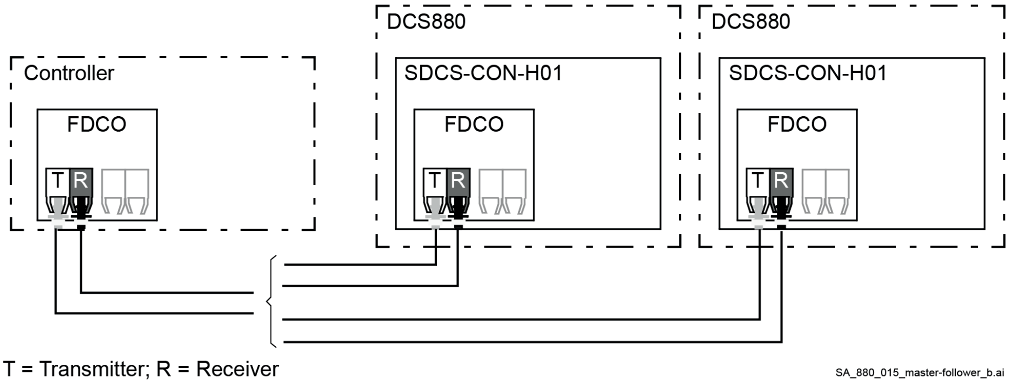
DDCS controller interface

General

The drive can be connected to a DDCS controller, such as the ABB AC 800M, using fiber optics. The DCS880 is compatible with both the ModuleBus and DriveBus connections.
Note: Some features of the DriveBus, such as BusManager, are not supported.

Topology

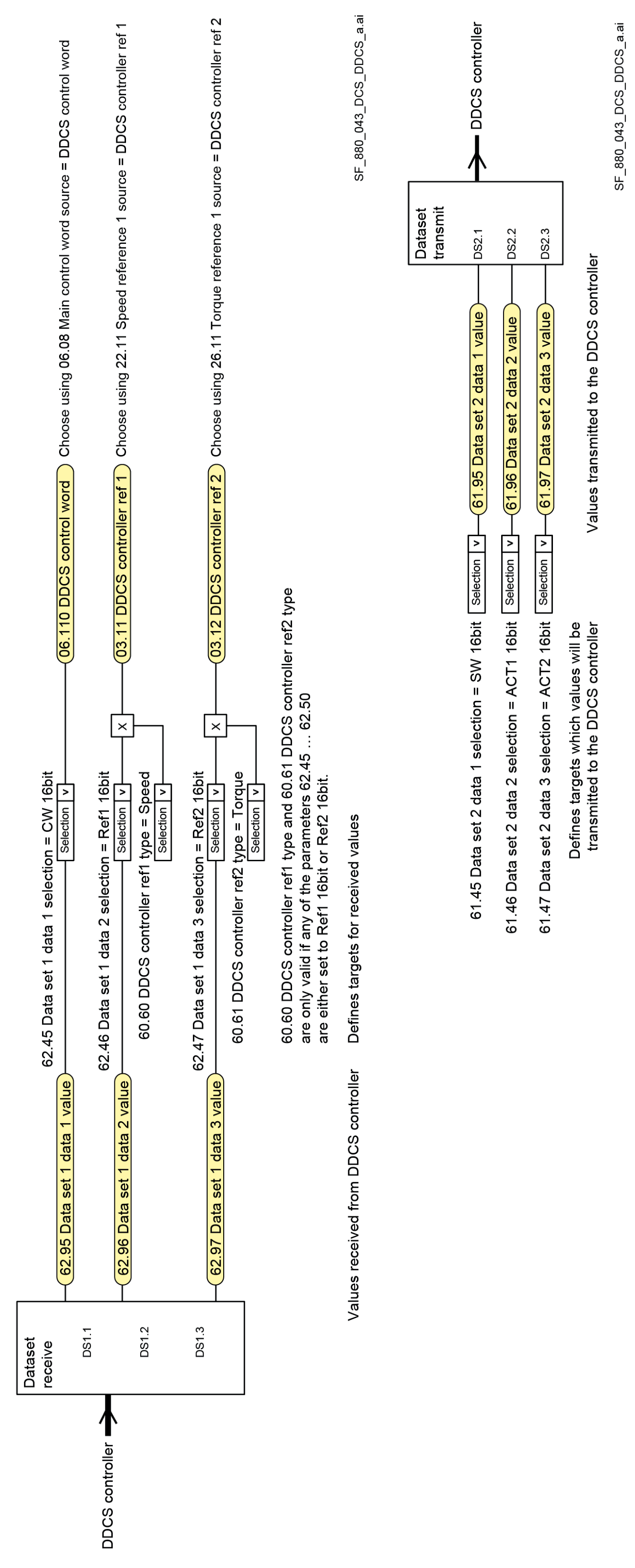
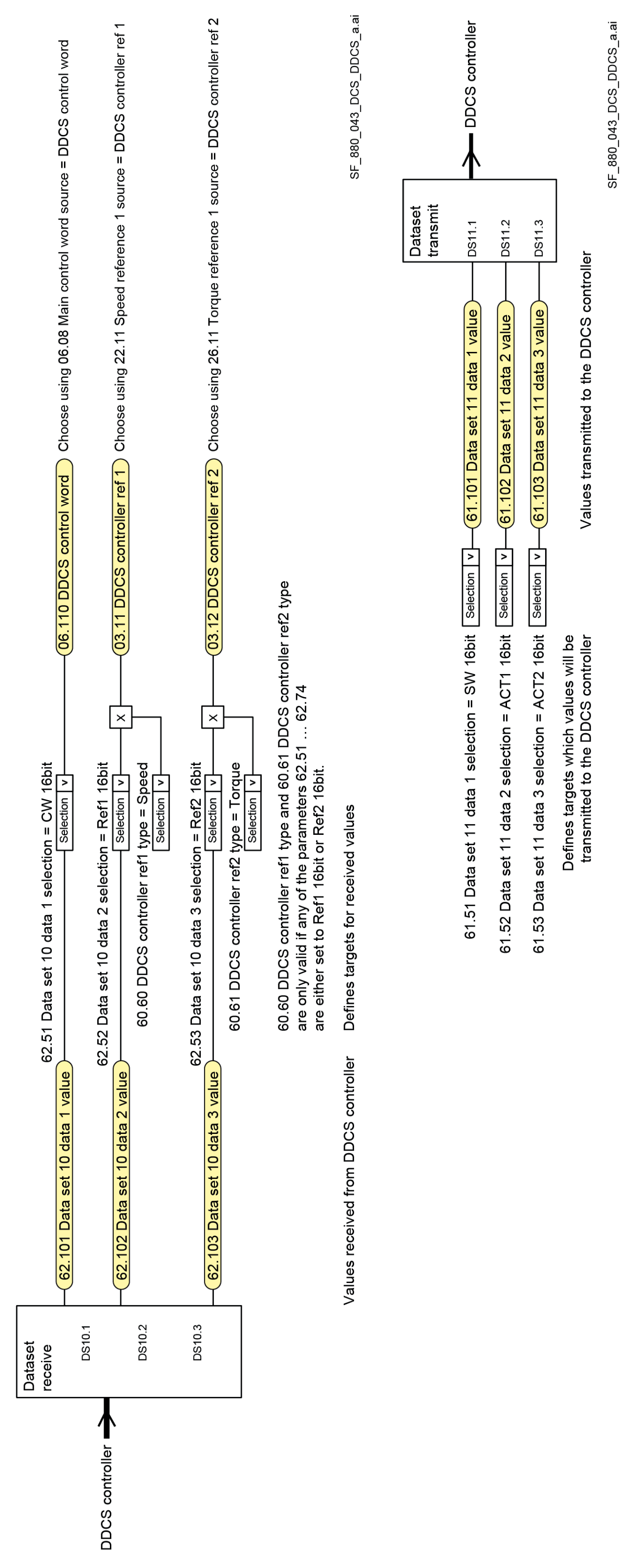
An example connection using fiber optic cables is shown below.
The drives require an additional FDCO-0x DDCS communication module. Ring and star configurations are possible. See 60.55 DDCS controller HW connection and chapter Configuration of the master-follower link.



The selection of the connection is made by 60.51 DDCS controller comm port.
The transfer rate can be selected by 60.56 DDCS controller baud rate.

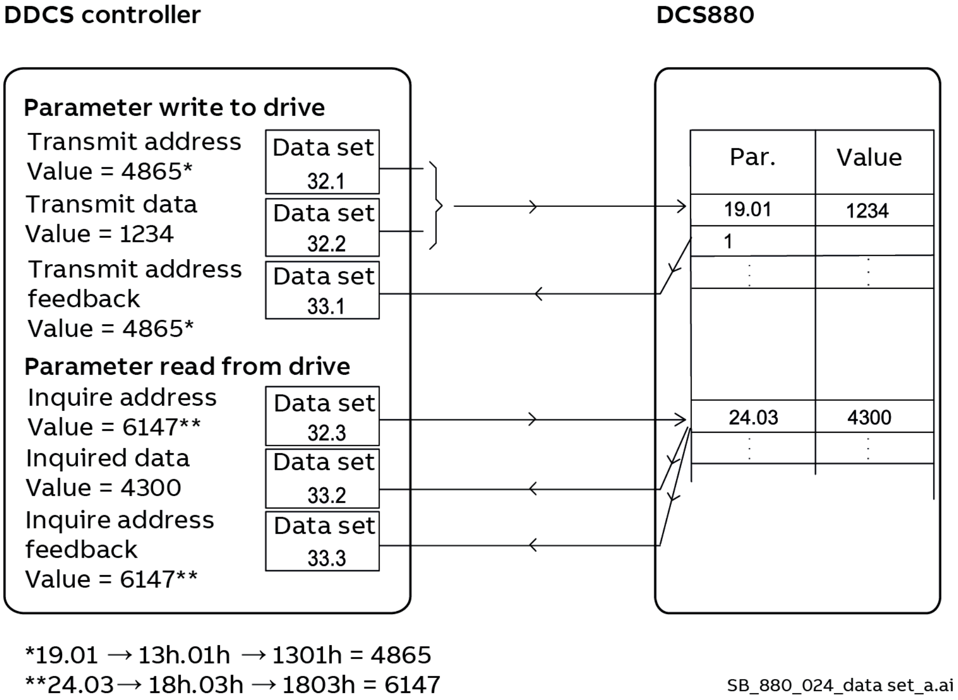
Communication

The communication between the controller and the drive consists of data sets of three 16-bit words each. The controller sends a data set to the drive, which returns the next data set to the controller.
The communication uses data sets 1 … 4, 10 … 25 and data sets 32, 33. The contents of the data sets are freely configurable, but data set 10 typically contains the control word and one or two references, while data set 11 returns the status word and selected actual values.
For ModuleBus communication, the DCS880 can be set up as an ABB standard drive or as an ABB engineered drive by 60.50 DDCS controller drive type. ModuleBus communication uses data sets 1 … 4 with an ABB standard drive and data sets 10 … 25 and data sets 32, 33 with an ABB engineered drive.
The word from the controller that is defined as the control word, e.g. 62.51 Data set 10 data 1 selection = CW 16bit, is send to 06.110 DDCS control word. The coding of the bits is shown in 06.01 Main control word.
The word from the drive that is defined as the status word, e.g. 61.51 Data set 11 data 1 selection = SW 16bit, is send to the controller. The coding of the bits is shown in 06.15 Main status word.

60.50 DDCS controller drive type = ABB standard drive	60.50 DDCS controller drive type = ABB engineered drive
	

Mailbox service

By default, data sets 32 and 33 are dedicated for the mailbox service, which enables the setting or inquiry of parameter values as follows:



SB_880_024_data set_a.ai

By means of 60.64 Mailbox data set selection it is possible to select data sets 24 and 25 instead of data sets 32 and 33.

The update intervals of the data sets are as follows:

- Data sets 10 and 11: 2 ms.
- Data sets 12 and 13: 4 ms.
- Data sets 14 … 17: 10 ms.
- Data sets 18 … 25, 32 and 33: 100 ms.

Settings and diagnostics

Parameter groups 60 DDCS communication, 61 D2D and DDCS transmit data and 62 D2D and DDCS receive data.

User Macros

Refer to the DCS880 Quick guide.

Parameters

What this chapter contains

The chapter describes the parameters and signals of the firmware.

Terms and abbreviations

Term	Definition
Change running	y = Parameter can be changed while the drive is running. n = Parameter can only be changed while the drive is stopped.
Default (def.)	The default value of a parameter.
Index	Signal and parameter numbers consists of group number and a consecutive number (index).
Other	The value is taken from another parameter. Choosing “Other” displays a parameter list in which the user can specify the source parameter.
Other [bit]	The value is taken from a specific bit in another parameter. Choosing “Other” displays a parameter list in which the user can specify the source parameter and bit.
Parameter	A user-adjustable operating instruction for the drive.
p.u.	Per unit.
Range	Range of a signal or parameter.
Scale/FbEq16	16-bit fieldbus equivalent: The scaling between the value shown on the panel and the integer used in communication when a 16-bit value is selected for transmission to an external system. A dash (-) indicates that the parameter is not accessible in 16-bit format.
Signal	Value measured or calculated by the drive. It can also contain status information. Most signals are read-only, but some (especially counter-type signals) can be reset.
Type	Either signal or parameter.
Unit	Shows the physical unit of a signal or parameter, if applicable. The unit is displayed in the control panel and Drive composer.
Volatile	y = Values are NOT stored in the flash memory, they will be lost when the drive is de-energized. n = Values are stored in the flash memory, they will remain when the drive is de-energized.

Summary of parameter groups

Group	Contents
01 Actual values	Basic signals for monitoring the drive.
03 Input references	Values of references received from various sources.
04 Warnings and faults	Information on warnings and faults that occurred last.
05 Diagnostics	Various run-time-type counters and measurements related to drive maintenance.
06 Control and status words	Drive control, status and event words.
07 System info	The drive’s hardware and firmware information.
10 Standard DI, RO	Configuration of digital inputs and relay outputs.
11 Standard DIO, FI, FO	Configuration of digital input/outputs and frequency inputs/outputs.
12 Standard AI	Configuration of standard analog inputs.

13 Standard AO	Configuration of standard analog outputs.
14 I/O extension module 1	Configuration of I/O extension module 1.
15 I/O extension module 2	Configuration of I/O extension module 2.
16 I/O extension module 3	Configuration of I/O extension module 3.
19 I/O Operation mode	Selection of local and remote control locations and operating modes.
20 Start/Stop/Direction	Start/Stop/Direction and Run/Start/jog enable signal source selection. Positive/Negative reference enable source selection. Breaker and acknowledge source selection.
21 Start/Stop mode	Start and stop modes, emergency stop mode and zero speed.
22 Speed reference selection	Speed reference selection and motor potentiometer settings.
23 Speed reference ramp	Speed reference ramp settings (programming of the acceleration and deceleration rates for the drive).
24 Speed reference conditioning	Speed error calculation, speed error window control configuration and speed error (Δn) step.
25 Speed control	Speed controller settings.
26 Torque reference chain	Settings for the torque reference chain.
27 Armature current control	Settings for the armature current control chain.
28 EMF and field current control	Settings for the EMF and field current control chain.
29 12-pulse/Hardparallel	Settings for 12-pulse and hardparallel.
30 Control limits	Drive operation limits.
31 Fault functions and fault levels	Configuration of external events. Selection of the drive behavior in fault situations.
32 Supervision	Configuration of signal supervision functions 1 … 3. Three values can be monitored. A warning or fault is generated whenever predefined limits are exceeded.
33 Generic timer & counter	Configuration of maintenance timers/counters.
35 Motor thermal protection	Motor thermal protection settings such as temperature measurement configuration and load curve definition.
36 Load analyzer	Peak value and amplitude logger settings.
37 User load curve	Settings for user load curve.
40 Process PID	Parameter values for process PID controller.
42 Shared motion (2nd motor)	Configuration of 2nd motor.
44 Mechanical brake control	Configuration of mechanical brake.
45 Energy efficiency	Settings for the energy saving calculators.
46 Monitoring/Scaling settings	Speed supervision settings, signal filtering and general scaling settings.
47 Data storage	Data storage parameters that can be written to and read from using other parameters' source and target settings.
49 Panel port communication	Communication settings for the control panel port on the drive.
50 Fieldbus adapter (FBA)l	Fieldbus communication configuration.
51 FBA A settings	Fieldbus adapter A configuration.
52 FBA A data in	Selection of data sent by fieldbus adapter A to the master (e.g. PLC).
53 FBA A data out	Selection of data sent by the master (e.g. PLC) to fieldbus adapter A.
54 FBA B settings	Description see group 51 FBA A settings.
55 FBA B data in	Description see group 52 FBA A data in.

56 FBA B data out	Description see group 53 FBA A data out.
58 Embedded fieldbus	Embedded fieldbus (EFB) configuration.
60 DDCS Communication	DDCS communication configuration.
61 D2D and DDCS transmit data	Defines the data sent from the drive to the DDCS/D2D link.
62 D2D and DDCS receive data	Defines the data sent from the DDCS/D2D link to the drive.
70 DCSLink Communication	Defines the DCSLink communication.
74 … 89 Application specific groups	Groups used for application programming.
90 Feedback selection	Motor and load feedback configuration.
91 Encoder module settings	Configuration of the encoder interface modules.
92 Encoder 1 configuration	Settings for encoder 1.
93 Encoder 2 configuration	Settings for encoder 2.
94 OnBoard speed feedback configuration	Settings for analog tacho and OnBoard encoder.
95 HW configuration	Various hardware-related settings.
96 System	Language selection; access levels; macro selection; parameter save and restore; control board reboot; user parameter sets; unit selection; data logger triggering; user lock.
99 Motor data	Motor configuration settings.

Parameter listing

01 Actual Values

Basic signals for monitoring the drive.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">01.01</td><td colspan="7">Used motor speed filtered</td></tr>
<tr><td colspan="7">Measured or EMF motor speed.
Displays the measured or EMF motor speed depending on which feedback is used. See 90.41 M1 feedback selection. A filter time constant is defined by 46.11 Filter time motor speed.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>-</td><td>rpm</td><td>See 46.02</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">01.02</td><td colspan="7">EMF speed filtered</td></tr>
<tr><td colspan="7">Motor speed calculated from EMF.
Displays the motor speed calculated from EMF in rpm. A filter time constant is defined by 46.11 Filter time motor speed.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>-</td><td>rpm</td><td>See 46.02</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">01.03</td><td colspan="7">Tacho speed filtered</td></tr>
<tr><td colspan="7">OnBoard tacho speed.
Displays the motor speed measured with OnBoard tacho in rpm. A filter time constant is defined by 46.11 Filter time motor speed.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>-</td><td>rpm</td><td>See 46.02</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">01.04</td><td colspan="7">OnBoard encoder speed filtered</td></tr>
<tr><td colspan="7">OnBoard encoder speed.
Displays the motor speed measured with OnBoard encoder in rpm. A filter time constant is defined by 46.11 Filter time motor speed.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>-</td><td>rpm</td><td>See 46.02</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">01.05</td><td colspan="7">Encoder 1 speed filtered</td></tr>
<tr><td colspan="7">Encoder 1 speed.
Displays the motor speed measured with encoder 1 in rpm. A filter time constant is defined by 46.11 Filter time motor speed.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>-</td><td>rpm</td><td>See 46.02</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">01.06</td><td colspan="7">Encoder 2 speed filtered</td></tr>
<tr><td colspan="7">Encoder 2 speed.
Displays the motor speed measured with encoder 2 in rpm. A filter time constant is defined by 46.11 Filter time motor speed.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>-</td><td>rpm</td><td>See 46.02</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">01.07</td><td colspan="7">Speed change rate</td></tr>
<tr><td colspan="7">Rate of speed change.
Displays the rate of motor speed change. Positive values indicate acceleration. Negative values indicate deceleration. See 31.31 Emergency ramp supervision, 31.32 Emergency ramp supervision delay, 31.33 Ramp stop supervision and 31.34 Ramp stop supervision delay.</td></tr>
<tr><td>-15000 … 15000</td><td>-</td><td>rpm/s</td><td>1 = 1 rpm/s</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">01.10</td><td colspan="7">Motor current in A</td></tr>
<tr><td colspan="7">Motor current.
Measured motor current in amperes.</td></tr>
<tr><td>-32500.0 … 32500.0</td><td>-</td><td>A</td><td>1 = 1 A</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="2">01.17</td><td colspan="7">Motor torque filtered</td></tr>
<tr><td colspan="7">Filtered motor torque.</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
	Displays the filtered motor torque in percent of 99.02 M1 nominal torque. A filter time constant is defined by 46.13 Filter time motor torque. Is used for the EMF controller and the EMF feed forward.						
	-325.00 … 325.00	-	%	See 46.04	y	n	Signal
01.18	**Motor torque 100 ms filtered**						
	Motor torque filtered with 100 ms. Displays the motor torque filtered with 100 ms in percent of 99.02 M1 nominal torque.						
	-325.00 … 325.00	-	%	See 46.04	y	n	Signal
01.20	**Mains voltage in V**						
	Mains voltage. Measured mains voltage in volt. Filtered with 10 ms.						
	0.0 … 3250.0	-	V	10 = 1 V	y	n	Signal
01.21	**Armature voltage in V**						
	Armature voltage. Measured armature voltage in volt. Filtered with 10 ms. This value is also influenced by 95.34 DC voltage measurement adjust and 95.35 DC voltage measurement offset.						
	-3250.0 … 3250.0	-	V	10 = 1 V	y	n	Signal
01.24	**Output power in kW**						
	Output power. Measured output power in kW. The unit is selected by 96.02 Unit selection. A filter time constant is defined by 46.14 Filter time power output.						
	-32500 … 32500	-	kW or hp	1 = 1 kW or hp	y	n	Signal
01.25	**Output power**						
	Output power. Measured output power in percent of 99.03 M1 nominal power.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.26	**Reactive power**						
	Reactive power. Measured reactive power in percent of 99.03 M1 nominal power.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.29	**M1 field current in A**						
	Motor 1 field current. Motor 1 measured field current in amps. Filtered with 500 ms.						
	-3250.0 … 3250.0	-	A	10 = 1 A	y	n	Signal
01.30	**M2 field current in A**						
	Motor 2 field current. Motor 2 measured field current in amps. Filtered with 500 ms.						
	-3250.0 … 3250.0	-	A	10 = 1 A	y	n	Signal
01.40	**Drive current**						
	Drive current. Measured drive current in percent of 07.62 Drive DC current scaling set.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.41	**Reactive current**						
	Reactive motor current. Measured reactive motor current in percent of 99.11 M1 nominal current.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.50	**Current ripple**						
	Armature current ripple output. Displays the armature current ripple monitor output in percent of 99.11 M1 nominal current or 42.08 M2 nominal current.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.51	**Current ripple filtered**						
	Filtered armature current ripple output. Displays the filtered armature current ripple monitor output in percent of 99.11 M1 nominal current. The filter time constant is 200 ms.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.60	**12-pulse serial armature voltage sum in V**						
	Calculated armature voltage in volt (12-pulse serial/serial sequential master only). Calculated armature voltage of 12-pulse serial/serial sequential master plus 12-pulse serial/serial sequential slave.						
	-3250.0 … 3250.0	-	V	10 = 1 V	y	n	Signal
01.61	**12-pulse parallel current sum in A**						
	Summed motor current in amperes (12-pulse parallel master only). Summed measured motor current of 12-pulse parallel master plus 12-pulse parallel slave.						
	-32500.0 … 32500.0	-	A	1 = 1 A	y	n	Signal
01.62	**12-pulse parallel slave current in A**						
	Slave motor current in amperes (12-pulse parallel master only). Measured motor current of the 12-pulse parallel slave.						
	-32500.0 … 32500.0	-	A	1 = 1 A	y	n	Signal
01.70	**99.01 Mains voltage fast**						
	Fast signal mirrored, 99.01 Mains voltage. Measured mains voltage in percent of 99.10 Nominal mains voltage.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.71	**28.05 Armature voltage fast**						
	Fast signal mirrored, 28.05 Armature voltage. Measured armature voltage in percent of 99.12 M1 nominal voltage.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.72	**24.01 Used speed reference fast**						
	Fast signal mirrored, 24.01 Used speed reference. Speed reference for speed error calculation. The unit is selected by 96.03 Unit for speed control.						
	-30000.00 … 30000.00	-	rpm, % or V	See 46.02	y	n	Signal
01.73	**24.02 Used speed feedback fast**						
	Fast signal mirrored, 24.02 used speed feedback. Speed feedback for speed error calculation.						
	-30000.00 … 30000.00	-	rpm	See 46.02	y	n	Signal
01.74	**27.02 Used current reference fast**						
	Fast signal mirrored, 27.02 Used current reference.						

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
	Displays the armature current reference in percent of 99.11 M1 nominal current after current limitation.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.75	**27.05 Motor current fast**						
	Fast signal mirrored, 27.05 Motor current. Measured motor current in percent of 99.11 M1 nominal current.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.76	**27.18 Firing angle fast**						
	Fast signal mirrored, 27.18 Firing angle. Displays the firing angel in degrees.						
	0.00 … 180.00	-	°	100 = 1°	y	n	Signal
01.77	**28.14 M1 field current reference fast**						
	Fast signal mirrored, 28.14 M1 field current reference. Displays motor 1 field current reference in percent of 99.13 M1 nominal field current.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.78	**28.15 M1 field current fast**						
	Fast signal mirrored, 28.15 M1 field current. Motor 1 measured field current in percent of 99.13 M1 nominal field current.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.79	**42.45 M2 field current reference fast**						
	Fast signal mirrored, 42.45 M2 field current reference. Displays motor 2 field current reference in percent of 42.10 M2 nominal field current.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.80	**42.46 M2 field current fast**						
	Fast signal mirrored, 42.46 M2 field current. Motor 2 measured field current in percent of 42.10 M2 nominal field current.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.81	**Motor current 500 µs**						
	Superfast motor current signal with 500 µs cycle time. Thus, it is possible to see the current bubbles when recorded using the Datalogger in Drive composer pro.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal

03 Input references

Values of references received from various sources.

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
03.01	**Panel reference 1**						
	Panel reference 1. Displays the local reference given from the control panel or PC tool.						
	-100000.00 … 100000.00	-	-	1 = 10	y	n	Signal
03.05	**FBA A reference 1**						
	Fieldbus adapter A reference 1. Displays reference 1 received via fieldbus adapter A.						
	-100000.00 … 100000.00	-	-	1 = 10	y	n	Signal

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
03.06	**FBA A reference 2**						
	Fieldbus adapter A reference 2. Displays reference 2 received via fieldbus adapter A.						
	-100000.00 … 100000.00	-	-	1 = 10	y	n	Signal
03.07	**FBA B reference 1**						
	Fieldbus adapter B reference 1. Displays reference 1 received via fieldbus adapter B.						
	-100000.00 … 100000.00	-	-	1 = 10	y	n	Signal
03.08	**FBA B reference 2**						
	Fieldbus adapter B reference 2. Displays reference 2 received via fieldbus adapter B.						
	-100000.00 … 100000.00	-	-	1 = 10	y	n	Signal
03.09	**EFB reference 1**						
	Embedded fieldbus reference 1. Displays scaled reference 1 received via the embedded fieldbus. The scaling is defined by 58.26 EFB ref1 type.						
	-30000.00 … 30000.00	-	-	1 = 10	y	n	Signal
03.10	**EFB reference 2**						
	Embedded fieldbus reference 2. Displays scaled reference 2 received via the embedded fieldbus. The scaling is defined by 58.27 EFB ref2 type.						
	-30000.00 … 30000.00	-	-	1 = 10	y	n	Signal
03.11	**DDCS controller ref1**						
	DDCS controller reference 1. Displays scaled reference 1 received via a DDCS communication option module (FDCO-0x). The scaling is defined by 60.60 DDCS controller ref1 type.						
	-30000.00 … 30000.00	-	-	1 = 10	y	n	Signal
03.12	**DDCS controller ref2**						
	DDCS controller reference 2. Displays scaled reference 2 received via a DDCS communication option module (FDCO-0x). The scaling is defined by 60.61 DDCS controller ref2 type.						
	-30000.00 … 30000.00	-	-	1 = 10	y	n	Signal
03.13	**M/F or D2D ref1**						
	Master-follower link reference 1 (followers only). Displays scaled master-follower link reference 1 received from the master. The scaling is defined by 60.10 M/F ref1 type.						
	-30000.00 … 30000.00	-	-	1 = 10	y	n	Signal
03.14	**M/F or D2D ref2**						
	Master reference 2 (followers only). Displays scaled master-follower link reference 2 received from the master. The scaling is defined by 60.11 M/F ref2 type.						
	-30000.00 … 30000.00	-	-	1 = 10	y	n	Signal

04 Warnings and faults

Information on warnings and faults that occurred last. For explanations of individual warning and fault codes. See chapter Fault tracing.

Index	**Name** **Text** **Range**	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**
04.01	**Tripping fault**						
	1st active fault. Code of the 1st active fault (the fault that caused the current trip).						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.02	**Active fault 2**						
	2nd active fault. Code of the 2nd active fault.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.03	**Active fault 3**						
	3rd active fault. Code of the 3rd active fault.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.04	**Active fault 4**						
	4th active fault. Code of the 4th active fault.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.05	**Active fault 5**						
	5th active fault. Code of the 5th active fault.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.06	**Active warning 1**						
	1st active warning. Code of the 1st active warning.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.07	**Active warning 2**						
	2nd active warning. Code of the 2nd active warning.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.08	**Active warning 3**						
	3rd active warning. Code of the 3rd active warning.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.09	**Active warning 4**						
	4th active warning. Code of the 4th active warning.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.10	**Active warning 5**						
	5th active warning. Code of the 5th active warning.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.11	**Latest fault**						
	1st stored fault. Code of the 1st stored (non-active) fault.						

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.12	**2nd latest fault**						
	2nd stored fault. Code of the 2nd stored (non-active) fault.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.13	**3rd latest fault**						
	3rd stored fault. Code of the 3rd stored (non-active) fault.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.14	**4th latest fault**						
	4th stored fault. Code of the 4th stored (non-active) fault.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.15	**5th latest fault**						
	5th stored fault. Code of the 5th stored (non-active) fault.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.16	**Latest warning**						
	1st stored warning. Code of the 1st stored (non-active) warning.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.17	**2nd latest warning**						
	2nd stored warning. Code of the 2nd stored (non-active) warning.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.18	**3rd latest warning**						
	3rd stored warning. Code of the 3rd stored (non-active) warning.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.19	**4th latest warning**						
	4th stored warning. Code of the 4th stored (non-active) warning.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.20	**5th latest warning**						
	5th stored warning. Code of the 5th stored (non-active) warning.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.21	**Fault word 1**						
	DCS800 compatible fault word 1. The bit assignments of this word correspond to *FaultWord1 (9.01)* in the DCS800. Each bit can indicate several DCS880 events as listed below. Bit assignment:						

Bit	DCS880 events correspond to following	DCS800 events
0	F501 Auxiliary undervoltage	F501 AuxUnderVolt

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type

1	2310 Armature overcurrent	F502 ArmOverCur
2	F503 Armature overvoltage	F503 ArmOverVolt
3	4310 Bridge temperature measured	F504 ConvOverTemp
4	2330 Residual current detected	F505 ResCurDetect
5	4981 Motor temperature 1 measured/estimated	F506 M1OverTemp
6	4981 Motor temperature 1 measured/estimated	F507 M1OverLoad
7	7082 I/O extension communication	F508 I/OBoardLoss
8	4982 Motor temperature 2 measured/estimated	F509 M2OverTemp
9	4982 Motor temperature 2 measured/estimated	F510 M2OverLoad
10	-	F511 ConvFanCur
11	3280 Mains low voltage	F512 MainsLowVolt
12	F513 Mains overvoltage	F513 MainsOvrVolt
13	F514 Mains synchronization lost	F514 MainsNotSync
14	F515 M1 field exciter overcurrent	F515 M1FexOverCur
15	F516 M1 field exciter communication	F516 M1FexCom

0000h … FFFFh	-	-	1 = 1	y	n	Signal

04.22 **Fault word 2**

DCS800 compatible fault word 2.
The bit assignments of this word correspond to *FaultWord2 (9.02)* in the DCS800. Each bit can indicate several DCS880 events as listed below.
Bit assignment:

Bit	DCS880 events correspond to following	DCS800 events
0	F517 Armature current ripple	F517 ArmCurRipple
1	F518 M2 field exciter overcurrent	F518 M2FexOverCur
2	F519 M2 field exciter communication	F519 M2FexCom
3	-	reserved
4	F521 Field acknowledge missing	F521 FieldAck
5	7301 Motor speed feedback, 7381 Speed feedback device, 73A1 Load speed feedback	F522 SpeedFb
6	71B1 Motor fan acknowledge	F523 ExtFanAck
7	F524 Mains contactor acknowledge	F524 MainContAck
8	50FE Type code	F525 TypeCode
9	9081 External fault 1 … 9085 External fault 5	F526 ExternalDI
10	5080 Drive fan acknowledge	F527 ConvFanAck
11	6681 EFB communication,	F528 FieldBusCom

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type

Bit	DCS880 events correspond to following	DCS800 events
	7510 FBA A communication, 7520 FBA B communication	
12	F529 M1 field exciter not OK	F529 M1FexNotOK
13	F530 M2 field exciter not OK	F530 M2FexNotOK
14	7121 Motor stall	F531 MotorStalled
15	7310 Overspeed	F532 MotOverSpeed

Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

04.23 **Fault word 3**

DCS800 compatible fault word 3.
The bit assignments of this word correspond to *FaultWord3 (9.03)* in the DCS800. Each bit can indicate several DCS880 events as listed below.
Bit assignment:

Bit	DCS880 events correspond to following	DCS800 events
0	F533 12-pulse reversal timeout	F533 12PRevTime
1	F534 12-pulse current difference	F534 12PCurDiff
2	F535 12-pulse communication	F535 12PulseCom
3	F536 12-pulse slave	F536 12PSlaveFail
4	F537 M1 field exciter ready lost	F537 M1FexRdyLost
5	F538 M2 field exciter ready lost	F538 M2FexRdyLost
6	F539 Fast current rise	F539 FastCurRise
7	-	F540 COM8Faulty
8	F541 M1 field exciter low current	F541 M1FexLowCur
9	F542 M2 field exciter low current	F542 M2FexLowCur
10	7581 DDCS controller communication, 7582 Master-follower link communication	F543 COM8Com
11	F544 P2P and M/F communication	F544 P2PandMFCom
12	64A3 Application loading	F545 ApplLoadFail
13	7081 Control panel/PC tool link communication	F546 LocalCmdLoss
14	F547 Drive hardware	F547 HwFailure
15	6000 Internal firmware	F548 FwFailure

Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

04.24 **Fault word 4**

DCS800 compatible fault word 4.
The bit assignments of this word correspond to *FaultWord4 (9.04)* in the DCS800. Each bit can indicate several DCS880 events as listed below.
Bit assignment:

Bit	DCS880 events correspond to following	DCS800 events

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type

0	-	F549 ParComp
1	64B2 User set fault	F550 ParMemRead
2	80A0 AI supervision	F551 AIRange
3	71A2 Mechanical brake closing failed, 71A3 Mechanical brake opening failed, 71A5 Mechanical brake opening not allowed	F552 MechBrake
4	7381 Speed feedback device	F553 TachPolarity
5	7381 Speed feedback device	F554 TachoRange
6	-	reserved
7	F556 Torque proving	F556 TorqProving
8	F557 Reversal time	F557 ReversalTime
9	-	reserved
10	-	reserved
11	-	F601 APFault1
12	-	F602 APFault2
13	-	F603 APFault3
14	-	F604 APFault4
15	-	F605 APFault5

Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

04.25 **User fault word**

DCS800 compatible user fault word.
The bit assignments of this word correspond to *UserFaultWord (9.05)* in the DCS800. Each bit can indicate several DCS880 events as listed below.
Bit assignment:

Bit	DCS880 events correspond to following	DCS800 events
0	5610	F610 UserFault1
1	5611	F611 UserFault2
2	5612	F612 UserFault3
3	5613	F613 UserFault4
4	5614	F614 UserFault5
5	5615	F615 UserFault6
6	5616	F616 UserFault7
7	5617	F617 UserFault8
8	5618	F618 UserFault9
9	5619	F619 UserFault10
10	561A	F620 UserFault11
11	561B	F621 UserFault12
12	561C	F622 UserFault13
13	561D	F623 UserFault14

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type

14	561E	F624 UserFault15
15	561F	F625 UserFault16

Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

04.26 **M1 field exciter fault word**

DCS800 compatible motor 1 field exciter fault word.
The bit assignments of this DCS880 word and the DCS800 word *M1FexFaultWord (9.18)* are the same.
Bit assignment:

Bit	DCS880/DCS800 fault name
0	DCSLink communication
1	Supply voltage synchronization
2	Overcurrent
3	Fast supply voltage rise
4	AC supply voltage < 30 V_{AC}
5	AC supply voltage > 650 V_{AC}
6	reserved
7	reserved
8	Temperature heatsink
9	Parameter flash memory read
10	Compatibility
11	Auxiliary voltage
12	reserved
13	General hardware
14	General firmware
15	reserved

Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

04.27 **M2 field exciter fault word**

DCS800 compatible motor 2 field exciter fault word.
The bit assignments of this DCS880 word and the DCS800 word *M2FexFaultWord (9.20)* are the same.
Bit assignment:

Bit	DCS880/DCS800 fault name
0	DCSLink communication
1	Supply voltage synchronization
2	Overcurrent
3	Fast supply voltage rise
4	AC supply voltage < 30 V_{AC}

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**

5	AC supply voltage > 650 V_{AC}
6	reserved
7	reserved
8	Temperature heatsink
9	Parameter flash memory read
10	Compatibility
11	Auxiliary voltage
12	reserved
13	General hardware
14	General firmware
15	reserved

Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

04.31 **Warning word 1**

DCS800 compatible warning word 1.
The bit assignments of this word correspond to *AlarmWord1 (9.06)* in the DCS800. Each bit can indicate several DCS880 events as listed below.
Bit assignment:

Bit	DCS880 events correspond to following	DCS800 events
0	AFE1 Off 2 (emergency off)	A101 Off2ViaDI
1	AFE2 Off 3 (emergency stop)	A102 Off3ViaDI
2	A103 DC-breaker acknowledge	A103 DC BreakAck
3	A4B0 Bridge temperature measured, A581 Drive fan acknowledge	A104 ConvOverTemp
4	A105 Dynamic braking acknowledge	A105 DynBrakeAck
5	A491 Motor temperature 1 measured/estimated	A106 M1OverTemp
6	A491 Motor temperature 1 measured/estimated	A107 M1OverLoad
7	-	reserved
8	A492 Motor temperature 2 measured/estimated	A109 M2OverTemp
9	A492 Motor temperature 2 measured/estimated	A110 M2OverLoad
10	A111 Mains low voltage	A111 MainsLowVolt
11	A112 P2P and M/F communication	A112 P2PandMFCom
12	A7CA DDCS controller communication, A7CB Master-follower link communication	A113 COM8Com
13	A114 Armature current deviation	A114 ArmCurDev
14	A7E1 Speed feedback device	A115 TachoRange
15	A116 Brake long falling	A116 BrakeLongFalling

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.32	**Warning word 2**						

DCS800 compatible warning word 2.
The bit assignments of this word correspond to *AlarmWord2 (9.07)* in the DCS800. Each bit can indicate several DCS880 events as listed below.
Bit assignment:

Bit	DCS880 events correspond to following	DCS800 events
0	A117 Armature current ripple	A117 ArmCurRipple
1	A118 Application	A118 FoundNewAppl
2	A118 Application	A119 ApplDiff
3	A120 Overvoltage protection active	A120 OverVoltProt
4	AF90 Autotuning	A121 AutotuneFail
5	A7A1 Mechanical brake closing failed, A7A2 Mechanical brake opening failed, A7A5 Mechanical brake opening not allowed	A122 MechBrake
6	-	A123 FaultSuppres
7	A124 Speed scaling	A124 SpeedScale
8	A7B0 Motor speed feedback, A7B1 Load speed feedback	A125 SpeedFb
9	A981 ... A985 External warning 1 … External Warning 5	A126 ExternalDI
10	A8A0 AI supervision	A127 AIRange
11	A7C1 FBA A communication, A7C2 FBA B communication, A7CE EFB communication	A128 FieldBusCom
12	-	A129 ParRestored
13	A7EE Control panel/PC tool link communication	A130 LocalCmdLoss
14	-	A131 ParAdded
15	A132 Parameter setting conflict	A132 ParConflict

	Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.33	**Warning word 3**						

DCS800 compatible warning word 3.
The bit assignments of this word correspond to *AlarmWord3 (9.08)* in the DCS800. Each bit can indicate several DCS880 events as listed below.
Bit assignment:

Bit	DCS880 events correspond to following	DCS800 events
0	-	A133 RetainInv
1	-	A134 ParComp
2	-	A135 ParUpDwnLoad

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type

3	-	A136 NoAPTaskTime
4	A137 Start condition conflict	A137 SpeedNotZero
5	AFE1 Off 2 (emergency off)	A138 Off2FieldBus
6	AFE2 Off 3 (emergency stop)	A139 Off3FieldBus
7	A6D1 FBA A parameter conflict, A6D2 FBA B parameter conflict	A140 IllgFieldBus
8	-	A141 COM8FwVer
9	FB11 Memory unit missing	A142 MemCardMiss
10	FB12 Memory unit incompatible, FB13 Memory unit, firmware incompatible, FB14 Memory unit, firmware load failed	A143 MemCardFail
11	-	A301 APWarning1
12	-	A302 APWarning2
13	-	A303 APWarning3
14	-	A304 APWarning4
15	-	A305 APWarning5

	0000h … FFFFh	-	-	1 = 1	y	n	Signal

04.34 **Warning word 4**

Warning word 4.
DCS880 warning word. Each bit indicates a certain warning as listed below.
Bit assignment:

Bit	DCS880 events correspond to following	DCS800 events
0	-	reserved
1	-	reserved
2	-	reserved
3	-	reserved
4	-	reserved
5	-	reserved
6	-	reserved
7	-	reserved
8	-	reserved
9	-	reserved
10	-	reserved
11	-	reserved
12	-	reserved
13	-	reserved
14	-	reserved
15	-	reserved

	0000h … FFFFh	-	-	1 = 1	y	n	Signal

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type

04.35 **User warning word**

DCS800 compatible user warning word.
The bit assignments of this word correspond to *UserAlarmWord (9.09)* in the DCS800. Each bit can indicate several DCS880 events as listed below.
Bit assignment:

Bit	DCS880 events correspond to following	DCS800 events
0	1310	F310 UserWarning1
1	1311	F311 UserWarning2
2	1312	F312 UserWarning3
3	1313	F313 UserWarning4
4	1314	F314 UserWarning5
5	1315	F315 UserWarning6
6	1316	F316 UserWarning7
7	1317	F317 UserWarning8
8	1318	F318 UserWarning9
9	1319	F319 UserWarning10
10	131A	F320 UserWarning11
11	131B	F321 UserWarning12
12	131C	F322 UserWarning13
13	131D	F323 UserWarning14
14	131E	F324 UserWarning15
15	131F	F325 UserWarning16

Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

04.36 **M1 field exciter warning word**

DCS800 compatible motor 1 field exciter warning word.
The bit assignments of this DCS880 word and the DCS800 word *M1FexAlarmWord (9.17)* are the same.
Bit assignment:

Bit	DCS880/DCS800 warning name
0	Phase missing
1	Temperature heatsink
2	reserved
3	reserved
4	reserved
5	Parameters added
6	Parameter up- or download failed
7	Compatibility
8	Parameters restored

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type

9	reserved
10	reserved
11	reserved
12	reserved
13	reserved
14	reserved
15	reserved

Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

04.37 **M2 field exciter warning word**

DCS800 compatible motor 2 field exciter warning word.
The bit assignments of this DCS880 word and the DCS800 word *M2FexAlarmWord (9.19)* are the same.
Bit assignment:

Bit	DCS880/DCS800 warning name
0	Phase missing
1	Temperature heatsink
2	reserved
3	reserved
4	reserved
5	Parameters added
6	Parameter up- or download failed
7	Compatibility
8	Parameters restored
9	reserved
10	reserved
11	reserved
12	reserved
13	reserved
14	reserved
15	Reserved

Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

05 Diagnostics

Various run-time-type counters and measurements related to drive maintenance.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">05.01</td><td colspan="7">On-time counter</td></tr>
<tr><td colspan="7">On-time counter.
The counter runs when the drive is powered.</td></tr>
<tr><td>0 … 65535</td><td>-</td><td>days</td><td>1 = 1 day</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">05.02</td><td colspan="7">Run-time counter</td></tr>
<tr><td colspan="7">Motor run-time counter.
The counter runs when the drive is in state ready for reference. See 06.15.b02 Main Status Word.</td></tr>
<tr><td>0 … 65535</td><td>-</td><td>days</td><td>1 = 1 day</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">05.04</td><td colspan="7">Fan on-time counter</td></tr>
<tr><td colspan="7">Drive fan cooling run-time counter.
Displays the running time of the drives cooling fan.
Can be reset from the control panel by keeping Reset depressed for over 3 seconds.</td></tr>
<tr><td>0 … 65535</td><td>-</td><td>days</td><td>1 = 1 day</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">05.10</td><td colspan="7">Control board temperature</td></tr>
<tr><td colspan="7">Control board temperature.
Measured temperature of the control board.
Warning A4A0 Control board temperature measured is generated, if the measured control board temperature exceeds 75°C or 167°F. The used hysteresis is 1°.
The unit is selected by 96.02 Unit selection.</td></tr>
<tr><td>-80.0 … 1000.0</td><td>-</td><td>°C or °F</td><td>1 = 1°C or °F</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">05.11</td><td colspan="7">Ch1 bridge temperature</td></tr>
<tr><td colspan="7">Bridge temperature or channel1 bridge temperature.
Measured bridge temperature or measured bridge temperature of the power unit connected to channel1 of the SDCS-DSL-H1x. The unit of the temperature is selected by 96.02 Unit selection. See also warning A4B0 Bridge temperature measured and fault 4310 Bridge temperature measured.</td></tr>
<tr><td>-80.0 … 1000.0</td><td>-</td><td>°C or °F</td><td>1 = 1°C or °F</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">05.12</td><td colspan="7">Ch2 bridge temperature</td></tr>
<tr><td colspan="7">Channel2 bridge temperature.
Measured bridge temperature of power unit connected to channel2 of the SDCS-DSL-H1x. The unit of the temperature is selected by 96.02 Unit selection. See also warning A4B0 Bridge temperature measured and fault 4310 Bridge temperature measured.</td></tr>
<tr><td>-80.0 … 1000.0</td><td>-</td><td>°C or °F</td><td>1 = 1°C or °F</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">05.13</td><td colspan="7">Ch3 bridge temperature</td></tr>
<tr><td colspan="7">Channel3 bridge temperature.
Measured bridge temperature of the power unit connected to channel3 of the SDCS-DSL-H1x. The unit of the temperature is selected by 96.02 Unit selection. See also warning A4B0 Bridge temperature measured and fault 4310 Bridge temperature measured.</td></tr>
<tr><td>-80.0 … 1000.0</td><td>-</td><td>°C or °F</td><td>1 = 1°C or °F</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="2">05.14</td><td colspan="7">Ch4 bridge temperature</td></tr>
<tr><td colspan="7">Channel4 bridge temperature.</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
	Measured bridge temperature of the power unit connected to channel4 of the SDCS-DSL-H1x. The unit of the temperature is selected by 96.02 Unit selection. See also warning A4B0 Bridge temperature measured and fault 4310 Bridge temperature measured.						
	-80.0 … 1000.0	-	°C or °F	1 = 1°C or °F	y	n	Signal
05.22	**Diagnostic**						
	Attention: 05.22 Diagnostic is set to zero by means of Reset. Displays the diagnostics messages:						

Thyristor test	
	For drives size H5 ... H8 make sure, that 99.11 M1 nominal current is set to 50 A or higher.
70002	– The drive was stopped before the autotuning finished. – The Run command (06.09.b03) was prematurely removed. – Autotuning aborted by a fault. Repeat autotuning until successful.
70003	Autotuning timeout, Run command (06.09.b03) was not set in time or is missing.
70004	Field current not zero.
70005	Armature current not zero.
70006	Motor is turning. No speed zero indication.
70007	Thyristor block test failed.
70008	Motor connected to ground (near terminal C).
70009	Motor connected to ground (near terminal D).
70010	Armature winding is not connected (terminals C and D are open).
70011	V11 short circuit.
70012	V12 short circuit.
70013	V13 short circuit.
70014	V14 short circuit.
70015	V15 short circuit.
70016	V16 short circuit.
70C11	V11 not conducting.
70C12	V12 not conducting.
70C13	V13 not conducting.
70C14	V14 not conducting.
70C15	V15 not conducting.
70C16	V16 not conducting.
70C21	V21 not conducting.
70C22	V22 not conducting.
70C23	V23 not conducting.
70C24	V24 not conducting.
70C25	V25 not conducting.
70C26	V26 not conducting.
71124	V11 or V24 short circuit.

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type

71225	V12 or V25 short circuit.
71326	V13 or V26 short circuit.
71421	V14 or V21 short circuit.
71522	V15 or V22 short circuit.
71623	V16 or V23 short circuit.
72000	Armature winding is short-circuited (short circuit between terminals C and D).
7FFFF	Thyristor test finishes successful, power unit okay.

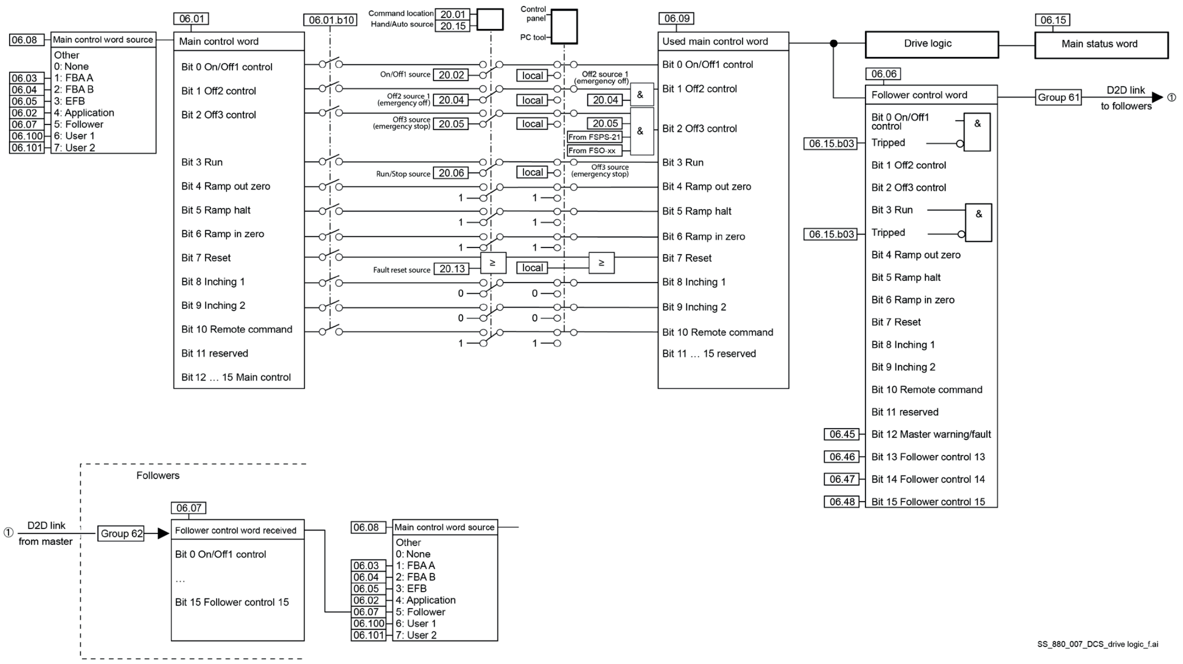
Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
	0 … 65535	-	-	1 = 1	y	n	Signal
05.41	**Main fan service counter**						
	Main cooling fan age. Displays the age of the main cooling fan as a percentage of its estimated lifetime. The estimate is based on the duty, operating conditions and other operating parameters of the fan. When the counter reaches 100 %, warning A8C0 Fan service counter is generated. Can be reset from the control panel by keeping Reset depressed for over 3 seconds.						
	0 … 150	-	%	1 = 1 %	y	n	Signal

06 Control and status words

Drive control, status and event words.

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

Drive logic:



Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
06.01	**Main control word**						
	Main control word.						

Index	Name					
	Text					
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**

Displays the main control word of the drive. This signal shows the control signals as received from the selected sources, such as digital inputs, the fieldbus interfaces and the application program. See 06.08 Main control word source.
Attention: Do not write on this signal.
Bit assignment:

Bit	Name	Value	Remarks
0	On/Off1 control	0 → 1	On command to Ready run state. The On command is edge-triggered. With 20.33 Mains contactor control mode = On: Contactors are closed, field exciter and fans are started. With 20.33 Mains contactor control mode = On and run: Ready run flag in 06.15 Main Status Word is forced to 1.
		0	Off1 command to Ready on state, unless other interlocks (Off2, Off3) are active. Stopping via 21.02 Off1 mode.
1	Off2 control	1	Normal operation (Off2 inactive).
		0	Off2 (emergency off/electrical disconnect/fast current off) command to Switch-on inhibited state. Stop by coasting. The firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked, the contactors are opened, field exciter and fans are stopped. Off2 control has priority over Off3 control and On/Off1 control.
2	Off3 control	1	Normal operation (Off3 inactive).
		0	Off3 (emergency stop) command to Switch-on inhibited state. Stopping via 21.03 Emergency stop mode. Off3 control has priority over On/Off1 control.
3	Run	0 → 1	Run command to Ready for reference state. The Run command is edge-triggered. The firing pulses are released, and the drive is running with the selected speed reference.
		0	Stop command to Ready run state. Stop via 21.04 Stop mode from 21.03.
4	Ramp out zero	1	Normal operation. Speed ramp output is enabled.
		0	Force speed ramp output to zero. The drive will immediately decelerate to zero speed.
5	Ramp halt	1	Normal operation. Speed ramp output is enabled.
		0	Halt (freeze) speed ramp output.
6	Ramp in zero	1	Normal operation. Speed ramp input is enabled.
		0	Force speed ramp input to zero.
7	Reset	0 → 1	Acknowledge fault indications with the positive edge.
8	Inching 1	1	Constant speed defined by 22.42 Jogging 1 reference, active only with 20.01 Command location = Main control word. Set

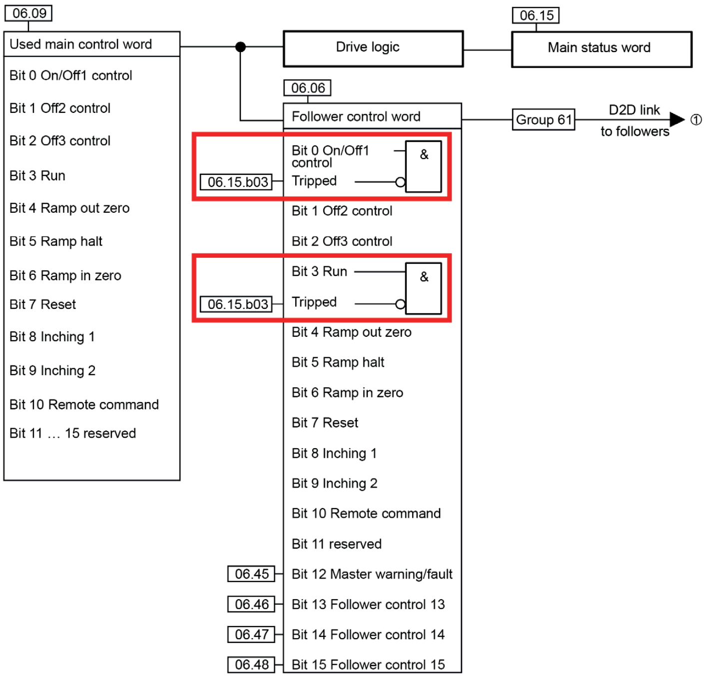
Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

			Ramp out zero = Ramp hold = Ramp in zero = 0, then give On command and Run command. If both Inching 1 and 2 are activated, the one that was activated first has priority.
9	Inching 2	1	Constant speed defined by 22.43 Jogging 2 reference, active only with 20.01 Command location = Main control word. Set Ramp out zero = Ramp hold = Ramp in zero = 0, then give On command and Run command. If both Inching 1 and 2 are activated, the one that was activated first has priority.
10	Remote command	1	Enable command: Overriding control enabled (overriding control must set this bit to 1).
		0	Disable command: Main control word and references are not getting through to the drive. Bits 0 … 2 and the main control bits 12 … 15 are not affected.
11	reserved		
12	Main control 12	1	Used by Adaptive Program, application program or overriding control as signal source for binary-source selector parameters.
		0	
13	Main control 13	1	
		0	
14	Main control 14	1	
		0	
15	Main control 15	1	
		0	

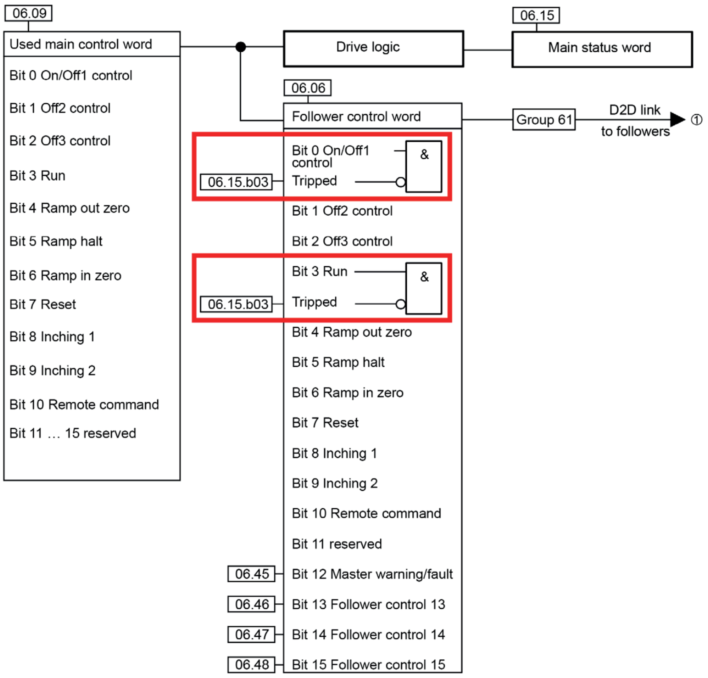
Bits 12 … 15 can be used to carry additional control data. E.g. as signal source for binary-source selector parameters (see: Other [bit], source selection).

Index	Name / Text / Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
06.02	**Application control word**						
	Application program control word. The drive control word received from the application program.						
	0000h … FFFFh	0000h	-	1 = 1	y	y	Parameter
06.03	**FBA A transparent control word**						
	Displays the control word received from the PLC via fieldbus adapter A after being modified by 50.29 FBA A profile.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
06.04	**FBA B transparent control word**						
	Displays the control word received from the PLC via fieldbus adapter B after being modified by 50.59 FBA B profile.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
06.05	**EFB transparent control word**						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	Displays the unaltered control word received from the PLC via the embedded fieldbus when a transparent communication profile is selected in 58.25 Control profile.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
06.06	**Follower control word**						
	Follower control word to followers (master only). Displays 06.06 Follower control word send by the master, using D2D link, to 06.07 Follower control word received in all followers. Bit assignment:						

Bit	Name	Value	Remarks
0	On/Off1 control	1	On command and no active fault in the master to Ready run state:  With 20.33 Mains contactor control mode = On: Contactors are closed, field exciter and fans are started. With 20.33 Mains contactor control mode= On and run: Ready run flag in 06.15 Main Status Word is forced to 1.
		0	Off1 command or active fault in the master to Ready on state, unless other interlocks (Off2, Off3) are active. Stopping via 21.02 Off1 mode.
1	Off2 control	1	Normal operation (Off2 inactive).
		0	Off2 (emergency off/fast current off) command to Switch-on inhibited state. Stop by coasting. The firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked, the contactors are opened, field exciter and fans are stopped.

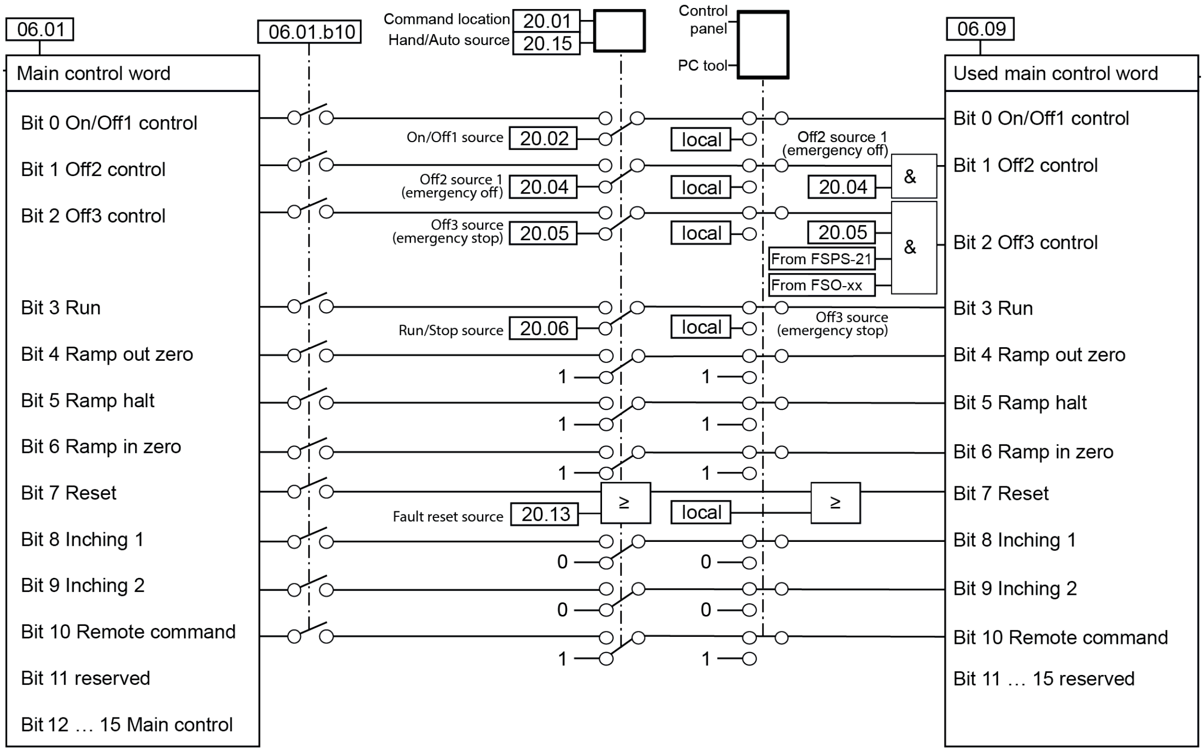
Index	**Name** **Text**					
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**

			Off2 control has priority over Off3 control and On/Off1 control.
2	Off3 control	1	Normal operation (Off3 inactive).
		0	Off3 (emergency stop) command to Switch-on inhibited state. Stopping via 21.03 Emergency stop mode. Off3 control has priority over On/Off1 control.
3	Run and master not tripped	1	Run command and no active fault in the master to Ready for reference state:  The firing pulses are released, and the drive is running with the selected speed reference.
		0	Stop command or active fault in the master to Ready run state. Stop via 21.04 Stop mode from 21.03.
4	Ramp out zero	1	Normal operation. Speed ramp output is enabled.
		0	Force speed ramp output to zero. The drive will immediately decelerate to zero speed.
5	Ramp halt	1	Normal operation. Speed ramp output is enabled.
		0	Halt (freeze) speed ramp output.
6	Ramp in zero	1	Normal operation. Speed ramp input is enabled.
		0	Force speed ramp input to zero
7	Reset	0 → 1	Acknowledge fault indications with the positive edge.

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

8	Inching 1	1	Constant speed defined by 22.42 Jogging 1 reference, active only with 20.01 Command location = Main control word. Set Ramp out zero = Ramp hold = Ramp in zero = 0, then give On command and Run command. If both Inching 1 and 2 are activated, the one that was activated first has priority.
9	Inching 2	1	Constant speed defined by 22.43 Jogging 2 reference, active only with 20.01 Command location = Main control word. Set Ramp out zero = Ramp hold = Ramp in zero = 0, then give On command and Run command. If both Inching 1 and 2 are activated, the one that was activated first has priority.
10	Remote command	1	Enable command: Overriding control enabled (overriding control must set this bit to 1).
		0	Disable command: Main control word and references are not getting through to the drive. Bits 0 … 2 and the follower control bits 12 … 15 are not affected.
11	reserved		
12	Master warning/fault	1	See 06.45 Follower CW bit 12 selection. Warning/Fault active in the master.
		0	Warning/Fault inactive in the master.
13	Follower control 13	1	See 06.46 Follower CW bit 13 selection.
		0	
14	Follower control 14	1	See 06.47 Follower CW bit 14 selection.
		0	
15	Follower control 15	1	See 06.48 Follower CW bit 15 selection.
		0	

	0000h … FFFFh	-	-	1 = 1	y	n	Signal
06.07	**Follower control word received**						
	Follower control word received from master (followers only). Displays 06.06 Follower control word send by the master, using D2D link, to 06.07 Follower control word received in all followers. Bit assignment see 06.06 Follower control word.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
06.08	**Main control word source**						
	Selects the source for 06.01 Main control word. **Other**; source selection. 0: **None**; inactive. All bits are forced to zero. 1: **FBA A**; 06.03 FBA A transparent control word. 2: **FBA B**; 06.04 FBA B transparent control word. 3: **EFB**; 06.05 EFB transparent control word. 4: **Application**; 06.02 Application control word. 5: **Follower**; 06.07 Follower control word received (follower only).						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	6: **User 1**; 06.100 User control word 1. 7: **User 2**; 06.101 User control word 2. 8: **DDCS control word**; 06.110 DDCS control word.						
	0 … 8	None	-	1 = 1	n	y	Parameter
06.09	**Used main control word**						
	Used main control word. Displays the main control word used by the internal drive logic. The selection is depending on the drives local/remote control setting, 20.01 Command location and 20.15 Hand/Auto source.  Bit assignment see 06.01 Main control word. Bits 11 … 15 are reserved.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
06.10	**Auxiliary control word 1**						
	Auxiliary control word 1. The auxiliary control word 1 can be written to by Adaptive Program, application program or overriding control. Bit assignment:						

Bit	Name	Value	Remarks
0	Direct speed reference	1	The speed ramp output is overwritten and forced to the selection in 23.32 Direct speed reference.
		0	Speed ramp is active.
1	Drive direction	1	Drive direction reverse (see note 1), changes the signs of 24.02 Used speed feedback and 27.01 Current reference.
		0	Drive direction forward (see note 1).

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

2	Limit used speed reference	1	24.01 Used speed reference is limited by 30.11 M1 minimum speed, 30.12 M1 maximum speed or by 42.19 M2 minimum speed, 42.20 M2 maximum speed.
		0	24.01 Used speed reference is not limited.
3	reserved		
4	Bypass speed ramp	1	Bypass speed ramp (speed ramp output is forced to value of speed ramp input).
5	reserved		
6	Halt speed controller	1	Halt (freeze) the speed controller integration time.
7	Reset speed controller	1	Reset the speed controller integration time.
8	Limit speed controller	1	No back calculation of the speed controller torque limitation. The speed controller output can run to the settings of 30.13 Speed control min torque or 30.14 Speed control max torque. This is typically used for winders.
		0	Back calculation of the speed controller torque limitation. The speed controller integration time is limited by torque or current limits. See 30.02 Torque limit status.
9	reserved		
10	Force max firing angle	1	Force single firing pulses to suppress the DC current and set the firing angle to 30.45 Maximum firing angle.
		0	Normal firing pulses released.
11	reserved		
12	Aux. control 12	1	Used by Adaptive Program, application program or overriding control as signal source for binary-source selector parameters.
		0	
13	Aux. control 13	1	
		0	
14	Aux. control 14	1	
		0	
15	Aux. control 15	1	
		0	

Note 1: Changes of Drive direction become active only in drive state Ready run. Changing the speed direction of a running drive (Ready for reference state) by means of Drive direction is not possible.
Note 2: Bits 12 … 15 can be used to carry additional control data. E.g. as signal source for binary-source selector parameters (see: Other [bit], source selection).

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	0000h … FFFFh	0000h	-	1 = 1	y	y	Parameter
06.11	**Auxiliary control word 2**						
	Auxiliary control word 2.						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	The auxiliary control word 2 can be written to by Adaptive Program, application program or overriding control. Bit assignment:						

Bit	Name	Value	Remarks
0	Dynamic braking on	1	Force dynamic braking regardless from settings of 19.20 Follower force ramp stop, 21.02 Off1 mode, 21.03 Emergency stop mode or 21.04 Stop mode.
1	reserved		
2	Synchronizing command	1	Positioning: Synchronizing command from overriding control for OnBoard encoder, encoder 1 or encoder 2. See 90.86 Pos counter init cmd source (trigger) and 90.51 Load feedback selection.
3	reserved		
4	Torque proving OK	1	Selected motor torque proving is OK. This bit to be set by Adaptive Program, application program or overriding control. See 44.25 M1 brake torque proving time.
		0	Selected motor torque proving is inactive. This bit is to be set by Adaptive Program, application program or overriding control.
5	Reset torque memory	1	Reset torque memory. Valid only if 44.09 M1 brake open torque source = 44.02 M1 Brake torque memory.
6	reserved		
7	Suppress armature current deviation	1	A114 Armature current deviation is blocked. See 04.31.B13 Warning word 1. Usually used for non-motoric applications.
		0	A114 Armature current deviation is released. See 04.31.B13 Warning word 1.
8 … 15	reserved		

Index	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	0000h … FFFFh	0000h	-	1 = 1	y	y	Parameter
06.14	**Selected motor**						
	Selected (currently used) motor. See 42.01 Motor 1/2 selection. 0: **Motor 1**; motor 1 selected. 1: **Motor 2**; motor 2 selected.						
	0 ... 1	-	-	1 = 1	y	n	Signal
06.15	**Main status word**						
	Main status word. Displays the main status word of the drive. Bit assignment:						

Bit	Name	Value	Remarks
0	Ready on	1	Ready to be switched on.

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**

		0	Not ready to be switched on.
1	Ready run	1	Ready to operate.
		0	Not ready to operate e.g. Off1 active.
2	Ready reference	1	Operation enabled (drive is running).
		0	Operation inhibited.
3	Tripped	1	Fault.
		0	No fault.
4	Off2 inactive	1	Off2 inactive.
		0	Off2 (emergency off/fast current off) active, Switch-on inhibited state.
5	Off3 inactive	1	Off3 inactive.
		0	Off3 (emergency stop) active, Switch-on inhibited state.
6	Switch-on inhibited	1	Switch-on inhibited state is active after: – Fault. – Off2 (emergency off/fast current off) active. – Off3 (emergency stop) active. – Switch-on inhibited via digital input 20.04 Off2 source 1 (emergency off), 20.08 Off2 source 2 (emergency off) or 20.05 Off3 source (emergency stop).
		0	Switch-on inhibited state inactive.
7	Warning	1	Warning.
		0	No warning.
8	At setpoint	1	Setpoint: The feedback value equals the reference. Means it is within the tolerance limits. See 46.21 At speed hysteresis and 46.23 At torque hysteresis feedback.
		0	Setpoint: The feedback value differs from the reference. Means it is outside the tolerance limits. See 46.21 At speed hysteresis and 46.23 At torque hysteresis feedback.
9	Remote	1	Drive control location: Remote.
		0	Drive control location: Local.
10	Above level	1	See 06.29 MSW bit 10 sel. Speed or torque feedback equals or exceeds levels defined by 46.31 Above speed level or 46.33 Above torque level. Valid in both rotation directions.
		0	Within speed or torque levels.
11	Status control 11	1	See 06.30 MSW bit 11 sel.
		0	
12	Status control 12	1	See 06.31 MSW bit 12 sel.
		0	
13	Status control 13	1	See 06.32 MSW bit 13 sel.
		0	
14	Status control 14	1	See 06.33 MSW bit 14 sel.
		0	

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

15	reserved		

Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.16 **Drive status word 1**

Drive status word 1.
Displays the drive status word 1.
Bit assignment:

Bit	Name	Value	Remarks
0	Tripped	1	Drive is tripped. A fault is active.
1	Inhibited	1	Start inhibited. See 06.19 Drive inhibit status word 2 and 06.20 Run inhibit status word for the source of the inhibiting signal.
2	Enabled	1	20.08 Off2 source 2 (emergency off) is set to 1 = Off2 inactive. This bit is not affected by the presence of a fault.
3	Ready on	1	Drive is ready to receive an On command.
4	Ready run	1	Drive is ready to receive a Run command.
5	Ready reference	1	Drive is ready to receive a reference (drive is running).
6	Stopping	1	Drive is stopping.
7	Off	1	Drive is off.
8	Off2	1	Off2 (emergency off/fast current off) active, Switch-on inhibited state.
9	Off3	1	Off3 (emergency stop) active, Switch-on inhibited state.
10	On requested	1	An On command was given.
11	Run requested	1	A Run command was given.
12	Limiting	1	One operating limit (speed, torque, etc.) is active. See 30.01 Limit word 1 and 30.02 Torque limit status.
13	Field current	1	Drive is generating field current.
14	Local control	1	Drive is in local control.
15	Network control	1	Drive is in network control. With fieldbus protocols based on the Common Industrial Protocol (CIPTM), such as DeviceNet and Ethernet/IP, denotes the control of the drive using the Net Ctrl and Net Ref objects of the ODVA AC/DC Drive Profile. For more information, see www.odva.org, and the following manuals: – FDNA-01 DeviceNet adapter module User's manual (3AFE68573360). – FENA-01/-11 Ethernet adapter module User's manual (3AUA0000093568).

Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.17 **Drive status word 2**

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	Drive status word 2. Displays the drive status word 2. Bit assignment:						

Bit	Name	Value	Remarks
0	Autotuning	1	The requested autotuning has been finished.
1	reserved		
2	Torque control	1	Torque control mode active.
3	Speed control	1	Speed control mode active.
4	reserved		
5	Safe reference	1	A safe speed reference is active. See 22.46 Speed reference safe and functions such as 49.05 Communication loss action and 50.02 FBA A comm loss func.
6	Last speed	1	A last speed reference is active. See functions such as 49.05 Communication loss action and 50.02 FBA A comm loss func.
7	Loss of reference	1	Reference signal lost.
8	Emergency stop failed	1	Emergency stop failed. See 31.31 Emergency ramp supervision and 31.32 Emergency ramp supervision delay.
9	Jogging	1	Jogging is enabled. See 20.25 Jogging enable.
10	Above level	1	Speed or torque feedback equals or exceeds levels defined by 46.31 Above speed level or 46.33 Above torque level. Valid in both rotation directions.
11	Emergency stop	1	An emergency stop command signal is active or the drive is stopping after receiving an emergency stop command.
12	reserved	1	
13	reserved		
14	Ramp stop failed	1	Ramp stop failed. See 31.33 Ramp stop supervision and 31.34 Ramp stop supervision delay.
15	reserved		

	0000h … FFFFh	-	-	1 = 1	y	n	Signal
06.18	**Drive status word 3**						
	Drive status word 3. Displays the drive status word 3. Bit assignment:						

Bit	Name	Value	Remarks
0	M1 field exciter	1	Motor 1 field exciter acknowledged.
1	M2 field exciter	1	Motor 2 field exciter acknowledged.

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

2	M1 field heating	1	Motor 1 field heating is active. See 28.36 Field heating source.
3	M2 field heating	1	Motor 2 field heating is active. See 42.53 Field heating source.
4	M1 (motor 1)	1	Motor 1 and field exciter 1 are active.
5	M2 (motor 2)	1	Motor 2 and field exciter 2 are active.
6	User set 1	1	User parameter set 1 active. See 96.22 User set save/load.
7	User set 2	1	User parameter set 2 active. See 96.22 User set save/load.
8	User set 3	1	User parameter set 3 active. See 96.22 User set save/load.
9	User set 4	1	User parameter set 4 active. See 96.22 User set save/load.
10	Auto-reclosing	1	Auto-reclosing logic is active. See 31.51 Mains loss mode.
11	Drive direction reverse	1	Reverse drive direction active. Controlled by 06.10.b01 Auxiliary control word 1.
12	Tripped/Warning	1	Fault or warning active.
13	reserved		
14	reserved		
15	reserved		

Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.19 **Drive inhibit status word 2**

Drive inhibit status word 2.
The drive inhibit status word 2 specifies the source of the inhibiting signal that is preventing the drive from starting. See 06.16.b01 Drive status word 1 and 06.20 Run inhibit status word.
Bit assignment:

Bit	Name	Value	Remarks
0	Follower	1	A follower is preventing the master from starting (master only).
1	Application	1	The application program is preventing the drive from starting.
2	Auxiliary power failure	1	Auxiliary power failure is preventing the drive from starting.
3	Encoder feedback	1	The encoder feedback configuration is preventing the drive from starting.
4	Reference source parametrization	1	A reference source parametrization conflict is preventing the drive from starting. See warning A6DA Reference source parametrization.
5	Speed not zero	1	Re-start of the drive is not possible, see also A137 Start condition conflict.

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

			Speed zero has not been reached. See 21.08 M1 zero speed level. Set On = Run = 0 (this includes jogging and inching) and check if the actual speed is within the zero-speed limit. This warning is valid: – For a normal stop. Off1 command in case of 21.01 Start mode = Start from zero. – For a coast stop. Off2 (emergency off/fast current off) command. – For an emergency stop. Off3 (emergency stop) command. – Even if the drive power is cycled. Check: – The settings of 21.08 M1 zero speed level, 21.01 Start mode and 90.41 M1 feedback selection. The function of the used speed feedback devices (tacho/encoder).
6	Re-start not possible	1	Re-start of the drive is not possible, see also A137 Start condition conflict. Either On and/or Run (this includes jogging and inching) command has been set wrong. See 06.09 Used main control word. In case of a wrong setting of either the On and/or the Run command, make sure, On = Run = 0 (this includes jogging and inching). Additionally, the timing of the commands must be checked. E.g.: After a fault reset and On and/or Run command is still high.
7 … 15	reserved		

Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.20 **Run inhibit status word**

Run inhibit status word.
The Run inhibit status word specifies the source of the inhibiting signal that is preventing the drive from starting. The conditions marked with an asterisk (*) require that the On command is cycled. In all other instances, the inhibiting condition must be removed first.
See 06.16.b01 Drive status word 1 and 06.19 Drive inhibit status word 2.
Bit assignment:

Bit	Name	Value	Remarks
0	Not ready run	1	– Jogging is enabled. See 20.25 Jog function enable. – Drive has not been parametrized correctly. Check the parameters in groups 95 HW configuration and 99 Motor data.
1	Control location changed	*1	Control location has changed.

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

2	Firmware inhibit	1	Control program is keeping itself in inhibited state. See 64B1 Internal firmware.
3	Fault reset	*1	A fault has been reset.
4	Off2 from source 2	1	20.08 Off2 source 2 (emergency off) is set to 0 = Off2 command (emergency off/fast current off).
5	reserved		
6	FSO inhibit	1	Operation prevented by FSO-xx safety functions module.
7	STO	1	Safe torque off active.
8	Off2 from source 1	1	20.04 Off2 source 1 (emergency off) is set to 0 = Off2 command (emergency off/fast current off).
9	Autotuning finished	1	The requested autotuning has been finished.
10	Off3 stop mode 0	1	Off3 active (emergency stop) using coast stop. See 21.03 Emergency stop mode.
11	Off3 stop mode 1	1	Off3 active (emergency stop) using ramp stop. See 21.03 Emergency stop mode.
12	Off3 stop mode 2	1	Off3 active (emergency stop) using emergency ramp stop. See 21.03 Emergency stop mode.
13	Off3 stop mode 3	1	Off3 active (emergency stop) using torque limit. See 21.03 Emergency stop mode.
14	Off3 stop mode 4	1	Off3 active (emergency stop) using dynamic braking. See 21.03 Emergency stop mode.
15	Jogging active	1	The jogging enable signal is inhibiting the operation. See 20.25 Jogging enable.

	0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.21 **Speed control status word**

Speed control status word.
Displays the speed control status word of the drive.
Bit assignment:

Bit	Name	Value	Remarks
0	Zero speed	1	Drive is running in the zero-speed level area. The absolute value of 90.01 Motor speed for control has remained below 21.08 M1 zero speed level, 42.21 M2 zero speed level for longer than 21.09 M1 zero speed delay, 42.22 M2 zero speed delay. **Notes:** – This bit is not updated when mechanical brake control is enabled by 44.06 M1 brake control enable, 42.76 M2 brake control enable and the drive is running. See 06.15.b02 Main Status Word.

Index	Name Text					
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**

			– During a ramp stop when the drive is running forward, the delay count runs whenever 90.01 < 21.08 or 42.21. – During a ramp stop when the drive is running reverse, the delay count runs whenever 90.01 > (-1) • 21.08 or (-1) • 42.21.
1	Forward	1	90.01 > 21.08 or 42.21, thus the drive is running forward above zero speed level.
2	Reverse	1	90.01 < (-1) • 21.08 or (-1) • 42.21, thus the drive is running reverse below zero speed level.
3	Out of window	1	Speed error window control is active, and the speed error is out of the window. See 24.41 Speed error window control enable.
4	EMF speed feedback	1	EMF speed feedback active. See 90.41 M1 feedback selection, 42.20 M2 feedback selection or 31.35 Motor feedback fault in case the selected OnBoard tacho/encoder has faulted.
		0	OnBoard tacho/Encoder is used for speed feedback.
5	OnBoard tacho speed feedback	1	OnBoard tacho speed feedback active. See 90.41 M1 feedback selection, 42.20 M2 feedback selection.
		0	OnBoard tacho faulted or not selected as source of speed feedback. See 90.41 M1 feedback selection, 42.20 M2 feedback selection or 31.35 Motor feedback fault.
6	OnBoard encoder speed feedback	1	OnBoard encoder speed feedback active. See 90.41 M1 feedback selection, 42.20 M2 feedback selection.
		0	OnBoard encoder faulted or not selected as source of speed feedback. See 90.41 M1 feedback selection, 42.20 M2 feedback selection or 31.35 Motor feedback fault.
7	Encoder 1 speed feedback	1	Encoder 1 speed feedback active. See 90.41 M1 feedback selection, 42.20 M2 feedback selection.
		0	Encoder 1 faulted or not selected as source of speed feedback. See 90.41 M1 feedback selection, 42.20 M2 feedback selection or 31.35 Motor feedback fault.
8	Encoder 2 speed feedback	1	Encoder 2 speed feedback active. See 90.41 M1 feedback selection, 42.20 M2 feedback selection.
		0	Encoder 2 faulted or not selected as source of speed feedback. See 90.41 M1 feedback selection, 42.20 M2 feedback selection or 31.35 Motor feedback fault.

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

9	Any constant speed request	1	A constant speed has been selected. See 06.22 Constant speed status word.
10	reserved	1	
11	reserved	1	
12 … 15	reserved		

Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.22 **Constant speed status word**

Constant speed status word.
Indicates which constant speed is active, if any. See 06.21.b09 Speed control status word.
Bit assignment:

Bit	Name	Value	Remarks
0	Constant speed 1	1	Constant speed 1 active.
1	Constant speed 2	1	Constant speed 2 active.
2	Constant speed 3	1	Constant speed 3 active.
3	Constant speed 4	1	Constant speed 4 active.
4	Constant speed 5	1	Constant speed 5 active.
5	Constant speed 6	1	Constant speed 6 active.
6	Constant speed 7	1	Constant speed 7 active.
7 … 15	reserved		

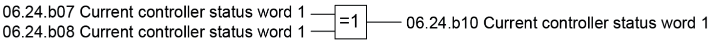
Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.24 **Current controller status word 1**

Current controller status word 1.
Displays the current controller status word 1 of the drive.
Bit assignment:

Bit	Name	Value	Remarks
0	Fans	1	Fans On command for drive and motor fans.
		0	Fans Off command for drive and motor fans.
1	reserved		
2	reserved		
3	Field heating	1	Active.
		0	Inactive.
4	Field current direction	1	Reverse (negative field current).
		0	Forward (positive field current).
5	Field exciter	1	Field exciter On command.
		0	Field exciter Off command.
6	Dynamic braking	1	Dynamic braking active/started.
		0	Dynamic braking inactive.

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

7	Mains contactor	1	Mains contactor Close command (see note 1).
		0	Mains contactor Open command (see note 1).
8	Dynamic braking contactor	1	Dynamic braking contactor close command. Close the contactor for the dynamic braking resistor. Armature current must be zero.
		0	Dynamic braking contactor open command. Open the contactor for the dynamic braking resistor.
9	Energy flow	1	Drive is generating.
		0	Drive is motoring.
10	US style DC-contactor	1	US style changeover DC-contactor close command. Close the DC-contactor and open the resistor contactor.
		0	US style changeover DC-contactor open command. Open the DC-contactor and close the resistor contactor. 
11	Firing pulses	1	Firing pulses active (on).
		0	Firing pulses inactive (blocked).
12	Continuous current	1	Continuous armature current.
		0	Discontinuous armature current.
13	Zero current	1	Zero armature current detected.
		0	Armature current not zero.
14	DC-breaker trip (continuous)	1	DC-breaker trip command (continuous signal).
15	DC-breaker trip (pulse)	1	DC-breaker trip command (1 s pulse).

Note 1: Fix connected to XSMC:1/2.

	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.25 **Current controller status word 2**

Current controller status word 2.
Displays the current controller status word 2 of the drive. Value of zero means, that the status is OK.
The firing angle is forced to the value of 30.45 Maximum firing angle if any of the bits is set.
Bit assignment:

Bit	Name	Value	Remarks
0	Armature overcurrent	1	2310 Armature overcurrent. See 04.21.b01 Fault word 1.
1	Mains overvoltage	1	F513 Mains overvoltage. See 04.21.b12 Fault word 1.
2	Mains undervoltage	1	A111 Mains low voltage. See 04.31.b10 Warning word 1 or 3280 Mains low voltage. See 04.21.b11 Fault word 1.
3	EMF reduction	1	A104 Reversal volt function or F504 Reversal volt function. See 31.60 Reversal volt function. Waiting for the reduction of the EMF to match the mains voltage. See 27.42 Reversal volt margin.

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

4	Bridge reversal	1	F533 12-pulse reversal timeout. See 04.23.b00 Fault word 3. F534 12-pulse current difference. See 04.23.b01 Fault word 3. F557 Reversal time. See 04.24.b08 Fault word 4.
5	12-pulse partner blocked/OVP active	1	1 = Overvoltage protection active (freewheeling), when 99.06 Operation mode = Large field exciter. 1 = Blocked by partner, when 99.06 Operation mode = 12-pulse parallel master. 12-pulse parallel slave. 12-pulse serial master. 12-pulse serial slave. 6-pulse serial master. 6-pulse serial slave. Serial sequential master. Serial sequential slave.
6	M1 field exciter self-test	1	F529 M1 field exciter not OK. See 04.22.b12 Fault word 2.
		0	Motor 1 field exciter self-test OK.
7	M1 field exciter ready	1	F537 M1 field exciter ready lost. See 04.23.b04 Fault word 3.
		0	Motor 1 field exciter ready.
8	M2 field exciter self-test	1	F530 M2 field exciter not OK. See 04.22.b13 Fault word 2.
		0	Motor 2 field exciter self-test OK.
9	M2 field exciter ready	1	F538 M2 field exciter ready lost. See 04.23.b05 Fault word 3.
		0	Motor 2 field exciter ready.
10	Zero current	1	Waiting for zero armature current, if 27.40 Zero current timeout elapses before bit 10 is set back to zero, F557 Reversal time is set. See 04.24.b08 Fault word 4.
11	Field reversal	1	Field reversal active.
		0	Field reversal inactive.
12	reserved		
13	PLL deviation level	1	A131 PLL deviation. PLL deviation level is exceeded. See 95.44 PLL deviation level.
		0	Below PLL deviation level. See 95.44 PLL deviation level.
14	Mains synchronization	1	F514 Mains synchronization lost. See 04.21.b13 Fault word 1.
		0	Mains synchronized.
15	Current controller	1	Disabled, the current controller is disabled and 27.02 Used current reference is forced to zero.
		0	Enabled.

	0000h … FFFFh	-	-	1 = 1	y	n	Signal
06.26	**M1 field exciter status word**						
	Motor 1 field exciter status word. Displays motor 1 field exciter status word of the drive. Bit assignment:						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

Bit	Name	Value	Remarks
0	None	1	No field exciter connected.
1	OK	1	Field exciter and communication to armature drive OK.
2	Communication failed	1	F516 M1 field exciter communication. See 04.21.b15 Fault word 1.
		0	Communication to armature drive OK.
3	Field exciter self-test failed	1	F529 M1 field exciter not OK. See 04.22.b12 Fault word 2.
		0	Field exciter self-test OK.
4	Field exciter ready lost	1	F537 M1 field exciter ready lost. See 04.23.b04 Fault word 3.
		0	Motor 1 field exciter ready.
5	Field exciter undercurrent	1	F541 M1 field exciter low current. See 04.23.b08 Fault word 3.
6	Field exciter overcurrent	1	F515 M1 field exciter overcurrent. See 04.21.b14 Fault word 1.
7	Wrong setting	1	Check setting of 99.07 M1 used field exciter type and 42.49 M2 used field exciter type.
8 … 15	reserved		

Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.27 **M2 field exciter status word**

Motor 2 field exciter status word.
Displays motor 1 field exciter status word of the drive.
Bit assignment:

Bit	Name	Value	Remarks
0	None	1	No field exciter connected.
1	OK	1	Field exciter and communication to armature drive OK.
2	Communication failed	1	F519 M2 field exciter communication. See 04.22.b02 Fault word 2.
		0	Communication to armature drive OK.
3	Field exciter self-test failed	1	F530 M2 field exciter not OK. See 04.22.b13 Fault word 2.
		0	Field exciter self-test OK.
4	Field exciter ready lost	1	F538 M2 field exciter ready lost. See 04.23.b05 Fault word 3.
		0	Motor 2 field exciter ready.
5	Field exciter undercurrent	1	F542 M2 field exciter low current. See 04.23.b09 Fault word 3.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">
<table>
<tr><td>6</td><td>Field exciter overcurrent</td><td>1</td><td>F518 M2 field exciter overcurrent. See 04.22.b01 Fault word 2.</td></tr>
<tr><td>7</td><td>Wrong setting</td><td>1</td><td>Check setting of 99.07 M1 used field exciter type and 42.49 M2 used field exciter type.</td></tr>
<tr><td>8 … 15</td><td>reserved</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">06.29</td><td colspan="7">MSW bit 10 sel</td></tr>
<tr><td colspan="7">Binary source for main status word bit 10 (Above level).
Selects a binary source whose status is transmitted as 06.15.b10 Main status word.
Other [bit]; source selection.
0: False;
1: True;
2: Above level; see 06.17.b10 Drive status word 2.</td></tr>
<tr><td>0 … 2</td><td>Above level</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">06.30</td><td colspan="7">MSW bit 11 sel</td></tr>
<tr><td colspan="7">Binary source for main status word bit 11 (Status control 11).
Selects a binary source whose status is transmitted as 06.15.b11 Main status word.
Other [bit]; source selection.
0: False;
1: True;</td></tr>
<tr><td>0 … 1</td><td>False</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">06.31</td><td colspan="7">MSW bit 12 sel</td></tr>
<tr><td colspan="7">Binary source for main status word bit 12 (Status control 12).
Selects a binary source whose status is transmitted as 06.15.b12 Main status word.
Other [bit]; source selection.
0: False;
1: True;</td></tr>
<tr><td>0 … 1</td><td>False</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">06.32</td><td colspan="7">MSW bit 13 sel</td></tr>
<tr><td colspan="7">Binary source for main status word bit 13 (Status control 13).
Selects a binary source whose status is transmitted as 06.15.b13 Main status word.
Other [bit]; source selection.
0: False;
1: True;</td></tr>
<tr><td>0 … 1</td><td>False</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">06.33</td><td colspan="7">MSW bit 14 sel</td></tr>
<tr><td colspan="7">Binary source for main status word bit 14 (Status control 14).
Selects a binary source whose status is transmitted as 06.15.b14 Main status word.
Other [bit]; source selection.
0: False;
1: True;</td></tr>
<tr><td>0 … 1</td><td>False</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">06.45</td><td colspan="7">Follower CW bit 12 selection</td></tr>
<tr><td colspan="7">Binary source for follower control word bit 12 (Master warning/fault) (master only).</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Selects a binary source whose status is transmitted as 06.06.b12 Follower control word to all followers.
Other [bit]; source selection.
0: False;
1: True;
2: Follower control 12; see 06.06.b12 Follower control word.
3: Follower control 13; see 06.06.b13 Follower control word.
4: Follower control 14; see 06.06.b14 Follower control word.
5: Follower control 15; see 06.06.b15 Follower control word.
6: Master warning/fault; see 06.18.b12 Drive status word 3.</td></tr>
<tr><td>0 … 6</td><td>Master warning/fault</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">06.46</td><td colspan="7">Follower CW bit 13 selection</td></tr>
<tr><td colspan="7">Binary source for follower control word bit 13 (Main control 13) (master only).
Selects a binary source whose status is transmitted as 06.06.b13 Follower control word to all followers.
Other [bit]; source selection.
0: False;
1: True;
2: Follower control 12; see 06.06.b12 Follower control word.
3: Follower control 13; see 06.06.b13 Follower control word.
4: Follower control 14; see 06.06.b14 Follower control word.
5: Follower control 15; see 06.06.b15 Follower control word.</td></tr>
<tr><td>0 … 5</td><td>Follower control 13</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">06.47</td><td colspan="7">Follower CW bit 14 selection</td></tr>
<tr><td colspan="7">Binary source for follower control word bit 14 (Main control 14) (master only).
Selects a binary source whose status is transmitted as 06.06.b14 Follower control word to all followers.
Other [bit]; source selection.
0: False;
1: True;
2: Follower control 12; see 06.06.b12 Follower control word.
3: Follower control 13; see 06.06.b13 Follower control word.
4: Follower control 14; see 06.06.b14 Follower control word.
5: Follower control 15; see 06.06.b15 Follower control word.</td></tr>
<tr><td>0 … 5</td><td>Follower control 14</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">06.48</td><td colspan="7">Follower CW bit 15 selection</td></tr>
<tr><td colspan="7">Binary source for follower control word bit 15 (Main control 15) (master only).
Selects a binary source whose status is transmitted as 06.06.b15 Follower control word to all followers.
Other [bit]; source selection.
0: False;
1: True;
2: Follower control 12; see 06.06.b12 Follower control word.
3: Follower control 13; see 06.06.b13 Follower control word.
4: Follower control 14; see 06.06.b14 Follower control word.</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	5: **Follower control 15**; see 06.06.b15 Follower control word.						
	0 … 5	Follower control 15	-	1 = 1	n	y	Parameter
06.50	**User status word 1**						
	User defined status word 1. This word displays the status of the binary sources selected by parameters 06.60 … 06.75. Bit assignment:						

Bit	**Name**	**Remarks**
0	User status bit 0	Status of source selected by 06.60 User status word 1 bit 0 sel.
1	User status bit 1	Status of source selected by 06.61 User status word 1 bit 1 sel.
2	User status bit 2	Status of source selected by 06.62 User status word 1 bit 2 sel.
3	User status bit 3	Status of source selected by 06.63 User status word 1 bit 3 sel.
4	User status bit 4	Status of source selected by 06.64 User status word 1 bit 4 sel.
5	User status bit 5	Status of source selected by 06.65 User status word 1 bit 5 sel.
6	User status bit 6	Status of source selected by 06.66 User status word 1 bit 6 sel.
7	User status bit 7	Status of source selected by 06.67 User status word 1 bit 7 sel.
8	User status bit 8	Status of source selected by 06.68 User status word 1 bit 8 sel.
9	User status bit 9	Status of source selected by 06.69 User status word 1 bit 9 sel.
10	User status bit 10	Status of source selected by 06.70 User status word 1 bit 10 sel.
11	User status bit 11	Status of source selected by 06.71 User status word 1 bit 11 sel.
12	User status bit 12	Status of source selected by 06.72 User status word 1 bit 12 sel.
13	User status bit 13	Status of source selected by 06.73 User status word 1 bit 13 sel.
14	User status bit 14	Status of source selected by 06.74 User status word 1 bit 14 sel.
15	User status bit 15	Status of source selected by 06.75 User status word 1 bit 15 sel.

	0000h … FFFFh	-	-	1 = 1	y	n	Signal
06.60	**User status word 1 bit 0 sel**						
	Binary source for bit 0. Selects a binary source whose status is shown as 06.50.b00 User Status Word 1. **Other [bit]**; source selection. 0: **False**; 1: **True**;						
	0 … 1	False	-	1 = 1	n	y	Parameter
06.61	**User status word 1 bit 1 sel**						
	Binary source for bit 1. Selects a binary source whose status is shown as 06.50.b01 User Status Word 1. **Other [bit]**; source selection. 0: **False**; 1: **True**;						
	0 … 1	False	-	1 = 1	n	y	Parameter
06.62	**User status word 1 bit 2 sel**						
	Binary source for bit 2.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Selects a binary source whose status is shown as 06.50.b02 User Status Word 1.
Other [bit]; source selection.
0: False;
1: True;</td></tr>
<tr><td>0 … 1</td><td>False</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">06.63</td><td colspan="7">User status word 1 bit 3 sel</td></tr>
<tr><td colspan="7">Binary source for bit 3.
Selects a binary source whose status is shown as 06.50.b03 User Status Word 1.
Other [bit]; source selection.
0: False;
1: True;</td></tr>
<tr><td>0 … 1</td><td>False</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">06.64</td><td colspan="7">User status word 1 bit 4 sel</td></tr>
<tr><td colspan="7">Binary source for bit 4.
Selects a binary source whose status is shown as 06.50.b04 User Status Word 1.
Other [bit]; source selection.
0: False;
1: True;</td></tr>
<tr><td>0 … 1</td><td>False</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">06.65</td><td colspan="7">User status word 1 bit 5 sel</td></tr>
<tr><td colspan="7">Binary source for bit 5.
Selects a binary source whose status is shown as 06.50.b05 User Status Word 1.
Other [bit]; source selection.
0: False;
1: True;</td></tr>
<tr><td>0 … 1</td><td>False</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">06.66</td><td colspan="7">User status word 1 bit 6 sel</td></tr>
<tr><td colspan="7">Binary source for bit 6.
Selects a binary source whose status is shown as 06.50.b06 User Status Word 1.
Other [bit]; source selection.
0: False;
1: True;</td></tr>
<tr><td>0 … 1</td><td>False</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">06.67</td><td colspan="7">User status word 1 bit 7 sel</td></tr>
<tr><td colspan="7">Binary source for bit 7.
Selects a binary source whose status is shown as 06.50.b07 User Status Word 1.
Other [bit]; source selection.
0: False;
1: True;</td></tr>
<tr><td>0 … 1</td><td>False</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">06.68</td><td colspan="7">User status word 1 bit 8 sel</td></tr>
<tr><td colspan="7">Binary source for bit 8.
Selects a binary source whose status is shown as 06.50.b08 User Status Word 1.
Other [bit]; source selection.
0: False;
1: True;</td></tr>
<tr><td>0 … 1</td><td>False</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>06.69</td><td colspan="7">User status word 1 bit 9 sel</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	Binary source for bit 9. Selects a binary source whose status is shown as 06.50.b09 User Status Word 1. **Other [bit]**; source selection. 0: **False**; 1: **True**;						
	0 … 1	False	-	1 = 1	n	y	Parameter
06.70	**User status word 1 bit 10 sel**						
	Binary source for bit 10. Selects a binary source whose status is shown as 06.50.b10 User Status Word 1. **Other [bit]**; source selection. 0: **False**; 1: **True**;						
	0 … 1	False	-	1 = 1	n	y	Parameter
06.71	**User status word 1 bit 11 sel**						
	Binary source for bit 11. Selects a binary source whose status is shown as 06.50.b11 User Status Word 1. **Other [bit]**; source selection. 0: **False**; 1: **True**;						
	0 … 1	False	-	1 = 1	n	y	Parameter
06.72	**User status word 1 bit 12 sel**						
	Binary source for bit 12. Selects a binary source whose status is shown as 06.50.b12 User Status Word 1. **Other [bit]**; source selection. 0: **False**; 1: **True**;						
	0 … 1	False	-	1 = 1	n	y	Parameter
06.73	**User status word 1 bit 13 sel**						
	Binary source for bit 13. Selects a binary source whose status is shown as 06.50.b13 User Status Word 1. **Other [bit]**; source selection. 0: **False**; 1: **True**;						
	0 … 1	False	-	1 = 1	n	y	Parameter
06.74	**User status word 1 bit 14 sel**						
	Binary source for bit 14. Selects a binary source whose status is shown as 06.50.b14 User Status Word 1. **Other [bit]**; source selection. 0: **False**; 1: **True**;						
	0 … 1	False	-	1 = 1	n	y	Parameter
06.75	**User status word 1 bit 15 sel**						
	Binary source for bit 15. Selects a binary source whose status is shown as 06.50.b15 User Status Word 1. **Other [bit]**; source selection. 0: **False**; 1: **True**;						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	0 … 1	False	-	1 = 1	n	y	Parameter
06.81	**Drive logic status word**						
	reserved						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
06.82	**Drive logic auxiliary status word**						
	reserved						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
06.86	**FBA A generic control word**						
	Displays the unaltered control word received from the PLC via fieldbus adapter A. See group 51 FBA A settings.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
06.87	**FBA B generic control word**						
	Displays the unaltered control word received from the PLC via fieldbus adapter B. See group 54 FBA B settings.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
06.88	**FBA A profile status word**						
	Displays the status word from the drive to the fieldbus controller (e.g. PLC) via fieldbus adapter A after being modified by 50.29 FBA A profile.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
06.89	**FBA B profile status word**						
	Displays the status word from the drive to the fieldbus controller (e.g. PLC) via fieldbus adapter B after being modified by 50.59 FBA B profile.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
06.100	**User control word 1**						
	User defined control word 1. Bit assignment:						

Bit	**Name**	**Remarks**
0	User control word 1 bit 0	User defined bits.
1	User control word 1 bit 1	
2	User control word 1 bit 2	
3	User control word 1 bit 3	
4	User control word 1 bit 4	
5	User control word 1 bit 5	
6	User control word 1 bit 6	
7	User control word 1 bit 7	
8	User control word 1 bit 8	
9	User control word 1 bit 9	
10	User control word 1 bit 10	
11	User control word 1 bit 11	
12	User control word 1 bit 12	
13	User control word 1 bit 13	
14	User control word 1 bit 14	
15	User control word 1 bit 15	

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7"></td></tr>
<tr><td></td><td>0000h … FFFFh</td><td>0000h</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>06.101</td><td colspan="7">User control word 2</td></tr>
<tr><td></td><td colspan="7">User defined control word 2.
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Remarks</th></tr>
<tr><td>0</td><td>User control word 2 bit 0</td><td>User defined bits.</td></tr>
<tr><td>1</td><td>User control word 2 bit 1</td><td></td></tr>
<tr><td>2</td><td>User control word 2 bit 2</td><td></td></tr>
<tr><td>3</td><td>User control word 2 bit 3</td><td></td></tr>
<tr><td>4</td><td>User control word 2 bit 4</td><td></td></tr>
<tr><td>5</td><td>User control word 2 bit 5</td><td></td></tr>
<tr><td>6</td><td>User control word 2 bit 6</td><td></td></tr>
<tr><td>7</td><td>User control word 2 bit 7</td><td></td></tr>
<tr><td>8</td><td>User control word 2 bit 8</td><td></td></tr>
<tr><td>9</td><td>User control word 2 bit 9</td><td></td></tr>
<tr><td>10</td><td>User control word 2 bit 10</td><td></td></tr>
<tr><td>11</td><td>User control word 2 bit 11</td><td></td></tr>
<tr><td>12</td><td>User control word 2 bit 12</td><td></td></tr>
<tr><td>13</td><td>User control word 2 bit 13</td><td></td></tr>
<tr><td>14</td><td>User control word 2 bit 14</td><td></td></tr>
<tr><td>15</td><td>User control word 2 bit 15</td><td></td></tr>
</table></td></tr>
<tr><td></td><td>0000h … FFFFh</td><td>0000h</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>06.110</td><td colspan="7">DDCS control word</td></tr>
<tr><td></td><td colspan="7">Displays the unaltered control word received from a DDCS controller via a DDCS communication option module (FDCO-0x).</td></tr>
<tr><td></td><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>06.122</td><td colspan="7">Follower status word node 2</td></tr>
<tr><td></td><td colspan="7">Master-follower link, 06.15 Main status word from follower node 2 via master-follower link to the master (master only).
06.15 Main status word can be transferred from follower node 2 to the master. See group 62.
Bit assignment see 06.15 Main status word.</td></tr>
<tr><td></td><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>06.123</td><td colspan="7">Follower status word node 3</td></tr>
<tr><td></td><td colspan="7">Master-follower link, 06.15 Main status word from follower node 3 via master-follower link to the master (master only).
06.15 Main status word can be transferred from follower node 3 to the master. See group 62.
Bit assignment see 06.15 Main status word.</td></tr>
<tr><td></td><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>06.124</td><td colspan="7">Follower status word node 4</td></tr>
</table>

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	Master-follower link, 06.15 Main status word from follower node 4 via master-follower link to the master (master only). 06.15 Main status word can be transferred from follower node 4 to the master. See group 62. Bit assignment see 06.15 Main status word.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal

07 System info

The drive’s hardware and firmware information.

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**
07.02	**Power unit set**						
	Type of power unit. The value is read from 95.14 Set: Power unit (saved on the SDCS-CON-H01). 0: **DCS converter**; the unit is a DCS880. 20: **DCT controller**; the unit is a DCT880. 40: **TSU supply unit**; the unit is a TSU880. 100: **Unsupported power unit type**; mismatch between 95.14 Set: Power unit read from SDCS-CON-H01 and 95.14 Set: Power unit read from the plugged-in memory unit. This event generates fault 50FE Type code and shows 95.14 Set: Power unit. Either adapt the SDCS-CON-H01 using 95.14 Set: Power unit and 95.25 Set: Type code or use a memory unit with an appropriate firmware.						
	0 … 100	-	-	1 = 1	y	n	Signal
07.03	**Drive rating ID set**						
	Type of the drive. The value is read from 95.25 Set: Type code (saved on the SDCS-CON-H01). **Example:** DCS880-S02-1000-05						
	0 … 520	-	-	1 = 1	y	n	Signal
07.04	**Firmware name**						
	Firmware identification. **Example:** DCSF1 = DCS880 Firmware.						
		-	-	-	y	n	Signal
07.05	**Firmware version**						
	Version number of the firmware. **Example:** 1.05.0.0 = Firmware version 1.05.						
	0.000.0.0 … 255.255.255.255	-	-	1 = 1	y	n	Signal
07.08	**Bootloader version**						
	Version number of the firmware bootloader. **Example:** 2.12.0.0 = Bootloader version 2.12.						
	0.000.0.0 … 255.255.255.255	-	-	1 = 1	y	n	Signal
07.11	**CPU usage**						
	Microprocessor load in percent.						
	0 … 100	-	%	1 = 1 %	y	n	Signal

Index	Name						
	Text						
	Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
07.13	**Control unit logic version**						
	Version number of the control board logic in the FPGA on the SDCS-CON-H01. **Example:** 10.10.0.0 = Firmware version 10.10.						
	0.000.0.0 … 255.255.255.255	-	-	1 = 1	y	n	Signal
07.14	**Ch1 power unit logic version**						
	Version number of the power unit logic in the FPGA on the SDCS-OPL-H01 connected to channel1 of the SDCS-DSL-H1x. **Example:** 10.10.0.0 = Firmware version 10.10.						
	0.000.0.0 … 255.255.255.255	-	-	1 = 1	y	n	Signal
07.15	**Ch2 power unit logic version**						
	Version number of the power unit logic in the FPGA on the SDCS-OPL-H01 connected to channel2 of the SDCS-DSL-H1x. **Example:** 10.10.0.0 = Firmware version 10.10.						
	0.000.0.0 … 255.255.255.255	-	-	1 = 1	y	n	Signal
07.16	**Ch3 power unit logic version**						
	Version number of the power unit logic in the FPGA on the SDCS-OPL-H01 connected to channel3 of the SDCS-DSL-H1x. **Example:** 10.10.0.0 = Firmware version 10.10.						
	0.000.0.0 … 255.255.255.255	-	-	1 = 1	y	n	Signal
07.17	**Ch4 power unit logic version**						
	Version number of the power unit logic in the FPGA on the SDCS-OPL-H01 connected to channel4 of the SDCS-DSL-H1x. **Example:** 10.10.0.0 = Firmware version 10.10.						
	0.000.0.0 … 255.255.255.255	-	-	1 = 1	y	n	Signal
07.19	**Control Builder system library version**						
	Version number of the Control Builder system library. **Example:** 1.01.0.0 = Control Builder system library version 1.01.						
	0.000.0.0 … 255.255.255.255	-	-	1 = 1	y	n	Signal
07.20	**Control Builder application**						
	Control Builder application information. Information about the Control Builder application. 0: **No license**; the memory unit contains no license. No Control Builder application programming possible. 1: **No application**; the memory unit contains a license. No Control Builder application loaded. 3: **Application: see 07.23 Application name**; the memory unit contains a license. A Control Builder application is loaded. The name can be found in 07.23 Application name.						
	0 … 3	-	-	1 = 1	y	n	Signal
07.21	**Application environment status 1**						
	Application program task status.						

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type

Shows, which tasks of the application program are running. See *Drive (IEC 61131-3) application programming manual 3AUA0000127808*.
Bit assignment:

Bit	Name	Value	Remarks
0	Pre-task	1	Pre-task running.
1	Application task 1	1	Task 1 running.
2	Application task 2	1	Task 2 running.
3	Application task 3	1	Task 3 running.
4	reserved		
5	reserved		
6	reserved		
7	reserved		
8	reserved		
9	reserved		
10	reserved		
11	reserved		
12	reserved		
13	reserved		
14	reserved		
15	Task monitoring	1	Task monitoring enabled.

Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
0000h … FFFFh	0000h	-	1 = 1	y	n	Signal

07.22 **Application environment status 2**

Application program opening status.
Shows the status of the openings in the application program. See *Drive (IEC 61131-3) application programming manual 3AUA0000127808*.
Bit assignment:

Bit	Name	Value	Remarks
0	Opening 1	1	Status of opening 1 in the application program.
1	Opening 2	1	Status of opening 2 in the application program.
2	Opening 3	1	Status of opening 3 in the application program.
3	Opening 4	1	Status of opening 4 in the application program.
4	Opening 5	1	Status of opening 5 in the application program.
5	Opening 6	1	Status of opening 6 in the application program.
6	Opening 7	1	Status of opening 7 in the application program.
7	Opening 8	1	Status of opening 8 in the application program.
8	Opening 9	1	Status of opening 9 in the application program.
9	Opening 10	1	Status of opening 10 in the application program.
10	Opening 11	1	Status of opening 11 in the application program.
11	Opening 12	1	Status of opening 12 in the application program.

Index	Name						
	Text						
	Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type

12	Opening 13	1	Status of opening 13 in the application program.
13	Opening 14	1	Status of opening 14 in the application program.
14	Opening 15	1	Status of opening 15 in the application program.
15	Opening 16	1	Status of opening 16 in the application program.

Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
0000h … FFFFh	0000h	-	1 = 1	y	n	Signal

07.23 **Application name**

Control Builder application program name.
Displays the first five ASCII signs of the name given to the application program. The full name is visible under System info on the control panel or in the PC tool.
_N/A_: **No name**;

Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
	-	-	-	y	n	Signal

07.24 **Application version**

Control Builder application version number.
Displays the version number given to the application program. Also visible under System info on the control panel or in the PC tool.
Example: 1.04.0.0 = Application program version 4.

Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
0.000.0.0 … 255.255.255.255	-	-	1 = 1	y	n	Signal

07.30 **Adaptive program status**

Adaptive program status.
Displays the status of the adaptive program.
Bit assignment:

Bit	Name	Value	Remarks
0	Initialized	1	Adaptive program initialized.
1	Editing	1	Adaptive program is being edited.
2	Edit done	1	Editing of adaptive program finished.
3	Running	1	Adaptive program running.
4	reserved		
5	reserved		
6	reserved		
7	reserved		
8	reserved		
9	reserved		
10	reserved		
11	reserved		
12	reserved		
13	reserved		
14	State changing	1	State change in progress in adaptive programming engine.
15	Faulted	1	Error in adaptive program.

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
07.40	**IEC application CPU usage peak**						
	Peak microprocessor load caused by the application program. Displays the peak load of the microprocessor caused by the application program. 07.40 IEC application Cpu usage peak can be used to check the effect of a given application program on the CPU load. The value is in percent of an internal microprocessor quota. Can be reset from the control panel by keeping Reset depressed for over 3 seconds.						
	0.0 … 100.0	-	%	10 = 1 %	y	n	Signal
07.41	**IEC application CPU load average**						
	Average microprocessor load caused by the application program. Displays the average load of the microprocessor caused by the application program. The value is in percent of an internal microprocessor quota.						
	0.0 … 100.0	-	%	10 = 1 %	y	n	Signal
07.49	**Diagram interface 1**						
	Reserved for function Diagrams in Drive composer pro.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
07.50	**Progress signal**						
	Reserved for function DCS880 Assistant in Drive composer pro.						
	0 … 100	-	%	1 = 1 %	y	n	Signal
07.51	**Slot 1 option module**						
	Slot 1 option module. Displays the option module plugged into slot 1. 0: **No option**; no option module plugged into slot 1. 1: **No communication**; no communication to option module plugged into slot 1. 2: **Unknown**; option module plugged into slot 1 is unknown, wrong type or not valid. 8: **FPBA-01**; 10: **FCAN-01**; 11: **FDNA-01**; 13: **FENA-11**; 19: **FB COMMON**; 22: **FSCA-01**; 23: **FSEA-21**; 25: **FECA-01**; 26: **FENA-21**; 28: **FMAC-01**; 29: **FCNA-01**; 27: **FEPL-02**; 33: **FPTC-01/02**; 1015: **FIO-01**; 1016: **FEN-01**; 1017: **FEN-11**; 1018: **FEN-21**; 1020: **FIO-11**; 1021: **FEN-31**; 1024: **FAIO-01**; 1025: **FDIO-01**;						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**
	1026: **FSE-31**;						
	0 … 65535	-	-	1 = 1	y	n	Signal
07.52	**Slot 2 option module**						
	Slot 2 option module. Displays the option module plugged into slot 2. For values, see 07.51 Slot 1 option module.						
	0 … 65535	-	-	1 = 1	y	n	Signal
07.53	**Slot 3 option module**						
	Slot 3 option module. Displays the option module plugged into slot 3. For values, see 07.51 Slot 1 option module.						
	0 … 65535	-	-	1 = 1	y	n	Signal
07.60	**Drive size**						
	Recognized drive size. Read from 95.25 Set: Type code. 0: **None**; when 95.25 Set: Type code = None. 1: **H1**; drive size H1. 2: **H2**; drive size H2. 3: **H3**; drive size H3. 4: **H4**; drive size H4. 5: **H5**; drive size H5. 6: **H6**; drive size H6. 7: **H7**; drive size H7. 8: **H8**; drive size H8. 9: **Manual set**; set by user. 95.27 Set: Drive DC current scaling and/or 95.28 Set: Drive AC voltage scaling have been changed for e.g. rebuild kits.						
	0 … 9	-	-	1 = 1	y	n	Signal
07.61	**Drive block bridge 2 set**						
	Recognized drive quadrant type. Displays the quadrant type of the drive (1 or 2 bridges). Read from 95.25 Set: Type code or set with 95.26 Set: Drive block bridge 2: – Read from 95.25 Set: Type code, if 95.26 Set: Drive block bridge 2= 0. – Read from 95.26 Set: Drive block bridge 2, if 95.26 Set: Drive block bridge 2 ≠ 0. 1: **Block bridge 2**; (reverse) bridge 2 blocked ≡ 2-Q operation. 2: **Release bridge 2**; (reverse) bridge 2 released ≡ 4-Q operation.						
	0 … 2	-	-	1 = 1	y	n	Signal
07.62	**Drive DC current scaling set**						
	Recognized drive nominal DC current. Displays the drive nominal DC current measurement circuit. Adjustment of DC current measuring channels (SDCS-PIN-H01 or SDCS-PIN-H51). Read from 95.25 Set: Type code or set with 95.27 Set: Drive DC current scaling: – Read from 95.25 Set: Type code, if 95.27 Set: Drive DC current scaling = 0. – Read from 95.27 Set: Drive DC current scaling, if 95.27 Set: Drive DC current scaling ≠ 0.						
	0 … 32500	-	A	1 = 1 A	y	n	Signal
07.63	**Drive DC overcurrent level**						
	Drive DC overcurrent level.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**
	Displays the drive current tripping level. This signal is set during initialization of the drive. New values are shown after the next power-up. Drive DC overcurrent level: – 2.3 • 95.25 Set: Type code, if 95.27 Set: Drive DC current scaling = 0. – 2.3 • 95.27 Set: Drive DC current scaling, if 95.27 Set: Drive DC current scaling ≠ 0.						
	0 … 32500	-	A	1 = 1 A	y	n	Signal
07.64	**Drive AC voltage scaling set**						
	Recognized drive nominal AC voltage. Displays the drive nominal AC voltage measurement circuit. Adjustment of AC voltage measuring channels (SDCS-PIN-H01 or SDCS-PIN-H51). Read from 95.25 Set: Type code or set with 95.28 Set: Drive AC voltage scaling: – Read from 95.25 Set: Type code, if 95.28 Set: Drive AC voltage scaling = 0. – Read from 95.28 Set: Drive AC voltage scaling, if 95.28 Set: Drive AC voltage scaling ≠ 0.						
	0.0 … 3250.0	-	V	10 = 1 V	y	n	Signal
07.65	**Drive max bridge temperature set**						
	Recognized drive maximum bridge temperature. Displays the drive maximum bridge temperature. Read from 95.25 Set: Type code or set with 95.29 Set: Drive max bridge temperature: – Read from 95.25 Set: Type code, if 95.29 Set: Drive max bridge temperature = 0. – Read from 95.29 Set: Drive max bridge temperature, if 95.29 Set: Drive max bridge temperature ≠ 0. The event generates fault 4310 Bridge temperature measured when 07.65 Drive max bridge temperature set is reached. The event generates warning A4B0 Bridge temperature measured, when the measured bridge temperature is approximately 5° below 07.65 Drive max bridge temperature set. The unit is selected by 96.02 Unit selection.						
	-80.0 … 1000.0	-	°C or °F	1 = 1°C or °F	y	n	Signal
07.68	**M1 field exciter type**						
	Motor 1 field exciter type. Read from 99.07 M1 used field exciter type. 0: **None**; no or third-party field exciter connected. 1: **OnBoard**; integrated 1-Q field exciter (for sizes H1 … H4 only). 2: **DCF803-0016**; external 1-Q 16 A field exciter used for field currents from 0.3 A ... 16 A. 3: **FEX-425-Int**; internal 1-Q 25 A field exciter (for size H5 and H6 only) used for field currents from 0.3 A ... 25 A. 4: **DCF803-0035**; external 1-Q 35 A field exciter used for field currents from 0.3 A ... 35 A. 5: **DCF803 terminal 5 A**; external 1-Q 16 A field exciter (DCF803-0016), internal 1-Q 25 A field exciter (FEX-425-Int) or external 1-Q 35 A field exciter (DCF803-0035) used for field currents from 0.3 A ... 5 A. **Note**: Use 5 A terminals. 6: **DCF803-0050**; external 1-Q 50 A field exciter. 7: **DCF804-0050**; external 4-Q 50 A field exciter. 8: **DCF803-0060**; external 1-Q 60 A field exciter. 9: **DCF804-0060**; external 4-Q 60 A field exciter. 10: **DCS880-S01**; external 2-Q standard DCS880 module. 11: **DCS880-S02**; external 4-Q standard DCS880 module. 16: **External field exciter via AI1**; third party field exciter, acknowledge via AI1. 17: **External field exciter via AI2**; third party field exciter, acknowledge via AI2. 18: **External field exciter via AI3**; third party field exciter, acknowledge via AI3. 19: **Multiple field exciters**; reserved.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td>0 … 19</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">07.69</td><td colspan="7">M1 field exciter firmware version</td></tr>
<tr><td colspan="7">Version number of Motor 1 field exciter firmware.
Example: 1.02.0.0 = Firmware version 1.02.</td></tr>
<tr><td>0.000.0.0 …
255.255.255.255</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">07.72</td><td colspan="7">M2 field exciter type</td></tr>
<tr><td colspan="7">Motor 2 field exciter type.
Read from 42.49 M2 used field exciter type.
0: None; no or third-party field exciter connected.
1: OnBoard; integrated 1-Q field exciter (for sizes H1 … H4 only).
2: DCF803-0016; external 1-Q 16 A field exciter used for field currents from 0.3 A ... 16 A.
3: FEX-425-Int; internal 1-Q 25 A field exciter (for size H5 and H6 only) used for field currents from 0.3 A ... 25 A.
4: DCF803-0035; external 1-Q 35 A field exciter used for field currents from 0.3 A ... 35 A.
5: DCF803 terminal 5 A; external 1-Q 16 A field exciter (DCF803-0016), internal 1-Q 25 A field exciter (FEX-425-Int) or external 1-Q 35 A field exciter (DCF803-0035) used for field currents from 0.3 A ... 5 A.
Note: Use 5 A terminals.
6: DCF803-0050; external 1-Q 50 A field exciter.
7: DCF804-0050; external 4-Q 50 A field exciter.
8: DCF803-0060; external 1-Q 60 A field exciter.
9: DCF804-0060; external 4-Q 60 A field exciter.
10: DCS880-S01; external 2-Q standard DCS880 module.
11: DCS880-S02; external 4-Q standard DCS880 module.
16: External field exciter via AI1; third party field exciter, acknowledge via AI1.
17: External field exciter via AI2; third party field exciter, acknowledge via AI2.
18: External field exciter via AI3; third party field exciter, acknowledge via AI3.
19: Multiple field exciters; reserved.</td></tr>
<tr><td>0 … 19</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">07.73</td><td colspan="7">M2 field exciter firmware version</td></tr>
<tr><td colspan="7">Version number of Motor 2 field exciter firmware.
Example: 1.01.0.0 = Firmware version 1,01.</td></tr>
<tr><td>0.000.0.0 …
255.255.255.255</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
</table>

10 Standard DI, RO

Configuration of digital inputs and relay outputs.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2">10.01</td><td colspan="7">DI status</td></tr>
<tr><td colspan="7">Status of digital inputs.
Displays the electrical status of DI1 … DI6 and DIL. The activation/deactivation delays of the inputs (if any are specified) are ignored. A filtering time is defined by 10.51 DI filter time.
Bits 0 … 5 reflect the status of DI1 … DI6. Bit 15 reflects the status of the DIL input.
Example: 1000000000010011b = DIL, DI5, DI2 and DI1 are on, DI3, DI4 and DI6 are off.</td></tr>
</table>

Index	Name						
	Text						
	Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type

Bit assignment:

Bit	Name	Value	Remarks
0	DI1	1	On.
1	DI2	1	On.
2	DI3	1	On.
3	DI4	1	On.
4	DI5	1	On.
5	DI6	1	On.
6	reserved		
7	reserved		
8	reserved		
9	reserved		
10	reserved		
11	reserved		
12	reserved		
13	reserved		
14	reserved		
15	DIL	1	On.

	Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
	0000h … FFFFh	-	-	1 = 1	y	n	Signal

10.02 **DI delayed status**

Delayed status of digital inputs.
Displays the delayed status of DI1 … DI6 and DIL. This word is updated only after activation/deactivation delays (if any are specified).
Bits 0 … 5 reflect the delayed status of DI1 … DI6. Bit 15 reflects the delayed status of the DIL input.
Example: 1000000000010011b = DIL, DI5, DI2 and DI1 are on, DI3, DI4 and DI6 are off.
Bit assignment:

Bit	Name	Value	Remarks
0	DI1	1	On.
1	DI2	1	On.
2	DI3	1	On.
3	DI4	1	On.
4	DI5	1	On.
5	DI6	1	On.
6	reserved		
7	reserved		
8	reserved		
9	reserved		
10	reserved		
11	reserved		
12	reserved		
13	reserved		

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type

Bit	Name	Value	Remarks
14	reserved		
15	DIL	1	On.

Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

10.03 **DI force selection**

Override selection for digital inputs.
The electrical status of DI1 … DI6 and DIL can be overridden for e.g. testing purposes. A bit in 10.04 DI force data is provided for each digital input and its value is applied whenever the corresponding bit in 10.03 DI force selection is 1.
Bit assignment:

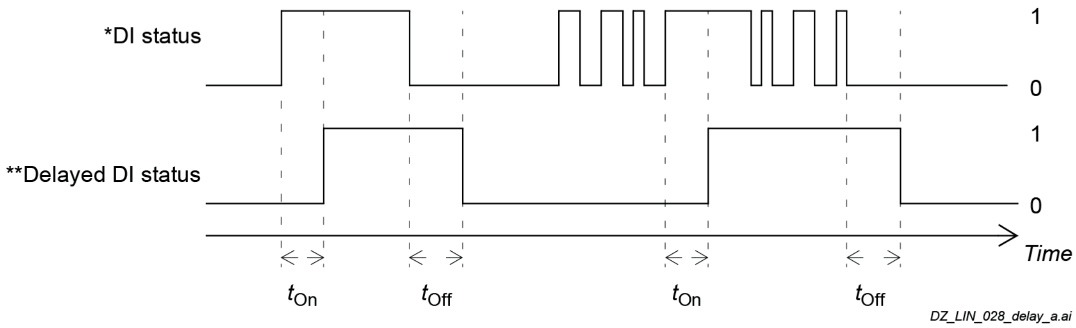
Bit	Name	Value	Remarks
0	DI1	1	Force DI1 to value of bit 0 of 10.04 DI force data.
1	DI2	1	Force DI2 to value of bit 1 of 10.04 DI force data.
2	DI3	1	Force DI3 to value of bit 2 of 10.04 DI force data.
3	DI4	1	Force DI4 to value of bit 3 of 10.04 DI force data.
4	DI5	1	Force DI5 to value of bit 4 of 10.04 DI force data.
5	DI6	1	Force DI6 to value of bit 5 of 10.04 DI force data.
6	reserved		
7	reserved		
8	reserved		
9	reserved		
10	reserved		
11	reserved		
12	reserved		
13	reserved		
14	reserved		
15	DIL	1	Force DIL to value of bit 15 of 10.04 DI force data.

Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
0000h … FFFFh	0000h	-	1 = 1	y	y	Parameter

10.04 **DI force data**

Forced values of digital inputs.
Allows the data value of a forced DI1 … DI6 and DIL to be changed from 0 to 1. It is only possible to force an input that has been selected in 10.03 DI force selection.
Bits 0 … 5 are the forced values for DI1 … DI6. Bit 15 is the forced value for the DIL input.
Bit assignment:

Bit	Name	Value	Remarks
0	DI1	1	Force DI1 to on.
1	DI2	1	Force DI2 to on.
2	DI3	1	Force DI3 to on.
3	DI4	1	Force DI4 to on.
4	DI5	1	Force DI5 to on.
5	DI6	1	Force DI6 to on.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7"><table>
<tr><td>6</td><td>reserved</td><td></td><td></td></tr>
<tr><td>7</td><td>reserved</td><td></td><td></td></tr>
<tr><td>8</td><td>reserved</td><td></td><td></td></tr>
<tr><td>9</td><td>reserved</td><td></td><td></td></tr>
<tr><td>10</td><td>reserved</td><td></td><td></td></tr>
<tr><td>11</td><td>reserved</td><td></td><td></td></tr>
<tr><td>12</td><td>reserved</td><td></td><td></td></tr>
<tr><td>13</td><td>reserved</td><td></td><td></td></tr>
<tr><td>14</td><td>reserved</td><td></td><td></td></tr>
<tr><td>15</td><td>DIL</td><td>1</td><td>Force DIL to on.</td></tr>
</table></td></tr>
<tr><td></td><td>0000h … FFFFh</td><td>0000h</td><td>-</td><td>1 = 1</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">10.05</td><td colspan="7">DI1 ON delay</td></tr>
<tr><td colspan="7">Activation delay for digital input DI1.
Defines the activation delay for DI1.


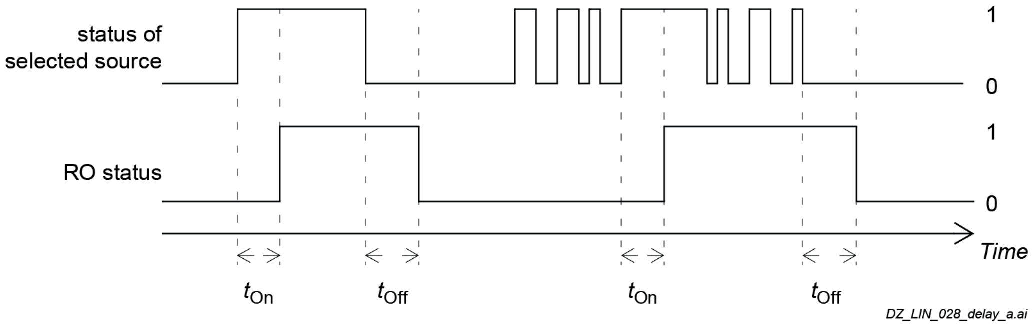
t_{On} = 10.05 DI1 ON delay
t_{Off} = 10.06 DI1 OFF delay
*Electrical status of digital input. Indicated by 10.01 DI status.
**Indicated by 10.02 DI delayed status.</td></tr>
<tr><td>0.0 … 3000.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">10.06</td><td colspan="7">DI1 OFF delay</td></tr>
<tr><td colspan="7">Deactivation delay for digital input DI1.
Defines the deactivation delay for DI1.
See 10.05 DI1 ON delay.</td></tr>
<tr><td>0.0 … 3000.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">10.07</td><td colspan="7">DI2 ON delay</td></tr>
<tr><td colspan="7">Activation delay for digital input DI2.
Defines the activation delay for DI2.
See 10.05 DI1 ON delay.</td></tr>
<tr><td>0.0 … 3000.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">10.08</td><td colspan="7">DI2 OFF delay</td></tr>
<tr><td colspan="7">Deactivation delay for digital input DI2.
Defines the deactivation delay for DI2.
See 10.05 DI1 ON delay.</td></tr>
<tr><td>0.0 … 3000.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>10.09</td><td colspan="7">DI3 ON delay</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
	Activation delay for digital input DI3. Defines the activation delay for DI3. See 10.05 DI1 ON delay.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
10.10	**DI3 OFF delay**						
	Deactivation delay for digital input DI3. Defines the deactivation delay for DI3. See 10.05 DI1 ON delay.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
10.11	**DI4 ON delay**						
	Activation delay for digital input DI4. Defines the activation delay for DI4. See 10.05 DI1 ON delay.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
10.12	**DI4 OFF delay**						
	Deactivation delay for digital input DI4. Defines the deactivation delay for DI4. See 10.05 DI1 ON delay.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
10.13	**DI5 ON delay**						
	Activation delay for digital input DI5. Defines the activation delay for DI5. See 10.05 DI1 ON delay.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
10.14	**DI5 OFF delay**						
	Deactivation delay for digital input DI5. Defines the deactivation delay for DI5. See 10.05 DI1 ON delay.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
10.15	**DI6 ON delay**						
	Activation delay for digital input DI6. Defines the activation delay for DI6. See 10.05 DI1 ON delay.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
10.16	**DI6 OFF delay**						
	Deactivation delay for digital input DI6. Defines the deactivation delay for DI6. See 10.05 DI1 ON delay.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
10.21	**RO status**						
	Status of relay outputs. Displays the status of RO1 … RO3 and the output for the mains contactor (XSMC:1/2). **Example**: 0000000000000001b = RO1 is energized, RO2 … RO3 are de-energized and XSMC:1/2 is off. Bit assignment:						

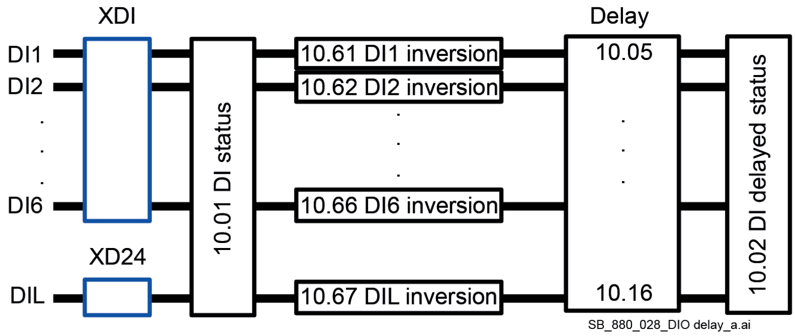
Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**

Bit	Name	Value	Remarks
0	RO1	1	Energized.
1	RO2	1	Energized.
2	RO3	1	Energized.
3 … 14	reserved		
15	XSMC:1/2	1	On.

Index	Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
10.24	**RO1 source**						
	Source for relay output RO1. Selects a signal/parameter bit to be connected to RO1. **Other [bit]**; source selection. 0: **Not energized**; output is not energized. 1: **Energized**; output is energized. 2: **Ready run**; 06.15.b01 Main status word. 3: **Ready on**; 06.15.b00 Main status word. 4: **Enabled**; 06.16.b02 Drive status word 1. 8: **Ready reference**; 06.15.b02 Main status word. 9: **At setpoint**; 06.15.b08 Main status word. 10: **Reverse**; 06.21.b02 Speed control status word. 11: **Zero speed**; 06.21.b00 Speed control status word. 12: **Above limit**; 06.17.b10 Drive status word 2. 13: **Warning**; 06.15.b07 Main status word. 14: **Tripped**; 06.15.b03 Main status word. 15: **Tripped (-1)**; 06.15.b03 Main status word inverted. 22: **Brake open command**; 44.01.b00 Brake control status (mechanical brake). 24: **Remote**; 06.11.b09 Main status word. 25: **Tripped or warning**; 06.18.b12 Drive status word 3. 30: **Fans on**; 06.24.b00 Current controller status word 1. 31: **Field exciter on**; 06.24.b05 Current controller status word 1. 32: **Close dynamic braking contactor**; 06.24.b08 Current controller status word 1. 33: **Close US style DC-contactor**; 06.24.b10 Current controller status word 1. 34: **Trip DC-breaker (pulse)**; 06.24.b15 Current controller status word 1. 40: **RO/DIO control word bit 0**; 10.99.b00 RO/DIO control word. 41: **RO/DIO control word bit 1**; 10.99.b01 RO/DIO control word. 42: **RO/DIO control word bit 2**; 10.99.b02 RO/DIO control word. 43: **RO/DIO control word bit 8**; 10.99.b08 RO/DIO control word. 44: **RO/DIO control word bit 9**; 10.99.b09 RO/DIO control word. 50: **STO reset indication**; 31.91.b07 STO status word. Reset of safety relay permitted.						
	0 … 50	STO reset indication	-	1 = 1	n	y	Parameter
10.25	**RO1 ON delay**						
	Activation delay for relay output RO1. Defines the activation delay for RO1.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">

t_{On} = 10.25 RO1 ON delay
t_{Off} = 10.26 RO1 OFF delay</td></tr>
<tr><td>0.0 … 3000.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">10.26</td><td colspan="7">RO1 OFF delay</td></tr>
<tr><td colspan="7">Deactivation delay for relay output RO1.
Defines the deactivation delay for RO1.
See 10.25 RO1 ON delay.</td></tr>
<tr><td>0.0 … 3000.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">10.27</td><td colspan="7">RO2 source</td></tr>
<tr><td colspan="7">Source for relay output RO2.
Selects a signal/parameter bit to be connected to RO2.
See 10.24 RO1 source.</td></tr>
<tr><td>0 … 50</td><td>Ready on</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">10.28</td><td colspan="7">RO2 ON delay</td></tr>
<tr><td colspan="7">Activation delay for relay output RO2.
Defines the activation delay for RO2.
See 10.25 RO1 ON delay.</td></tr>
<tr><td>0.0 … 3000.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">10.29</td><td colspan="7">RO2 OFF delay</td></tr>
<tr><td colspan="7">Deactivation delay for relay output RO2.
Defines the deactivation delay for RO2.
See 10.25 RO1 ON delay.</td></tr>
<tr><td>0.0 … 3000.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">10.30</td><td colspan="7">RO3 source</td></tr>
<tr><td colspan="7">Source for relay output RO3.
Selects a signal/parameter bit to be connected to RO3.
See 10.24 RO1 source.</td></tr>
<tr><td>0 … 50</td><td>Ready reference</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">10.31</td><td colspan="7">RO3 ON delay</td></tr>
<tr><td colspan="7">Activation delay for relay output RO3.
Defines the activation delay for RO3
See 10.25 RO1 ON delay.</td></tr>
<tr><td>0.0 … 3000.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">10.32</td><td colspan="7">RO3 OFF delay</td></tr>
<tr><td colspan="7">Deactivation delay for relay output RO3.</td></tr>
</table>

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**
	Defines the deactivation delay for RO3. See 10.25 RO1 ON delay.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
10.51	**DI filter time**						
	Filter time constant for 10.01 DI status. Defines a filter time constant for 10.01 DI status.						
	0.3 … 100.0	5.0	ms	10 = 1 ms	n	y	Parameter
10.61	**DI1 inversion**						
	Inverts digital input DI1. Inversion selection for digital input DI1.  0: **Direct**; digital input DI1 is not inverted. 1: **Inverted**; digital input DI1 is inverted.						
	0 … 1	Direct	-	1 = 1	n	y	Parameter
10.62	**DI2 inversion**						
	Inverts digital input DI2. Inversion selection for digital input DI2. See 10.61 DI1 inversion.						
	0 … 1	Direct	-	1 = 1	n	y	Parameter
10.63	**DI3 inversion**						
	Inverts digital input DI3. Inversion selection for digital input DI3. See 10.61 DI1 inversion.						
	0 … 1	Direct	-	1 = 1	n	y	Parameter
10.64	**DI4 inversion**						
	Inverts digital input DI4. Inversion selection for digital input DI4. See 10.61 DI1 inversion.						
	0 … 1	Direct	-	1 = 1	n	y	Parameter
10.65	**DI5 inversion**						
	Inverts digital input DI5. Inversion selection for digital input DI5. See 10.61 DI1 inversion.						
	0 … 1	Direct	-	1 = 1	n	y	Parameter
10.66	**DI6 inversion**						
	Inverts digital input DI6.						

Index	Name					
	Text					
	Range	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**
	Inversion selection for digital input DI6. See 10.61 DI1 inversion.						
	0 … 1	Direct	-	1 = 1	n	y	Parameter
10.67	**DIL inversion**						
	Inverts digital input DIL. Inversion selection for digital input DIL. See 10.61 DI1 inversion.						
	0 … 1	Direct	-	1 = 1	n	y	Parameter
10.99	**RO/DIO control word**						

Control word for relay outputs (RO) and digital inputs/outputs (DIO).
Storage parameter to control relay outputs and digital inputs/outputs via e.g. a fieldbus.
To control the relay outputs and the digital inputs/outputs of the drive, send a control word with the bit assignments shown below e.g. as Modbus I/O data (see 58.101 Data I/O 1 … 58.124 Data I/O 24).
Example for relay output RO1:
58.101 Data I/O 1 = RO/DIO control word and 10.24 RO1 source = RO/DIO control word bit 0.
Bit assignment:

Bit	Name	Value	Remarks
0	RO1	1	Energized. Bit for relay output RO1. See 10.24 RO1 source.
1	RO2	1	Energized. Bit for relay output RO2. See 10.27 RO2 source.
2	RO3	1	Energized. Bit for relay output RO3. See 10.30 RO3 source.
3	reserved		
4	reserved		
5	reserved		
6	reserved		
7	reserved		
8	DIO1	1	Energized. Bit for digital input/output DIO1. See 11.06 DIO1 output source.
9	DIO2	1	Energized. Bit for digital input/output DIO2. See 11.10 DIO2 output source.
10 … 15	reserved		

Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
0000h … FFFFh	0000h	-	1 = 1	n	y	Parameter

11 Standard DIO, FI, FO

Configuration of digital input/outputs and frequency inputs/outputs.

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**
11.01	**DIO status**						
	Status of digital inputs/outputs. Displays the status of DIO1 … DIO2. The activation/deactivation delays (if any are specified) are ignored. A filtering time (for input mode) is defined by 11.81 DIO filter time. Bits 0 … 1 reflect the status of DIO1 … DIO2.						

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type

Example: 0000000000000010b = DIO2 is on, DIO1 is off.
Bit assignment:

Bit	Name	Value	Remarks
0	DIO1	1	On.
1	DIO2	1	On.
2 … 15	reserved		

Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

11.02 **DIO delayed status**

Delayed status of digital inputs/outputs.
Displays the delayed status of DIO1 … DIO2. This word is updated only after activation/deactivation delays (if any are specified).
Bits 0 … 1 reflect the status of DIO1 … DIO2.
Example: 0000000000000010b = DIO2 is on, DIO1 is off.
Bit assignment:

Bit	Name	Value	Remarks
0	DIO1	1	On.
1	DIO2	1	On.
2 … 15	reserved		

Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

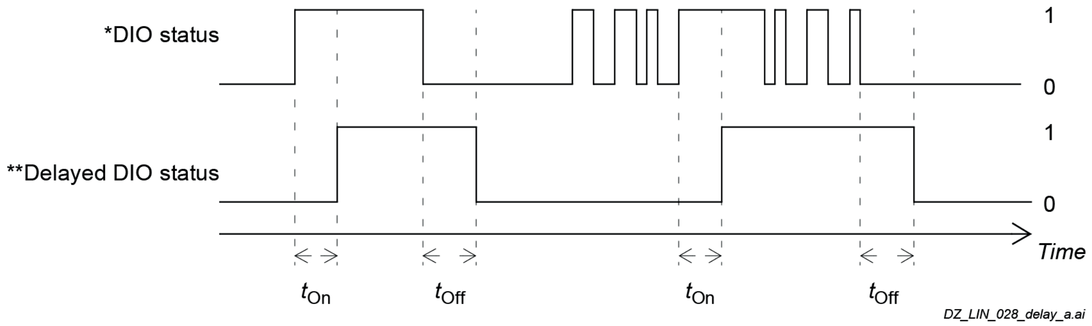
11.05 **DIO1 function**

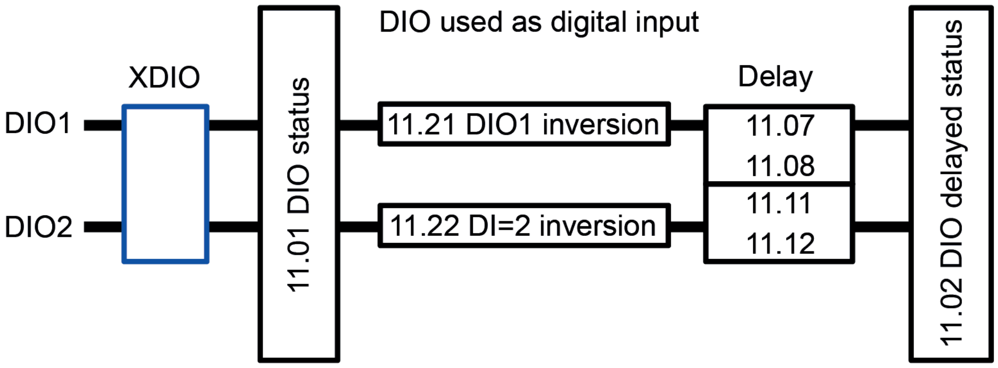
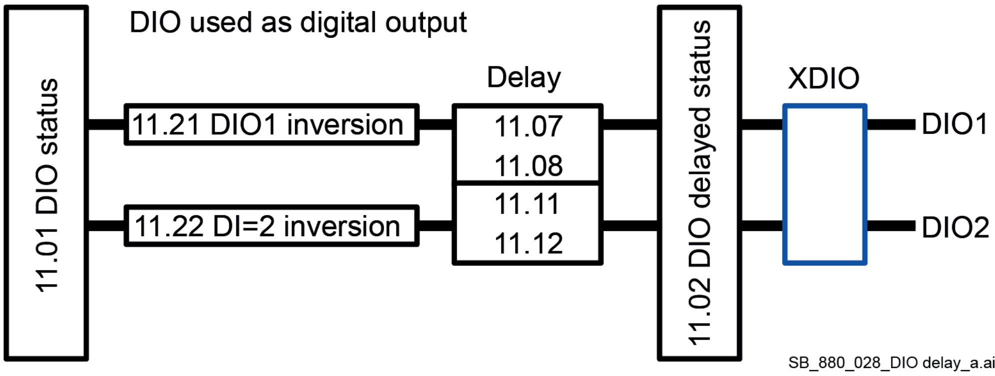
Function of digital input/output DIO1.
Selects whether DIO1 is used as a digital output or input, or a frequency input.
0: **Output**; DIO1 is used as a digital output.
1: **Input**; DIO1 is used as a digital input.
2: **Frequency**; DIO1 is used as a frequency input.

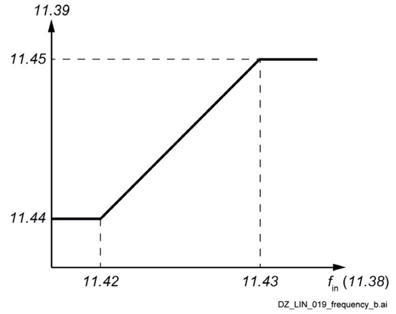
Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
0 … 2	Output	-	1 = 1	n	y	Parameter

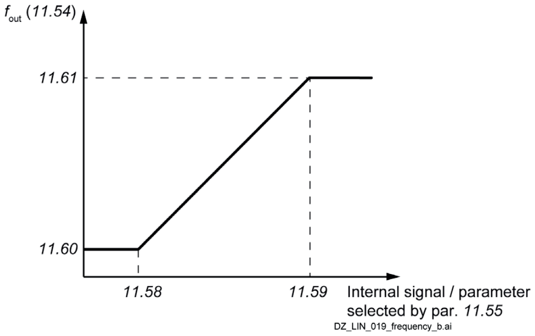
11.06 **DIO1 output source**

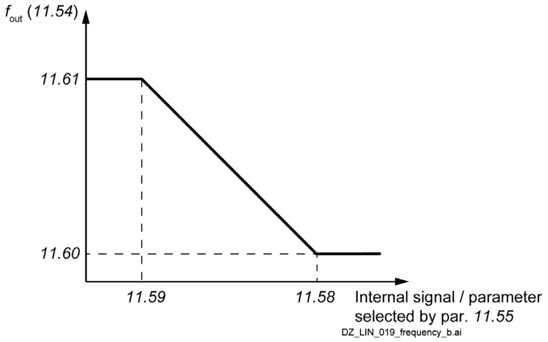
Source for digital input/output DIO1.
Selects a signal/parameter bit to be connected to DIO1 when 11.05 DIO1 function = Output.
Other [bit]; source selection.
0: **Not energized**; output is not energized.
1: **Energized**; output is energized.
2: **Ready run**; 06.15.b01 Main status word.
3: **Ready on**; 06.15.b00 Main status word.
4: **Enabled**; 06.16.b02 Drive status word 1.
8: **Ready reference**; 06.15.b02 Main status word.
9: **At setpoint**; 06.15.b08 Main status word.
10: **Reverse**; 06.21.b02 Speed control status word.
11: **Zero speed**; 06.21.b00 Speed control status word.
12: **Above limit**; 06.17.b10 Drive status word 2.
13: **Warning**; 06.15.b07 Main status word.
14: **Tripped**; 06.15.b03 Main status word.
15: **Tripped (-1)**; 06.15.b03 Main status word inverted.
22: **Brake open command**; 44.01.b00 Brake control status (mechanical brake).

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**
	24: **Remote**; 06.11.b09 Main status word. 25: **Tripped or warning**; 06.18.b12 Drive status word 3. 30: **Fans on**; 06.24.b00 Current controller status word 1. 31: **Field exciter on**; 06.24.b05 Current controller status word 1. 32: **Close dynamic braking contactor**; 06.24.b08 Current controller status word 1. 33: **Close US style DC-contactor**; 06.24.b10 Current controller status word 1. 34: **Trip DC-breaker (pulse)**; 06.24.b15 Current controller status word 1. 40: **RO/DIO control word bit 0**; 10.99.b00 RO/DIO control word. 41: **RO/DIO control word bit 1**; 10.99.b01 RO/DIO control word. 42: **RO/DIO control word bit 2**; 10.99.b02 RO/DIO control word. 43: **RO/DIO control word bit 8**; 10.99.b08 RO/DIO control word. 44: **RO/DIO control word bit 9**; 10.99.b09 RO/DIO control word. 50: **STO reset indication**; 31.91.b07 STO status word. Reset of safety relay permitted.						
	0 … 50	Tripped (-1)	-	1 = 1	n	y	Parameter
11.07	**DIO1 ON delay**						
	Activation delay for digital input/output DIO1. Defines the activation delay for DIO1 (when used as a digital output or digital input).  t_{On} = 11.07 DIO1 ON delay t_{Off} = 11.08 DIO1 OFF delay *Electrical status of DIO1 (in input mode) or status of selected source (in output mode). Indicated by 11.01 DIO status. **Indicated by 11.02 DIO delayed status.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
11.08	**DIO1 OFF delay**						
	Deactivation delay for digital input/output DIO1. Defines the deactivation delay for DIO1 (when used as a digital output or digital input). See 11.07 DIO1 ON delay.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
11.09	**DIO2 function**						
	Function of digital input/output DIO2. Selects whether DIO2 is used as a digital output or input, or a frequency output. 0: **Output**; DIO2 is used as a digital output. 1: **Input**; DIO2 is used as a digital input. 2: **Frequency**; DIO2 is used as a frequency output.						
	0 … 2	Output	-	1 = 1	n	y	Parameter
11.10	**DIO2 output source**						
	Source for digital input/output DIO2. Selects a signal/parameter bit to be connected to DIO2 when 11.09 DIO2 function = Output.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**
	See 11.06 DIO1 output source.						
	0 … 50	Warning	-	1 = 1	n	y	Parameter
11.11	**DIO2 ON delay**						
	Activation delay for digital input/output DIO2. Defines the activation delay for DIO2 (when used as a digital output or digital input). See 11.07 DIO1 ON delay.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
11.12	**DIO2 OFF delay**						
	Deactivation delay for digital input/output DIO2. Defines the deactivation delay for DIO2 (when used as a digital output or digital input). See 11.07 DIO1 ON delay.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
11.21	**DIO1 inversion**						
	Inverts digital input/output DIO1. Inversion selection for digital input/output DIO1.  SB_880_028_DIO delay_a.ai  SB_880_028_DIO delay_a.ai 0: **Direct**; digital input/output DIO1 is not inverted. 1: **Inverted**; digital input/output DIO1 is inverted.						
	0 … 1	Direct	-	1 = 1	n	y	Parameter
11.22	**DIO2 inversion**						
	Inverts digital input/output DIO2. Inversion selection for digital input/output DIO2. See 11.21 DIO1 inversion.						
	0 … 1	Direct	-	1 = 1	n	y	Parameter

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">11.38</td><td colspan="7">Freq in 1 actual value</td></tr>
<tr><td colspan="7">Unscaled value of frequency input 1.
Displays the value of frequency input 1 in Hz (via DIO1 when it is used as a frequency input) before scaling.
See 11.42 Freq in 1 min.</td></tr>
<tr><td>0 … 16000</td><td>-</td><td>Hz</td><td>1 = 1 Hz</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">11.39</td><td colspan="7">Freq in 1 scaled</td></tr>
<tr><td colspan="7">Scaled value of frequency input 1.
Displays the value of frequency input 1 (via DIO1 when it is used as a frequency input) after scaling.
See 11.42 Freq in 1 min.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">11.42</td><td colspan="7">Freq in 1 min</td></tr>
<tr><td colspan="7">Minimum frequency of frequency input 1 (DIO1).
Defines the minimum input frequency for frequency input 1 in Hz (via DIO1 when it is used as a frequency input).
Parameters 11.42 and 11.43 set the low and high limit of the frequency input signal in Hz.
Scaling parameters 11.44 and 11.45 define the internal values that correspond to these limits as follows:

 </td></tr>
<tr><td>0 … 16000</td><td>0</td><td>Hz</td><td>1 = 1 Hz</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">11.43</td><td colspan="7">Freq in 1 max</td></tr>
<tr><td colspan="7">Maximum frequency for frequency input 1 (DIO1).
Defines the maximum input frequency for frequency input 1 in Hz (via DIO1 when it is used as a frequency input).
See 11.42 Freq in 1 min.</td></tr>
<tr><td>0 … 16000</td><td>16000</td><td>Hz</td><td>1 = 1 Hz</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">11.44</td><td colspan="7">Freq in 1 at scaled min</td></tr>
<tr><td colspan="7">Internal value corresponding to the minimum value of frequency input 1 (DIO1).
Defines the value that corresponds internally to the minimum input frequency defined by 11.42 Freq in 1 min (via DIO1 when it is used as a frequency input).
See 11.42 Freq in 1 min.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>0.000</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">11.45</td><td colspan="7">Freq in 1 at scaled max</td></tr>
<tr><td colspan="7">Internal value corresponding to the maximum value of frequency input 1 (DIO1).
Defines the value that corresponds internally to the maximum input frequency defined by 11.43 Freq in 1 max (via DIO1 when it is used as a frequency input).</td></tr>
</table>

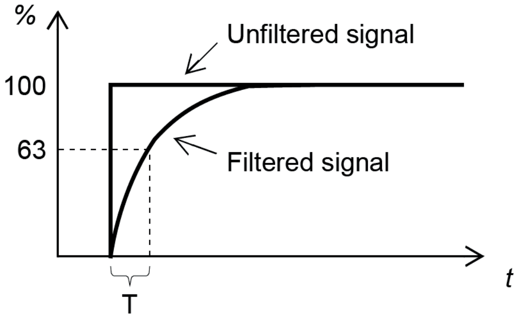
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">See 11.42 Freq in 1 min.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>1500.000</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">11.54</td><td colspan="7">Freq out 1 actual value</td></tr>
<tr><td colspan="7">Value of frequency output 1 (DIO2).
Displays the value of frequency output 1 after scaling in Hz (via DIO2 when it is used as a frequency output).
See 11.58 Freq out 1 src min.</td></tr>
<tr><td>0 … 16000</td><td>-</td><td>Hz</td><td>1 = 1 Hz</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">11.55</td><td colspan="7">Freq out 1 source</td></tr>
<tr><td colspan="7">Source for frequency output 1 (DIO2).
Selects a signal/parameter to be connected to frequency output 1 (via DIO2 when it is used as a frequency output).
Other; source selection.
0: Zero; not in use.
1: Used motor speed; 01.01 Used motor speed filtered.
4: Motor current; 01.10 Motor current in A.
6: Motor torque; 01.17 Motor torque filtered.
8: Output power; 01.24 Output power in kW.
10: Speed reference ramp input; 23.01 Speed reference ramp input.
11: Speed reference ramp output; 23.02 Speed reference ramp output.
12: Used speed reference; 24.01 Used speed reference.
13: Torque reference used; 26.02 Torque reference used.
16: Process PID output actual; 40.01 Process PID output actual.
17: Process PID feedback actual; 40.02 Process PID feedback actual.
18: Process PID setpoint actual; 40.03 Process PID setpoint actual.
19: Process PID deviation actual; 40.04 Process PID deviation actual.</td></tr>
<tr><td>0 … 19</td><td>Zero</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">11.58</td><td colspan="7">Freq out 1 src min</td></tr>
<tr><td colspan="7">Internal value corresponding to minimum value of frequency output 1 (DIO2).
Defines the internal value that corresponds to the minimum frequency of frequency output 1 (via DIO2 when it is used as a frequency output).
Scaling parameters 11.58 and 11.59 set the low and high internal limits that corresponds to the frequency output values in Hz defined by parameters 11.60 and 11.61:

Setting parameter 11.58 as maximum value and parameter 11.59 as minimum value inverts the output:</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">
</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>0.000</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">11.59</td><td colspan="7">Freq out 1 src max</td></tr>
<tr><td colspan="7">Internal value corresponding to maximum value of frequency output 1 (DIO2).
Defines the internal value that corresponds to the maximum frequency of frequency output 1 (via DIO2 when it is used as a frequency output).
See 11.58 Freq out 1 src min.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>1500.000</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">11.60</td><td colspan="7">Freq out 1 at src min</td></tr>
<tr><td colspan="7">Minimum value of frequency output 1 (DIO2).
Defines the minimum frequency of frequency output 1 in Hz (via DIO2 when it is used as a frequency output).
See 11.58 Freq out 1 src min.</td></tr>
<tr><td>0 … 16000</td><td>0</td><td>Hz</td><td>1 = 1 Hz</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">11.61</td><td colspan="7">Freq out 1 at src max</td></tr>
<tr><td colspan="7">Maximum value of frequency output 1 (DIO2).
Defines the maximum frequency of frequency output 1 in Hz (via DIO2 when it is used as a frequency output).
See 11.58 Freq out 1 src min.</td></tr>
<tr><td>0 … 16000</td><td>16000</td><td>Hz</td><td>1 = 1 Hz</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">11.81</td><td colspan="7">DIO filter time</td></tr>
<tr><td colspan="7">Filter time constant for 11.01 DIO status.
Defines a filter time constant for 11.01 DIO status.</td></tr>
<tr><td>0.3 … 100.0</td><td>10.0</td><td>ms</td><td>10 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

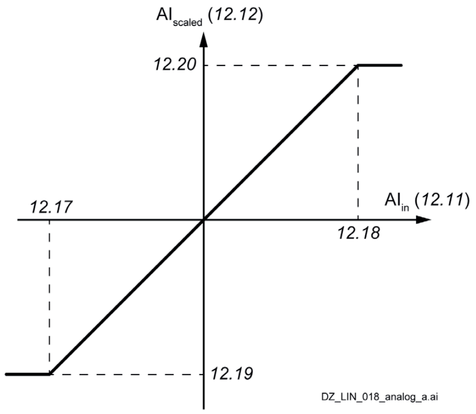
12 Standard AI

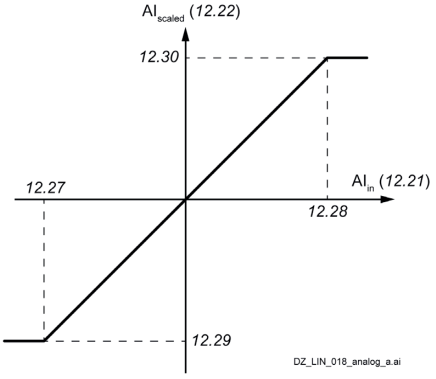
Configuration of standard analog inputs.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">**12.03**</td><td colspan="7">**AI supervision function**</td></tr>
<tr><td colspan="7">Supervision function analog inputs.
Selects how the drive reacts when AI1 … AI3 signals move out of the minimum and/or maximum limits specified for an input.
The inputs and the limits to be observed are selected by 12.04 AI supervision selection.
The analog input signal supervision is activated when an analog input is used. E.g. set 22.11 Speed reference 1 = AI1 scaled, AI2 scaled or AI3 scaled.
0: **No action**; none, disable AI supervision function.
1: **Fault**; the event generates fault 80A0 AI supervision.
2: **Warning**; the event generates warning A8A0 AI supervision.
WARNING
Make sure that it is safe to continue operation in case of a communication break.
3: **Last speed**; the evet generates warning A8A0 AI supervision and freezes the speed to the level the drive was operating at. The last speed is determined based on the speed feedback using an 850 ms low-pass filter.
WARNING
Make sure that it is safe to continue operation in case of a communication break.
4: **Speed reference safe**; the event generates warning A8A0 AI supervision and sets the speed to the value defined in 22.46 Speed reference safe.
WARNING
Make sure that it is safe to continue operation in case of a communication break.</td></tr>
<tr><td>0 … 4</td><td>No action</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**12.04**</td><td colspan="7">**AI supervision selection**</td></tr>
<tr><td colspan="7">Activation of analog input supervision.
Specifies which limits of AI1 … AI3 are supervised by12.03 AI supervision function.
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>AI1 < MIN</td><td>1</td><td>Minimum limit supervision of AI1 active. See12.17 AI1 min.</td></tr>
<tr><td>1</td><td>AI1 > MAX</td><td>1</td><td>Maximum limit supervision of AI1 active. See 12.18 AI1 max.</td></tr>
<tr><td>2</td><td>AI2 < MIN</td><td>1</td><td>Minimum limit supervision of AI2 active. See12.27 AI2 min.</td></tr>
<tr><td>3</td><td>AI2 > MAX</td><td>1</td><td>Maximum limit supervision of AI2 active. See 12.28 AI2 max.</td></tr>
<tr><td>4</td><td>AI3 < MIN</td><td>1</td><td>Minimum limit supervision of AI3 active. See12.37 AI3 min.</td></tr>
<tr><td>5</td><td>AI3 > MAX</td><td>1</td><td>Maximum limit supervision of AI3 active. See 12.38 AI3 max.</td></tr>
<tr><td>6 … 15</td><td>reserved</td><td></td><td></td></tr>
</table>
The supervision applies a margin of 0.5 V or 1.0 mA, see12.15 AI1 unit selection, to the limits.
Examples:
– 12.17 AI1 min = 4.000 V. The minimum limit supervision activates at values lower than 3.500 V. The limit supervision clears at values greater than 4.000 V.
– 12.18 AI1 max = 7.000 V. The maximum limit supervision activates at values greater than 7.500 V. The limit supervision clears at values lower than 7.000 V.
– 12.17 AI1 min = 4.000 mA. The minimum limit supervision activates at values lower than 3.000 mA. The limit supervision clears at values greater than 4.000 mA.</td></tr>
</table>

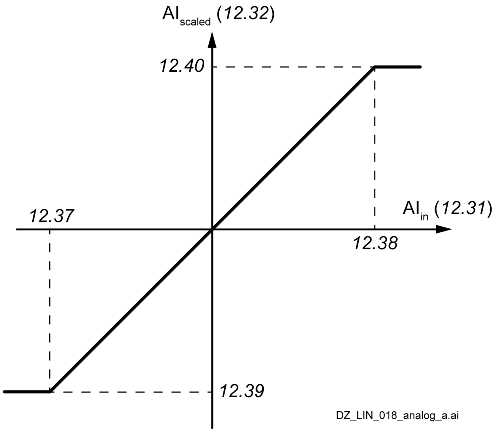
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">– 12.18 AI1 max = 7.000 mA. The maximum limit supervision activates at values greater than 8.000 mA. The limit supervision clears at values lower than 7.000 mA.</td></tr>
<tr><td>0000h … FFFFh</td><td>0000h</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">12.11</td><td colspan="7">AI1 actual value</td></tr>
<tr><td colspan="7">Value of analog input AI1.
Displays the value of AI1 in mA or V corresponding to the setting of jumper J1 (see chapter I/O configuration of this manual).</td></tr>
<tr><td>-22.000 … 22.000 or -11.000 … 11.000</td><td>-</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">12.12</td><td colspan="7">AI1 scaled value</td></tr>
<tr><td colspan="7">Scaled value of analog input AI1.
Displays the value of AI1 after scaling.
See 12.19 AI1 scaled at AI1 min and 12.20 AI1 scaled at AI1 max.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">12.14</td><td colspan="7">AI1 offset</td></tr>
<tr><td colspan="7">Offset for analog input AI1.
Adds an offset to 12.11 AI1 actual value.</td></tr>
<tr><td>-0.100 … 0.100</td><td>0.000</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">12.15</td><td colspan="7">AI1 unit selection</td></tr>
<tr><td colspan="7">Unit selection of analog input AI1.
Selects the unit for readings and settings related to AI1. Set to either mA or V corresponding to the setting of jumper J1 (see chapter I/O configuration of this manual).
2: V; volts.
10: mA; milliamps.</td></tr>
<tr><td>2 … 10</td><td>V</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">12.16</td><td colspan="7">AI1 filter time</td></tr>
<tr><td colspan="7">Filter time constant of analog input AI1.
Defines the filter time constant for AI1.


$O = I \times (1 - e^{-t/T})$
I = filter input (step)
O = filter output
t = time
T = filter time constant
SF_880_024_DCS_filter_a.ai</td></tr>
</table>

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**
	The signal is also filtered due to the analog input hardware (approximately 0.25 ms time constant). This cannot be changed by any parameter.						
	0.000 … 30.000	0.100	s	1000 = 1 s	n	y	Parameter
12.17	**AI1 min**						
	Minimum value of analog input AI1. Defines the minimum input value for AI1 in mA or V. Parameters 12.17 and 12.18 set the low and high limit of the analog input signal in mA or V. Scaling parameters 12.19 and 12.20 define the internal values that correspond to these limits as follows: 						
	-22.000 … 22.000 or -11.000 … 11.000	-20.000 or -10.000	mA or V	1000 = 1 mA or V	n	y	Parameter
12.18	**AI1 max**						
	Maximum value of analog input AI1. Defines the maximum input value for AI1 in mA or V. See 12.17 AI1 min.						
	-22.000 … 22.000 or -11.000 … 11.000	20.000 or 10.000	mA or V	1000 = 1 mA or V	n	y	Parameter
12.19	**AI1 scaled at AI1 min**						
	Internal value corresponding to minimum analog input AI1 value. Defines the internal value that corresponds to the minimum AI1 value defined by 12.17 AI1 min. Changing the polarity settings of 12.19 and 12.20 can effectively invert the analog input. See 12.17 AI1 min.						
	-32768.000 … 32767.000	-1500.000	-	1 = 1	n	y	Parameter
12.20	**AI1 scaled at AI1 max**						
	Internal value corresponding to maximum analog input AI1 value. Defines the internal value that corresponds to the maximum AI1 value defined by 12.18 AI1 max. See 12.17 AI1 min.						
	-32768.000 … 32767.000	1500.000	-	1 = 1	n	y	Parameter
12.21	**AI2 actual value**						
	Value of analog input AI2. Displays the value of AI2 in mA or V corresponding to the setting of jumper J2 (see chapter I/O configuration of this manual).						
	-22.000 … 22.000 or	-	mA or V	1000 = 1 mA	y	n	Signal

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**
	-11,000 … 11,000			or V			
12.22	**AI2 scaled value**						
	Scaled value of analog input AI2. Displays the value of analog input AI2 after scaling. See 12.29 AI2 scaled at AI2 min and 12.30 AI2 scaled at AI2 max.						
	-32768.000 … 32767.000	-	-	1 = 1	y	n	Signal
12.24	**AI2 offset**						
	Offset for analog input AI2. Adds an offset to 12.21 AI2 actual value.						
	-0.100 … 0.100	0.000	mA or V	1000 = 1 mA or V	n	y	Parameter
12.25	**AI2 unit selection**						
	Unit selection of analog input AI2. Selects the unit for readings and settings related to AI2. Set to either mA or V corresponding to the setting of jumper J2 (see chapter I/O configuration of this manual). 2: **V**; volts. 10: **mA**; milliamps.						
	2 … 10	V	-	1 = 1	n	y	Parameter
12.26	**AI2 filter time**						
	Filter time constant of analog input AI2. Defines the filter time constant for AI2. See 12.16 AI1 filter time.						
	0.000 … 30.000	0.100	s	1000 = 1 s	n	y	Parameter
12.27	**AI2 min**						
	Minimum value of analog input AI2. Defines the minimum input value for analog input AI2 in mA or V. Parameters 12.27 and 12.28 set the low and high limit of the analog input signal in mA or V. Scaling parameters 12.29 and 12.30 define the internal values that correspond to these limits as follows: 						
	-22.000 … 22.000 or -11.000 … 11.000	-20.000 or -10.000	mA or V	1000 = 1 mA or V	n	y	Parameter
12.28	**AI2 max**						
	Maximum value of analog input AI2.						

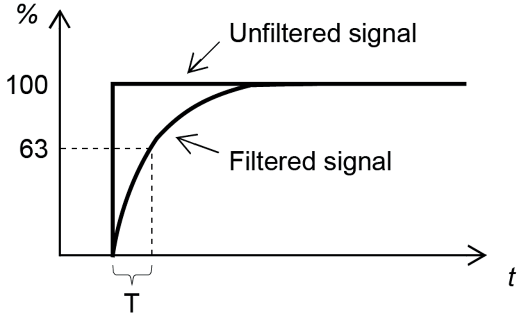
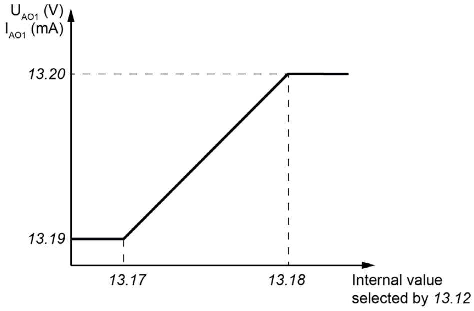
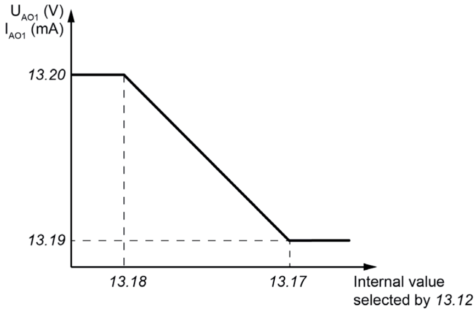
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Defines the maximum input value for AI2 in mA or V.
See 12.27 AI2 min.</td></tr>
<tr><td>-22.000 … 22.000 or -11.000 … 11.000</td><td>20.000 or 10.000</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">12.29</td><td colspan="7">AI2 scaled at AI2 min</td></tr>
<tr><td colspan="7">Internal value corresponding to minimum analog input AI2 value.
Defines the internal value that corresponds to the minimum AI2 value defined by 12.27 AI2 min.
Changing the polarity settings of 12.29 and 12.30 can effectively invert the analog input.
See 12.27 AI2 min.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>-100.000</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">12.30</td><td colspan="7">AI2 scaled at AI2 max</td></tr>
<tr><td colspan="7">Internal value corresponding to maximum analog input AI2 value.
Defines the internal value that corresponds to the maximum AI2 value defined by 12.28 AI2 max.
See 12.27 AI2 min.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>100.000</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">12.31</td><td colspan="7">AI3 actual value</td></tr>
<tr><td colspan="7">Value of analog input AI3.
Displays the value of AI3 in V.</td></tr>
<tr><td>-11.000 … 11.000</td><td>-</td><td>V</td><td>1000 = 1 V</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">12.32</td><td colspan="7">AI3 scaled value</td></tr>
<tr><td colspan="7">Scaled value of analog input AI3.
Displays the value of AI3 after scaling.
See 12.39 AI3 scaled at AI3 min and 12.40 AI3 scaled at AI3 max.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">12.34</td><td colspan="7">AI3 offset</td></tr>
<tr><td colspan="7">Offset for analog input AI3.
Adds an offset to 12.31 AI3 actual value.</td></tr>
<tr><td>-0.100 … 0.100</td><td>0.000</td><td>V</td><td>1000 = 1 V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">12.36</td><td colspan="7">AI3 filter time</td></tr>
<tr><td colspan="7">Filter time constant of analog input AI3.
Defines the filter time constant for analog input AI3.
See 12.16 AI1 filter time.</td></tr>
<tr><td>0.000 … 30.000</td><td>0.100</td><td>s</td><td>1000 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">12.37</td><td colspan="7">AI3 min</td></tr>
<tr><td colspan="7">Minimum value of analog input AI3.
Defines the minimum input value for AI3 in V.
Parameters 12.37 and 12.38 set the low and high limit of the analog input signal in V. Scaling parameters 12.39 and 12.40 define the internal values that correspond to these limits as follows:</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">
</td></tr>
<tr><td>-11.000 … 11.000</td><td>-10.000</td><td>V</td><td>1000 = 1 V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">12.38</td><td colspan="7">AI3 max</td></tr>
<tr><td colspan="7">Maximum value of analog input AI3.
Defines the maximum input value for AI3 in V.
See 12.37 AI3 min.</td></tr>
<tr><td>-11.000 … 11.000</td><td>10.000</td><td>V</td><td>1000 = 1 V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">12.39</td><td colspan="7">AI3 scaled at AI3 min</td></tr>
<tr><td colspan="7">Internal value corresponding to minimum analog input AI3 value.
Defines the internal value that corresponds to the minimum AI3 value defined by 12.37 AI3 min.
Changing the polarity settings of 12.39 and 12.40 can effectively invert the analog input.
See 12.37 AI3 min.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>-100.000</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">12.40</td><td colspan="7">AI3 scaled at AI3 max</td></tr>
<tr><td colspan="7">Internal value corresponding to maximum analog input AI3 value.
Defines the internal value that corresponds to the maximum AI3 value defined by 12.38 AI3 max.
See 12.37 AI3 min.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>100.000</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

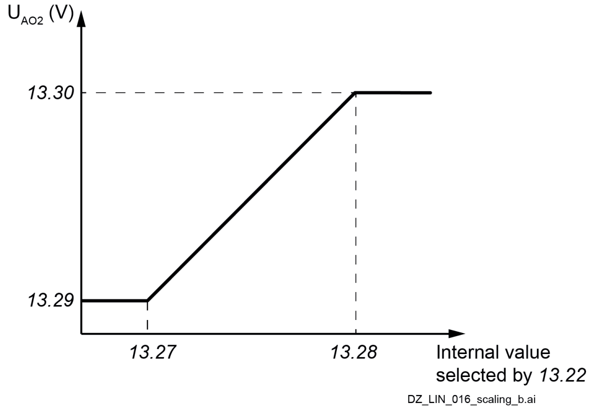
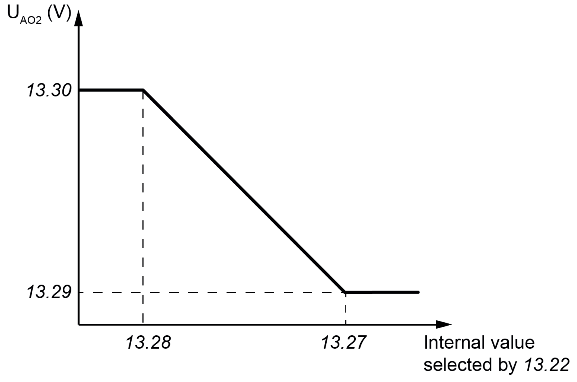
13 Standard AO

Configuration of standard analog outputs.

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**
13.11	**AO1 actual value**						
	Value of analog output AO1. Displays the value of AO1 in mA or V corresponding to the setting of jumper J5 (see chapter I/O configuration of this manual).						
	0.000 … 22.000 or -10.000 … 10.000	-	mA or V	1000 = 1 mA or V	y	n	Signal
13.12	**AO1 source**						
	Source for analog output AO1. Selects a signal/parameter to be connected to AO1. Alternatively, sets the output to excitation mode to feed a constant current to a temperature sensor. **Other**; source selection. 0: **Zero**; not in use. 1: **Used motor speed**; 01.01 Used motor speed filtered. 4: **Motor current**; 01.10 Motor current in A. 6: **Motor torque**; 01.17 Motor torque filtered. 7: **Armature voltage**; 28.05 Armature voltage. 8: **Output power**; 01.24 Output power in kW. 10: **Speed reference ramp input**; 23.01 Speed reference ramp input. 11: **Speed reference ramp output**; 23.02 Speed reference ramp output. 12: **Used speed reference**; 24.01 Used speed reference. 13: **Torque reference used**; 26.02 Torque reference used. 16: **Process PID output actual**; 40.01 Process PID output actual. 17: **Process PID feedback actual**; 40.02 Process PID feedback actual. 18: **Process PID setpoint actual**; 40.03 Process PID setpoint actual. 19: **Process PID deviation actual**; 40.04 Process PID deviation actual. 20: **Force PT100 excitation**; AO1 is used to feed an excitation current to 1 … 3 PT100 sensors. See chapter Motor thermal protection of this manual. 21: **Force KTY84 excitation**; AO1 is used to feed an excitation current to a KTY84 sensor. See chapter Motor thermal protection of this manual. 22: **Force PTC excitation**; AO1 is used to feed an excitation current to 1 … 3 PTC sensors. See chapter Motor thermal protection of this manual. 23: **Force PT1000 excitation**; AO1 is used to feed an excitation current to 1 … 3 PT1000 sensors. See chapter Motor thermal protection of this manual. 37: **AO1 data storage**; see 13.91 AO1 data storage. 38: **AO2 data storage**; see 13.92 AO2 data storage.						
	0 … 38	Used motor speed	-	1 = 1	n	y	Parameter
13.15	**AO1 unit selection**						
	Unit selection of analog output AO1. Selects the unit for readings and settings related to AO1. Set to either mA or V corresponding to the setting of jumper J5 (see chapter I/O configuration of this manual). 2: **V**; volts. 10: **mA**; milliamps.						
	2 … 10	V	-	1 = 1	n	y	Parameter
13.16	**AO1 filter time**						
	Filter time constant of analog output AO1. Defines the filter time constant for AO1.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">
$O = I \times (1 - e^{-t/T})$
I = filter input (step)
O = filter output
t = time
T = filter time constant
SF_880_024_DCS_filter_a.ai</td></tr>
<tr><td></td><td>0.000 … 30.000</td><td>0.100</td><td>s</td><td>1000 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>13.17</td><td colspan="7">AO1 source min</td></tr>
<tr><td></td><td colspan="7">Internal value corresponding to minimum analog output AO1 value.
Defines the internal value that corresponds to the minimum required AO1 value.
Scaling parameters 13.17 and 13.18 set the low and high internal limits that corresponds to the analog output values in mA or V defined by parameters 13.19 and 13.20:

DZ_LIN_016_scaling_b.ai
Setting parameter 13.17 as maximum value and parameter 13.18 as minimum value inverts the output:

DZ_LIN_016_scaling_b.ai</td></tr>
<tr><td></td><td>-32768.0 … 32767.0</td><td>-1500.0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>13.18</td><td colspan="7">AO1 source max</td></tr>
<tr><td></td><td colspan="7">Internal value corresponding to maximum analog output AO1 value.</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
	Defines the internal value that corresponds to the maximum required AO1 value. See 13.17 AO1 source min.						
	-32768.0 … 32767.0	1500.0	-	1 = 1	n	y	Parameter
13.19	**AO1 out at AO1 src min**						
	Minimum analog output AO1 value. Defines the minimum output value for AO1 in mA or V. See 13.17 AO1 source min.						
	0.000 … 22.000 or -10.000 … 10.000	0.000 or -10.000	mA or V	1000 = 1 mA or V	n	y	Parameter
13.20	**AO1 out at AO1 src max**						
	Maximum analog output AO1 value. Defines the maximum output value for AO1 in mA or V. See 13.17 AO1 source min.						
	0.000 … 22.000 or -10.000 … 10.000	20.000 or 10.000	mA or V	1000 = 1 mA or V	n	y	Parameter
13.21	**AO2 actual value**						
	Value of analog output AO2. Displays the value of AO2 in V.						
	-10.000 … 10.000	-	V	1000 = 1 V	y	n	Signal
13.22	**AO2 source**						
	Source for analog output AO2. Selects a signal/parameter to be connected to AO2. **Other**; source selection. 0: **Zero**; not in use. 1: **Used motor speed**; 01.01 Used motor speed filtered. 4: **Motor current**; 01.10 Motor current in A. 6: **Motor torque**; 01.17 Motor torque filtered. 7: **Armature voltage**; 28.05 Armature voltage. 8: **Output power**; 01.24 Output power in kW. 10: **Speed reference ramp input**; 23.01 Speed reference ramp input. 11: **Speed reference ramp output**; 23.02 Speed reference ramp output. 12: **Used speed reference**; 24.01 Used speed reference. 13: **Torque reference used**; 26.02 Torque reference used. 16: **Process PID output actual**; 40.01 Process PID output actual. 17: **Process PID feedback actual**; 40.02 Process PID feedback actual. 18: **Process PID setpoint actual**; 40.03 Process PID setpoint actual. 19: **Process PID deviation actual**; 40.04 Process PID deviation actual. 37: **AO1 data storage**; see 13.91 AO1 data storage. 38: **AO2 data storage**; see 13.92 AO2 data storage.						
	0 … 38	Armature voltage	-	1 = 1	n	y	Parameter
13.26	**AO2 filter time**						
	Filter time constant of analog output AO2. Defines the filter time constant for AO2. See 13.16 AO1 filter time.						
	0.000 … 30.000	0.100	s	1000 = 1 s	n	y	Parameter
13.27	**AO2 source min**						
	Internal value corresponding to minimum analog output AO2 value.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Defines the internal value that corresponds to the minimum required AO2 value.
Scaling parameters 13.27 and 13.28 set the low and high internal limits that corresponds to the analog output values in V defined by parameters 13.29 and 13.30:

DZ_LIN_016_scaling_b.ai
Setting parameter 13.27 as maximum value and 13.28 as minimum value inverts the output:

DZ_LIN_016_scaling_b.ai</td></tr>
<tr><td>-32768.0 … 32767.0</td><td>-100.0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">13.28</td><td colspan="7">AO2 source max</td></tr>
<tr><td colspan="7">Internal value corresponding to maximum analog output AO2 value.
Defines the internal value that corresponds to the maximum required AO2 value.
See 13.27 AO2 source min.</td></tr>
<tr><td>-32768.0 … 32767.0</td><td>100.0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">13.29</td><td colspan="7">AO2 out at AO2 src min</td></tr>
<tr><td colspan="7">Minimum analog output AO2 value.
Defines the minimum output value for AO2 in V.
See 13.27 AO2 source min.</td></tr>
<tr><td>-10.000 … 10.000</td><td>-10.000</td><td>V</td><td>1000 = 1 V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">13.30</td><td colspan="7">AO2 out at AO2 src max</td></tr>
<tr><td colspan="7">Maximum analog output AO2 value.
Defines the maximum output value for AO2 in V.
See 13.27 AO2 source min.</td></tr>
<tr><td>-10.000 … 10.000</td><td>10.000</td><td>V</td><td>1000 = 1 V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">13.80</td><td colspan="7">Scaling of fixed current output</td></tr>
<tr><td colspan="7">Scaling of fixed armature current output (IACT).</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
	Displays the scaling of the analog output for the armature current in amperes/10 V output voltage. This output is used to measure the armature current using an oscilloscope. See terminals SDCS-CON-H01 XAO:4 and XAO:5 for units' size H1 … H6 or SDCS-OPL-H01 X4:1 and X4:4 for units' size H7 and H8.						
	-32500 … 32500	-	A	1 = 1 A	y	n	Signal
13.91	**AO1 data storage**						
	Storage parameter for analog output AO1. Storage parameter to set analog output AO1 via e.g. a fieldbus. To set analog output AO1 send a value e.g. via embedded fieldbus (see 58.101 Data I/O 1 … 58.124 Data I/O 24). **Example**: Set 58.101 Data I/O 1 = AO1 data storage and 13.12 AO1 source = AO1 data storage.						
	-327.68 … 327.67	0.00	-	100 = 1	n	y	Parameter
13.92	**AO2 data storage**						
	Storage parameter for analog output AO2. Storage parameter to set analog output AO2 via e.g. a fieldbus. To set analog output AO2 send a value e.g. via embedded fieldbus (see 58.101 Data I/O 1 … 58.124 Data I/O 24). **Example**: Set 58.101 Data I/O 1 = AO2 data storage and 13.22 AO2 source = AO2 data storage.						
	-327.68 … 327.67	0.00	-	100 = 1	n	y	Parameter

14 I/O extension module 1

Configuration of I/O extension module 1.
The contents of the parameter group varies according to the selected I/O extension module type.

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
14.01	**Module 1 type**						
	First I/O extension module. Activates (and specifies the type of) I/O extension module 1. 0: **None**; inactive. 1: **FIO-01**; adds 4 DIO and 2 RO. 2: **FIO-11**; adds 2 DIO, 3 AI and 1 AO. 3: **FDIO-01**; adds 3 DI and 2 RO. 4: **FAIO-01**; adds 2 AI and 2 AO.						
	0 … 4	None	-	1 = 1	n	n	Parameter
14.02	**Module 1 location**						
	First I/O extension module location. Activates and specifies the slot (1 … 3) on the drive's control board into which the I/O extension module 1 is installed. Alternatively, specifies the node ID of the slot on a FEA-03 extension module. 1: **Slot 1**; I/O extension module 1 is in slot 1. 2: **Slot 2**; I/O extension module 1 is in slot 2. 3: **Slot 3**; I/O extension module 1 is in slot 3. **04 … 254**: Node ID of the slot on a FEA-03 extension module. **Note:** The node ID of the slot on a FEA-03 extension module can be typed in. This is only possible with Drive composer.						
	1 … 254	Slot 1	-	1 = 1	n	n	Parameter

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">14.03</td><td colspan="7">Module 1 status</td></tr>
<tr><td colspan="7">First I/O extension module status.
0: No option; no module detected in the specified slot.
1: No communication; a module has been detected but cannot be communicated with.
2: Unknown; the module type is unknown.
15: FIO-01; a FIO-01 has been detected and is active.
20: FIO-11; a FIO-11 has been detected and is active.
23: FDIO-01; a FDIO-01 has been detected and is active.
24: FAIO-01; a FAIO-01 has been detected and is active.</td></tr>
<tr><td>0 … 24</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">14.05</td><td colspan="7">DI status</td></tr>
<tr><td colspan="7">Status of digital inputs.
(Visible when 14.01 Module 1 type = FDIO-01)
Displays the electrical status of DI1 … DI3. The activation/deactivation delays of the inputs (if any are specified) are ignored. A filtering time is defined by 14.08 DI filter time.
Bits 0 … 2 reflect the status of DI1 … DI3.
Example: 0000000000000011b = DI2 and DI1 are on, DI3 is off.
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>DI1</td><td>1</td><td>On.</td></tr>
<tr><td>1</td><td>DI2</td><td>1</td><td>On.</td></tr>
<tr><td>2</td><td>DI3</td><td>1</td><td>On.</td></tr>
<tr><td>3 … 15</td><td>reserved</td><td></td><td></td></tr>
</table></td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">14.05</td><td colspan="7">DIO status</td></tr>
<tr><td colspan="7">Status of digital input/outputs.
(Visible when 14.01 Module 1 type = FIO-01 or FIO-11)
Displays the status of DIO1 … DIO2/DIO4 on the extension module. The activation/deactivation delays (if any are specified) are ignored. A filtering time (for input mode) is defined by 14.08 DIO filter time.
Bit 0 … 3 reflect the status of DIO1 … DIO4.
The number of active bits in this parameter depends on the number of digital input/outputs on the extension module.
Example: 0000000000001001b = DIO1 and DIO4 are on, remainder are off.
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>DIO1</td><td>1</td><td>On.</td></tr>
<tr><td>1</td><td>DIO2</td><td>1</td><td>On.</td></tr>
<tr><td>2</td><td>DIO3</td><td>1</td><td>On.</td></tr>
<tr><td>3</td><td>DIO4</td><td>1</td><td>On.</td></tr>
<tr><td>4 … 15</td><td>reserved</td><td></td><td></td></tr>
</table></td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>14.06</td><td colspan="7">DI delayed status</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type

Delayed status of digital inputs.
(Visible when 14.01 Module 1 type = FDIO-01)
Displays the delayed status of DI1 … DI3. This word is updated only after activation/deactivation delays (if any are specified).
Bits 0 … 2 reflect the status of DI1 … DI3.
Example: 0000000000000011b = DI2 and DI1 are on, DI3 is off.
Bit assignment:

Bit	Name	Value	Remarks
0	DI1	1	On.
1	DI2	1	On.
2	DI3	1	On.
3 … 15	reserved		

Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
0000h … FFFFh	0000h	-	1 = 1	y	n	Signal

14.06 **DIO delayed status**

Delayed status of digital input/outputs.
(Visible when 14.01 Module 1 type = FIO-01 or FIO-11)
Displays the delayed status of DIO1 … DIO2/DIO4 on the extension module. This word is updated only after activation/deactivation delays (if any are specified).
Bit 0 … 3 reflect the status of DIO1 … DIO4.
The number of active bits in this parameter depends on the number of digital input/outputs on the extension module.
Example: 000000000000001001b = DIO4 and DIO1 are on, remainder are off.
Bit assignment:

Bit	Name	Value	Remarks
0	DIO1	1	On.
1	DIO2	1	On.
2	DIO3	1	On.
3	DIO4	1	On.
4 … 15	reserved		

Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

14.08 **DI filter time**

Filter time constant for 14.05 DI status.
(Visible when 14.01 Module 1 type = FDIO-01)
Defines a filter time constant for 14.05 DI status.

Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
0.8 … 100.0	10.0	ms	10 = 1 ms	n	y	Parameter

14.08 **DIO filter time**

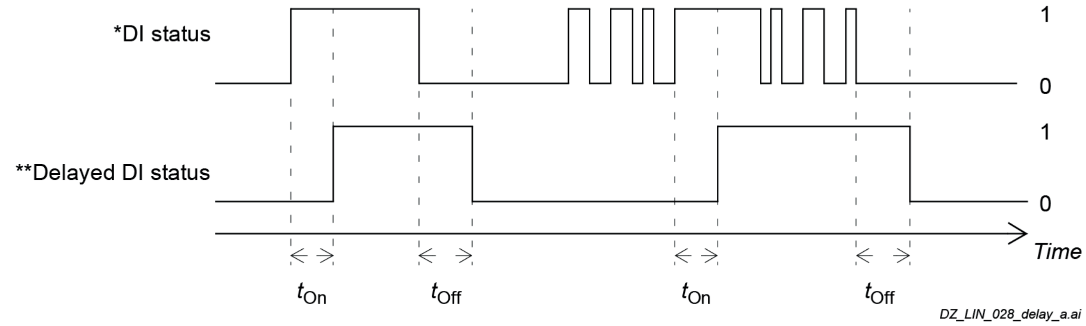
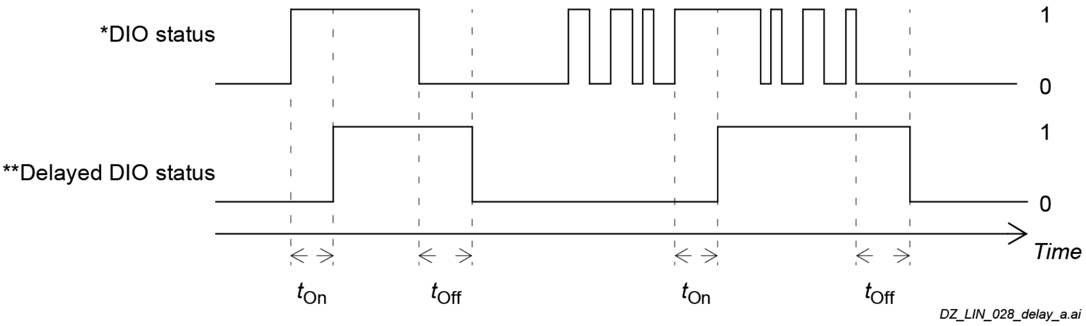
Filter time constant for 14.05 DIO status.
(Visible when 14.01 Module 1 type = FIO-01 or FIO-11)
Defines a filter time constant for 14.05 DIO status.

Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
0.8 … 100.0	10.0	ms	10 = 1 ms	n	y	Parameter

14.09 **DIO1 function**

Function of digital input/output DIO1.

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**
	(Visible when 14.01 Module 1 type = FIO-01 or FIO-11) Selects whether DIO1 of the extension module is used as a digital input or output. 0: **Output**; DIO1 is used as a digital output. 1: **Input**; DIO1 is used as a digital input.						
	0 … 1	Input	-	1 = 1	n	y	Parameter
14.11	**DIO1 output source**						
	Source for digital input/output DIO1. (Visible when 14.01 Module 1 type = FIO-01 or FIO-11) Selects a signal/parameter bit to be connected to DIO1 of the extension module when parameter 14.09 DIO1 function = Output. **Other [bit]**; source selection. 0: **Not energized**; output is not energized. 1: **Energized**; output is energized. 2: **Ready run**; 06.15.b01 Main status word. 3: **Ready on**; 06.15.b00 Main status word. 4: **Enabled**; 06.16.b02 Drive status word 1. 8: **Ready reference**; 06.15.b02 Main status word. 9: **At setpoint**; 06.15.b08 Main status word. 10: **Reverse**; 06.21.b02 Speed control status word. 11: **Zero speed**; 06.21.b00 Speed control status word. 12: **Above limit**; 06.17.b10 Drive status word 2. 13: **Warning**; 06.15.b07 Main status word. 14: **Tripped**; 06.15.b03 Main status word. 15: **Tripped (-1)**; 06.15.b03 Main status word inverted. 22: **Brake open command**; 44.01.b00 Brake control status (mechanical brake). 24: **Remote**; 06.11.b09 Main status word. 25: **Tripped or warning**; 06.18.b12 Drive status word 3. 30: **Fans on**; 06.24.b00 Current controller status word 1. 31: **Field exciter on**; 06.24.b05 Current controller status word 1. 32: **Close dynamic braking contactor**; 06.24.b08 Current controller status word 1. 33: **Close US style DC-contactor**; 06.24.b10 Current controller status word 1. 34: **Trip DC-breaker (pulse)**; 06.24.b15 Current controller status word 1. 40: **RO/DIO control word bit 0**; 10.99.b00 RO/DIO control word. 41: **RO/DIO control word bit 1**; 10.99.b01 RO/DIO control word. 42: **RO/DIO control word bit 2**; 10.99.b02 RO/DIO control word. 43: **RO/DIO control word bit 8**; 10.99.b08 RO/DIO control word. 44: **RO/DIO control word bit 9**; 10.99.b09 RO/DIO control word. 50: **STO reset indication**; 31.91.b07 STO status word. Reset of safety relay permitted.						
	0 … 50	Not energized	-	1 = 1	n	y	Parameter
14.12	**DI1 ON delay**						
	Activation delay for digital input DI1. (Visible when 14.01 Module 1 type = FDIO-01) Defines the activation delay for DI1.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**
	 t_{On} = 14.12 DI1 ON delay t_{Off} = 14.13 DI1 OFF delay *Electrical status of digital input. Indicated by 14.05 DI status. **Indicated by 14.06 DI delayed status.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.12	**DIO1 ON delay**						
	Activation delay for digital input/output DIO1. (Visible when 14.01 Module 1 type = FIO-01 or FIO-11) Defines the activation delay for DIO1.  t_{On} = 14.12 DIO1 ON delay t_{Off} = 14.13 DIO1 OFF delay *Electrical status of DIO (in input mode) or status of selected source (in output mode). Indicated by 14.05 DIO status. **Indicated by 14.06 DIO delayed status.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.13	**DI1 OFF delay**						
	Deactivation delay for digital input DI1. (Visible when 14.01 Module 1 type = FDIO-01) Defines the deactivation delay for DI1. See 14.12 DI1 ON delay.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.13	**DIO1 OFF delay**						
	Deactivation delay for digital input/output DIO1. (Visible when 14.01 Module 1 type = FIO-01 or FIO-11) Defines the deactivation delay for DIO1. See 14.12 DIO1 ON delay.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.14	**DIO2 function**						
	Function of digital input/output DIO2.						

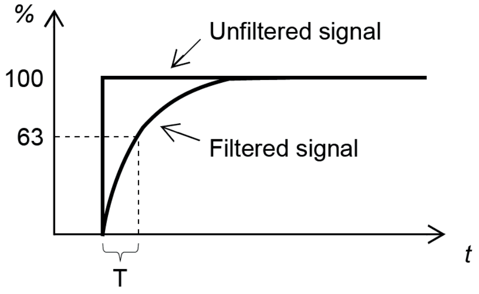
Index	Name					
	Text					
	Range	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**
	(Visible when 14.01 Module 1 type = FIO-01 or FIO-11) Selects whether DIO2 of the extension module is used as a digital input or output. 0: **Output**; DIO2 is used as a digital output. 1: **Input**; DIO2 is used as a digital input.						
	0 … 1	Input	-	1 = 1	n	y	Parameter
14.16	**DIO2 output source**						
	Source for digital input/output DIO2. (Visible when 14.01 Module 1 type = FIO-01 or FIO-11) Selects a signal/parameter bit to be connected to DIO2 when parameter 14.14 DIO2 function = Output. See 14.11 DIO1 output source.						
	0 … 50	Not energized	-	1 = 1	n	y	Parameter
14.17	**DI2 ON delay**						
	Activation delay for digital input DI2. (Visible when 14.01 Module 1 type = FDIO-01) Defines the activation delay for DI2. See 14.12 DI1 ON delay.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.17	**DIO2 ON delay**						
	Activation delay for digital input/output DIO2. (Visible when 14.01 Module 1 type = FIO-01 or FIO-11) Defines the activation delay for DIO2. See 14.12 DIO1 ON delay.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.18	**DI2 OFF delay**						
	Deactivation delay for digital input DI2. (Visible when 14.01 Module 1 type = FDIO-01) Defines the deactivation delay for DI2. See 14.12 DI1 ON delay.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.18	**DIO2 OFF delay**						
	Deactivation delay for digital input/output DIO2. (Visible when 14.01 Module 1 type = FIO-01 or FIO-11) Defines the deactivation delay for DIO2. See 14.12 DIO1 ON delay.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.19	**DIO3 function**						
	Function of digital input/output DIO3. (Visible when 14.01 Module 1 type = FIO-01) Selects whether DIO3 of the extension module is used as a digital input or output. 0: **Output**; DIO3 is used as a digital output. 1: **Input**; DIO3 is used as a digital input.						
	0 … 1	Input	-	1 = 1	n	y	Parameter
14.19	**AI supervision function**						
	Supervision function analog inputs. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)						

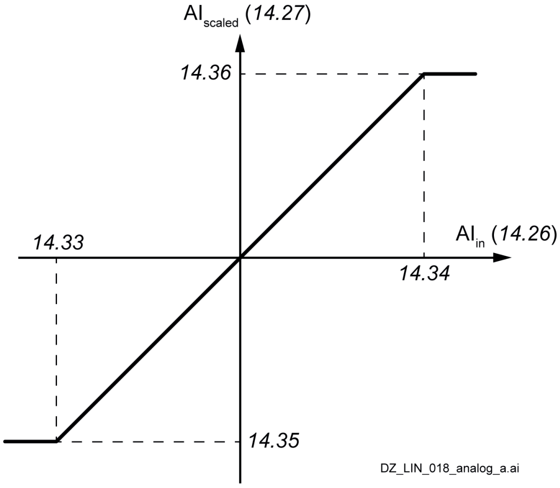
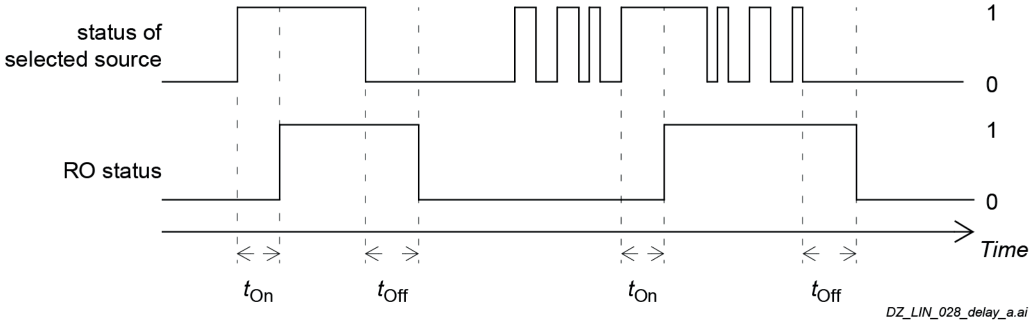
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Selects how the unit reacts when AI1 … AI2/AI3 signals move out of the minimum and/or maximum limits specified for the input.
The inputs and the limits to be observed are selected by parameter 14.20 AI supervision selection.
The analog input signal supervision is activated when the analog input is used. E.g. set 22.11 Speed reference 1 = AI1 scaled, AI2 scaled or AI3 scaled.
0: **No action**; none, disable AI supervision function.
1: **Fault**; the event generates fault 80A0 AI supervision.
2: **Warning**; the event generates warning A8A0 AI supervision.
WARNING
Make sure that it is safe to continue operation in case of a communication break.
3: **Last speed**; the event generates warning A8A0 AI supervision and freezes the speed to the level the drive was operating at. The last speed is determined based on the speed feedback using an 850 ms low-pass filter.
WARNING
Make sure that it is safe to continue operation in case of a communication break.
4: **Speed reference safe**; the event generates warning A8A0 AI supervision and sets the speed to the value defined in 22.46 Speed reference safe.
WARNING
Make sure that it is safe to continue operation in case of a communication break.</td></tr>
<tr><td>0 … 4</td><td>No action</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**14.20**</td><td colspan="7">**AI supervision selection**</td></tr>
<tr><td colspan="7">Activation of analog input supervision.
(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)
Specifies which limits of AI1 … AI2/AI3 are supervised by 14.19 AI supervision function.
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>AI1 < MIN</td><td>1</td><td>Minimum limit supervision of AI1 active. See 14.33 AI1 min.</td></tr>
<tr><td>1</td><td>AI1 > MAX</td><td>1</td><td>Maximum limit supervision of AI1 active. See 14.34 AI1 max.</td></tr>
<tr><td>2</td><td>AI2 < MIN</td><td>1</td><td>Minimum limit supervision of AI2 active. See 14.48 AI2 min.</td></tr>
<tr><td>3</td><td>AI2 > MAX</td><td>1</td><td>Maximum limit supervision of AI2 active. See 14.49 AI2 max.</td></tr>
<tr><td>4</td><td>AI3 < MIN</td><td>1</td><td>Minimum limit supervision of AI3 active. See 14.63 AI3 min.</td></tr>
<tr><td>5</td><td>AI3 > MAX</td><td>1</td><td>Maximum limit supervision of AI3 active. See 14.64 AI3 max.</td></tr>
<tr><td>6 … 15</td><td>reserved</td><td></td><td></td></tr>
</table></td></tr>
<tr><td>0000h … FFFFh</td><td>0000h</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**14.21**</td><td colspan="7">**DIO3 output source**</td></tr>
<tr><td colspan="7">Source for digital input/output DIO3.
(Visible when 14.01 Module 1 type = FIO-01)
Selects a signal/parameter bit to be connected to DIO3 when 14.19 DIO3 function = Output.
See 14.11 DIO1 output source.</td></tr>
<tr><td>0 … 50</td><td>Not energized</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**14.21**</td><td colspan="7">**AI tune**</td></tr>
<tr><td colspan="7">Tuning of minimum and maximum analog input values.
(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Triggers the analog input tuning function, which uses the actual measurement of minimum and maximum input values instead of potentially inaccurate estimated values.
Apply the minimum or maximum signal to the analog input and select the appropriate tuning function.
See drawing at 14.33 AI1 min.
0: **No action**; tuning action completed, or no action has been requested. The parameter automatically reverts to this value after any tuning action.
1: **AI1 min tune**; the measured value at AI1 is written as minimum value of AI1 into 14.33 AI1 min.
2: **AI1 max tune**; the measured value at AI1 is written as maximum value of AI1 into 14.34 AI1 max.
3: **AI2 min tune**; the measured value at AI2 is written as minimum value of AI2 into 14.48 AI2 min.
4: **AI2 max tune**; the measured value at AI2 is written as maximum value of AI2 into 14.49 AI2 max.
5: **AI3 min tune**; the measured value at AI3 is written as minimum value of AI3 into 14.63 AI3 min. (Visible when 14.01 Module 1 type = FIO-11)
6: **AI3 max tune**; the measured value at AI3 is written as maximum value of AI3 into 14.64 AI3 max. (Visible when 14.01 Module 1 type = FIO-11)</td></tr>
<tr><td>0 … 6</td><td>No action</td><td>-</td><td>1 = 1</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**14.22**</td><td colspan="7">**DI3 ON delay**</td></tr>
<tr><td colspan="7">Activation delay for digital input DI3.
(Visible when 14.01 Module 1 type = FDIO-01)
Defines the activation delay for DI3.
See 14.12 DI1 ON delay.</td></tr>
<tr><td>0.00 … 3000.00</td><td>0.00</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**14.22**</td><td colspan="7">**DIO3 ON delay**</td></tr>
<tr><td colspan="7">Activation delay for digital input/output DIO3.
(Visible when 14.01 Module 1 type = FIO-01)
Defines the activation delay for DIO3.
See 14.12 DIO1 ON delay.</td></tr>
<tr><td>0.00 … 3000.00</td><td>0.00</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**14.22**</td><td colspan="7">**AI force selection**</td></tr>
<tr><td colspan="7">Forced values selector for analog inputs.
(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)
The true readings of AI1 … AI2/AI3 can be overridden for e.g. testing purposes. A forced value parameter (see table below) is provided for each analog input and its value is applied whenever the corresponding bit in 14.22 AI force selection is 1.
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>AI1</td><td>1</td><td>Force mode: Force AI1 to value of 14.28 AI1 force data.</td></tr>
<tr><td>1</td><td>AI2</td><td>1</td><td>Force mode: Force AI2 to value of 14.43 AI2 force data.</td></tr>
<tr><td>2</td><td>AI3</td><td>1</td><td>Force mode: Force AI3 to value of 14.58 AI3 force data (FIO-11 only).</td></tr>
<tr><td>3 … 15</td><td>reserved</td><td></td><td></td></tr>
</table></td></tr>
<tr><td>0000h … FFFFh</td><td>0000h</td><td>-</td><td>1 = 1</td><td>y</td><td>y</td><td>Parameter</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">14.23</td><td colspan="7">DI3 OFF delay</td></tr>
<tr><td colspan="7">Deactivation delay for digital input DI3.
(Visible when 14.01 Module 1 type = FDIO-01)
Defines the deactivation delay for DI3.
See 14.12 DI1 ON delay.</td></tr>
<tr><td>0.00 … 3000.00</td><td>0.00</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">14.23</td><td colspan="7">DIO3 OFF delay</td></tr>
<tr><td colspan="7">Deactivation delay for digital input/output DIO3.
(Visible when 14.01 Module 1 type = FIO-01)
Defines the deactivation delay for DIO3.
See 14.12 DIO1 ON delay.</td></tr>
<tr><td>0.00 … 3000.00</td><td>0.00</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">14.24</td><td colspan="7">DIO4 function</td></tr>
<tr><td colspan="7">Function of digital input/output DIO4.
(Visible when 14.01 Module 1 type = FIO-01)
Selects whether DIO4 is used as a digital input or output.
0: Output; DIO4 is used as a digital output.
1: Input; DIO4 is used as a digital input.</td></tr>
<tr><td>0 … 1</td><td>Input</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">14.26</td><td colspan="7">DIO4 output source</td></tr>
<tr><td colspan="7">Source for digital input/output DIO4.
(Visible when 14.01 Module 1 type = FIO-01)
Selects a signal/parameter bit to be connected to DIO4 when 14.24 DIO4 function = Output.
See 14.11 DIO1 output source.</td></tr>
<tr><td>0 … 50</td><td>Not energized</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">14.26</td><td colspan="7">AI1 actual value</td></tr>
<tr><td colspan="7">Value of analog input AI1.
(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)
Displays the value of AI1 in mA or V, depending on whether the input is set to current or voltage.</td></tr>
<tr><td>-22.000 … 22.000 or
-11.000 … 11.000</td><td>-</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">14.27</td><td colspan="7">DIO4 ON delay</td></tr>
<tr><td colspan="7">Activation delay for digital input/output DIO4.
(Visible when 14.01 Module 1 type = FIO-01)
Defines the activation delay for DIO4.
See 14.12 DIO1 ON delay.</td></tr>
<tr><td>0.00 … 3000.00</td><td>0.00</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">14.27</td><td colspan="7">AI1 scaled value</td></tr>
<tr><td colspan="7">Scaled value of analog input AI1.
(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)
Displays the value of AI1 after scaling.
See 14.35 AI1 scaled at AI1 min and 14.36 AI1 scaled at AI1 max.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="2">14.28</td><td colspan="7">DIO4 OFF delay</td></tr>
<tr><td colspan="7">Deactivation delay for digital input/output DIO4.</td></tr>
</table>

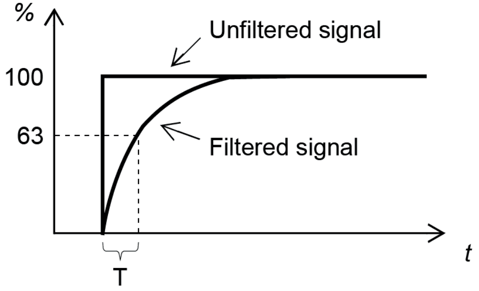
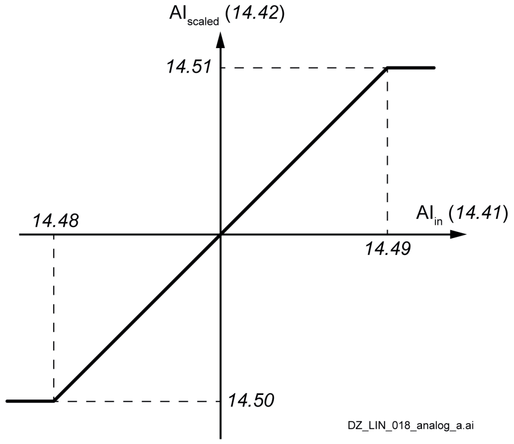
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">(Visible when 14.01 Module 1 type = FIO-01)
Defines the deactivation delay for DIO4.
See 14.12 DIO1 ON delay.</td></tr>
<tr><td>0.00 … 3000.00</td><td>0.00</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**14.28**</td><td colspan="7">**AI1 force data**</td></tr>
<tr><td colspan="7">Forced value of analog input AI1.
(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)
Forced value that can be used instead of the true input value.
See 14.22 AI force selection.</td></tr>
<tr><td>-22.000 … 22.000 or -11.000 … 11.000</td><td>0.000</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**14.29**</td><td colspan="7">**AI1 HW switch position**</td></tr>
<tr><td colspan="7">Unit selection switch of analog input AI1.
(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)
Displays the position of the hardware current/voltage selector on the I/O extension module. The setting of the current/voltage selector must match the unit selection made in 14.30 AI1 unit selection.
2: V; volts.
10: mA; milliamps.</td></tr>
<tr><td>2 … 10</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">**14.30**</td><td colspan="7">**AI1 unit selection**</td></tr>
<tr><td colspan="7">Unit selection of analog input AI1.
(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)
Selects the unit for readings and settings related to AI1. Set to either mA or V corresponding to the setting of the I/O extension module (see manual of the I/O extension module). The hardware setting is also shown in 14.29 AI1 HW switch position.
2: **V;** volts.
10: **mA**; milliamps.</td></tr>
<tr><td>2 … 10</td><td>mA</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**14.31**</td><td colspan="7">**RO status**</td></tr>
<tr><td colspan="7">Status of relay outputs.
(Visible when 14.01 Module 1 type = FIO-01or FDIO-01)
Displays the status of RO1 … RO2 on the I/O extension module.
Example: 0000000000000001b = RO1 is energized, RO2 is de-energized.
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>RO1</td><td>1</td><td>Energized.</td></tr>
<tr><td>1</td><td>RO2</td><td>1</td><td>Energized.</td></tr>
<tr><td>2 … 15</td><td>reserved</td><td></td><td></td></tr>
</table></td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="2">**14.31**</td><td colspan="7">**AI1 filter gain**</td></tr>
<tr><td colspan="7">Hardware filter time constant of analog input AI1.
(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)
Selects a hardware filter time constant for AI1.</td></tr>
</table>

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**
	See 14.32 AI1 filter time. 0: **No filtering**; no filtering. 1: **125 µs**; 125 microseconds. 2: **250 µs**; 250 microseconds. 3: **500 µs**; 500 microseconds. 4: **1 ms**; 1 millisecond. 5: **2 ms**; 2 milliseconds. 6: **4 ms**; 4 milliseconds. 7: **7.9375 ms**; 7.9375 milliseconds.						
	0 … 7	1 ms	-	1 = 1	n	y	Parameter
14.32	**AI1 filter time**						
	Filter time constant of analog input AI1. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Defines the filter time constant for AI1.  $O = I \times (1 - e^{-t/T})$ I = filter input (step) O = filter output *t* = time T = filter time constant SF_880_024_DCS_filter_a.ai The signal is also filtered due to the analog input hardware. See 14.31 AI1 filter gain.						
	0.000 … 30.000	0.100	s	1000 = 1 s	n	y	Parameter
14.33	**AI1 min**						
	Minimum value of analog input AI1. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Defines the minimum value for AI1 in mA or V. See 14.21 AI tune. Parameters 14.33 and 14.34 set the low and high limit of the analog input signal in mA or V. Scaling parameters 14.35 and 14.36 define the internal values that correspond to these limits as follows:						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7"> </td></tr>
<tr><td>-22.000 … 22.000 or
-11.000 … 11.000</td><td>-20.000 or
-10.000</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">14.34</td><td colspan="7">RO1 source</td></tr>
<tr><td colspan="7">Source for relay output RO1.
(Visible when 14.01 Module 1 type = FIO-01or FDIO-01)
Selects a signal/parameter bit to be connected to RO1.
See 14.11 DIO1 output source.</td></tr>
<tr><td>0 … 50</td><td>Not energized</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">14.34</td><td colspan="7">AI1 max</td></tr>
<tr><td colspan="7">Maximum value of analog input AI1.
(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)
Defines the maximum value for AI1 in mA or V. See 14.21 AI tune.
See 14.33 AI1 min.</td></tr>
<tr><td>-22.000 … 22.000 or
-11.000 … 11.000</td><td>20.000 or
10.000</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">14.35</td><td colspan="7">RO1 ON delay</td></tr>
<tr><td colspan="7">Activation delay for relay output RO1.
(Visible when 14.01 Module 1 type = FIO-01or FDIO-01)
Defines the activation delay for RO1.

t_{On} = 14.35 RO1 ON delay
t_{Off} = 14.36 RO1 OFF delay</td></tr>
<tr><td>0.00 … 3000.00</td><td>0.00</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

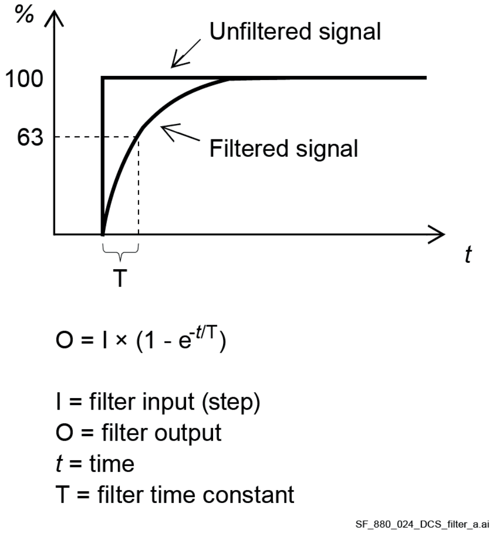
Index	Name						
	Text						
	Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
14.35	**AI1 scaled at AI1 min**						
	Internal value corresponding to minimum analog input AI1 value. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Defines the internal value that corresponds to the minimum AI1 value defined by 14.33 AI1 min. See 14.33 AI1 min.						
	-32768.000 … 32767.000	-100.000	-	1 = 1	n	y	Parameter
14.36	**RO1 OFF delay**						
	Deactivation delay for relay output RO1. (Visible when 14.01 Module 1 type = FIO-01or FDIO-01) Defines the deactivation delay for RO1. See 14.35 RO1 ON delay.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.36	**AI1 scaled at AI1 max**						
	Internal value corresponding to maximum analog input AI1 value. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Defines the internal value that corresponds to the maximum AI1 value defined by 14.34 AI1 max. See 14.33 AI1 min.						
	-32768.000 … 32767.000	100.000	-	1 = 1	n	y	Parameter
14.37	**RO2 source**						
	Source for relay output RO2. (Visible when 14.01 Module 1 type = FIO-01or FDIO-01) Selects a signal/parameter bit to be connected to RO2. See 14.11 DIO1 output source.						
	0 … 50	Not energized	-	1 = 1	n	y	Parameter
14.38	**RO2 ON delay**						
	Activation delay for relay output RO2. (Visible when 14.01 Module 1 type = FIO-01or FDIO-01) Defines the activation delay for RO2. See 14.35 RO1 ON delay.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.39	**RO2 OFF delay**						
	Deactivation delay for relay output RO2. (Visible when 14.01 Module 1 type = FIO-01or FDIO-01) Defines the deactivation delay for RO2. See 14.35 RO1 ON delay.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.41	**AI2 actual value**						
	Value of analog input AI2. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Displays the value of AI2 in mA or V, depending on whether the input is set to current or voltage.						
	-22.000 … 22.000 or -11.000 … 11.000	-	mA or V	1000 = 1 mA or V	y	n	Signal
14.42	**AI2 scaled value**						
	Scaled value of analog input AI2.						

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
	(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Displays the value of AI2 after scaling. See 14.50 AI2 scaled at AI2 min and 14.51 AI2 scaled at AI2 max.						
	-32768.000 … 32767.000	-	-	1 = 1	y	n	Signal
14.43	**AI2 force data**						
	Forced value of analog input AI2. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Forced value that can be used instead of the true input value. See 14.22 AI force selection.						
	-22.000 … 22.000 or -11.000 … 11.000	0.000	mA or V	1000 = 1 mA or V	y	y	Parameter
14.44	**AI2 HW switch position**						
	Unit selection switch of analog input AI2. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Displays the position of the hardware current/voltage selector on the I/O extension module. The setting of the current/voltage selector must match the unit selection made in 14.45 AI2 unit selection. 2: V; volts. 10: mA; milliamps.						
	2 … 10	-	-	1 = 1	y	n	Signal
14.45	**AI2 unit selection**						
	Unit selection of analog input AI2. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Selects the unit for readings and settings related to AI2. Set to either mA or V corresponding to the setting of the I/O extension module (see the manual of the I/O extension module). The hardware setting is also shown in 14.44 AI2 HW switch position. 2: **V**; volts. 10: **mA**; milliamps.						
	2 … 10	mA	-	1 = 1	n	y	Parameter
14.46	**AI2 filter gain**						
	Hardware filter time constant of analog input AI2. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Selects a hardware filter time constant for AI2. See 14.47 AI2 filter time. 0: **No filtering**; no filtering. 1: **125 µs**; 125 microseconds. 2: **250 µs**; 250 microseconds. 3: **500 µs**; 500 microseconds. 4: **1 ms**; 1 millisecond. 5: **2 ms**; 2 milliseconds. 6: **4 ms**; 4 milliseconds. 7: **7.9375 ms**; 7.9375 milliseconds.						
	0 … 7	1 ms	-	1 = 1	n	y	Parameter
14.47	**AI2 filter time**						
	Filter time constant of analog input AI2. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Defines the filter time constant for AI2.						

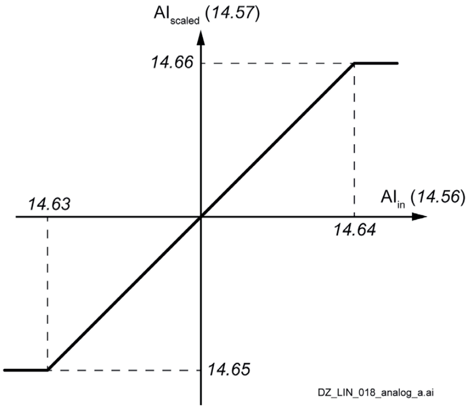
Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
	 $O = I \times (1 - e^{-t/T})$ I = filter input (step) O = filter output t = time T = filter time constant SF_880_024_DCS_filter_a.ai The signal is also filtered due to the analog input hardware. See 14.46 AI2 filter gain.						
	0.000 … 30.000	0.100	s	1000 = 1 s	n	y	Parameter
14.48	**AI2 min**						
	Minimum value of analog input AI2. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Defines the minimum value for AI2 in mA or V. See 14.21 AI tune. Parameters 14.48 and 14.49 set the low and high limit of the analog input signal in mA or V. Scaling parameters 14.50 and 14.51 define the internal values that correspond to these limits as follows:  DZ_LIN_018_analog_a.ai						
	-22.000 … 22.000 or -11.000 … 11.000	-20.000 or -10.000	mA or V	1000 = 1 mA or V	n	y	Parameter
14.49	**AI2 max**						
	Maximum value of analog input AI2. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Defines the maximum value for AI2 in mA or V. See 14.21 AI tune. See 14.48 AI2 min.						
	-22.000 … 22.000 or -11.000 … 11.000	20.000 or 10.000	mA or V	1000 = 1 mA or V	n	y	Parameter
14.50	**AI2 scaled at AI2 min**						
	Internal value corresponding to minimum analog input AI2 value.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)
Defines the internal value that corresponds to the minimum AI2 value defined by 14.48 AI2 min. See 14.48 AI2 min.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>-100.000</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">14.51</td><td colspan="7">AI2 scaled at AI2 max</td></tr>
<tr><td colspan="7">Internal value corresponding to maximum analog input AI2 value.
(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)
Defines the internal value that corresponds to the maximum AI2 value defined by 14.49 AI2 max.
See 14.48 AI2 min.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>100.000</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">14.56</td><td colspan="7">AI3 actual value</td></tr>
<tr><td colspan="7">Value of analog input AI3.
(Visible when 14.01 Module 1 type = FIO-11)
Displays the value of AI3 in mA or V, depending on whether the input is set to current or voltage.</td></tr>
<tr><td>-22.000 … 22.000 or -11.000 … 11.000</td><td>-</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">14.57</td><td colspan="7">AI3 scaled value</td></tr>
<tr><td colspan="7">Scaled value of analog input AI3.
(Visible when 14.01 Module 1 type = FIO-11)
Displays the value of AI3 after scaling.
See 14.65 AI3 scaled at AI3 min and 14.66 AI3 scaled at AI3 max.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">14.58</td><td colspan="7">AI3 force data</td></tr>
<tr><td colspan="7">Forced value of analog input AI3.
(Visible when 14.01 Module 1 type = FIO-11)
Forced value that can be used instead of the true input value.
See 14.22 AI force selection.</td></tr>
<tr><td>-22.000 … 22.000 or -11.000 … 11.000</td><td>0.000</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">14.59</td><td colspan="7">AI3 HW switch position</td></tr>
<tr><td colspan="7">Unit selection switch of analog input AI3.
(Visible when 14.01 Module 1 type = FIO-11)
Displays the position of the hardware current/voltage selector on the I/O extension module. The setting of the current/voltage selector must match the unit selection made in 14.60 AI3 unit selection.
2: V; volts.
10: mA; milliamps.</td></tr>
<tr><td>2 … 10</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="2">14.60</td><td colspan="7">AI3 unit selection</td></tr>
<tr><td colspan="7">Unit selection of analog input AI3.
(Visible when 14.01 Module 1 type = FIO-11)</td></tr>
</table>

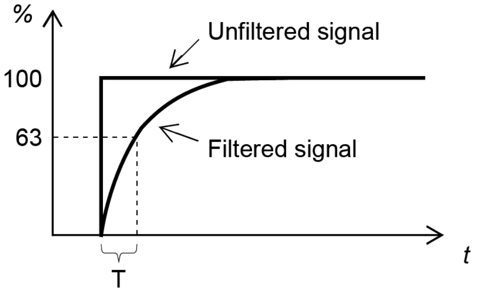
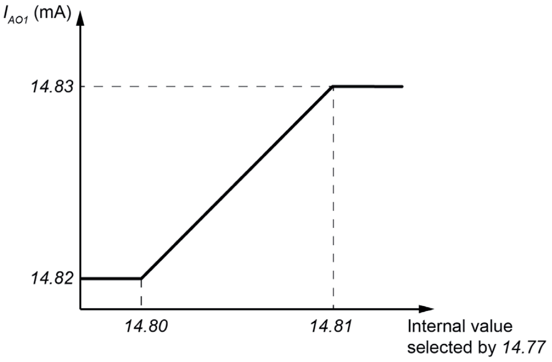
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Selects the unit for readings and settings related to AI3. Set to either mA or V corresponding to the setting of the I/O extension module (see manual of the I/O extension module). The hardware setting is also shown in 14.59 AI3 HW switch position.
2: V; volts.
10: mA; milliamps.</td></tr>
<tr><td>2 … 10</td><td>mA</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">14.61</td><td colspan="7">AI3 filter gain</td></tr>
<tr><td colspan="7">Hardware filter time constant of analog input AI3.
(Visible when 14.01 Module 1 type = FIO-11)
Selects a hardware filter time constant for AI3.
See 14.62 AI3 filter time.
0: No filtering; no filtering.
1: 125 µs; 125 microseconds.
2: 250 µs; 250 microseconds.
3: 500 µs; 500 microseconds.
4: 1 ms; 1 millisecond.
5: 2 ms; 2 milliseconds.
6: 4 ms; 4 milliseconds.
7: 7.9375 ms; 7.9375 milliseconds.</td></tr>
<tr><td>0 … 7</td><td>1 ms</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">14.62</td><td colspan="7">AI3 filter time</td></tr>
<tr><td colspan="7">Filter time constant of analog input AI3.
(Visible when 14.01 Module 1 type = FIO-11)
Defines the filter time constant for AI3.

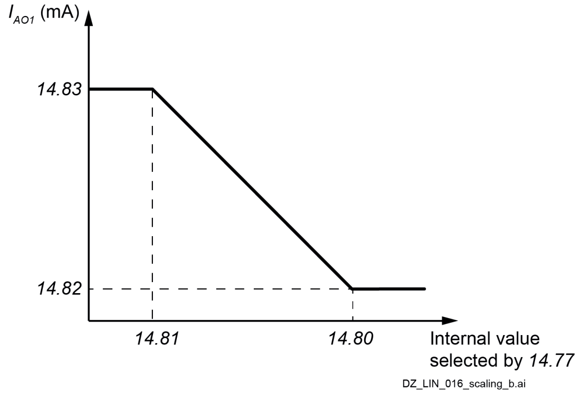


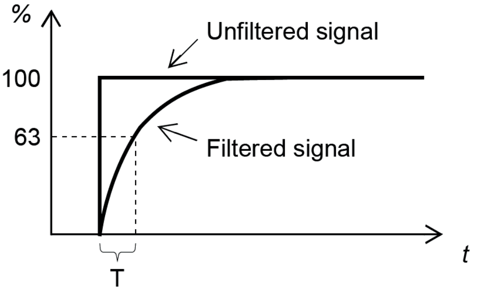
The signal is also filtered due to the analog input hardware. See 14.61 AI3 filter gain.</td></tr>
<tr><td>0.000 … 30.000</td><td>0.100</td><td>s</td><td>1000 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">14.63</td><td colspan="7">AI3 min</td></tr>
<tr><td colspan="7">Minimum value of analog input AI3.
(Visible when 14.01 Module 1 type = FIO-11)
Defines the minimum value for AI3 mA or V. See 14.21 AI tune.
Parameters 14.63 and 14.64 set the low and high limit of the analog input signal in mA or V. Scaling parameters 14.65 and 14.66 define the internal values that correspond to these limits as follows:</td></tr>
</table>

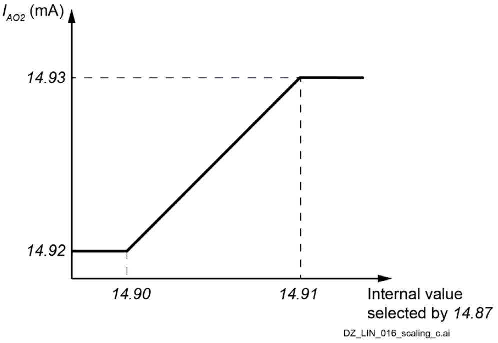
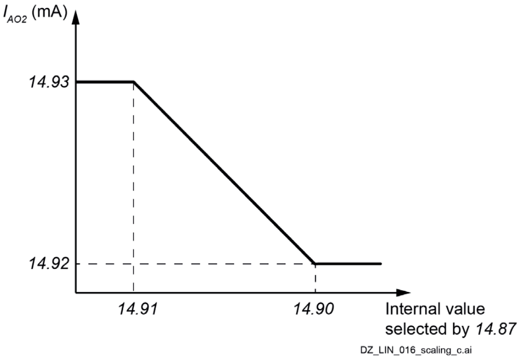
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7"> </td></tr>
<tr><td>-22.000 … 22.000 or
-11.000 … 11.000</td><td>-20.000 or
-10.000</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">14.64</td><td colspan="7">AI3 max</td></tr>
<tr><td colspan="7">Maximum value of analog input AI3.
(Visible when 14.01 Module 1 type = FIO-11)
Defines the maximum value for AI3 in mA or V. See 14.21 AI tune.
See 14.63 AI3 min.</td></tr>
<tr><td>-22.000 … 22.000 or
-11.000 … 11.000</td><td>20.000 or
10.000</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">14.65</td><td colspan="7">AI3 scaled at AI3 min</td></tr>
<tr><td colspan="7">Internal value corresponding to minimum analog input AI3 value.
(Visible when 14.01 Module 1 type = FIO-11)
Defines the internal value that corresponds to the minimum AI3 value defined by 14.63 AI3 min.
See 14.63 AI3 min.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>-100.000</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">14.66</td><td colspan="7">AI3 scaled at AI3 max</td></tr>
<tr><td colspan="7">Internal value corresponding to maximum analog input AI3 value.
(Visible when 14.01 Module 1 type = FIO-11)
Defines the internal value that corresponds to the maximum AI3 value defined by 14.64 AI3 max.
See 14.63 AI3 min.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>100.000</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">14.71</td><td colspan="7">AO force selection</td></tr>
<tr><td colspan="7">Forced values selector for analog outputs.
(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)
The value of AO1 … AO1/AO2 can be overridden for e.g. testing purposes. A forced value parameter (see table below) is provided for each analog output and its value is applied whenever the corresponding bit in 14.71 AO fore selection is 1.
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>AO1</td><td>1</td><td>Force mode: Force AO1 to value of 14.78 AO1 force data.</td></tr>
</table></td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7"><table><tr><td>1</td><td>AO2</td><td>1</td><td>Force mode: Force AO2 to value of 14.88 AO2 force data (FAIO-01 only).</td></tr><tr><td>2 … 15</td><td>reserved</td><td></td><td></td></tr></table></td></tr>
<tr><td>0000h … FFFFh</td><td>0000h</td><td>-</td><td>1 = 1</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">14.76</td><td colspan="7">AO1 actual value</td></tr>
<tr><td colspan="7">Value of analog output AO1.
(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)
Displays the value of AO1 in mA.</td></tr>
<tr><td>0.000 … 22.000</td><td>-</td><td>mA</td><td>1000 = 1 mA</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">14.77</td><td colspan="7">AO1 source</td></tr>
<tr><td colspan="7">Source for analog output AO1.
(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)
Selects a signal/parameter to be connected to AO1. Alternatively, sets the output to excitation mode to feed a constant current to a temperature sensor.
Other; source selection.
0: Zero; not in use.
1: Used motor speed; 01.01 Used motor speed filtered.
4: Motor current; 01.10 Motor current in A.
6: Motor torque; 01.17 Motor torque filtered.
7: Armature voltage; 28.05 Armature voltage.
8: Output power; 01.24 Output power in kW.
10: Speed reference ramp input; 23.01 Speed reference ramp input.
11: Speed reference ramp output; 23.02 Speed reference ramp output.
12: Used speed reference; 24.01 Used speed reference.
13: Torque reference used; 26.02 Torque reference used.
16: Process PID output actual; 40.01 Process PID output actual.
17: Process PID feedback actual; 40.02 Process PID feedback actual.
18: Process PID setpoint actual; 40.03 Process PID setpoint actual.
19: Process PID deviation actual; 40.04 Process PID deviation actual.
20: Force PT100 excitation; AO1 is used to feed an excitation current to 1 … 3 PT100 sensors. See chapter Motor thermal protection of this manual.
21: Force KTY84 excitation; AO1 is used to feed an excitation current to a KTY84 sensor. See chapter Motor thermal protection of this manual.
22: Force PTC excitation; AO1 is used to feed an excitation current to 1 … 3 PTC sensors. See chapter Motor thermal protection of this manual.
23: Force PT1000 excitation; AO1 is used to feed an excitation current to 1 … 3 PT1000 sensors. See chapter Motor thermal protection of this manual.
37: AO1 data storage; see 13.91 AO1 data storage.
38: AO2 data storage; see 13.92 AO2 data storage.</td></tr>
<tr><td>0 … 38</td><td>Zero</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">14.78</td><td colspan="7">AO1 force data</td></tr>
<tr><td colspan="7">Forced value of analog output AO1.
(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)
Forced value that can be used instead of the selected output signal.
See 14.71 AO force selection.</td></tr>
<tr><td>0.000 … 22.000</td><td>0.000</td><td>mA</td><td>1000 = 1 mA</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td>14.79</td><td colspan="7">AO1 filter time</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Filter time constant of analog output AO1.
(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)
Defines the filter time constant for AO1.

$O = I \times (1 - e^{-t/T})$
I = filter input (step)
O = filter output
t = time
T = filter time constant
SF_880_024_DCS_filter_a.ai</td></tr>
<tr><td>0.000 … 30.000</td><td>0.100</td><td>s</td><td>1000 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">14.80</td><td colspan="7">AO1 source min</td></tr>
<tr><td colspan="7">Internal value corresponding to minimum analog output AO1 value.
(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)
Defines the internal value that corresponds to the minimum required AO1 value.
Scaling parameters 14.80 and 14.81 set the low and high internal limits that corresponds to the analog output values in mA defined by parameters 14.82 and 14.83:

DZ_LIN_016_scaling_b.ai
Setting parameter 14.82 as maximum value and 14.83 as minimum value inverts the output:</td></tr>
</table>

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**
							
	-32768.0 … 32767.0	0.0	-	1 = 1	n	y	Parameter
14.81	**AO1 source max**						
	Internal value corresponding to maximum analog output AO1 value. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Defines the internal value that corresponds to the maximum required AO1 value. See 14.80 AO1 source min.						
	-32768.0 … 32767.0	100.0	-	1 = 1	n	y	Parameter
14.82	**AO1 out at AO1 src min**						
	Minimum analog output AO1 value. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Defines the minimum output value for AO1 in mA. See 14.80 AO1 source min.						
	0.000 … 22.000	0.000	mA	1000 = 1 mA	n	y	Parameter
14.83	**AO1 out at AO1 src max**						
	Maximum analog output AO1 value. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Defines the maximum output value for AO1 in mA. See 14.80 AO1 source min.						
	0.000 … 22.000	20.000	mA	1000 = 1 mA	n	y	Parameter
14.86	**AO2 actual**						
	Value of analog output AO2. (Visible when 14.01 Module 1 type = FAIO-01) Displays the value of AO2 in mA.						
	0.000 … 22.000	-	mA	1000 = 1 mA	y	n	Signal
14.87	**AO2 source**						
	Source for analog output AO2. (Visible when 14.01 Module 1 type = FAIO-01) Selects a signal/parameter to be connected to AO2. **Other**; source selection. 0: **Zero**; not in use. 1: **Used motor speed**; 01.01 Used motor speed filtered. 4: **Motor current**; 01.10 Motor current in A. 6: **Motor torque**; 01.17 Motor torque filtered. 7: **Armature voltage**; 28.05 Armature voltage. 8: **Output power**; 01.24 Output power in kW. 10: **Speed reference ramp input**; 23.01 Speed reference ramp input.						

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
	11: **Speed reference ramp output**; 23.02 Speed reference ramp output. 12: **Used speed reference**; 24.01 Used speed reference. 13: **Torque reference used**; 26.02 Torque reference used. 16: **Process PID output actual**; 40.01 Process PID output actual. 17: **Process PID feedback actual**; 40.02 Process PID feedback actual. 18: **Process PID setpoint actual**; 40.03 Process PID setpoint actual. 19: **Process PID deviation actual**; 40.04 Process PID deviation actual. 37: **AO1 data storage**; see 13.91 AO1 data storage. 38: **AO2 data storage**; see 13.92 AO2 data storage.						
	0 … 38	Zero	-	1 = 1	n	y	Parameter
14.88	**AO2 force data**						
	Forced value of analog output AO2. (Visible when 14.01 Module 1 type = FAIO-01) Forced value that can be used instead of the selected output signal. See 14.71 AO force selection.						
	0.000 … 22.000	0.000	mA	1000 = 1 mA	y	y	Parameter
14.89	**AO2 filter time**						
	Filter time constant of analog output AO2. (Visible when 14.01 Module 1 type = FAIO-01) Defines the filter time constant for AO2.  O = I × (1 - $e^{-t/T}$) I = filter input (step) O = filter output *t* = time T = filter time constant SF_880_024_DCS_filter_a.ai						
	0.000 … 30.000	0.100	s	1000 = 1 s	n	y	Parameter
14.90	**AO2 source min**						
	Internal signal value corresponding to minimum analog output AO2 value. (Visible when 14.01 Module 1 type = FAIO-01) Defines the internal value that corresponds to the minimum required AO2 value. Scaling parameters 14.90 and 14.91 set the low and high internal limits that corresponds to the analog output values in mA defined by parameters 14.92 and 14.93:						

Index	Name						
	Text						
	Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
	 Setting parameter 14.92 as maximum value and 14.93 as minimum value inverts the output: 						
	-32768.0 … 32767.0	0.0	-	1 = 1	n	y	Parameter
14.91	**AO2 source max**						
	Internal value corresponding to maximum analog output AO2 value. (Visible when 14.01 Module 1 type = FAIO-01) Defines the internal value that corresponds to the maximum required AO2 value. See 14.90 AO2 source min.						
	-32768.0 … 32767.0	100.0	-	1 = 1	n	y	Parameter
14.92	**AO2 out at AO2 src min**						
	Minimum analog output AO2 value. (Visible when 14.01 Module 1 type = FAIO-01) Defines the minimum output value for AO2. See 14.90 AO2 source min.						
	0.000 … 22.000	0.000	mA	1000 = 1 mA	n	y	Parameter
14.93	**AO2 out at AO2 src max**						
	Maximum analog output AO2 value. (Visible when 14.01 Module 1 type = FAIO-01) Defines the maximum output value for AO2. See 14.90 AO2 source min.						
	0.000 … 22.000	20.000	mA	1000 = 1 mA	n	y	Parameter

15 I/O extension module 2

Description see group 14 I/O extension module 1.
Configuration of I/O extension module 2.
The contents of the parameter group vary according to the selected I/O extension module type.

16 I/O extension module 3

Description see group 14 I/O extension module 1.
Configuration of I/O extension module 3.
The contents of the parameter group vary according to the selected I/O extension module type.

19 Operation mode

Selection of local and remote control locations and operating modes.

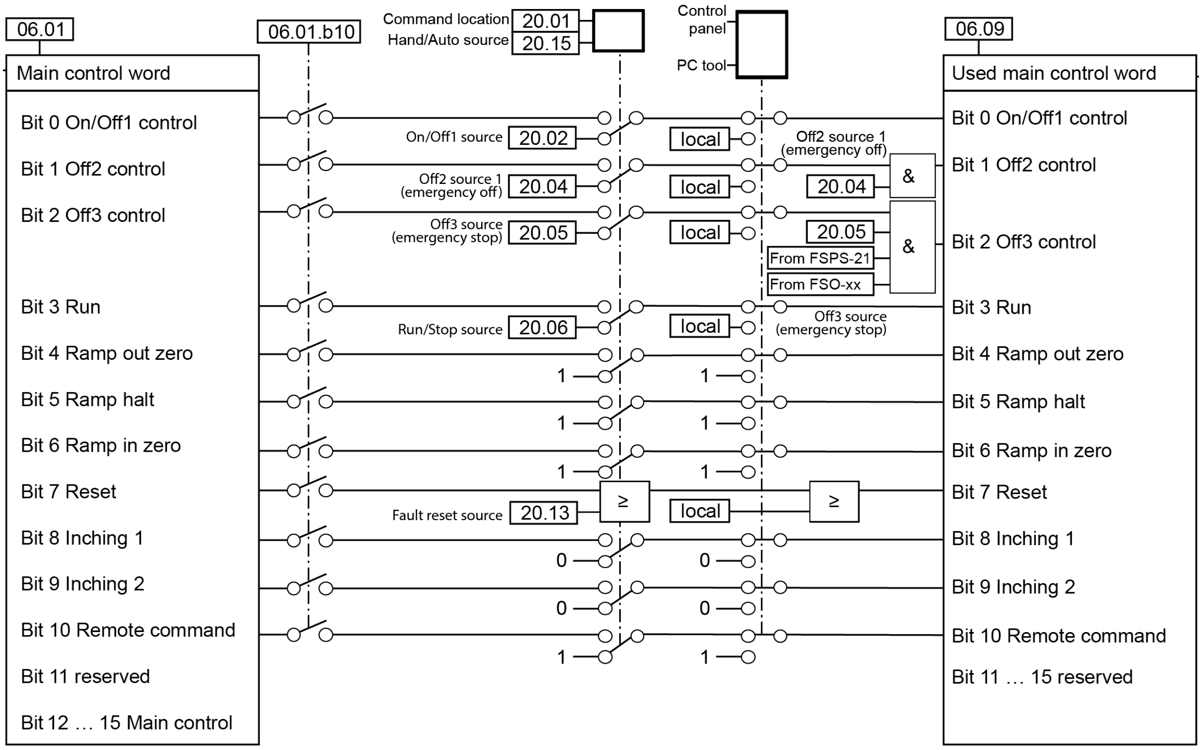
Index	**Name** **Text** **Range**	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**
19.01	**Actual operation mode**						
	Currently used operating mode. Displays the operating mode currently used. See parameters 19.11 … 19.14. 1: **Zero**; output of the torque selector has been set to zero. 2: **Speed**; speed control, torque reference taken from 25.01 Torque reference speed control. 3: **Torque**; torque control, torque reference taken from 26.74 Torque reference ramp output. 4: **Min**; minimum of 25.01 Torque reference speed control and 26.74 Torque reference ramp output. The smaller of the two is used. 5: **Max**; maximum of 25.01 Torque reference speed control and 26.74 Torque reference ramp output. The greater of the two is used. 6: **Add**; sum of 25.01 Torque reference speed control and 26.74 Torque reference ramp output is used. 7: **Limitation**; limitation control, 26.74 Torque reference ramp output is limited by 25.01 Torque reference speed control. **Example**: If 26.74 Torque reference ramp output = 50 %, then 25.01 Torque reference speed control is limited to ±50 %. 8: **Current**; current control, current reference taken from 27.22 Current reference source.						
	1 … 8	-	-	1 = 1	y	n	Signal
19.11	**Ext1/Ext2 selection**						
	Selection of control location. Selects the source for the control location. Thus, a change of the operating mode is possible. 0 = EXT1, see 19.12 Ext1 control mode. 1 = EXT2, see 19.14 Ext2 control mode. **Other [bit]**; source selection. 0: **EXT1**; 0, select EXT1. Normal operation. 1: **EXT2**; 1, select EXT2. 3: **DI1**; 10.02.b00 DI delayed status. 4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status.						
	0 … 19	EXT1	-	1 = 1	n	y	Parameter

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">**19.12**</td><td colspan="7">**Ext1 control mode**</td></tr>
<tr><td colspan="7">Operating mode of control location EXT1.
Selects the operating mode for control location EXT1.
1: **Zero**; set the output of the torque selector to zero.
2: **Speed**; speed control, set torque reference to 25.01 Torque reference speed control.
3: **Torque**; torque control, set torque reference to 26.74 Torque reference ramp output.
4: **Min**; combination of selections Speed and Torque. Use the minimum of 25.01 Torque reference speed control and 26.74 Torque reference ramp output.
If speed error becomes negative, the drive follows the speed controller output until the speed error becomes positive again. This prevents the drive from accelerating uncontrollably if the load is lost in torque control.
5: **Max**; combination of selections Speed and Torque. Use the maximum of 25.01 Torque reference speed control and 26.74 Torque reference ramp output.
If speed error becomes positive, the drive follows the speed controller output until speed error becomes negative again. This prevents the drive from accelerating uncontrollably if the load is lost in torque control.
6: **Add**; combination of selections Speed and Torque. Use the sum of 25.01 Torque reference speed control and 26.74 Torque reference ramp output.
7: **Limitation**; limitation control, 26.74 Torque reference ramp output limits 25.01 Torque reference speed control.
Example: If 26.74 Torque reference ramp output = 50 %, then 25.01 Torque reference speed control is limited to ±50 %.</td></tr>
<tr><td>1 … 7</td><td>Speed</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**19.14**</td><td colspan="7">**Ext2 control mode**</td></tr>
<tr><td colspan="7">Operating mode of control location EXT2.
Selects the operating mode for control location EXT2.
See 19.12 Ext1 control mode.</td></tr>
<tr><td>1 … 7</td><td>Speed</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**19.16**</td><td colspan="7">**Local control mode**</td></tr>
<tr><td colspan="7">Operating mode of local control.
Selects the operating mode for local control from the control panel or Drive composer.
0: **Speed**; speed control, the torque reference is taken from 25.01 Torque reference speed control (output of the speed controller). Thus, the speed reference is given by the control panel or Drive composer.
1: **Torque**; torque control, the torque reference is taken from 26.74 Torque reference ramp output (output of the torque reference selection). Thus, the torque reference is given by the control panel or Drive composer.</td></tr>
<tr><td>0 … 1</td><td>Speed</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**19.20**</td><td colspan="7">**Follower force ramp stop**</td></tr>
<tr><td colspan="7">Force follower to speed control (follower only).
Forces or selects a source that forces a torque-controlled follower drive to switch to speed control upon a ramp stop by an Off1- or Off3 (emergency stop) command. This is required for an independent ramp stop of the follower.
0 = Keep control mode.
1 = Force speed control.
Other [bit]; source selection.
0: **Keep control mode**; 0, keep the current control mode. Normal operation.
1: **Force speed control**; 1, ramp stop forces speed control.
3: **DI1**; 10.02.b00 DI delayed status.</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
	4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status.						
	0 … 19	Keep control mode	-	1 = 1	n	y	Parameter

20 Start/Stop/Direction

Start/Stop/Direction and run/start/jog enable signal source selection. Positive/Negative reference enable source selection. Breaker and acknowledge source selection.

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
	Command location:  						
20.01	**Command location**						
	Command location. Selector for 06.09 Used main control word. 0: **Local I/O**; drive is controlled via local I/O: – 20.02 On/Off1 source = DI1. – 20.04 Off2 source 1 (emergency off) = DIL. – 20.05 Off3 source (emergency stop) = Off3 inactive. – 20.06 Run/Stop source = DI2.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**
	– 20.08 Off2 source 2 (emergency off) = Off2 inactive. – 20.13 Fault reset source = DI3. 1: **Main control word**; drive is controlled via 06.01 Main control word. 2: **Key**; automatic switchover from Main control word to Local I/O in case of faults 6681 EFB communication, 7510 FBA A communication or 7520 FBA B communication. It is still possible to control the drive via Local I/O. The used speed reference is set by means of 22.32 Constant speed 7. 3: **12-pulse link**; the drive is controlled from the 12-pulse master, On/Off1 control, Off2 control, Run and Reset. Only available when 99.06 Operation mode = 12-pulse parallel slave, 12-pulse serial slave, 6-pulse serial slave, Serial sequential slave 30° or Serial sequential slave 0°. 4: **Field exciter link**; The field exciter is controlled by the armature converter, On/Off1 control, Off2 control, Run and Reset. Only available when 99.06 Operation mode = Field exciter. **Notes**: – Local control mode has higher priority than the selection made with 20.01 Command location. – Commands from 20.04 Off2 source 1 (emergency off), 20.05 Off3 source (emergency stop) and 20.13 Fault reset source are always valid, if activated. This is regardless of 20.01 Command location setting.						
	0 … 4	Local I/O	-	1 = 1	n	y	Parameter
20.02	**On/Off1 source**						
	On/Off1 command source. Binary signal for On/Off1 control. See 06.09.b00 Used main control word. The state transition is edge-triggered. 0 = Off1 command. 0 → 1 = On command, edge-triggered. **Note**: To give On- and Run command at the same time set 20.02 On/Off1 source = 20.06 Run/Stop source. **Other [bit]**; source selection. 0: **Off1 command**; 0. 1: **On command**; 1. 2: **None**; inactive. Off1 command is forced. 3: **DI1**; 10.02.b00 DI delayed status. 4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status. 20: **DI1 and DI2**; 3 wire control. – On- and Run command by rising edge (0 → 1) of DI1. DI2 must be high. – Stop- and Off1 command by falling edge (1 → 0) of DI2. Setting of DI1 does not matter. – Following settings apply: 20.02 On/Off1 source = 20.06 Run/Stop source = DI1 and DI2. – See 20.28 3 wire jogging off delay time. **Note:** DI2 = 0 stops the drive. Additionally, it overrides the On- and Run command of DI1.						
	0 … 20	DI1	-	1 = 1	n	n	Parameter
20.04	**Off2 source 1 (emergency off)**						
	1st Off2 command source.						

Index	Name						
	Text						
	Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
	1st binary signal for Off2 control (emergency off/fast current off). See 06.09.b01 Used main control word. Via an AND with 20.08 Off2 source 2 (emergency off). 0 = Off2 command. 1 = Off2 inactive. **Other [bit]**; source selection. 0: **Off2 command**; 0, emergency off/fast current off. 1: **Off2 inactive**; 1, normal operation. 3: **DI1**; 10.02.b00 DI delayed status. 4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status.						
	0 … 19	DIL	-	1 = 1	n	n	Parameter
20.05	**Off3 source (emergency stop)**						
	Off3 (emergency stop) command source. Binary signal for Off3 control (emergency stop). See 06.09.b02 Used main control word. The stop mode is selected by 21.03 Emergency stop mode. 0 = Off3 command. 1 = Off3 inactive. **Other [bit]**; source selection. 0: **Off3 command**; 0, emergency stop. 1: **Off3 inactive**; 1, normal operation. 3: **DI1**; 10.02.b00 DI delayed status. 4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status.						
	0 … 19	Off3 inactive	-	1 = 1	n	n	Parameter
20.06	**Run/Stop source**						
	Run/Stop command source. Binary signal for Run. See 06.09.b03 Used main control word. The state transition is edge-triggered. 0 = Stop command. 0 → 1 = Run command, edge-triggered. **Note**: To give On- and Run command at the same time set 20.02 On/Off1 source = 20.06 Run/Stop source. **Other [bit]**; source selection. 0: **Stop command**; 0. 1: **Run command**; 1. 2: **None**; inactive. Stop command is forced. 3: **DI1**; 10.02.b00 DI delayed status.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">4: DI2; 10.02.b01 DI delayed status.
5: DI3; 10.02.b02 DI delayed status.
6: DI4; 10.02.b03 DI delayed status.
7: DI5; 10.02.b04 DI delayed status.
8: DI6; 10.02.b05 DI delayed status.
11: DIO1; 11.02.b00 DIO delayed status.
12: DIO2; 11.02.b01 DIO delayed status.
19: DIL; 10.02.b15 DI delayed status.
20: DI1 and DI2; 3 wire control.
– On- and Run command by rising edge (0 → 1) of DI1. DI2 must be high.
– Stop- and Off1 command by falling edge (1 → 0) of DI2. Setting of DI1 does not matter.
– Following settings apply: 20.02 On/Off1 source = 20.06 Run/Stop source = DI1 and DI2.
– See 20.28 3 wire jogging off delay time.
Notes:
– DI2 = 0 stops the drive. Additionally, it overrides the On- and Run command of DI1.
– After a STO it is mandatory to give a Stop- and Off1 command and to give an On- and Run command. Thus, both DI1 and DI2 need to be toggled.</td></tr>
<tr><td>0 … 20</td><td>DI2</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3">20.08</td><td colspan="7">Off2 source 2 (emergency off)</td></tr>
<tr><td colspan="7">2nd Off2 command source.
2nd binary signal for Off2 control (emergency off/fast current off). See 06.09.b01 Used main control word. Via an AND with 20.04 Off2 source 1 (emergency off).
0 = Off2 command.
1 = Off2 inactive.
Other [bit]; source selection.
0: Off2 command; 0, emergency off/fast current off.
1: Off2 inactive; 1, normal operation.
3: DI1; 10.02.b00 DI delayed status.
4: DI2; 10.02.b01 DI delayed status.
5: DI3; 10.02.b02 DI delayed status.
6: DI4; 10.02.b03 DI delayed status.
7: DI5; 10.02.b04 DI delayed status.
8: DI6; 10.02.b05 DI delayed status.
11: DIO1; 11.02.b00 DIO delayed status.
12: DIO2; 11.02.b01 DIO delayed status.
19: DIL; 10.02.b15 DI delayed status.</td></tr>
<tr><td>0 … 19</td><td>Off2 inactive</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="2">20.13</td><td colspan="7">Fault reset source</td></tr>
<tr><td colspan="7">Reset source.
Binary signal for Reset. See 06.09.b07 Used main control word. The signal resets the drive after a fault trip if the cause of the fault no longer exists. The state transition is edge-triggered.
0 = Not selected.
0 → 1 = Reset.
Other [bit]; source selection.
0: No Reset; 0.
1: Reset; 1.
2: None; inactive. No Reset is forced.
3: DI1; 10.02.b00 DI delayed status.
4: DI2; 10.02.b01 DI delayed status.
5: DI3; 10.02.b02 DI delayed status.</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type

6: **DI4**; 10.02.b03 DI delayed status.
7: **DI5**; 10.02.b04 DI delayed status.
8: **DI6**; 10.02.b05 DI delayed status.
11: **DIO1**; 11.02.b00 DIO delayed status.
12: **DIO2**; 11.02.b01 DIO delayed status.
19: **DIL**; 10.02.b15 DI delayed status.
30: **FBA A MCW bit 7**; 06.03.b07 FBA A transparent control word.
31: **FBA B MCW bit 7**; 06.04.b07 FBA B transparent control word.
32: **EFB MCW bit 7**; 06.05.b07 EFB transparent control word.

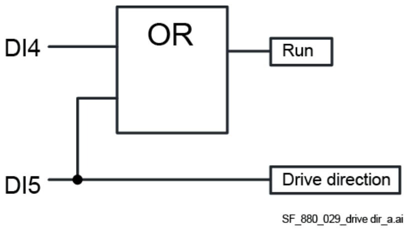
Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
0 … 32	DI3	-	1 = 1	n	y	Parameter

20.14 **Direction of rotation source**

Direction source.
Binary signal for Direction. 20.14 Direction of rotation source allows changing the direction of rotation by negating the speed reference in remote operation.
Example 1: Typically used for a standard interface. 20.06 Run/Stop source = DI4 and 20.14 Direction of rotation source = DI5:

DI4	DI5	06.09.b03 Used main control word = Run	Direction of rotation
0	0	0 = Stop command	-
0	1	0 = Stop command	-
1	0	1 = Run command	Forward
1	1	1 = Run command	Reverse

Example 2: Typically used for a joystick interface. 20.06 Run/Stop source = DI4 and 20.14 Direction of rotation source = DI5 set Run:

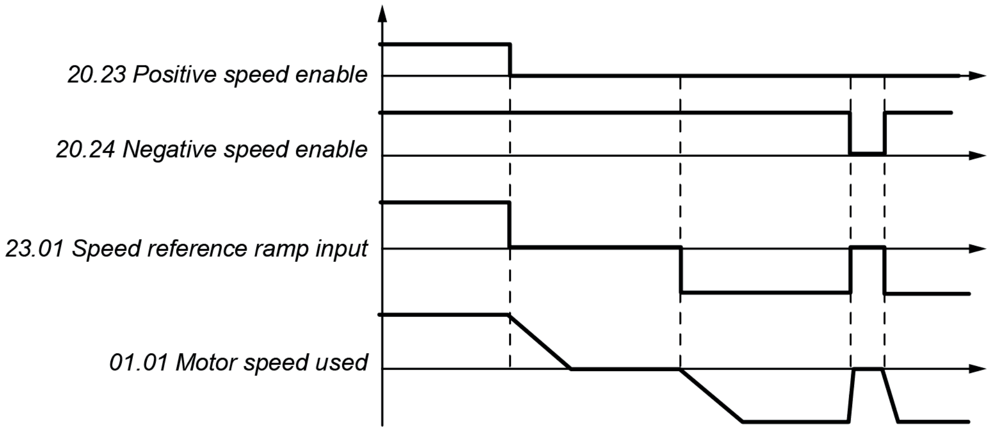


SF_880_029_drive dir_a.ai

DI4	DI5	06.09.b03 Used main control word = Run	Direction of rotation
0	0	0 = Stop command	-
0	1	1 = Run command	Reverse
1	0	1 = Run command	Forward
1	1	Not used by joystick (1 = Run command)	Not used by joystick (reverse)

0 = Forward.
1 = Reverse.
Other [bit]; source selection.
0: **Forward**; 0, normal operation.
1: **Reverse**; 1.
3: **DI1**; 10.02.b00 DI delayed status.
4: **DI2**; 10.02.b01 DI delayed status.

Index	Name						
	Text						
	Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
	5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status. 40: **DI1 set Run**; 10.02.b00 DI delayed status. DI1 = 1: Direction reverse and set Run command. DI1 = 0: normal operation, see 20.06 Run/Stop source. 41: **DI2 set Run**; 10.02.b01 DI delayed status. DI2 = 1: Direction reverse and set Run command. DI2 = 0: normal operation, see 20.06 Run/Stop source. 42: **DI3 set Run**; 10.02.b02 DI delayed status. DI3 = 1: Direction reverse and set Run command. DI3 = 0: normal operation, see 20.06 Run/Stop source. 43: **DI4 set Run**; 10.02.b03 DI delayed status. DI4 = 1: Direction reverse and set Run command. DI4 = 0: normal operation, see 20.06 Run/Stop source. 44: **DI5 set Run**; 10.02.b04 DI delayed status. DI5 = 1: Direction reverse and set Run command. DI5 = 0: normal operation, see 20.06 Run/Stop source. 45: **DI6 set Run**; 10.02.b05 DI delayed status. DI6 = 1: Direction reverse and set Run command. DI6 = 0: normal operation, see 20.06 Run/Stop source. 46: **DIO1 set Run**; 11.02.b00 DIO delayed status. DIO1 = 1: Direction reverse and set Run command. DIO1 = 0: normal operation, see 20.06 Run/Stop source. 47: **DIO2 set Run**; 11.02.b01 DIO delayed status. DIO2 = 1: Direction reverse and set Run command. DIO2 = 0: normal operation, see 20.06 Run/Stop source. 48: **DIL set Run**; 10.02.b15 DI delayed status. DIL = 1: Direction reverse and set Run command. DIL = 0: normal operation, see 20.06 Run/Stop source.						
	0 … 48	Forward	-	1 = 1	n	y	Parameter
20.15	**Hand/Auto source**						
	Hand/Auto source. Binary signal to switch between Hand (Local I/O) and Auto (Main control word) control. The selection made by 20.01 Command location is overwritten. 0 = Hand. 1 = Auto. **Other [bit]**; source selection. 0: **Hand**; 0. 1: **Auto**; 1. 2: **None**; inactive. 20.01 Command location is valid. 3: **DI1**; 10.02.b00 DI delayed status. 4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status.						
	0 … 19	None	-	1 = 1	n	y	Parameter
20.23	**Positive speed enable**						
	Enable positive speed source. Binary signal to enable positive speed. 0 = Disable positive speed.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">1 = Enable positive speed.
In the figure below, positive speed reference is set to zero after the positive speed enable signal has been cleared. Actions:
If in speed control, the speed reference is set to zero and the motor is stopped along the currently active deceleration ramp.
If in torque control, the rotation direction of the motor is monitored.

DZ_LIN_035_speed_a.ai
Example: The motor is rotating in the forward direction. To stop the motor, the positive speed enable signal is cleared by a hardware limit switch (e.g. via digital input).
If the positive speed enable signal remains deactivated and the negative speed enable signal is active, only reverse rotation of the motor is allowed.
Other [bit]; source selection.
0: Disable positive speed; 0; positive speed reference is set to zero.
1: Enable positive speed; 1; normal operation.
3: DI1; 10.02.b00 DI delayed status.
4: DI2; 10.02.b01 DI delayed status.
5: DI3; 10.02.b02 DI delayed status.
6: DI4; 10.02.b03 DI delayed status.
7: DI5; 10.02.b04 DI delayed status.
8: DI6; 10.02.b05 DI delayed status.
11: DIO1; 11.02.b00 DIO delayed status.
12: DIO2; 11.02.b01 DIO delayed status.
19: DIL; 10.02.b15 DI delayed status.</td></tr>
<tr><td>0 … 19</td><td>Enable positive speed</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">20.24</td><td colspan="7">Negative speed enable</td></tr>
<tr><td colspan="7">Enable negative speed source.
Binary signal to enable negative speed.
0 = Disable negative speed.
1 = Enable negative speed.
See 20.23 Positive speed enable.</td></tr>
<tr><td>0 … 19</td><td>Enable negative speed</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">20.25</td><td colspan="7">Jog function enable</td></tr>
<tr><td colspan="7">Enable jog function source.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Binary signal for the jog function. Jogging itself is selected by 20.26 Jogging 1 start source or 20.27 Jogging 2 start source.
0 = Disable jog function.
1 = Enable jog function.
Note: If a start command is active, 20.25 Jog function enable is ignored. If 20.25 Jog function enable is active, all start commands are ignored, apart from jogging and inching. See 06.02.b08/b09 Main control word.
Other [bit]; source selection.
0: **Disable jog function**; 0, normal operation.
1: **Enable jog function**; 1. This suppresses the run command given from remote or local I/O. Thus, the drive can only be run from local, jogging and inching.
2: **Enable by jog commands**; jog function is directly enabled by jogging 1 start or jogging 2 start. See 20.26 Jogging 1 start source and 20.27 Jogging 2 start source.
3: **DI1**; 10.02.b00 DI delayed status.
4: **DI2**; 10.02.b01 DI delayed status.
5: **DI3**; 10.02.b02 DI delayed status.
6: **DI4**; 10.02.b03 DI delayed status.
7: **DI5**; 10.02.b04 DI delayed status.
8: **DI6**; 10.02.b05 DI delayed status.
11: **DIO1**; 11.02.b00 DIO delayed status.
12: **DIO2**; 11.02.b01 DIO delayed status.
19: **DIL**; 10.02.b15 DI delayed status.</td></tr>
<tr><td>0 … 19</td><td>Disable jog function</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**20.26**</td><td colspan="7">**Jogging 1 start source**</td></tr>
<tr><td colspan="7">Enable jogging 1 start source.
Binary signal for jogging 1 start. If enabled by 20.25 Jog function enable, selects the source for the activation of jogging 1.
0 = Disable jogging 1.
1 = Enable jogging 1.
Notes:
– 20.01 Command location = Local I/O:
– The drive must be in state Ready run. Mark, that only the On command has been given. When jogging 1 start is given the drives sets automatically the Run command. The motor accelerates to the speed set in 22.42 Jogging 1 reference.
– Acceleration and deceleration time for jogging is selected by 23.20 Acceleration time jogging and 23.21 Deceleration time jogging.
– If both jogging 1 and 2 are activated, the one that was activated first has priority.
– Inching is not possible.
– 20.01 Command location = Main control word:
– Set Ramp out zero = Ramp hold = Ramp in zero = 0, then give On command, Run command and Inching 1. See 06.01.b08 Main control word.
– Acceleration and deceleration time for jogging is selected by 23.20 Acceleration time jogging and 23.21 Deceleration time jogging.
– If both inching 1 and 2 are activated, the one that was activated first has priority.
– Jogging is not possible.
Other [bit]; source selection.
0: **Disable jogging 1**; 0, normal operation.
1: **Enable jogging 1**; 1.
3: **DI1**; 10.02.b00 DI delayed status.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">4: **DI2**; 10.02.b01 DI delayed status.
5: **DI3**; 10.02.b02 DI delayed status.
6: **DI4**; 10.02.b03 DI delayed status.
7: **DI5**; 10.02.b04 DI delayed status.
8: **DI6**; 10.02.b05 DI delayed status.
11: **DIO1**; 11.02.b00 DIO delayed status.
12: **DIO2**; 11.02.b01 DIO delayed status.
19: **DIL**; 10.02.b15 DI delayed status.
40: **DI1 plus direction**; 10.02.b00 DI delayed status. 20.14 Direction of rotation source is considered.
41: **DI2 plus direction**; 10.02.b01 DI delayed status. 20.14 Direction of rotation source is considered.
42: **DI3 plus direction**; 10.02.b02 DI delayed status. 20.14 Direction of rotation source is considered.
43: **DI4 plus direction**; 10.02.b03 DI delayed status. 20.14 Direction of rotation source is considered.
44: **DI5 plus direction**; 10.02.b04 DI delayed status. 20.14 Direction of rotation source is considered.
45: **DI6 plus direction**; 10.02.b05 DI delayed status. 20.14 Direction of rotation source is considered.
46: **DIO1 plus direction**; 11.02.b00 DIO delayed status. 20.14 Direction of rotation source is considered.
47: **DIO2 plus direction**; 11.02.b01 DIO delayed status. 20.14 Direction of rotation source is considered.
48: **DIL plus direction**; 10.02.b15 DI delayed status. 20.14 Direction of rotation source is considered.</td></tr>
<tr><td>0 … 48</td><td>Disable jogging 1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**20.27**</td><td colspan="7">**Jogging 2 start source**</td></tr>
<tr><td colspan="7">Enable jogging 2 start source.
Binary signal for jogging 2 start. If enabled by 20.25 Jog function enable, selects the source for the activation of jogging 2.
0 = Disable jogging 2.
1 = Enable jogging 2.
Notes:
– 20.01 Command location = Local I/O:
    – The drive must be in state Ready run. Mark, that only the On command has been given. When jogging 2 start is given the drives sets automatically the Run command. The motor accelerates to the speed set in 22.43 Jogging 2 reference.
    – Acceleration and deceleration time for jogging is selected by 23.20 Acceleration time jogging and 23.21 Deceleration time jogging.
    – If both jogging 1 and 2 are activated, the one that was activated first has priority.
    – Inching is not possible.
– 20.01 Command location = Main control word:
    – Set Ramp out zero = Ramp hold = Ramp in zero = 0, then give On command, Run command and Inching 2. See 06.01.b09 Main control word.
    – Acceleration and deceleration time for jogging is selected by 23.20 Acceleration time jogging and 23.21 Deceleration time jogging.
    – If both inching 1 and 2 are activated, the one that was activated first has priority.
    – Jogging is not possible.</td></tr>
</table>

Index	Name						
	Text						
	Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
	Other [bit]; source selection. 0: **Disable jogging 2**; 0, normal operation. 1: **Enable jogging 2**; 1. 3: **DI1**; 10.02.b00 DI delayed status. 4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status. 40: **DI1 plus direction**; 10.02.b00 DI delayed status. 20.14 Direction of rotation source is considered. 41: **DI2 plus direction**; 10.02.b01 DI delayed status. 20.14 Direction of rotation source is considered. 42: **DI3 plus direction**; 10.02.b02 DI delayed status. 20.14 Direction of rotation source is considered. 43: **DI4 plus direction**; 10.02.b03 DI delayed status. 20.14 Direction of rotation source is considered. 44: **DI5 plus direction**; 10.02.b04 DI delayed status. 20.14 Direction of rotation source is considered. 45: **DI6 plus direction**; 10.02.b05 DI delayed status. 20.14 Direction of rotation source is considered. 46: **DIO1 plus direction**; 11.02.b00 DIO delayed status. 20.14 Direction of rotation source is considered. 47: **DIO2 plus direction**; 11.02.b01 DIO delayed status. 20.14 Direction of rotation source is considered. 48: **DIL plus direction**; 10.02.b15 DI delayed status. 20.14 Direction of rotation source is considered.						
	0 … 48	Disable jogging 2	-	1 = 1	n	y	Parameter
20.28	**3 wire jogging off delay time**						
	Delay time for 3 wire jogging. Mains contactor off delay when 20.02 On/Off1 source = 20.06 Run/Stop source = DI1 and DI2. After jogging is taken away the opening of the mains contactor is delayed by 20.28 3 wire jogging off delay time. That means the mains contactor is held during cyclic jogging.						
	0.0 … 3250.0	5.0	s	10 = 1 s	n	y	Parameter
	Bit	**Name**	**Value**	**Remarks**			
20.33	**Mains contactor control mode**						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**

Control mode for mains contactor or DC-breaker.

20.33 Mains contactor control mode determines the reaction to On- and Run command. See 06.09.b03 Used main control word.

Notes:

- If a DC-breaker is used and the DC voltage measurement is taken inside the converter module (H1 … H8 modules in default configuration) do the following:
  - Set 20.33 Mains contactor control mode = DC-contactor.
  - Set 95.37 DC voltage measurement mode = DC-contactor.
  - Balance 01.21 Armature voltage by means of 95.35 DC voltage measurement offset.
  - Use XSMC:1/2 to close the DC-breaker. Alternatively, it is also possible to use 06.24.b07 Current controller status word 1 via a relay output (RO).
- If a DC-breaker is used and the DC voltage measurement is located at the motor terminals via SDCS-UCM-01 and AI3 (H1 … H5 modules in default configuration) do the following:
  - Set 20.33 Mains contactor control mode = On, default.
  - Set 95.37 DC voltage measurement mode = AI3 scaled.
  - Set 95.35 DC voltage measurement offset = 0, default.
  - Use XSMC:1/2 to close the DC-breaker. Alternatively, it is also possible to use 06.24.b07 Current controller status word 1 via a relay output (RO).
- If a DC-breaker is used and the DC voltage measurement is located at the motor terminals (re-wired H6 … H8 modules) do the following:
  - Set 20.33 Mains contactor control mode = On, default.
  - Set 95.37 DC voltage measurement mode = Manual, default.
  - Set 95.35 DC voltage measurement offset = 0, default.
  - Use XSMC:1/2 to close the DC-breaker. Alternatively, it is also possible to use 06.24.b07 Current controller status word 1 via a relay output (RO).

0: **On**; mains contactor or DC-breaker closes with the On command.

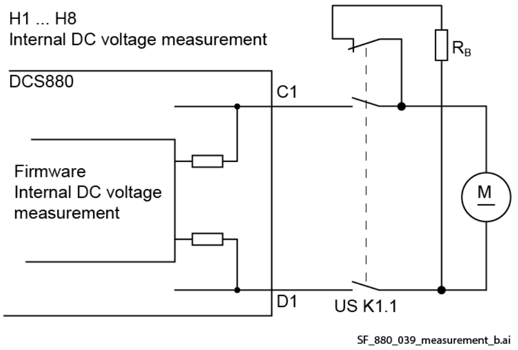
1: **On and Run**; mains contactor or DC-breaker closes with On- and Run command.

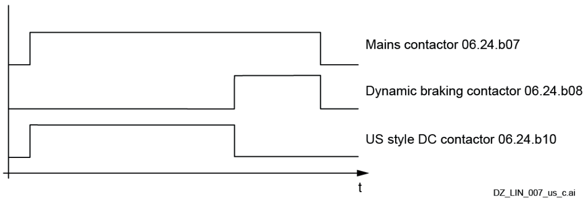
3: **DC-contactor**; if a DC-breaker or a DC-contactor (US style) is used as a mains contactor, it will be closed with the On command:

- Use manual voltage balancing. Thus, set 95.37 DC voltage measurement mode = DC-contactor and balance 01.21 Armature voltage by means of 95.35 DC voltage measurement offset.
- The armature voltage measurements are adapted to an open DC-breaker by clamping 01.21 Armature voltage in V, 28.05 Armature voltage, 28.06 EMF voltage and 94.01 EMF speed to zero when the drive is Off. The clamping is released either 100 ms after an On command is given in case 20.35 DC-breaker acknowledge source = None or when using the DC-breaker acknowledge with 20.35 DC-breaker acknowledge source = DIxx until the acknowledge signal indicates that the DC-breaker is closed.

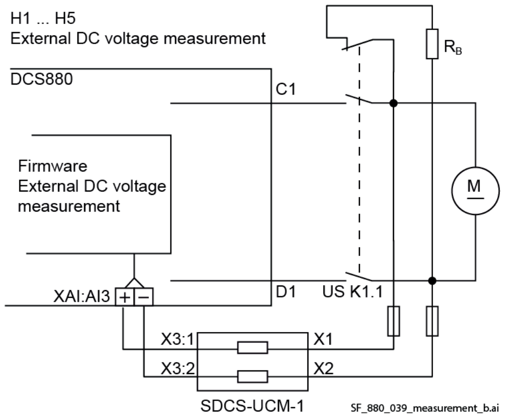
Note: The DC-contactor (US style) K1.1 is a special designed DC-contactor with one normally closed contact for the dynamic braking resistor R_B and two normally open contacts for C1 and D1. The DC-contactor should be controlled by 06.24.b10 Current controller status word 1. The acknowledge signal can be connected to either 20.34 Mains contactor acknowledge source, or 20.35 DC-breaker acknowledge source. Use 20.33 Mains contactor control mode = DC-contactor.

Index	Name					
	Text					
	Range	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**





Set 95.37 DC voltage measurement mode = DC-contactor.



	Internal DC voltage measurement	External DC voltage measurement
Without field weakening	20.44 Dynamic braking delay ≥ 0.1 s.	20.44 Dynamic braking delay ≤ -0.1 s.
With field weakening	Not allowed.	

Set 95.37 DC voltage measurement mode = AI3 scaled.

See also DCS880 External DC voltage measurement H1 ... H5 (3ADW000601).

	0 … 3	On	-	1 = 1	n	y	Parameter

20.34 **Mains contactor acknowledge source**

Mains contactor acknowledge source.
The event generates fault F524 Mains contactor acknowledge:
- Immediately, when the acknowledge signal is selected and the feedback is lost during operation.
- After 10 seconds, when the drive is being switched on, the acknowledge is selected and the feedback is missing for longer than 10 seconds.

The mains contactor acknowledge is also dependent on the setting of 20.33 Mains contactor control mode.
0 = No acknowledge.
1 = Acknowledge.
Other [bit]; source selection.
0: **No acknowledge**; 0.
1: **Acknowledge**; 1.
2: **None**; inactive. Mains contactor acknowledge is disabled.
3: **DI1**; 10.02.b00 DI delayed status.
4: **DI2**; 10.02.b01 DI delayed status.
5: **DI3**; 10.02.b02 DI delayed status.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">6: DI4; 10.02.b03 DI delayed status.
7: DI5; 10.02.b04 DI delayed status.
8: DI6; 10.02.b05 DI delayed status.
11: DIO1; 11.02.b00 DIO delayed status.
12: DIO2; 11.02.b01 DIO delayed status.
19: DIL; 10.02.b15 DI delayed status</td></tr>
<tr><td>0 … 19</td><td>None</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">20.35</td><td colspan="7">DC-breaker acknowledge source</td></tr>
<tr><td colspan="7">DC-breaker acknowledge source.
The event generates warning A103 DC-breaker acknowledge, if the DC-breaker acknowledge is selected and the feedback is missing.
The motor will coast if the warning is set.
0 = No acknowledge.
1 = Acknowledge.
Other [bit]; source selection.
0: No acknowledge; 0.
1: Acknowledge; 1.
2: None; inactive. DC-breaker acknowledge is disabled.
3: DI1; 10.02.b00 DI delayed status.
4: DI2; 10.02.b01 DI delayed status.
5: DI3; 10.02.b02 DI delayed status.
6: DI4; 10.02.b03 DI delayed status.
7: DI5; 10.02.b04 DI delayed status.
8: DI6; 10.02.b05 DI delayed status.
11: DIO1; 11.02.b00 DIO delayed status.
12: DIO2; 11.02.b01 DIO delayed status.
19: DIL; 10.02.b15 DI delayed status</td></tr>
<tr><td>0 … 19</td><td>None</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">20.38</td><td colspan="7">Drive fan acknowledge source</td></tr>
<tr><td colspan="7">Drive fan acknowledge source.
31.41 Drive fan fault function = Warning:
– At start the event generates warning A581 Drive fan acknowledge, if the drive fan acknowledge is selected and the feedback is missing for longer than 6 seconds.
– During running the event immediately generates warning A581 Drive fan acknowledge, if the drive fan acknowledge is selected and the feedback is missing.
– The warning is reset if the drive fan acknowledge is coming back.
31.41 Drive fan fault function = Fault:
– At start the event generates warning A581 Drive fan acknowledge, if the drive fan acknowledge is selected and the feedback is missing for longer than 6 seconds.
If the feedback is missing for longer than 10 seconds the event generates fault 5080 Drive fan acknowledge.
– During running the event immediately generates warning A581 Drive fan acknowledge, if the drive fan acknowledge is selected and the feedback is missing.
If the feedback is missing for longer than 10 seconds the event generates fault 5080 Drive fan acknowledge.
– The warning is reset automatically if the drive fan acknowledge is coming back before 10 seconds are elapsed.
0 = No acknowledge.
1 = Acknowledge.</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
	Other [bit]; source selection. 0: **No acknowledge**; 0. 1: **Acknowledge**; 1. 2: **None**; inactive. Drive fan acknowledge is disabled. 3: **DI1**; 10.02.b00 DI delayed status. 4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status						
	0 … 19	None	-	1 = 1	n	y	Parameter
20.39	**Motor fan acknowledge source**						
	Motor/External fan acknowledge source. – At start the event generates warning A781 Motor fan acknowledge, if the motor/external fan acknowledge is selected and the feedback is missing for longer than 6 seconds. If the feedback is missing for longer than 10 seconds the event generates fault 71B1 Motor fan acknowledge. – During running the event immediately generates warning A781 Motor fan acknowledge, if the motor/external fan acknowledge is selected and the feedback is missing. If the feedback is missing for longer than 10 seconds the event generates fault 71B1 Motor fan acknowledge. – The warning is reset automatically if the motor/external fan acknowledge is coming back before 10 seconds are elapsed. 0 = No acknowledge. 1 = Acknowledge. **Other [bit]**; source selection. 0: **No acknowledge**; 0. 1: **Acknowledge**; 1. 2: **None**; inactive. Motor fan acknowledge is disabled. 3: **DI1**; 10.02.b00 DI delayed status. 4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status						
	0 … 19	None	-	1 = 1	n	y	Parameter
20.40	**Drive/Motor fan delay time**						
	Delay time for drive/motor fan. After the drive has given an Off command all fans, drive and motor, continue to run until 20.40 Drive/Motor fan delay time elapses. If drive or motor overtemperature is pending, the delay starts after the temperature has dropped below the overtemperature level.						
	0.0 … 3250.0	0.0	s	10 = 1 s	n	y	Parameter
20.43	**Dynamic braking acknowledge source**						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Dynamic braking acknowledge source.
The event generates warning A105 Dynamic braking acknowledge, if dynamic braking acknowledge is selected and the feedback dynamic braking active is still present when an On command is given. This prevents the drive from starting, while dynamic braking is active.
0 = Dynamic braking inactive.
1 = Dynamic braking active.
Other [bit]; source selection.
0: **Dynamic braking inactive**; 0, normal operation.
1: **Dynamic braking active**; 1.
3: **DI1**; 10.02.b00 DI delayed status.
4: **DI2**; 10.02.b01 DI delayed status.
5: **DI3**; 10.02.b02 DI delayed status.
6: **DI4**; 10.02.b03 DI delayed status.
7: **DI5**; 10.02.b04 DI delayed status.
8: **DI6**; 10.02.b05 DI delayed status.
11: **DIO1**; 11.02.b00 DIO delayed status.
12: **DIO2**; 11.02.b01 DIO delayed status.
19: **DIL**; 10.02.b15 DI delayed status</td></tr>
<tr><td>0 … 19</td><td>Dynamic braking inactive</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**20.44**</td><td colspan="7">**Dynamic braking delay**</td></tr>
<tr><td colspan="7">Delay time for Dynamic braking.
In case of dynamic braking with EMF speed feedback, see 90.41 M1 feedback selection, or a speed feedback fault and the motor voltage is not measured directly at the motor terminals, e.g. due to a DC-contactor (US style), there is no valid information about the motor speed and no zero-speed information. Thus, dynamic braking and excitation is active until 20.44 Dynamic braking delay is elapsed.
≤ -0.1 s; the motor voltage is measured directly at the motor terminals and is valid during dynamic braking.
= 0.0 s; during dynamic braking, no zero-speed signal is generated.
≥ 0.1 s; during dynamic braking, a zero-speed signal is generated after the programmed time is elapsed.</td></tr>
<tr><td>-1.0 … 3250.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**20.47**</td><td colspan="7">**Overvoltage protection trigger source**</td></tr>
<tr><td colspan="7">Overvoltage protection trigger source.
The event generates warning A120 Overvoltage protection active and blocks the current controller, if the overvoltage protection trigger is selected and triggered. The drive must be in field exciter mode. See 99.06 Operation mode.
Note: The DO of the DCF506 must be connected to a DI of the large field exciter.
0 = No trigger command.
1 = Trigger.
Other [bit]; source selection.
0: **No trigger command**; 0, normal operation.
1: **Trigger command**; 1.
3: **DI1**; 10.02.b00 DI delayed status.
4: **DI2**; 10.02.b01 DI delayed status.
5: **DI3**; 10.02.b02 DI delayed status.
6: **DI4**; 10.02.b03 DI delayed status.
7: **DI5**; 10.02.b04 DI delayed status.</td></tr>
</table>

Index	Name						
	Text						
	Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
	8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status						
	0 … 19	No trigger command	-	1 = 1	n	y	Parameter

21 Start/Stop mode

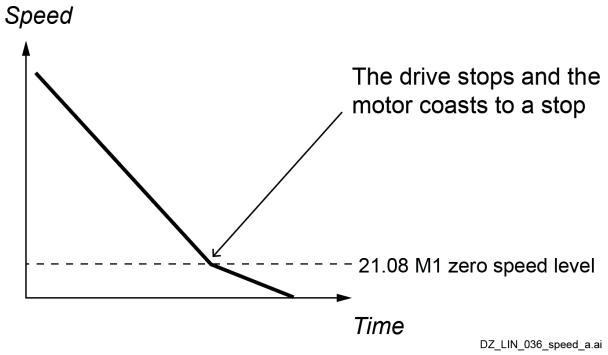
Start and stop modes, emergency stop mode and zero speed.

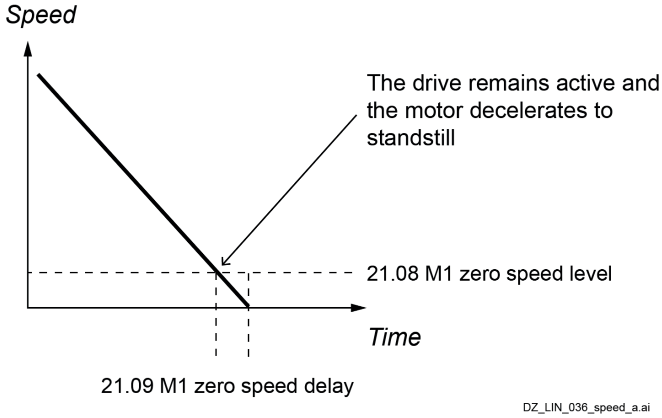
Index	Name						
	Text						
	Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
21.01	**Start mode**						
	Start mode of the drive. Selects the motor start function in response to a Run command. See 06.09.b03 Used main control word. 0: **Start from zero**; wait until the motor has reached zero speed, then restart. See 21.08 M1 zero speed level. In case the restart command comes before zero speed is reached, A137 Start condition conflict is generated. 1: **Flying start**; start the drive into a rotating motor, when stopping via Coast stop, Ramp stop or Torque limit. Stop via Dynamic braking, Off2 (emergency off/electrical disconnect/fast current off) or Off3 (emergency stop) is not interrupted. Wait until zero speed is reached. 2: **Flying start dynamic braking**; start the drive into a rotating motor, when stopping via Coast stop, Ramp stop, Torque limit or Dynamic braking. Dynamic braking is interrupted. Make sure, that the hardware, e.g. the switch disconnecting the braking resistor, can disconnect the current.						
	0 … 2	Flying start	-	1 = 1	n	y	Parameter
21.02	**Off1 mode**						
	Mode for On/Off1 control. Selects the way the motor is stopped when an Off1 command is given. See 06.09.b00 Used main control word. In case Off1 command and Stop command are given at the same time or nearly contemporary 21.02 Off1 mode and 21.04 Stop mode must have the same setting. Priority list: Highest priority: 06.09.b01 Off2 control. 21.03 Emergency stop mode. 21.02 Off1 mode. Lowes priority: 21.04 Stop mode. 0: **Coast stop**; the motor coasts to a stop. The firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current as fast as possible. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped. 1: **Ramp stop**; the input of the drive ramp is set to zero. Thus, the motor stops along the active deceleration ramp. See 23.11 Ramp set selection. When reaching 21.08 M1 zero speed level the firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped. In case 19.20 Follower force ramp stop = Force speed control the torque selector is bypassed, and the drive is forced to speed control.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">3: **Torque limit**; the output of the drive ramp is set to zero. Thus, the motor stops at the active torque limit. When reaching 21.08 M1 zero speed level the firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.
In case 19.20 Follower force ramp stop = Force speed control the torque selector is bypassed, and the drive is forced to speed control.
4: **Dynamic braking**; the motor stops by means of dynamic braking. After dynamic braking is finished the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.</td></tr>
<tr><td>0 … 4</td><td>Ramp stop</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**21.03**</td><td colspan="7">**Emergency stop mode**</td></tr>
<tr><td colspan="7">Mode for Off3 control (emergency stop).
Selects the way the motor is stopped when an Off3 (emergency stop) command is given. See 06.09.b02 Used main control word.
Priority list:
Highest priority: 06.09.b01 Off2 control.
21.03 Emergency stop mode.
21.02 Off1 mode.
Lowes priority: 21.04 Stop mode.
Attention:
– An emergency stop request (SS1) by a fieldbus safety module (FSPS-21/FSO-21) automatically forces 21.03 Emergency stop mode = Emergency ramp stop if option 0 ... 4 is set.
– An emergency stop request (SS1) by a fieldbus safety module (FSPS-21/FSO-21) automatically forces 21.03 Emergency stop mode = Emergency ramp stop MC on if option 6 ... 10 is set.
Otherwise the function is executed as described below.
0: **Coast stop**; the motor coasts to a stop. The firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current as fast as possible. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.
See Off3 stop mode 0 in 06.20.b10 Run inhibit status word.
1: **Ramp stop**; the input of the drive ramp is set to zero. Thus, the motor stops along the active deceleration ramp. See 23.11 Ramp set selection. When reaching 21.08 M1 zero speed level the firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped. See Off3 stop mode 1 in 06.20.b11 Run inhibit status word.
In case 19.20 Follower force ramp stop = Force speed control the torque selector is bypassed, and the drive is forced to speed control.
2: **Emergency ramp stop**; the input of the drive ramp is set to zero. Thus, the motor stops along the emergency stop ramp. See 23.23 Emergency stop time. When reaching 21.08 M1 zero speed level the firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped. See Off3 stop mode 2 in 06.20.b12 Run inhibit status word.
In case 19.20 Follower force ramp stop = Force speed control the torque selector is bypassed, and the drive is forced to speed control.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">3: Torque limit; the output of the drive ramp is set to zero. Thus, the motor stops at the active torque limit. When reaching 21.08 M1 zero speed level the firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped. See Off3 stop mode 3 in 06.20.b13 Run inhibit status word.
In case 19.20 Follower force ramp stop = Force speed control the torque selector is bypassed, and the drive is forced to speed control.
4: Dynamic braking; the motor stops by means of dynamic braking. See Off3 stop mode 4 in 06.20.b14 Run inhibit status word. After dynamic braking is finished the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.
6: Coast stop MC on; the motor coasts to a stop. The firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current as fast as possible. When the armature current is zero the firing pulses are blocked. The breakers stay closed. Field exciter and fans continue to run. To re-start give a new Run command (06.01.b03 Main control word). See Off3 stop mode 0 in 06.20.b10 Run inhibit status word.
7: Ramp stop MC on; the input of the drive ramp is set to zero. Thus, the motor stops along the active deceleration ramp. See 23.11 Ramp set selection. When reaching 21.08 M1 zero speed level the firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked. The breakers stay closed. Field exciter and fans continue to run. To re-start give a new Run command (06.01.b03 Main control word). See Off3 stop mode 1 in 06.20.b11 Run inhibit status word.
In case 19.20 Follower force ramp stop = Force speed control the torque selector is bypassed, and the drive is forced to speed control.
8: Emergency ramp stop MC on; the input of the drive ramp is set to zero. Thus, the motor stops along the emergency stop ramp. See 23.23 Emergency stop time. When reaching 21.08 M1 zero speed level the firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked. The breakers stay closed. Field exciter and fans continue to run. To re-start give a new Run command (06.01.b03 Main control word). See Off3 stop mode 2 in 06.20.b12 Run inhibit status word.
In case 19.20 Follower force ramp stop = Force speed control the torque selector is bypassed, and the drive is forced to speed control.
9: Torque limit MC on; the output of the drive ramp is set to zero. Thus, the motor stops at the active torque limit. When reaching 21.08 M1 zero speed level the firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked. The breakers stay closed. Field exciter and fans continue to run. To re-start give a new Run command (06.01.b03 Main control word). See Off3 stop mode 3 in 06.20.b13 Run inhibit status word.
In case 19.20 Follower force ramp stop = Force speed control the torque selector is bypassed, and the drive is forced to speed control.
10: Dynamic braking MC on; the motor stops by means of dynamic braking. See Off3 stop mode 4 in 06.20.b14 Run inhibit status word. After dynamic braking is finished the firing pulses are blocked. The breakers stay closed. Field exciter and fans continue to run. To re-start give a new Run command (06.01.b03 Main control word).</td></tr>
<tr><td>0 … 10</td><td>Emergency ramp stop</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">21.04</td><td colspan="7">Stop mode</td></tr>
<tr><td colspan="7">Mode for Stop.</td></tr>
</table>

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**
	Selects the way the motor is stopped when a Stop command is given. See 06.09.b03 Used main control word. In case Off1 command and Stop command are given at the same time or nearly contemporary 21.02 Off1 mode and 21.04 Stop mode must have the same setting. Priority list: Highest priority: 06.09.b01 Off2 control. 21.03 Emergency stop mode. 21.02 Off1 mode. Lowes priority: 21.04 Stop mode. 0: **Coast stop**; the motor coasts to a stop. The firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current as fast as possible. When the armature current is zero the firing pulses are blocked. 1: **Ramp stop**; the input of the drive ramp is set to zero. Thus, the motor stops along the active deceleration ramp. See 23.11 Ramp set selection. When reaching 21.08 M1 zero speed level the firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked. In case 19.20 Follower force ramp stop = Force speed control the torque selector is bypassed, and the drive is forced to speed control. 3: **Torque limit**; the output of the drive ramp is set to zero. Thus, the motor stops at the active torque limit. When reaching 21.08 M1 zero speed level the firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked. In case 19.20 Follower force ramp stop = Force speed control the torque selector is bypassed, and the drive is forced to speed control. 4: **Dynamic braking**; the motor stops by means of dynamic braking. After dynamic braking is finished the firing pulses are blocked.						
	0 … 4	Ramp stop	-	1 = 1	n	y	Parameter
21.06	**Used zero speed level**						
	Used zero speed level. Shows the used zero speed level depending on the setting of 42.01 Motor 1/2 selection, 21.08 M1 zero speed level and 42.21 M2 zero speed level. **Note**: E.g. used for the mechanical brake control and for the SS1 function with a fieldbus safety module (FSPS-21/FSO-21).						
	-30000.00 … 30000.00	-	rpm	See 46.02	y	n	Signal
21.07	**Used zero speed delay**						
	Used zero speed delay. Shows the used zero speed delay depending on the setting of 42.01 Motor 1/2 selection, 21.09 M1 zero speed delay and 42.22 M2 zero speed delay. **Note**: E.g. used for the mechanical brake control and for the SS1 function with a fieldbus safety module (FSPS-21/FSO-21).						
	0.0 … 3250.0	-	s	10 = 1 s	n	y	Signal
21.08	**M1 zero speed level**						
	Motor 1 zero speed level. Depending on the situation, the following is happening: – When a Stop command is given, the motor decelerates along a speed ramp or at torque limit until the zero-speed level is reached and 21.09 M1 zero speed delay is elapsed. See						

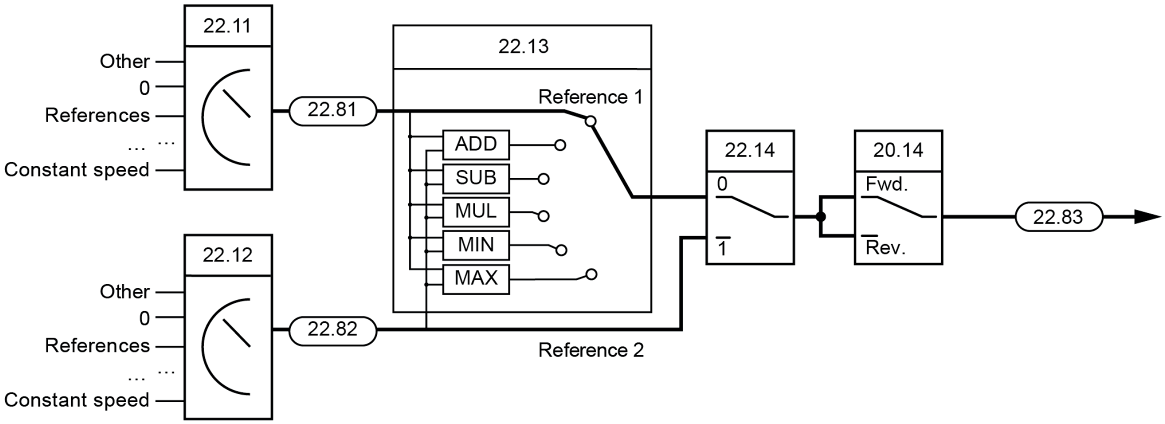
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">21.04 Stop mode. Afterwards the motor will coast. At that moment, existing brakes are closed (applied).
– When an emergency stop request (SS1) is given by a fieldbus safety module (FSPS-21/FSO-21), the motor decelerates according to 23.23 Emergency stop time until the zero-speed level is reached and 21.09 M1 zero speed delay is elapsed. At that moment, existing brakes are closed (applied) and the STO command is applied by the safety fieldbus module (FSPS-21/FSO-21). See 21.03 Emergency stop mode.
While the speed feedback is in the level, Zero speed is set high. See 06.21.b00 Speed control status word.
Notes:
– In case 21.01 Start mode = Start from zero and in case the restart command comes before zero speed is reached, warning A137 Start condition conflict is generated.
– Setting 21.08 M1 zero speed level = 30000.00 rpm disables the zero-speed supervision.</td></tr>
<tr><td></td><td>0.00 … 30000.00</td><td>75.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">21.09</td><td colspan="7">M1 zero speed delay</td></tr>
<tr><td colspan="7">Motor 1 zero speed delay.
The zero-speed delay compensates for the time the motor needs to decelerate from 21.08.M1 zero speed level to standstill. Until 21.09 M1 zero speed delay elapses the drive remains active and the brake is kept open (lifted).
Without zero speed delay:
The drive receives a Stop command and decelerates along a speed ramp or at torque limit. When the motor speed feedback falls below 21.08 M1 zero speed level, the drive stops and the motor coasts to standstill.

With zero speed delay:
The drive receives a Stop command and decelerates along a speed ramp or at torque limit. When the motor speed feedback falls below 21.08 M1 zero speed level the zero-speed delay is activated. Until the zero speed delay elapses, the drive keeps on working and thus the motor can decelerate to standstill.</td></tr>
</table>

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/FbEq16**	**Volatile**	**Change running**	**Type**
	 Is also used for the SS1 function with a fieldbus safety module (FSPS-21/FSO-21). See 21.08 M1 zero speed level.						
	0.0 … 3250.0	0.2	s	10 = 1 s	n	y	Parameter

22 Speed reference selection

Speed reference selection and motor potentiometer settings.

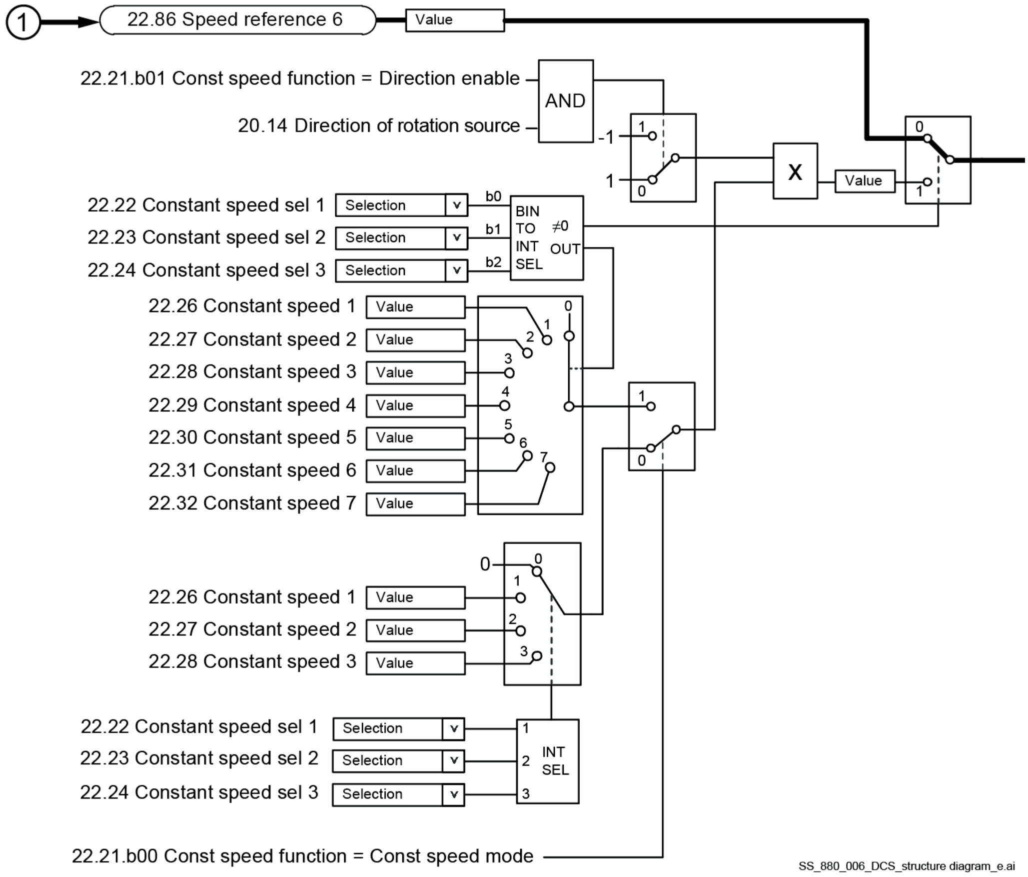
Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
22.01	**Speed reference unlimited**						
	Speed reference after selections. Displays the speed reference after selections like constant speeds, jogging, local control from control panel and safe speed. The unit is selected by 96.03 Unit for speed control.						
	-30000.00 … 30000.00	-	rpm, % or V	See 46.02	y	n	Signal
22.07	**Speed reference**						
	Main speed reference input. Main speed reference input of the drive. Can be connected via 22.11 Speed reference 1 source and/or 22.12 Speed reference 2 source. The unit is selected by 96.03 Unit for speed control.						
	-30000.00 … 30000.00	0.00	rpm, % or V	See 46.02	n	y	Parameter
22.08	**Auxiliary speed reference**						
	Auxiliary speed reference input. Auxiliary speed reference input of the drive. Can be connected via 22.11 Speed reference 1 source and/or 22.12 Speed reference 2 source. The unit is selected by 96.03 Unit for speed control.						
	-30000.00 … 30000.00	0.00	rpm, % or V	See 46.02	n	y	Parameter
22.11	**Speed reference 1 source**						
	Selects speed reference source 1. Two signal sources can be defined. See 22.11 Speed reference 1 source and 22.12 Speed reference 2 source. 22.14 Speed reference 1/2 selection switches between the two sources or a mathematical function. The mathematical function depends on 22.13 Speed reference function. Direction on rotation depends on 20.14 Direction of rotation source.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">


SF_880_025_DCS_speed reference_a.ai
Other; source selection.
0: **Zero**; 0 rpm, speed reference is set to zero.
1: **22.07 Speed reference**; 22.07 Speed reference.
3: **22.08 Auxiliary speed reference**; 22.08 Auxiliary speed reference.
4: **AI1 scaled**; 12.12 AI1 scaled value.
5: **AI2 scaled**; 12.22 AI2 scaled value.
6: **AI3 scaled**; 12.32 AI3 scaled value.
7: **FBA A reference 1**; 03.05 FBA A reference 1.
8: **FBA A reference 2**; 03.06 FBA A reference 2.
9: **FBA B reference 1**; 03.07 FBA B reference 1.
10: **FBA B reference 2**; 03.08 FBA B reference 2.
11: **EFB reference 1**; 03.09 EFB reference 1.
12: **EFB reference 2**; 03.10 EFB reference 2.
13: **DDCS controller ref1**; 03.11 DDCS controller ref1.
14: **DDCS controller ref2**; 03.12 DDCS controller ref2.
15: **M/F or D2D ref1**; 03.13 M/F or D2D ref1.
16: **M/F or D2D ref2**; 03.14 M/F or D2D ref2.
17: **Motor potentiometer reference**; 22.80 Motor potentiometer reference.
18: **Process PID output actual**; 40.01 Process PID output actual.
19: **Encoder 1 speed**; 90.10 Encoder 1 speed.
20: **Encoder 2 speed**; 90.20 Encoder 2 speed.
21: **OnBoard encoder**; 94.04 OnBoard encoder speed.
26: **Constant speed 6**; 22.31 Constant speed 6.
27: **Constant speed 7**; 22.32 Constant speed 7.
</td></tr>
<tr><td>0 … 27</td><td>AI1 scaled</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**22.12**</td><td colspan="7">**Speed reference 2 source**</td></tr>
<tr><td colspan="7">Selects speed reference source 2.
For selections and diagram, see 22.11 Speed reference 1 source.</td></tr>
<tr><td>0 … 27</td><td>Zero</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**22.13**</td><td colspan="7">**Speed reference function**</td></tr>
<tr><td colspan="7">Speed reference function.
Selects a mathematical function between speed reference 1 and speed reference 2. See 22.11 Speed reference 1 source.
0: **Ref 1**; speed reference 1 selected by 22.11 Speed reference 1 source is used.
1: **Add (ref 1 + ref 2)**; the sum of the two speed references is used.</td></tr>
</table>

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	2: **Sub (ref 1 - ref 2)**; the result of speed reference 1 minus speed reference 2 is used. 3: **Mul (ref 1 • ref 2)**; the multiplication of the two speed references is used. 4: **Min (ref 1, ref 2)**; the smaller of the two speed references is used. 5: **Max (ref 1, ref 2)**; the greater of the two speed references is used.						
	0 … 5	Ref 1	-	1 = 1	n	y	Parameter
22.14	**Speed reference 1/2 selection**						
	Selection between speed reference 1 and speed reference 2. Configures the selection between speed reference 1 and speed reference 2. See 22.11 Speed reference 1 source. 0 = Speed reference 1. 1 = Speed reference 2. **Other [bit]**; source selection. 0: **Speed reference 1**; 0, normal operation. 1: **Speed reference 2**; 1. 3: **DI1**; 10.02.b00 DI delayed status. 4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status.						
	0 … 19	Speed reference 1	-	1 = 1	n	y	Parameter
22.15	**Speed additive 1 source**						
	1st additive speed reference. Defines a speed reference to be added to 22.83 Speed reference 3. See 22.11 Speed reference 1 source.						
	0 … 27	Zero	-	1 = 1	n	y	Parameter
22.16	**Speed share**						
	Speed reference scaling factor. Defines a scaling factor between 22.84 Speed reference 4 and 22.85 Speed reference 5.						
	-8.000 … 8.000	1.000	-	1000 = 1	n	y	Parameter
22.17	**Speed additive 2 source**						
	2nd additive speed reference. Defines a speed reference to be added to 22.85 Speed reference 5. See 22.11 Speed reference 1 source.						
	0 … 27	Zero	-	1 = 1	n	y	Parameter
22.21	**Constant speed function**						
	Constant speed configuration word. Determines how constant speeds are selected and whether 20.14 Direction of rotation source is considered or not when applying a constant speed.						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type



Bit assignment:

Bit	Name	Value	Remarks
0	Constant speed mode	1	Packed: 7 constant speeds are selectable using the three sources defined by 22.22 Constant speed sel 1, 22.23 Constant speed sel 2 and 22.24 Constant speed sel 3.
		0	Separate: Constant speeds 1, 2 and 3 are separately activated by the sources defined by 22.22 Constant speed sel 1, 22.23 Constant speed sel 2 and 22.24 Constant speed sel 3. In case of conflict, the constant speed with the smaller number takes priority.
1	Direction enable	1	Depending on 20.14 Direction of rotation source: To determine the direction of rotation for a constant speed, the sign of the constant speed setting is multiplied by 20.14 Direction of rotation source. This effectively allows the drive to have 14 (7 forward and 7 reverse) constant speeds. **WARNING** If the direction signal is reverse and the active constant speed is negative, the drive will run in the forward direction.

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

		0	According to parameter: The running direction for the constant speed is determined by the sign of the constant speed setting parameters.
2 … 15	reserved		

Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
0000h … FFFFh	0000h	-	1 = 1	n	y	Parameter

22.22 **Constant speed sel 1**

Constant speed selector 1.
22.21.b00 Constant speed function = 0 (separate) activates the source that selects constant speed 1.
0 = Always off.
1 = Always on.
22.21.b00 Constant speed function = 1 (packed) activates the constant speeds according to the following table.

Source defined by 22.22 Constant speed sel 1	Source defined by 22.23 Constant speed sel 2	Source defined by 22.24 Constant speed sel 3	Active constant speed
0	0	0	None
1	0	0	Constant speed 1
0	1	0	Constant speed 2
1	1	0	Constant speed 3
0	0	1	Constant speed 4
1	0	1	Constant speed 5
0	1	1	Constant speed 6
1	1	1	Constant speed 7

Other [bit]; source selection.
0: **Not selected**; 0, normal operation.
1: **Selected**; 1.
3: **DI1**; 10.02.b00 DI delayed status.
4: **DI2**; 10.02.b01 DI delayed status.
5: **DI3**; 10.02.b02 DI delayed status.
6: **DI4**; 10.02.b03 DI delayed status.
7: **DI5**; 10.02.b04 DI delayed status.
8: **DI6**; 10.02.b05 DI delayed status.
11: **DIO1**; 11.02.b00 DIO delayed status.
12: **DIO2**; 11.02.b01 DIO delayed status.
19: **DIL**; 10.02.b15 DI delayed status
Note: 22.22 Constant speed sel 1 overrides 22.23 Constant speed sel 2 and 22.24 Constant speed sel 3.

Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
0 … 19 or 0000h … FFFFh	Not selected or 0000h	-	1 = 1	n	y	Parameter

22.23 **Constant speed sel 2**

Constant speed selector 2.
See 22.22 Constant speed sel 1.

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	Note: 22.23 Constant speed sel 2 overrides 22.24 Constant speed sel 3.						
	0 … 19 or 0000h … FFFFh	Not selected or 0000h	-	1 = 1	n	y	Parameter
22.24	**Constant speed sel 3**						
	Constant speed selector 3. See 22.22 Constant speed sel 1.						
	0 … 19 or 0000h … FFFFh	Not selected or 0000h	-	1 = 1	n	y	Parameter
22.26	**Constant speed 1**						
	Constant speed 1. Defines constant speed 1, the speed the motor will turn when constant speed 1 is selected.						
	-30000.00 … 30000.00	0.00	rpm	See 46.02	n	y	Parameter
22.27	**Constant speed 2**						
	Constant speed 2. Defines constant speed 2, the speed the motor will turn when constant speed 2 is selected.						
	-30000.00 … 30000.00	0.00	rpm	See 46.02	n	y	Parameter
22.28	**Constant speed 3**						
	Constant speed 3. Defines constant speed 3, the speed the motor will turn when constant speed 3 is selected.						
	-30000.00 … 30000.00	0.00	rpm	See 46.02	n	y	Parameter
22.29	**Constant speed 4**						
	Constant speed 4. Defines constant speed 4, the speed the motor will turn when constant speed 4 is selected.						
	-30000.00 … 30000.00	0.00	rpm	See 46.02	n	y	Parameter
22.30	**Constant speed 5**						
	Constant speed 5. Defines constant speed 5, the speed the motor will turn when constant speed 5 is selected.						
	-30000.00 … 30000.00	0.00	rpm	See 46.02	n	y	Parameter
22.31	**Constant speed 6**						
	Constant speed 6. Defines constant speed 6, the speed the motor will turn when constant speed 6 is selected. The unit is selected by 96.03 Unit for speed control.						
	-30000.00 … 30000.00	0.00	rpm, % or V	See 46.02	n	y	Parameter
22.32	**Constant speed 7**						
	Constant speed 7. Defines constant speed 7, the speed the motor will turn when constant speed 7 is selected. The unit is selected by 96.03 Unit for speed control.						
	-30000.00 … 30000.00	0.00	rpm, % or V	See 46.02	n	y	Parameter
22.42	**Jogging 1 reference**						
	Speed reference for jogging function 1.						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	Defines the speed reference for jogging 1. See 20.26 Jogging 1 start source.						
	-30000.00 … 30000.00	0.00	rpm	See 46.02	n	y	Parameter
22.43	**Jogging 2 reference**						
	Speed reference for jogging function 2. Defines the speed reference for jogging 2. See 20.27 Jogging 2 start source.						
	-30000.00 … 30000.00	0.00	rpm	See 46.02	n	y	Parameter
22.46	**Speed reference safe**						
	Defines a safe speed reference value that is used with supervision functions such as: – 12.03 AI supervision function. – 14.19 AI supervision function. – 15.19 AI supervision function. – 16.19 AI supervision function. – 49.05 Communication loss action. – 50.02 FBA A comm loss func. – 50.32 FBA B comm loss func. – 58.14 Communication loss action. – 60.59 DDCS controller comm loss function. – 70.07 DCSLink comm loss function.						
	-30000.00 … 30000.00	0.00	rpm	See 46.02	n	y	Parameter
22.71	**Motor potentiometer function**						
	Motor potentiometer function. Activates and selects the mode of the motor potentiometer. 0: **Disable**; disable the motor potentiometer and set its value to 0. 1: **Enable (initialization at stop/power-up)**; the motor potentiometer first adopts the value defined by 22.72 Motor potentiometer initial value. When the drive is running, the value can be adjusted from the up and down sources defined by 22.73 Motor potentiometer up source and 22.74 Motor potentiometer down source. A stop or a power cycle will reset the motor potentiometer to the value 22.72 Motor potentiometer initial value. 2: **Enable (resume always)**; the motor potentiometer value is retained over a stop or a power cycle. The value can be adjusted from the up and down sources defined by 22.73 Motor potentiometer up source and 22.74 Motor potentiometer down source, independent of the drive status.						
	0 … 2	Disable	-	1 = 1	n	y	Parameter
22.72	**Motor potentiometer initial value**						
	Initial value for motor potentiometer. Defines an initial value (starting point) for the motor potentiometer. See 21.71 Motor potentiometer function.						
	-30000.00 … 30000.00	0.00	-	1 = 1	n	y	Parameter
22.73	**Motor potentiometer up source**						
	Source for motor potentiometer up. Selects the source for motor potentiometer up signal. 0 = No change. 1 = Increase.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">**Other [bit]**; source selection.
0: **No change**; 0, hold the motor potentiometer value.
1: **Increase**; 1, increase the motor potentiometer value. If both the up and down sources are on, the potentiometer value will not change.
2: **None**; inactive. Motor potentiometer up is disabled. Normal operation.
3: **DI1**; 10.02.b00 DI delayed status.
4: **DI2**; 10.02.b01 DI delayed status.
5: **DI3**; 10.02.b02 DI delayed status.
6: **DI4**; 10.02.b03 DI delayed status.
7: **DI5**; 10.02.b04 DI delayed status.
8: **DI6**; 10.02.b05 DI delayed status.
11: **DIO1**; 11.02.b00 DIO delayed status.
12: **DIO2**; 11.02.b01 DIO delayed status.
19: **DIL**; 10.02.b15 DI delayed status.</td></tr>
<tr><td>0 … 19</td><td>None</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**22.74**</td><td colspan="7">**Motor potentiometer down source**</td></tr>
<tr><td colspan="7">Source for motor potentiometer down.
Selects the source for motor potentiometer down signal.
0 = No change.
1 = Decrease.
Other [bit]; source selection.
0: **No change**; 0, hold the motor potentiometer value.
1: **Decrease**; 1, decrease the motor potentiometer value. If both the up and down sources are on, the potentiometer value will not change.
2: **None**; inactive. Motor potentiometer down is disabled. Normal operation.
3: **DI1**; 10.02.b00 DI delayed status.
4: **DI2**; 10.02.b01 DI delayed status.
5: **DI3**; 10.02.b02 DI delayed status.
6: **DI4**; 10.02.b03 DI delayed status.
7: **DI5**; 10.02.b04 DI delayed status.
8: **DI6**; 10.02.b05 DI delayed status.
11: **DIO1**; 11.02.b00 DIO delayed status.
12: **DIO2**; 11.02.b01 DIO delayed status.
19: **DIL**; 10.02.b15 DI delayed status
40: **DI1 or stop**; 10.02.b00 DI delayed status plus stop. DI1 = 1 or stop command active → the motor potentiometer value is decreased, DI1 = 0: the motor potentiometer value is held.
41: **DI2 or stop**; 10.02.b01 DI delayed status plus stop. DI2 = 1 or stop command active → the motor potentiometer value is decreased, DI2 = 0: the motor potentiometer value is held.
42: **DI3 or stop**; 10.02.b02 DI delayed status plus stop. DI3 = 1 or stop command active → the motor potentiometer value is decreased, DI3 = 0: the motor potentiometer value is held.
43: **DI4 or stop**; 10.02.b03 DI delayed status plus stop. DI4 = 1 or stop command active → the motor potentiometer value is decreased, DI4 = 0: the motor potentiometer value is held.
44: **DI5 or stop**; 10.02.b04 DI delayed status plus stop. DI5 = 1 or stop command active → the motor potentiometer value is decreased, DI5 = 0: the motor potentiometer value is held.
45: **DI6 or stop**; 10.02.b05 DI delayed status plus stop. DI6 = 1 or stop command active → the motor potentiometer value is decreased, DI6 = 0: the motor potentiometer value is held.
46: **DIO1 or stop**; 11.02.b00 DIO delayed status plus stop. DIO1 = 1 or stop command active → the motor potentiometer value is decreased, DIO1 = 0: the motor potentiometer value is held.
47: **DIO2 or stop**; 11.02.b01 DIO delayed status plus stop. DIO2 = 1 or stop command active → the motor potentiometer value is decreased, DIO2 = 0: the motor potentiometer value is held.</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	48: **DIL or stop**; 10.02.b15 DI delayed status plus stop. DIL = 1 or stop command active → the motor potentiometer value is decreased, DIL = 0: the motor potentiometer value is held.						
	0 … 48	None	-	1 = 1	n	y	Parameter
22.75	**Motor potentiometer ramp time**						
	Motor potentiometer change time. Defines the change rate of the motor potentiometer. This is the time required for the motor potentiometer to change from 22.76 Motor potentiometer min value to 22.77 Motor potentiometer max value. The same change rate applies in both directions (up and down).						
	0.0 … 3250.0	10.0	s	10 = 1 s	n	y	Parameter
22.76	**Motor potentiometer min value**						
	Motor potentiometer minimum. Defines the minimum value of the motor potentiometer.						
	-30000.00 … 30000.00	-1500.00	-	1 = 1	n	y	Parameter
22.77	**Motor potentiometer max value**						
	Motor potentiometer maximum. Defines the maximum value of the motor potentiometer.						
	-30000.00 … 30000.00	1500.00	-	1 = 1	n	y	Parameter
22.80	**Motor potentiometer reference**						
	Value of the motor potentiometer. Displays the output of the motor potentiometer function. It can directly be set as the source of parameters such as 22.11 Speed reference 1 source.						
	-30000.00 … 30000.00	-	-	1 = 1	y	n	Signal
22.81	**Speed reference 1**						
	Value of speed reference 1 source. Displays the speed reference after speed reference 1 source. See 22.11 Speed reference 1 source.						
	-30000.00 … 30000.00	-	rpm	See 46.02	y	n	Signal
22.82	**Speed reference 2**						
	Value of speed reference 2 source. Displays the speed reference after speed reference 2 source. See 22.12 Speed reference 2 source.						
	-30000.00 … 30000.00	-	rpm	See 46.02	y	n	Signal
22.83	**Speed reference 3**						
	Speed reference after source selection. Displays the speed reference after the mathematical function, speed reference 1/2 selection and rotation direction. See 22.13 Speed reference function, 22.14 Speed reference 1/2 selection and 20.14 Direction of rotation source.						
	-30000.00 … 30000.00	-	rpm	See 46.02	y	n	Signal
22.84	**Speed reference 4**						
	Speed reference after additive 1. Displays the speed reference after 1st additive speed. See 22.15 Speed additive 1 source.						

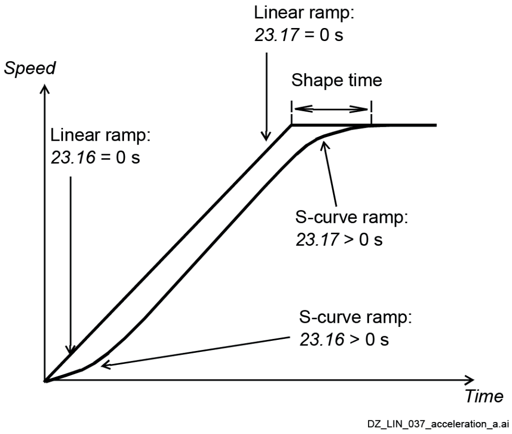
Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	-30000.00 … 30000.00	-	rpm	See 46.02	y	n	Signal
22.85	**Speed reference 5**						
	Speed reference after speed share. Displays the speed reference after scaling by means of speed share. See 22.16 Speed share.						
	-30000.00 … 30000.00	-	rpm	See 46.02	y	n	Signal
22.86	**Speed reference 6**						
	Speed reference after additive 2. Displays the speed reference after 2nd additive speed. See 22.17 Speed additive 2 source.						
	-30000.00 … 30000.00	-	rpm	See 46.02	y	n	Signal

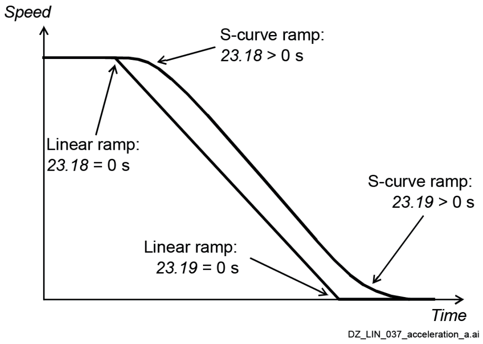
23 Speed reference ramp

Speed reference ramp settings (programming of the acceleration and deceleration rates for the drive).

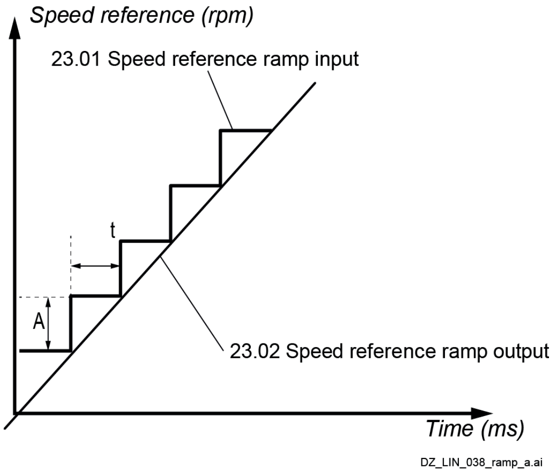
Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
23.01	**Speed reference ramp input**						
	Speed reference at the ramp input. Displays the speed reference after limitation and before ramping and shaping. See 30.11 M1 minimum speed and 30.12 M1 maximum speed. The unit is selected by 96.03 Unit for speed control.						
	-30000.00 … 30000.00	-	rpm, % or V	See 46.02	y	n	Signal
23.02	**Speed reference ramp output**						
	Speed reference at the ramp output. Displays the ramped and shaped speed reference. The unit is selected by 96.03 Unit for speed control.						
	-30000.00 … 30000.00	-	rpm, % or V	See 46.02	y	n	Signal
23.03	**Speed reference 7**						
	Speed reference after direct speed reference. Displays the speed reference after direct speed reference. See 23.32 Direct speed reference. The unit is selected by 96.03 Unit for speed control.						
	-30000.00 … 30000.00	-	rpm, % or V	See 46.02	y	n	Signal
23.04	**dv/dt**						
	Deviation of the speed reference. Displays the acceleration/deceleration (speed reference change) at the output of the speed reference ramp.						
	-30000.00 … 30000.00	-	rpm/s	See 46.02	y	n	Signal
23.11	**Ramp set selection**						
	Select active ramp parameters.						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	Selects the source that switches between the two sets of acceleration/deceleration ramp times. See 23.12 Acceleration time 1, 23.13 Deceleration time 1, 23.14 Acceleration time 2 and 23.15 Deceleration time 2. 0 = Acc/Dec time 1. 1 = Acc/Dec time 2. **Other [bit]**; source selection. 0: **Acc/Dec time 1**; 0, acceleration time 1 and deceleration time 1 are active. Normal operation. 1: **Acc/Dec time 2**; 1, acceleration time 2 and deceleration time 2 are active. 2: **Speed level**; if |23.03 Speed reference 7| ≤ |46.31 Above speed level|, then Acc/Dec time 1 is active. If |23.03 Speed reference 7| > |46.31 Above speed level|, then Acc/Dec time 2 is active. 3: **DI1**; 10.02.b00 DI delayed status. 4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status. 21: **Motor1/Motor2**; used acceleration/deceleration time depends on setting of 42.01 Motor 1/2 selection. If 42.01 Motor 1/2 selection = Motor 1 use Acc/Dec time 1. If 42.01 Motor 1/2 selection = Motor 2 use Acc/Dec time 2.						
	0 … 21	Acc/Dec time 1	-	1 = 1	n	y	Parameter
23.12	**Acceleration time 1**						
	Acceleration time 1. The time within the drive will accelerate from zero speed to 46.02 M1 speed scaling actual. If the speed reference increases faster than the set acceleration time, the motor speed will follow the set acceleration time. If the speed reference increases slower than the set acceleration time, the motor speed will follow the reference. If the set acceleration time is set too short, the drive will accelerate at the active torque limit.						
	0.000 … 3250.000	20.000	s	10 = 1 s	n	y	Parameter
23.13	**Deceleration time 1**						
	Deceleration time 1. The time within the drive will decelerate from 46.02 M1 speed scaling actual to zero speed. If the speed reference decreases faster than the set deceleration time, the motor speed will follow the deceleration time. If the speed reference decreases slower than the set deceleration time, the motor speed will follow the reference. If the set deceleration time is set too short, the drive will decelerate at the active torque limit.						
	0.000 … 3250.000	20.000	s	10 = 1 s	n	y	Parameter
23.14	**Acceleration time 2**						
	Acceleration time 1. See 23.12 Acceleration time 1.						
	0.000 … 3250.000	60.000	s	10 = 1 s	n	y	Parameter
23.15	**Deceleration time 2**						
	Deceleration time 2. See 23.13 Deceleration time 1.						
	0.000 … 3250.000	60.000	s	10 = 1 s	n	y	Parameter
23.16	**Shape time acceleration 1**						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Ramp shape at acceleration start.
Defines the shape of the acceleration ramp at the start of the acceleration.
0.0 s: Linear ramp. Suitable for steady acceleration or deceleration and for slow ramps.
0.1 … 3250.0 s: S-curve ramp. S-curve ramps are ideal for lifting applications. The S-curve consists of curves at both ends of the ramp and a linear part in between.
Note: For safety reasons, shape times are not applied during an emergency stop.
Acceleration:


Deceleration:

 </td></tr>
<tr><td>0.000 … 3250.000</td><td>0.000</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">23.17</td><td colspan="7">Shape time acceleration 2</td></tr>
<tr><td colspan="7">Ramp shape at acceleration end.
Defines the shape of the acceleration ramp at the end of the acceleration. See 23.16 Shape time acceleration 1.</td></tr>
<tr><td>0.000 … 3250.000</td><td>0.000</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">23.18</td><td colspan="7">Shape time deceleration 1</td></tr>
<tr><td colspan="7">Ramp shape at deceleration start.
Defines the shape of the deceleration ramp at the start of the deceleration. See 23.16 Shape time acceleration 1.</td></tr>
<tr><td>0.000 … 3250.000</td><td>0.000</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">23.19</td><td colspan="7">Shape time deceleration 2</td></tr>
<tr><td colspan="7">Ramp shape at deceleration end.
Defines the shape of the deceleration ramp at the end of the deceleration. See 23.16 Shape time acceleration 1.</td></tr>
<tr><td>0.000 … 3250.000</td><td>0.000</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>23.20</td><td colspan="7">Acceleration time jogging</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Acceleration time for jogging.
The time within the drive will accelerate from zero speed to 46.02 M1 speed scaling actual in case of jogging or inching.</td></tr>
<tr><td>0.000 … 3250.000</td><td>60.000</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">23.21</td><td colspan="7">Deceleration time jogging</td></tr>
<tr><td colspan="7">Deceleration time for jogging.
The time within the drive will decelerate from 46.02 M1 speed scaling actual to zero speed in case of jogging or inching.</td></tr>
<tr><td>0.000 … 3250.000</td><td>60.000</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">23.23</td><td colspan="7">Emergency stop time</td></tr>
<tr><td colspan="7">Deceleration time for Off3 (emergency stop) command.
The time within the drive will decelerate from 46.02 M1 speed scaling actual to zero speed.
With an Off3 (emergency stop) command and 21.03 Emergency stop mode = Ramp stop/Emergency ramp stop or as reaction to a fault of fault level 4 and 31.15 Fault stop mode fault level 4 = Ramp stop.
This applies also to torque control, because the drive automatically switches to speed control with an Off3 (emergency stop) command. For followers see 19.20 Follower force ramp stop.</td></tr>
<tr><td>0.000 … 3250.000</td><td>10.000</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">23.24</td><td colspan="7">Speed ramp in zero source</td></tr>
<tr><td colspan="7">Force speed ramp input to zero.
Selects a source that forces the speed ramp input to zero. Via an OR with 06.09.b06 Used main control word.
0 = Zero input.
1 = Enable input.
Other [bit]; source selection.
0: Zero input; 0, force speed ramp input to zero.
1: Enable input; 1, enable speed ramp input. Normal operation.
3: DI1; 10.02.b00 DI delayed status.
4: DI2; 10.02.b01 DI delayed status.
5: DI3; 10.02.b02 DI delayed status.
6: DI4; 10.02.b03 DI delayed status.
7: DI5; 10.02.b04 DI delayed status.
8: DI6; 10.02.b05 DI delayed status.
11: DIO1; 11.02.b00 DIO delayed status.
12: DIO2; 11.02.b01 DIO delayed status.
19: DIL; 10.02.b15 DI delayed status.</td></tr>
<tr><td>0 … 19</td><td>Enable input</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">23.26</td><td colspan="7">Ramp out balancing enable</td></tr>
<tr><td colspan="7">Force speed ramp output to 23.27 Ramp out balancing reference.
Selects the source to force the speed ramp output balancing.
This function is used to generate a smooth, bump-less transfer from a torque- or tension-controlled motor back to being speed controlled. The balancing output is tracking the present (line) speed of the application. When a transfer is required, the speed reference can then be quickly set to the needed (line) speed. Balancing is also possible in the speed controller. See 25.09 Speed balancing enable.
0 = Enable output.
1 = Balance output.
Other [bit]; source selection.</td></tr>
</table>

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	0: **Enable output**; 0, enable speed ramp output. Normal operation. 1: **Balance output**; 1, force speed ramp output to 23.27 Ramp out balancing reference. 3: **DI1**; 10.02.b00 DI delayed status. 4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status.						
	0 … 19	Enable output	-	1 = 1	n	y	Parameter
23.27	**Ramp out balancing reference**						
	Speed ramp output balancing reference. Defines the reference for speed ramp output balancing. The output of the ramp generator is forced to this value when speed ramp output balancing is enabled. See 23.26 Ramp out balancing enable. he unit is selected by 96.03 Unit for speed control.						
	-30000.00 … 30000.00	0.00	rpm, % or V	See 46.02	n	y	Parameter
23.28	**Variable slope enable**						
	Enable variable slope. Activates the variable slope function, which controls the slope of the speed ramp during a speed reference change from the overriding control system. Variable slope rate and the internal drive ramp are connected in series. Thus, the ramp acceleration and deceleration times must be faster than the complete variable slope rate time. See 23.12 Acceleration time 1 and 23.13 Deceleration time 1. 23.29 Variable slope rate defines the speed ramp time t (ms) for the speed reference change A (rpm).  t (ms) = cycle time of the speed reference from the overriding control system. A (rpm) = speed reference change during cycle time t (ms). **Note**: If the cycle time t (ms) of the speed reference from the overriding control system and 23.29 Variable slope rate are equal, the shape of 23.02 Speed reference ramp output is a straight line. **Other [bit]**; source selection.						

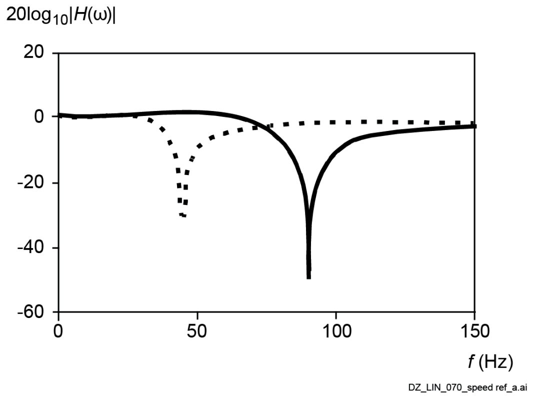
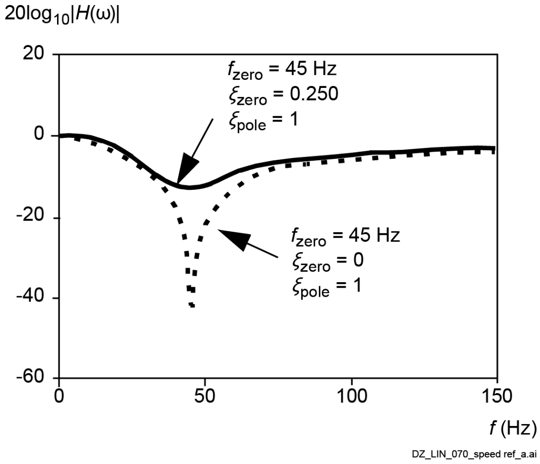
Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	0: **Disable**; disable variable slope. 1: **Enable**; enable variable slope (not available in local control).						
	0 … 1	Disable	-	1 = 1	n	y	Parameter
23.29	**Variable slope rate**						
	Variable slope rate. Defines the rate of the speed reference change when variable slope is enabled. See 23.28 Variable slope enable. For the best results, use the speed reference cycle time.						
	0 … 32500	0	ms	1 = 1 ms	n	y	Parameter
23.32	**Direct speed reference**						
	Direct speed reference. Feeds the speed reference direct into the speed error calculation. Activated by 06.10.b00 Auxiliary control word 1 = 1. **Other**; source selection. 0: **Zero**; 0 rpm, speed reference is set to zero. 1: **22.07 Speed reference**; 22.07 Speed reference. 2: **23.02 Speed reference ramp output**; 23.02 Speed reference ramp output. 3: **22.08 Auxiliary speed reference**; 22.08 Auxiliary speed reference. 4: **AI1 scaled**; 12.12 AI1 scaled value. 5: **AI2 scaled**; 12.22 AI2 scaled value. 6: **AI3 scaled**; 12.32 AI3 scaled value. 7: **FBA A reference 1**; 03.05 FBA A reference 1. 8: **FBA A reference 2**; 03.06 FBA A reference 2. 9: **FBA B reference 1**; 03.07 FBA B reference 1. 10: **FBA B reference 2**; 03.08 FBA B reference 2. 11: **EFB reference 1**; 03.09 EFB reference 1. 12: **EFB reference 2**; 03.10 EFB reference 2. 13: **DDCS controller ref1**; 03.11 DDCS controller ref1. 14: **DDCS controller ref2**; 03.12 DDCS controller ref2. 15: **M/F or D2D ref1**; 03.13 M/F or D2D ref1. 16: **M/F or D2D ref2**; 03.14 M/F or D2D ref2. 17: **Motor potentiometer reference**; 22.80 Motor potentiometer reference. 18: **Process PID output actual**; 40.01 Process PID output actual. 19: **Encoder 1 speed**; 90.10 Encoder 1 speed. 20: **Encoder 2 speed**; 90.20 Encoder 2 speed. 21: **OnBoard encoder**; 94.04 OnBoard encoder speed. 26: **Constant speed 6**; 22.31 Constant speed 6. 27: **Constant speed 7**; 22.32 Constant speed 7.						
	0 … 27	23.02 Speed reference ramp output	-	1 = 1	n	y	Parameter

24 Speed reference conditioning

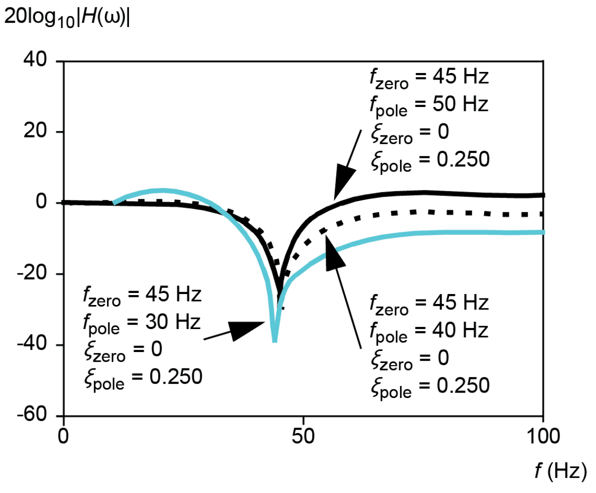
Speed error calculation, speed error window control configuration and speed error (Δn) step.

Index	Name						
	Text						
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
24.01	**Used speed reference**						
	Speed reference after scaling. Displays the speed reference after speed correction, limitation and scaling. See 24.11 Speed correction, 30.11 M1 minimum speed, 30.12 M1 maximum speed and 24.14 Speed reference scaling. Used for speed error calculation. The unit is selected by 96.03 Unit for speed control.						
	-30000.00 … 30000.00	-	rpm, % or V	See 46.02	y	n	Signal
24.02	**Used speed feedback**						
	Speed feedback after scaling. Displays the speed feedback after scaling. See 24.15 Speed feedback scaling. Used for speed error calculation.						
	-30000.00 … 30000.00	-	rpm	See 46.02	y	n	Signal
24.03	**Speed error filtered**						
	Filtered speed error (Δn). Displays the speed error after filters and window control. See 24.18 Speed error filter time 1 and 24.19 Speed error filter time 2. Δn = 24.01 Used speed reference - 24.02 Used speed feedback.						
	-30000.00 … 30000.00	-	rpm	See 46.02	y	n	Signal
24.04	**Speed error inverted**						
	Inverted speed error (-Δn). Displays the inverted speed error (unfiltered). Δn = 24.01 Used speed reference - 24.02 Used speed feedback. The unit is selected by 96.03 Unit for speed control.						
	-30000.00 … 30000.00	-	rpm, % or V	See 46.02	y	n	Signal
24.11	**Speed correction**						
	Speed reference correction. The speed reference correction is added to 23.03 Speed reference 7 between ramping and limitation. This is useful to trim the speed if necessary, for example to adjust draw between sections of a paper machine. The unit is selected by 96.03 Unit for speed control. **Note**: Due to safety reasons, the speed correction is not applied when any of the stop functions are active.						
	-30000.00 … 30000.00	0.00	rpm, % or V	See 46.02	n	y	Parameter
24.14	**Speed reference scaling**						
	Speed reference scaling factor. Defines a scaling factor between 23.03 Speed reference 7 and 24.01 Used speed reference.						
	-325.00 … 325.00	1.00	-	100 = 1	n	y	Parameter
24.15	**Speed feedback scaling**						
	Speed feedback scaling factor. Defines a scaling factor between 90.01 Motor speed for control and 24.02 Used speed feedback.						
	-325.00 … 325.00	1.00	-	100 = 1	n	y	Parameter

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">24.18</td><td colspan="7">Speed error filter time 1</td></tr>
<tr><td colspan="7">Speed error (Δn) filter time constant 1.
Defines the filter time constant of the speed error low-pass filter 1. Reducing the ripple with this filter may cause speed controller tuning problems. A long filter time constant and fast acceleration times contradict one another. A very long filter time constant results in unstable control.
Note: There are three different filters for speed feedback and speed error:
– 90.42 Motor speed filter time is filtering the speed feedback and should be used for filter time constants smaller than 30 ms.
– 24.18 Speed error filter time 1 and 24.19 Speed error filter time 2 are filtering the speed error and should be used for filter time constants greater than 30 ms. Set 24.18 Speed error filter time 1 = 24.19 Speed error filter time 2.</td></tr>
<tr><td>0 … 32500</td><td>0</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">24.19</td><td colspan="7">Speed error filter time 2</td></tr>
<tr><td colspan="7">Speed error (Δn) filter time constant 2.
See 24.18 Speed error filter time 1.</td></tr>
<tr><td>0 … 32500</td><td>0</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">24.20</td><td colspan="7">RFE speed filter</td></tr>
<tr><td colspan="7">Source to enable the RFE filter (Resonance FrEquency filter).
Enables/Disables the RFE filter.
The speed error value send to the speed controller is filtered by a common 2nd order band-elimination filter to eliminate the amplification of mechanical resonance frequencies.
Note: Tuning the resonance frequency filter requires a basic understanding of frequency filters. Incorrect tuning can amplify the mechanical oscillations and damage the drive and the driven machinery. To ensure the stability of the speed controller, stop the drive or disable the filtering before changing the RFE filter settings.
0 = Disable RFE filter.
1 = Enable RFE filter.
0: Disable RFE filter; 0, normal operation.
1: Enable RFE filter; 1, enable RFE filter.</td></tr>
<tr><td>0 … 1</td><td>Disable RFE filter</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">24.21</td><td colspan="7">RFE filter zero frequency</td></tr>
<tr><td colspan="7">RFE filter zero frequency.
Defines the zero frequency of the RFE filter. The value must be set near the resonance frequency, which is filtered out before the speed controller.
The drawing shows the frequency response:</td></tr>
</table>

Index	Name						
	Text						
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
							
	0.50 … 500.00	45.00	Hz	1 = 1 Hz	n	y	Parameter
24.22	**RFE filter zero damping**						
	RFE filter zero damping coefficient. Defines the damping coefficient for 24.21 RFE filter zero frequency. A value of 0 corresponds to the maximum elimination of the resonance frequency:  **Note:** To ensure, that the resonance frequency band is filtered rather than amplified, the value in 24.22 RFE filter zero damping must be smaller than the value in 24.24 RFE filter pole damping.						
	-1.000 … 1.000	0.000	-	100 = 1	n	y	Parameter
24.23	**RFE filter pole frequency**						
	RFE filter pole frequency. Defines the pole frequency of the RFE filter:						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type



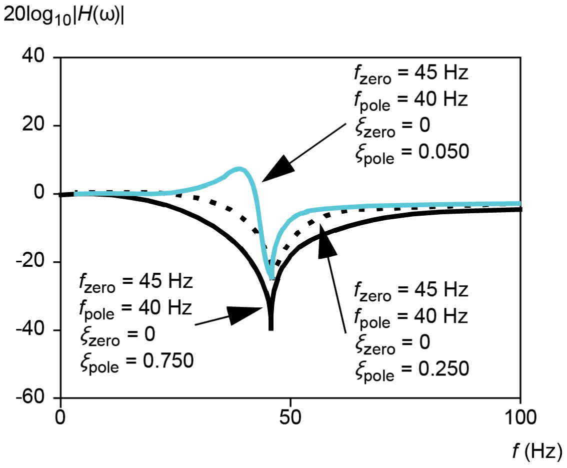
DZ_LIN_070_speed ref_a.ai

Note: If the value in 24.23 RFE filter pole frequency is very different from the value in 24.21 RFE filter zero frequency, the frequencies near the pole frequency are amplified. This can damage the driven machinery.

	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	0.50 … 500.00	40.00	Hz	1 = 1 Hz	n	y	Parameter

24.24 **RFE filter pole damping**

RFE filter pole damping coefficient.
Defines the damping coefficient for 24.23 RFE filter pole frequency. The coefficient shapes the frequency response of the RFE filter. A narrower bandwidth results in better dynamic properties. By setting 24.24 RFE filter pole damping = 1, the effect of the pole is eliminated.



DZ_LIN_070_speed ref_a.ai

Note: To ensure, that the resonance frequency band is filtered rather than amplified, the value in 24.22 RFE filter zero damping must be smaller than the value in 24.24 RFE filter pole damping.

	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	-1.000 … 1.000	0.000	-	100 = 1	n	y	Parameter

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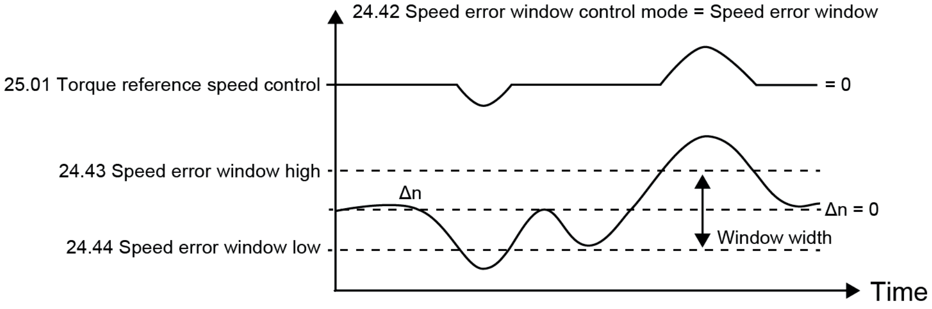
Concept of window control:
The concept of window control is to block the speed controller if the speed error (Δn) or the speed feedback remains within the window set by 24.43 Speed error window high and 24.44 Speed error window low. This allows the external torque reference to affect the process directly. See 26.74 Torque reference ramp output.

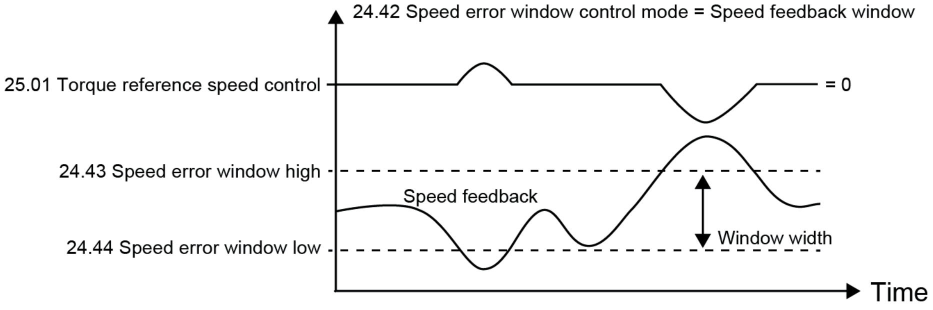
Index	Name						
	Text						
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

If the speed error or the speed feedback exceeds the programmed window, the speed controller becomes active and influences the process by means of 25.01 Torque reference speed control. The activation is indicated by 06.21.b03 Speed control status word.
To release window control, use 24.41 Speed error window control enable and choose the desired window control mode using 24.42 Speed error window control mode. Additionally, set the drive to Add operating mode. See 19.12 Ext1 control mode and 19.14 Ext2 control mode.
This function is sometimes also called dead band control or strip break protection. It forms a speed supervision function for a torque-controlled drive, preventing the motor from running away if the material, which is under tension, breaks.



DZ_LIN_039_speed error_a.ai

Note: To open a window with a width of 100 rpm set 24.43 Speed error window high = 50 rpm and 24.44 Speed error window low = -50 rpm.



DZ_LIN_039_speed error_a.ai

24.41 **Speed error window control enable**

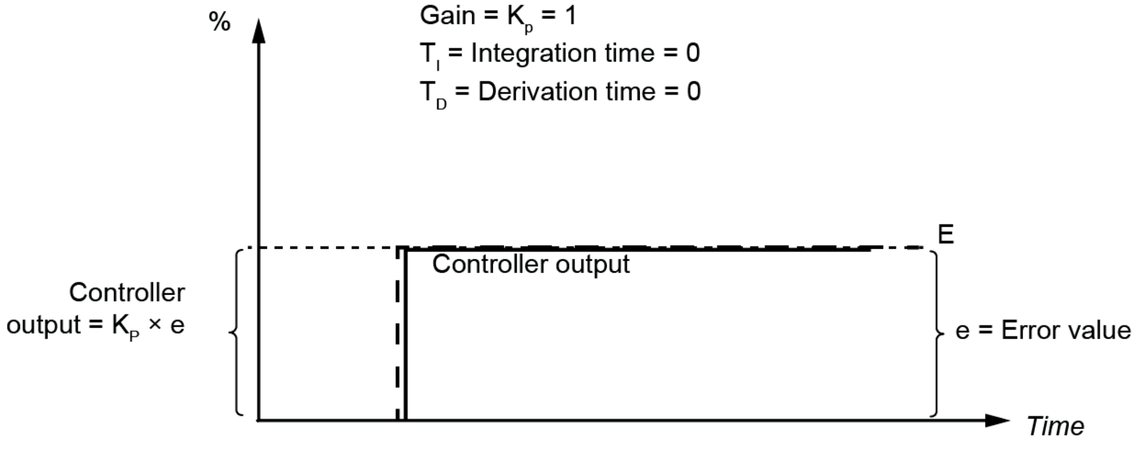
Source to enable window control.
Enables/Disables window control.
0 = Disable window control.
1 = Enable window control.
Other [bit]; source selection.
0: **Disable window control**; 0, normal operation.
1: **Enable window control**; 1, enable speed error window control.
3: **DI1**; 10.02.b00 DI delayed status.
4: **DI2**; 10.02.b01 DI delayed status.
5: **DI3**; 10.02.b02 DI delayed status.
6: **DI4**; 10.02.b03 DI delayed status.
7: **DI5**; 10.02.b04 DI delayed status.
8: **DI6**; 10.02.b05 DI delayed status.
11: **DIO1**; 11.02.b00 DIO delayed status.
12: **DIO2**; 11.02.b01 DIO delayed status.
19: **DIL**; 10.02.b15 DI delayed status.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td>0 … 19</td><td>Disable window control</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">24.42</td><td colspan="7">Speed error window control mode</td></tr>
<tr><td colspan="7">Mode for window control.
Determines the used type of window control. Additionally, the integration time of the speed controller can be enabled/disabled.
0: Speed error window + TI = on; standard window control. The speed error (Δn) must be in a window set by 24.43 Speed error window high and 24.44 Speed error window low. The integration time (T_I) of the speed controller is enabled when window control is released.
1: Speed error window + TI = off; standard window control. The speed error must be in a window set by 24.43 Speed error window high and 24.44 Speed error window low. The integration time (T_I) of the speed controller is disabled when window control is released.
Typically used for torque followers to limit differential speed.
10: Speed feedback window; the speed feedback must be in a window set by 24.43 Speed error window high and 24.44 Speed error window low. The integration time (T_I) of the speed controller is disabled when window control is released.
Typically used for torque-controlled test rigs to limit the no load speed or winders.
Example 1: To get a window of 10 rpm width around the speed error set:
24.42 Speed error window control mode = Speed error window + TI = off.
24.43 Speed error window high = 5 rpm.
24.44 Speed error window low = -5 rpm.
Example 2: To get a window of 500 … 1000 rpm around the speed feedback set:
24.42 Speed error window control mode = Speed feedback window.
24.43 Speed error window high = 1000 rpm.
24.44 Speed error window low = 500 rpm.
Example 3: To get a window of -50 … 100 rpm around the speed feedback set:
24.42 Speed error window control mode = Speed feedback window.
24.43 Speed error window high = 100 rpm.
24.44 Speed error window low = -50 rpm.</td></tr>
<tr><td>0 … 10</td><td>Speed error window + TI = off</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">24.43</td><td colspan="7">Speed error window high</td></tr>
<tr><td colspan="7">Upper boundary of the speed error window.
Upper boundary for the window control, when the speed error (Δn = 24.01 Used speed reference - 24.02 Used speed feedback) is positive.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>50.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">24.44</td><td colspan="7">Speed error window low</td></tr>
<tr><td colspan="7">Lower boundary of the speed error window.
Lower boundary for the window control, when the speed error (Δn = 24.01 Used speed reference - 24.02 Used speed feedback) is negative.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>-50.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">24.46</td><td colspan="7">Speed error step</td></tr>
<tr><td colspan="7">Speed error (Δn) step.</td></tr>
</table>

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	Defines an additional speed error step given to the input of the speed controller. The given min/max values are limited by 30.11 M1 minimum speed and 30.12 M1 maximum speed. **Note:** Make sure the speed error step is removed when a stop command is given. The unit is selected by 96.03 Unit for speed control.						
	-30000.00 … 30000.00	0.00	rpm, % or V	See 46.02	y	y	Parameter

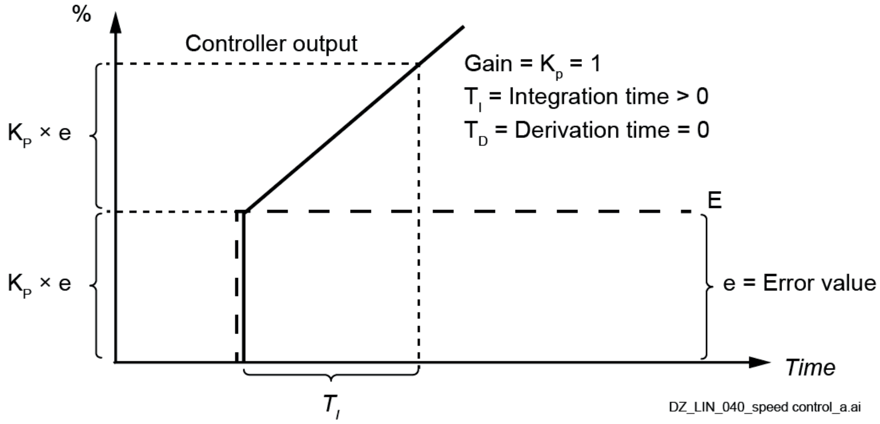
25 Speed control

Speed controller settings.

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
25.01	**Torque reference speed control**						
	Limited speed controller output torque. Displays the torque reference in percent of 99.02 M1 nominal torque after limitation. See 30.13 Speed control min torque and 30.14 Speed control max torque.						
	-325.00 … 325.00	-	%	See 46.04	y	n	Signal
25.02	**Speed proportional gain 1**						
	Proportional gain 1 (K_P) of the speed controller. The proportional gain of the speed controller can be released by means of 25.13 Speed controller set selection. Too high a gain may cause speed oscillation. The figure below shows a controller output after an error step when the error remains constant:  DZ_LIN_040_speed control_a.ai **Example**: The speed controller generates 15 % of motor nominal torque with 25.02 Speed proportional gain 1 = 3, if the speed error (Δn) is 5 % of 46.02 M1 speed scaling actual.						
	0.00 … 325.00	5.00	-	100 = 1	n	y	Parameter
25.03	**Speed integration time 1**						
	Integration time 1 (T_I) of the speed controller. The integration time of the speed controller can be released by means of 25.13 Speed controller set selection. Setting the integration time to zero disables the integral part of the speed controller and resets the integrator. The integration time defines the time within the integral part of the speed controller achieves the same value as the proportional part, when the error value is constant.						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

The integrator has anti-windup control for operation at torque or current limit.
The figure below shows a controller output after an error step when the error remains constant:



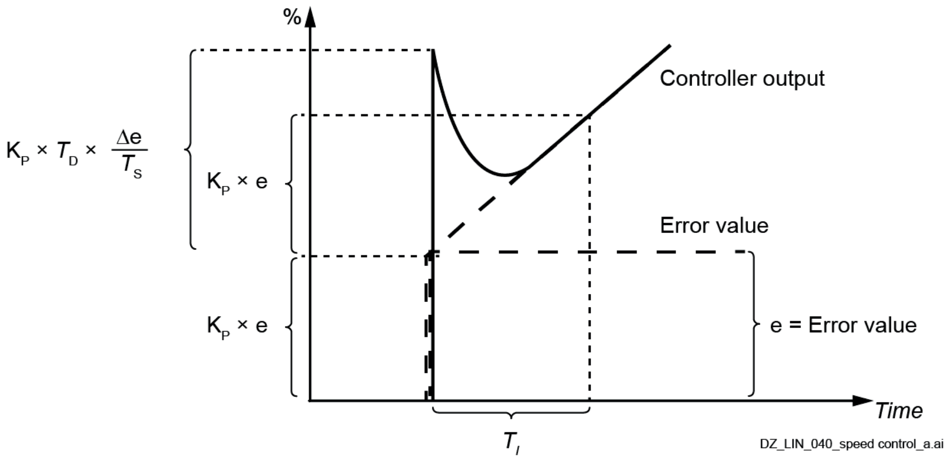
Example: The speed controller generates 15 % of motor nominal torque with 25.02 Speed proportional gain 1 = 3, if the speed error (Δn) is 5 % of 46.02 M1 speed scaling actual. On that condition and with 25.03 Speed integration time 1 = 300 ms follows:

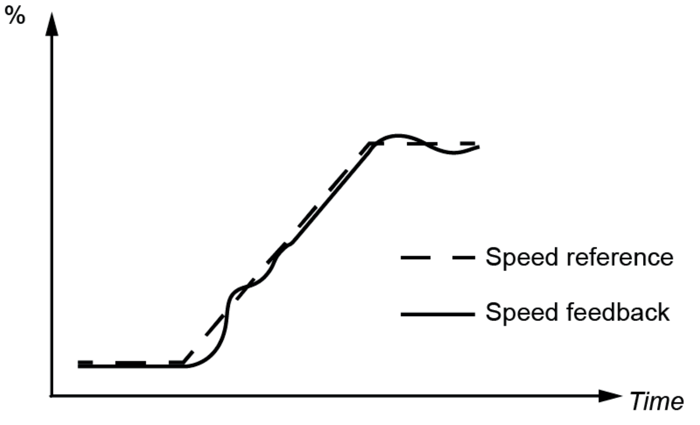
- The speed controller generates 30 % of motor nominal torque, if the speed error is constant, after 300 ms are elapsed. 15 % derive from the proportional part and 15 % derive from the integral part.

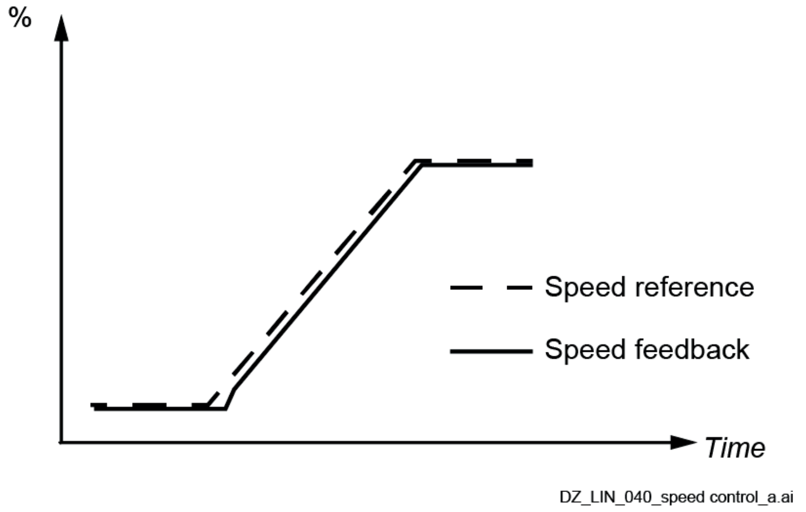
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	0 … 32500	2500	ms	1 = 1 ms	n	y	Parameter

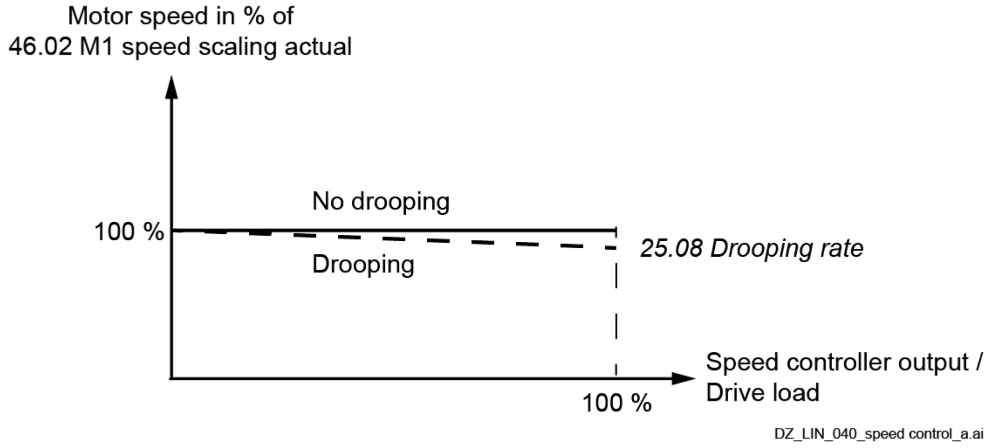
25.04 **Speed derivation time**

Derivation time (T_D) of the speed controller.
Speed controller derivation time. If the derivation time is set to zero, the controller works as a PI controller, otherwise as a PID controller.
For normal applications, derivation time should be left at zero.
Derivative action boosts the controller output if the error value changes. The longer the derivation time, the more the speed controller output is boosted during the change. The derivation makes the control more responsive for disturbances. The speed error derivative must be filtered with a low pass filter to eliminate external disturbances. See 25.05 Derivation filter time.
The figure below shows a controller output after an error step when the error remains constant:

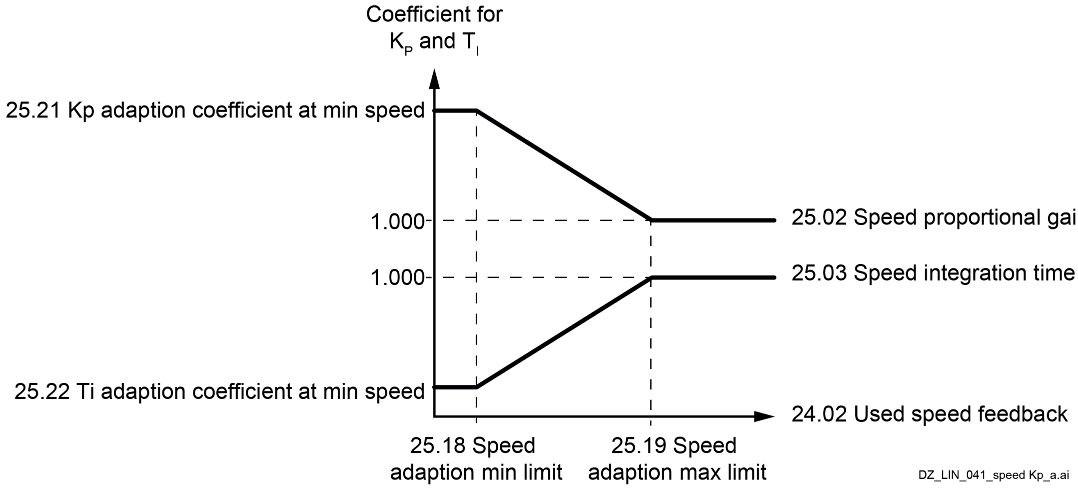
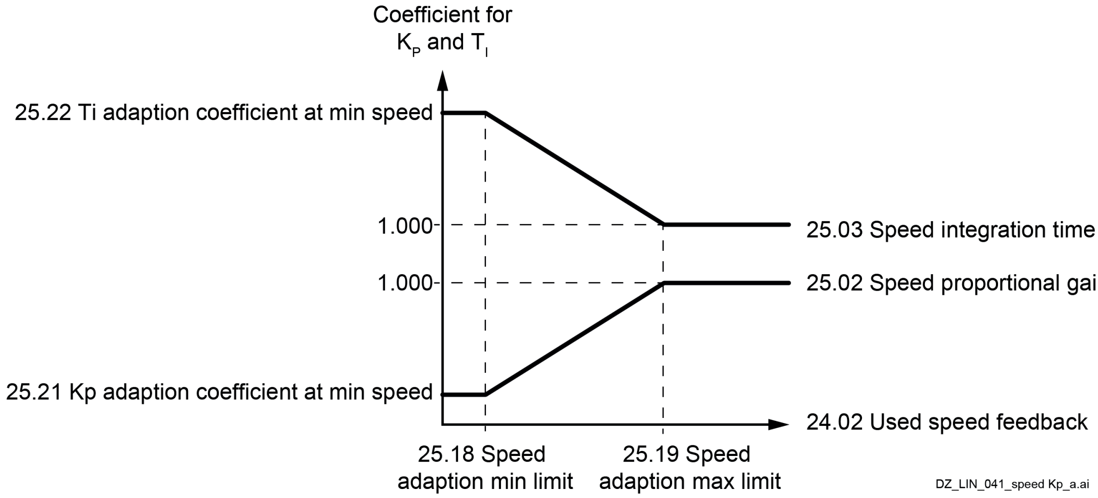


Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	Gain = K_P = 1 T_I = integration time > 0 T_D = derivation time > 0 T_S= sample time period = 500 µs Δe = error value change between two samples						
	0 … 32500	0	ms	1 = 1 ms	n	y	Parameter
25.05	**Derivation filter time**						
	Derivation filter time constant. Derivation filter time constant for 25.04 Speed derivation time.						
	0 … 32500	8	ms	1 = 1 ms	n	y	Parameter
25.06	**Acceleration compensation derivation time**						
	Acceleration compensation derivation time. Derivation time for the acceleration compensation. Setting the acceleration compensation to zero disables it. To compensate for high inertia loads during acceleration/deceleration, a derivative of 23.03 Speed reference 7 is added to the output of the speed controller. **Note**: As a rule, use a value between 50 … 100 % of the sum of the mechanical time constants of the motor and the driven machinery. The figures below show the speed responses when a high inertia load is accelerated along a ramp. Without acceleration compensation:  DZ_LIN_040_speed control_a.ai With acceleration compensation:						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	 DZ_LIN_040_speed control_a.ai						
	0.0 … 3250.0	0.0	s	10 = 1 s	n	y	Parameter
25.07	**Acceleration compensation filter time**						
	Acceleration compensation filter time constant. Acceleration compensation filter time constant for 25.06 Acceleration compensation derivation time.						
	0.0 … 32500.0	8.0	ms	1 = 1 ms	n	y	Parameter
25.08	**Drooping rate**						
	Droop rate. Droop rate in percent of 46.02 M1 speed scaling actual. Drooping decreases the drive speed slightly as the drive load increases. The amount of speed drop caused by the load is determined by 25.08 Drooping rate. Drooping may become necessary for proper load sharing between drives that are linked via material (e.g. paper, steel, foil) and running with a common speed reference. The correct droop rate for a process must be found out case by case in practice. **Example**: Following formula is valid: Speed decrease = Speed controller output • Drooping • Speed scaling With: – Speed controller output = 25.57 Torque reference unbalanced = 50 %. – Drooping = 25.08 Drooping rate = 1 %. – Speed scaling = 46.02 M1 speed scaling actual = 1500 rpm. Follows: Speed decrease = 0.5 • 0.01 • 150 rpm = 7.5 rpm.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7"> </td></tr>
<tr><td>0.00 … 100.00</td><td>0.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">25.09</td><td colspan="7">Speed control balancing enable</td></tr>
<tr><td colspan="7">Force speed controller output to 25.10 Speed control balancing reference.
Selects the source to force the speed controller output balancing.
This function is used to generate a smooth, bump-less transfer from a torque- or tension-controlled motor back to being speed controlled.
Balancing is also possible in the speed ramp. See 23.26 Ramp out balancing enable.
0 = Enable output.
1 = Balance output.
Other [bit]; source selection.
0: Enable output; 0, enable speed controller output. Normal operation.
1: Balance output; 1, force speed controller to 25.10 Speed control balancing reference.
3: DI1; 10.02.b00 DI delayed status.
4: DI2; 10.02.b01 DI delayed status.
5: DI3; 10.02.b02 DI delayed status.
6: DI4; 10.02.b03 DI delayed status.
7: DI5; 10.02.b04 DI delayed status.
8: DI6; 10.02.b05 DI delayed status.
11: DIO1; 11.02.b00 DIO delayed status.
12: DIO2; 11.02.b01 DIO delayed status.
19: DIL; 10.02.b15 DI delayed status.</td></tr>
<tr><td>0 … 19</td><td>Enable output</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">25.10</td><td colspan="7">Speed control balancing reference</td></tr>
<tr><td colspan="7">Speed controller output balancing reference.
Defines the reference for speed controller output balancing in percent of 99.02 M1 nominal torque. The output of the speed controller is forced to this value when speed controller output balancing is enabled. See 25.09 Speed control balancing enable.</td></tr>
<tr><td>-325.00 … 325.00</td><td>0.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">25.11</td><td colspan="7">Emergency stop proportional gain</td></tr>
<tr><td colspan="7">Proportional gain (K_P) upon an Off3 (emergency stop) command.
Proportional gain of the speed controller when an Off3 (emergency stop) command is active and 25.11 Proportional gain emergency stop is ≠ zero. Otherwise the value of either 25.02 Speed proportional gain 1 or 25.14 Speed proportional gain 2 is taken.</td></tr>
<tr><td>0.00 … 325.00</td><td>0.00</td><td>-</td><td>100 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">25.13</td><td colspan="7">Speed controller set selection</td></tr>
<tr><td colspan="7">Select active speed controller parameters.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Selects the source that switches between the two sets of speed controller parameters. 25.02 Speed proportional gain 1, 25.03 Speed integration time 1, 25.14 Speed proportional gain 2 and 25.15 Speed integration time 2.
0 = Speed controller set 1.
1 = Speed controller set 2.
Other [bit]; source selection.
0: Speed controller set 1; 0, proportional gain 1 and integration time 1 are active. Normal operation.
1: Speed controller set 2; 1, proportional gain 2 and integration time 2 are active.
2: Speed level; if |90.01 Motor speed for control| ≤ |46.31 Above speed level|, then Speed controller set 1 is active. If |90.01 Motor speed for control| > |46.31 Above speed level|, then Speed controller set 2 is active.
3: DI1; 10.02.b00 DI delayed status.
4: DI2; 10.02.b01 DI delayed status.
5: DI3; 10.02.b02 DI delayed status.
6: DI4; 10.02.b03 DI delayed status.
7: DI5; 10.02.b04 DI delayed status.
8: DI6; 10.02.b05 DI delayed status.
11: DIO1; 11.02.b00 DIO delayed status.
12: DIO2; 11.02.b01 DIO delayed status.
19: DIL; 10.02.b15 DI delayed status.
20: Speed error; if |24.04 Speed error inverted| ≤ |46.31 Above speed level|, then Speed controller set 1 is active. If |24.04 Speed error inverted| > |46.31 Above speed level|, then Speed controller set 2 is active.
21: Motor1/Motor2; used speed controller set depends on setting of 42.01 Motor 1/2 selection. If 42.01 Motor 1/2 selection = Motor 1 use Speed controller set 1. If 42.01 Motor 1/2 selection = Motor 2 use Speed controller set 2.</td></tr>
<tr><td>0 … 21</td><td>Speed controller set 1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">25.14</td><td colspan="7">Speed proportional gain 2</td></tr>
<tr><td colspan="7">Proportional gain 2 (K_P) of the speed controller.
See 25.02 Speed proportional gain 1.</td></tr>
<tr><td>0.00 … 325.00</td><td>5.00</td><td>-</td><td>100 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">25.15</td><td colspan="7">Speed integration time 2</td></tr>
<tr><td colspan="7">Integration time 2 (T_I) of the speed controller.
See 25.03 Speed integration time 1.</td></tr>
<tr><td>0 … 32500</td><td>2500</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td></td><td colspan="7">Speed adaptive proportional gain and integration time:
In certain applications, it is useful to increase/decrease proportional gain and decrease/increase integration time of the speed controller at low speeds to improve the performance of the speed controller. Thus, it is possible to adapt proportional gain and integration time according to the speed feedback. See 25.02 Speed proportional gain 1, 25.03 Speed integration time 1 and 24.02 Used speed feedback.
This is done by multiplying proportional gain and integration time by coefficients at certain speeds. The coefficients are defined individually for both proportional gain and integration time.
When the speed feedback is below or equal to 25.18 Speed adaption min limit, proportional gain is multiplied by 25.21 Kp adaption coefficient at min speed and integration time is multiplied by 25.22 Ti adaption coefficient at min speed.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">When the speed feedback is between 25.18 Speed adaption min limit and 25.19 Speed adaption max limit, the coefficients for proportional gain and integration time are calculated linearly.
When the speed feedback is equal to or above 25.19 Speed adaption max limit, no adaptation takes place. Thus, the coefficient is 1.
The speed adaptation is valid for positive and negative speeds.
Increase the proportional gain (K_P) and decrease the integration time (T_I):

Decrease the proportional gain (K_P) and increase the integration time (T_I):
 </td></tr>
<tr><td rowspan="3">25.18</td><td colspan="7">Speed adaption min limit</td></tr>
<tr><td colspan="7">Minimum speed feedback for the speed controller adaptation.
The speed feedback limit below that the proportional gain is defined by 25.21 Kp adaption coefficient at min speed and the integration time is defined 25.22 Ti adaption coefficient at min speed. The speed feedback is 24.02 Used speed feedback.</td></tr>
<tr><td>0 … see 25.19</td><td>0</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">25.19</td><td colspan="7">Speed adaption max limit</td></tr>
<tr><td colspan="7">Maximum speed feedback for the speed controller adaptation.
The speed feedback limit above that the proportional gain is defined by 25.02 Speed proportional gain 1 and the integration time is defined by 25.03 Speed integration time 1. The speed feedback is 24.02 Used speed feedback.</td></tr>
<tr><td>See 25.18 … 30000</td><td>0</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>25.21</td><td colspan="7">Kp adaption coefficient at min speed</td></tr>
</table>

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	Proportional gain (K_P) coefficient at minimum speed feedback. Determines the proportional gain coefficient at the speed feedback defined by 25.18 Speed adaption min limit.						
	0.000 … 10.000	1.000	-	1000 = 1	n	y	Parameter
25.22	**Ti adaption coefficient at min speed**						
	Integration time (T_I) coefficient at minimum speed feedback. Determines the integration time coefficient at the speed feedback defined by 25.18 Speed adaption min limit.						
	0.000 … 10.000	1.000	-	1000 = 1	n	y	Parameter

Torque adaptive proportional gain:

It is possible to adapt the proportional gain of the speed controller according to the torque reference. See 25.02 Speed proportional gain 1 and 25.01 Torque reference speed control. This can be used to smooth out disturbances caused by small loads and backlashes and is done by multiplying proportional gain by a coefficient within a certain torque range.

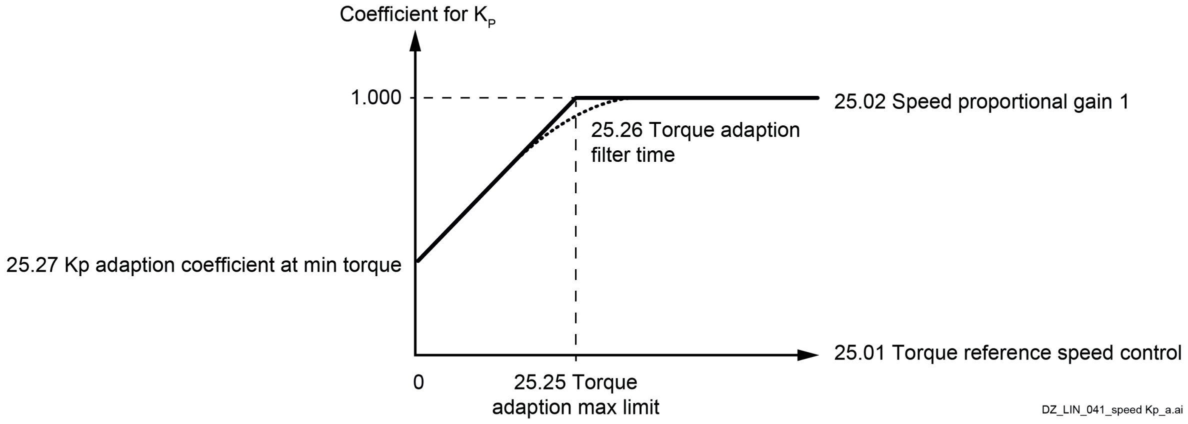
When the torque reference is 0 %, proportional gain is multiplied by 25.27 Kp adaption coefficient at min torque.

When the torque reference is between 0 % and 25.25 Torque adaption max limit, the coefficient for proportional gain is calculated linearly.

When the torque reference is equal to or above 25.25 Torque adaption max limit, no adaptation takes place. Thus, the coefficient is 1.

Filtering can be applied on the torque reference using 25.26 Torque adaption filter time.

The load adaptation is valid for positive and negative torque.



Index	Name						
25.25	**Torque adaption max limit**						
	Maximum torque reference for the speed controller adaptation. The torque reference limit in percent of 99.02 M1 nominal torque above which the proportional gain is defined by 25.02 Speed proportional gain 1. The torque reference is 25.01 Torque reference speed control.						
	0.00 … 325.00	0.00	%	See 46.04	n	y	Parameter
25.26	**Torque adaption filter time**						
	Filter time constant for the speed controller adaptation. Filter time constant to soften the proportional gain rate of change.						
	0 … 32500	100	ms	1 = 1 ms	n	y	Parameter
25.27	**Kp adaption coefficient at min torque**						
	Proportional gain (K_P) coefficient at 0 % torque reference. Determines the proportional gain coefficient at 0 % torque reference.						

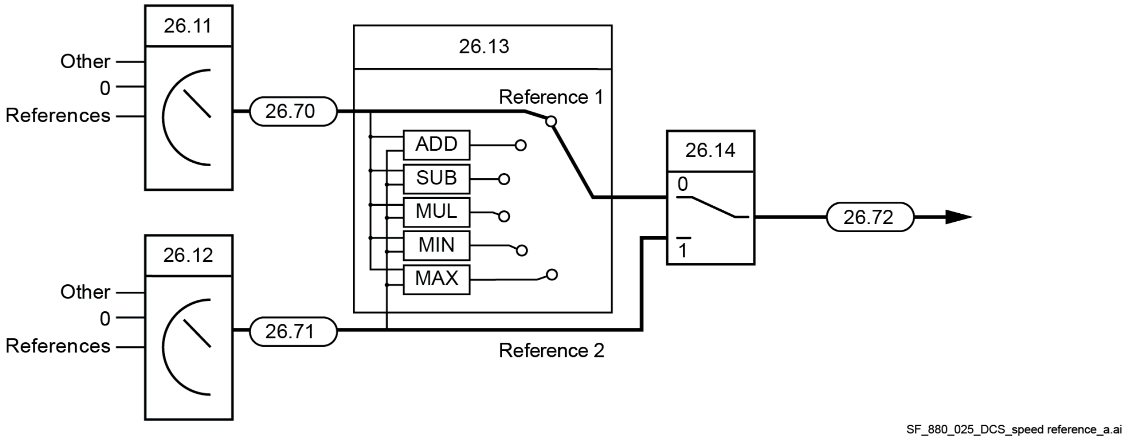
Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	0.000 … 10.000	1.000	-	1000 = 1	n	y	Parameter
25.30	**Integration time initial enable**						
	Force integration time (T_I) to 25.31 Integration time initial reference. Selects the source to force the integration time. 0 = Automatic. 1 = Initial reference. **Other [bit]**; source selection. 0: **Automatic**; 0, the integration time (T_I) is set to 25.31 Integration time initial reference as soon as Ready reference is set, see 06.15.b02 Main Status Word, or if 19.01 Actual operation mode changes from Torque to Speed. Normal operation. 1: **Initial reference**; 1, force integration time (T_I) to 25.31 Integration time initial reference. 3: **DI1**; 10.02.b00 DI delayed status. 4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status.						
	0 … 19	Automatic	-	1 = 1	n	y	Parameter
25.31	**Integration time initial reference**						
	Initial reference of the integration time (T_I). Initial value of the speed controller integration time in percent of 99.02 M1 nominal torque. The integration time is set: – As soon as Ready reference is set. See 06.15.b02 Main Status Word. – If 19.01 Actual operation mode changes from Torque to Speed.						
	-325.00 … 325.00	0.00	%	See 46.04	n	y	Parameter
25.53	**Torque proportional reference**						
	Proportional gain (K_P) part of the speed controller. Displays the proportional gain (K_P) part of the speed controller in percent of 99.02 M1 nominal torque.						
	-325.00 … 325.00	-	%	See 46.04	y	n	Signal
25.54	**Torque integral reference**						
	Integration time (T_I) part of the speed controller. Displays the integration time (T_I) part of the speed controller in percent of 99.02 M1 nominal torque.						
	-325.00 … 325.00	-	%	See 46.04	y	n	Signal
25.55	**Torque derivative reference**						
	Derivation time (T_D) part of the speed controller. Displays the derivation time (T_D) part of the speed controller in percent of 99.02 M1 nominal torque.						
	-325.00 … 325.00	-	%	See 46.04	y	n	Signal
25.56	**Torque acceleration compensation**						
	Output of the acceleration compensation function. Displays the output of the acceleration compensation function in percent of 99.02 M1 nominal torque.						
	-325.00 … 325.00	-	%	See 46.04	y	n	Signal

Index	Name						
	Text						
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
25.57	**Torque reference unbalanced**						
	Unlimited speed controller output torque. Displays the unlimited speed controller output torque after acceleration compensation in percent of 99.02 M1 nominal torque.						
	-325.00 … 325.00	-	%	See 46.04	y	n	Signal

26 Torque reference chain

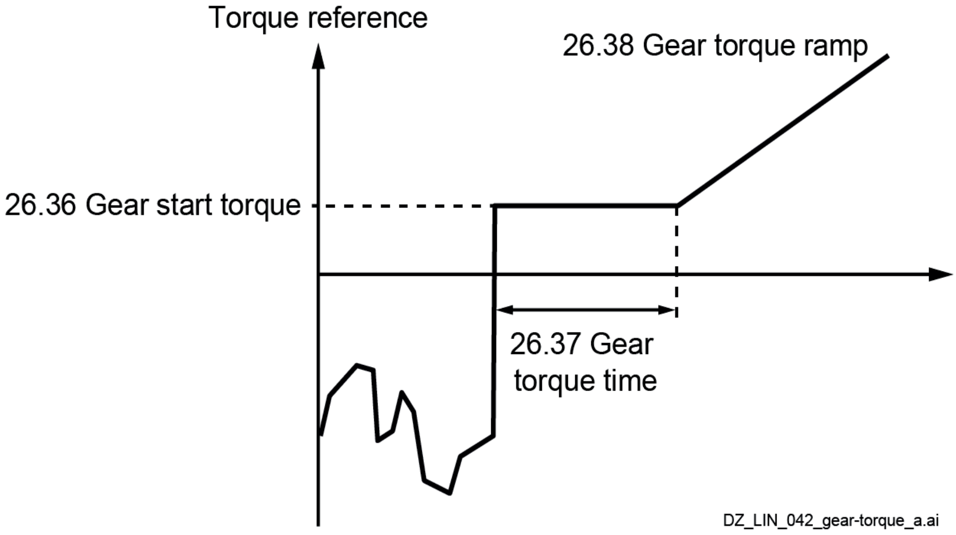
Settings for the torque reference chain.

Index	Name						
	Text						
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
26.01	**Torque reference to limitation**						
	Torque reference after gear backlash compensation. Displays the torque reference in percent of 99.02 M1 nominal torque after gear backlash compensation and before limitation.						
	-325.00 … 325.00	-	%	See 46.04	y	n	Signal
26.02	**Torque reference used**						
	Torque reference after torque correction. Displays the final torque reference in percent of 99.02 M1 nominal torque after torque correction and before current control.						
	-325.00 … 325.00	-	%	See 46.04	y	n	Signal
26.05	**Motor torque unfiltered**						
	Unfiltered motor torque. Displays the unfiltered motor torque in percent of 99.02 M1 nominal torque.						
	-325.00 … 325.00	-	%	See 46.04	y	n	Signal
26.07	**External torque reference 1**						
	1st external torque reference. External torque reference 1 in percent of 99.02 M1 nominal torque.						
	-325.00 … 325.00	0.00	%	See 46.04	n	y	Parameter
26.08	**External torque reference 2**						
	2nd external torque reference. External torque reference 2 in percent of 99.02 M1 nominal torque.						
	-325.00 … 325.00	0.00	%	See 46.04	n	y	Parameter
26.11	**Torque reference 1 source**						
	Selects torque reference source 1. Two signal sources can be defined. See 26.11 Torque reference 1 source and 26.12 Torque reference 2 source. 26.14 Torque reference 1/2 selection switches between the two sources or a mathematical function. The mathematical function depends on 26.13 Torque reference function.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">
SF_880_025_DCS_speed reference_a.ai
Other; source selection.
0: Zero; 0 %, torque reference is set to zero.
1: External torque ref 1; 26.07 External torque reference 1.
2: External torque ref 2; 26.08 External torque reference 2.
4: AI1 scaled; 12.12 AI1 scaled value.
5: AI2 scaled; 12.22 AI2 scaled value.
6: AI3 scaled; 12.32 AI3 scaled value.
7: FBA A reference 1; 03.05 FBA A reference 1.
8: FBA A reference 2; 03.06 FBA A reference 2.
9: FBA B reference 1; 03.07 FBA B reference 1.
10: FBA B reference 2; 03.08 FBA B reference 2.
11: EFB reference 1; 03.09 EFB reference 1.
12: EFB reference 2; 03.10 EFB reference 2.
13: DDCS controller ref1; 03.11 DDCS controller ref1.
14: DDCS controller ref2; 03.12 DDCS controller ref2.
15: M/F or D2D ref1; 03.13 M/F or D2D ref1.
16: M/F or D2D ref2; 03.14 M/F or D2D ref2.
17: Motor potentiometer reference; 22.80 Motor potentiometer reference.
18: Process PID output actual; 40.01 Process PID output actual.</td></tr>
<tr><td>0 … 18</td><td>Zero</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">26.12</td><td colspan="7">Torque reference 2 source</td></tr>
<tr><td colspan="7">Selects torque reference source 2.
For selections and diagram, see 26.11 Torque reference 1 source.</td></tr>
<tr><td>0 … 18</td><td>Zero</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">26.13</td><td colspan="7">Torque reference function</td></tr>
<tr><td colspan="7">Torque reference function.
Selects a mathematical function between torque reference 1 and torque reference 2. See 26.11 Torque reference 1 source.
0: Ref 1; torque reference 1 selected by 26.11 Torque reference 1 source is used.
1: Add (ref 1 + ref 2); the sum of the two torque references is used.
2: Sub (ref 1 - ref 2); the result of torque reference 1 minus torque reference 2 is used.
3: Mul (ref 1 • ref 2); the multiplication of the two torque references is used.
4: Min (ref 1, ref 2); the smaller of the two torque references is used.
5: Max (ref 1, ref 2); the greater of the two torque references is used.</td></tr>
<tr><td>0 … 5</td><td>Ref 1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">26.14</td><td colspan="7">Torque reference 1/2 selection</td></tr>
<tr><td colspan="7">Selection between torque reference 1 and torque reference 2.
Configures the selection between torque reference 1 and torque reference 2. See 26.11 Torque reference 1.
0 = Torque reference 1.
1 = Torque reference 2.
Other [bit]; source selection.
0: Torque reference 1; 0, normal operation.
1: Torque reference 2; 1.
3: DI1; 10.02.b00 DI delayed status.
4: DI2; 10.02.b01 DI delayed status.
5: DI3; 10.02.b02 DI delayed status.
6: DI4; 10.02.b03 DI delayed status.
7: DI5; 10.02.b04 DI delayed status.
8: DI6; 10.02.b05 DI delayed status.
11: DIO1; 11.02.b00 DIO delayed status.
12: DIO2; 11.02.b01 DIO delayed status.
19: DIL; 10.02.b15 DI delayed status</td></tr>
<tr><td>0 … 19</td><td>Torque reference 1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">26.15</td><td colspan="7">Load share</td></tr>
<tr><td colspan="7">Torque reference scaling factor.
Defines a scaling factor between 26.72 Torque reference 3 and 26.73 Torque reference 4. This allows drives sharing the load of two motors connected to the same mechanics to be tailored to share the correct amount each. But it is possible to use the same master torque reference.</td></tr>
<tr><td>-8.000 … 8.000</td><td>1.000</td><td>-</td><td>1000 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">26.16</td><td colspan="7">Torque additive 1 source</td></tr>
<tr><td colspan="7">1st additive torque reference.
Defines a torque reference to be added to the torque reference after load sharing. See 26.11 Torque reference 1 source.
Note: Due to safety reasons, the additive torque reference is not applied during an emergency stop.</td></tr>
<tr><td>0 … 18</td><td>Zero</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">26.17</td><td colspan="7">Torque reference filter time</td></tr>
<tr><td colspan="7">Filter time constant for the torque reference.
Low-pass filter time constant for the torque reference.</td></tr>
<tr><td>0 … 32500</td><td>0</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">26.18</td><td colspan="7">Torque ramp up time</td></tr>
<tr><td colspan="7">Torque reference ramp-up time.
The time within the torque reference will increase from zero to 99.02 M1 nominal torque. See also 46.04 M1 torque scaling actual.</td></tr>
<tr><td>0.0 … 3250.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">26.19</td><td colspan="7">Torque ramp down time</td></tr>
<tr><td colspan="7">Torque reference ramp-down time.
The time within the torque reference will decrease from 99.02 M1 nominal torque to zero. See also 46.04 M1 torque scaling actual.</td></tr>
<tr><td>0.0 … 3250.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>26.24</td><td colspan="7">Torque additive 2 enable</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Enable 2nd additive torque (load compensation).
Source to enable torque additive 2.
0 = Disable torque additive 2.
1 = Enable torque additive 2.
Other [bit]; source selection.
0: Disable torque additive 2; 0, normal operation.
1: Enable torque additive 2; 1.
3: DI1; 10.02.b00 DI delayed status.
4: DI2; 10.02.b01 DI delayed status.
5: DI3; 10.02.b02 DI delayed status.
6: DI4; 10.02.b03 DI delayed status.
7: DI5; 10.02.b04 DI delayed status.
8: DI6; 10.02.b05 DI delayed status.
11: DIO1; 11.02.b00 DIO delayed status.
12: DIO2; 11.02.b01 DIO delayed status.
19: DIL; 10.02.b15 DI delayed status.</td></tr>
<tr><td>0 … 19</td><td>Disable torque additive 2</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">26.25</td><td colspan="7">Torque additive 2 source</td></tr>
<tr><td colspan="7">2nd additive torque reference (load compensation).
Defines a torque reference to be added to 26.75 Torque reference 5. See 26.11 Torque reference 1 source.
Note: Due to safety reasons, the additive torque reference is not applied during an emergency stop.
WARNING
If the additive torque 2 exceeds the limits set by 30.13 Speed control min torque and 30.14 Speed control max torque, a ramp stop may be impossible. Make sure additive torque 2 is reduced or removed when a ramp stop is required. See 26.11 Torque reference 1 source.</td></tr>
<tr><td>0 … 18</td><td>Zero</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>.</td><td colspan="7">Gear backlash compensation:
Gear backlash compensation is used to reduce the gear backlash. Thus, it is possible to make torque reference direction changes faster without damaging the gearbox.</td></tr>
</table>

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	When the torque reference is changing its direction, the torque limit is reduced to 26.36 Gear start torque for the time defined by 26.37 Gear torque time. After the time has elapsed, the torque limit is increased to its normal value according to the ramp time defined by 26.38 Gear torque ramp.  DZ_LIN_042_gear-torque_a.ai						
26.36	**Gear start torque**						
	Torque limit for the gear backlash compensation. Defines the reduced torque limit in percent of 99.02 M1 nominal torque after a direction change of the torque reference.						
	0.00 … 325.00	325.00	%	See 46.04	n	y	Parameter
26.37	**Gear torque time**						
	Time for the gear backlash compensation. When the torque reference is changing its direction, the torque limit is reduced for the time defined by 26.37 Gear torque time.						
	0 … 32500	100	ms	1 = 1 ms	n	y	Parameter
26.38	**Gear torque ramp**						
	Torque reference ramp-up time for the gear backlash compensation. The time within the torque reference will increase from zero to 99.02 M1 nominal torque.						
	0 … 32500	100	ms	1 = 1 ms	n	y	Parameter
26.41	**Torque step**						
	Torque step value. Adds an additional torque step in percent of 99.02 M1 nominal torque to 26.76 Torque reference 6. **Note**: Due to safety reasons, the torque step is not applied during an emergency stop. **WARNING** If the torque step exceeds the limits set by 30.13 Speed control min torque and 30.14 Speed control max torque, a ramp stop may be impossible. Make sure the torque step is reduced or removed when a ramp stop is required. See 26.42 Torque step enable.						
	-325.00 … 325.00	0.00	%	See 46.04	n	y	Parameter
26.42	**Torque step enable**						
	Enable a torque step.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	Enables/Disables a torque step. 0: **Disable**; disable torque step. 1: **Enable**; enable torque step.						
	0 … 1	Disable	-	1 = 1	n	y	Parameter
26.43	**Torque correction enable**						
	Enable torque correction. Source to enable torque correction. 0 = Disable torque correction. 1 = Enable torque correction. **Other [bit]**; source selection. 0: **Disable torque correction**; 0, normal operation. 1: **Enable torque correction**; 1. 3: **DI1**; 10.02.b00 DI delayed status. 4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status.						
	0 … 19	Disable torque correction	-	1 = 1	n	y	Parameter
26.44	**Torque correction source**						
	Torque correction source. Defines a torque correction to be added to the torque reference after the limitation. See 26.11 Torque reference 1 source. **Note**: Due to safety reasons, the additive torque reference is not applied during an emergency stop. **WARNING** If the torque correction exceeds the limits set by 30.03 Minimum torque all limits and 30.04 Maximum torque all limits, a ramp stop may be impossible. Make sure torque correction is reduced or removed when a ramp stop is required. See 26.11 Torque reference 1 source.						
	0 … 18	Zero	-	1 = 1	n	y	Parameter
26.70	**Torque reference 1**						
	Value of torque reference 1 source. Displays the torque reference in percent of 99.02 M1 nominal torque after torque reference 1 source. See 26.11 Torque reference 1 source.						
	-325.00 … 325.00	-	%	See 46.04	y	n	Signal
26.71	**Torque reference 2**						
	Value of torque reference 2 source. Displays the torque reference in percent of 99.02 M1 nominal torque after torque reference 2 source. See 26.12 Torque reference 2 source.						
	-325.00 … 325.00	-	%	See 46.04	y	n	Signal
26.72	**Torque reference 3**						
	Torque reference after source selection. Displays the torque reference in percent of 99.02 M1 nominal torque after the mathematical function and torque reference 1/2 selection. See 26.13 Torque reference function and 26.14 Torque reference 1/2 selection.						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	-325.00 … 325.00	-	%	See 46.04	y	n	Signal
26.73	**Torque reference 4**						
	Torque reference after additive 1. Displays the torque reference in percent of 99.02 M1 nominal torque after 1st additive torque and after torque reference from control panel. See 26.16 Torque additive 1 source.						
	-325.00 … 325.00	-	%	See 46.04	y	n	Signal
26.74	**Torque reference ramp output**						
	Torque reference at the ramp output. Displays the limited, filtered and ramped torque reference in percent of 99.02 M1 nominal torque. See 30.03 Minimum torque all limits and 30.04 Maximum torque all limits.						
	-325.00 … 325.00	-	%	See 46.04	y	n	Signal
26.75	**Torque reference 5**						
	Torque reference after torque selector. Displays the torque reference in percent of 99.02 M1 nominal torque after control mode selection. See 19.01 Actual operation mode.						
	-325.00 … 325.00	-	%	See 46.04	y	n	Signal
26.76	**Torque reference 6**						
	Torque reference after additive 2 (load compensation). Displays the torque reference in percent of 99.02 M1 nominal torque after 2nd additive torque. See 26.24 Torque additive 2 enable and 26.25 Torque additive 2 source.						
	-325.00 … 325.00	-	%	See 46.04	y	n	Signal
26.77	**Torque reference additive A**						
	Torque reference after additive 2 (load compensation) source selection. Displays the torque reference in percent of 99.02 M1 nominal torque after additive 2 selection. See 26.25 Torque additive 2 source.						
	-325.00 … 325.00	-	%	See 46.04	y	n	Signal
26.78	**Torque reference additive B**						
	Torque reference after additive 2 (load compensation) enable. Displays the torque reference in percent of 99.02 M1 nominal torque after additive 2 enable. See 26.24 Torque additive 2 enable.						
	-325.00 … 325.00	-	%	See 46.04	y	n	Signal
26.79	**Torque correction reference**						
	Torque correction reference after source selection and enable. Displays the torque correction reference in percent of 99.02 M1 nominal torque after source selection and enable. See 26.43 Torque correction enable and 26.44 Torque correction source.						
	-325.00 … 325.00	-	%	See 46.04	y	n	Signal

27 Armature current control

Settings for the armature current control chain.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">27.01</td><td colspan="7">Current reference</td></tr>
<tr><td colspan="7">Armature current reference after flux adaption.
Displays the armature current reference in percent of 99.11 M1 nominal current after flux adaption.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>100 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">27.02</td><td colspan="7">Used current reference</td></tr>
<tr><td colspan="7">Armature current reference after limitation.
Displays the armature current reference in percent of 99.11 M1 nominal current after current limitation. See 30.34 M1 current limit bridge 2, 30.35 M1 current limit bridge 1 and 30.37 … 30.41 Current limit at speed 1 … 5.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>100 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">27.05</td><td colspan="7">Motor current</td></tr>
<tr><td colspan="7">Motor current.
Measured motor current in percent of 99.11 M1 nominal current.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>100 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">27.06</td><td colspan="7">Motor peak current</td></tr>
<tr><td colspan="7">Motor peak current.
Measured motor peak current in percent of 99.11 M1 nominal current.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>100 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">27.09</td><td colspan="7">Current controller i-part</td></tr>
<tr><td colspan="7">Integration time (T_I) part of the armature current controller.
Displays the integration time (T_I) part of the armature current controller in percent of 99.11 M1 nominal current.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>100 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">27.18</td><td colspan="7">Firing angle</td></tr>
<tr><td colspan="7">Firing angle.
Displays the firing angel in degrees.</td></tr>
<tr><td>0.00 … 180.00</td><td>-</td><td>°</td><td>100 = 1°</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">27.19</td><td colspan="7">Selected bridge</td></tr>
<tr><td colspan="7">Selected (current-conducting) bridge:
0: No bridge; no bridge selected.
1: Bridge 1; bridge 1 selected.
2: Bridge 2; bridge 2 selected.</td></tr>
<tr><td>0 … 2</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="2">27.22</td><td colspan="7">Current reference source</td></tr>
<tr><td colspan="7">Selects the current reference source.
Selects the source for the current reference either as armature drive or as field exciter.
Other; source selection.
0: Zero; 0, forces single firing pulses to suppress the DC current and sets 27.01 Current reference to zero.
1: 27.01 Current reference; 27.01 Current reference as armature current reference.
2: 27.23 Current reference external; 27.23 Current reference external as armature current reference.
3: 26.02 Torque reference used; 26.02 Torque reference used is directly used as armature current reference (torque = current).</td></tr>
</table>

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	Note: The flux adaption in field weakening is inactive (means no flux dependent armature current reference). 4: **AI1 scaled**; 12.12 AI1 scaled value as armature current reference. 5: **AI2 scaled**; 12.22 AI2 scaled value as armature current reference. 6: **AI3 scaled**; 12.32 AI3 scaled value as armature current reference. 7: **FBA A reference 1**; 03.05 FBA A reference 1 as armature current reference. 8: **FBA A reference 2**; 03.06 FBA A reference 2 as armature current reference. 9: **FBA B reference 1**; 03.07 FBA B reference 1 as armature current reference. 10: **FBA B reference 2**; 03.08 FBA B reference 2 as armature current reference. 11: **EFB reference 1**; 03.09 EFB reference 1 as armature current reference. 12: **EFB reference 2**; 03.10 EFB reference 2 as armature current reference. 13: **DDCS controller ref1**; 03.11 DDCS controller ref1 as armature current reference. 14: **DDCS controller ref2**; 03.12 DDCS controller ref2 as armature current reference. 15: **M/F or D2D ref1**; 03.13 M/F or D2D ref1 as armature current reference. 16: **M/F or D2D ref2**; 03.14 M/F or D2D ref2 as armature current reference. 30: **FieldRef via DCSLink**; from the armature drive via DCSLink. Depending on the node number settings in group 70 either 28.14 M1 field current reference (if it is motor 1 field exciter) or 42.45 M2 field current reference (if it is motor 2 field exciter) as field current reference. Only available if 99.06 Operation mode = Field exciter. 32: **FieldRef via DCSLink + CurRefExt**; from the armature drive via DCSLink. Depending on the node number settings in group 70 either 28.14 M1 field current reference (if it is motor 1 field exciter) or 42.45 M2 field current reference (if it is motor 2 field exciter) plus 27.23 Current reference external as field current reference. Only available if 99.06 Operation mode = Field exciter. 34: **FluxRef after EMF control**; 28.09 Flux reference after EMF control from the armature drive via DCSLink as field current reference. Only available if 99.06 Operation mode = Field exciter.						
	0 … 34	27.01 Current reference	-	1 = 1	n	y	Parameter
27.23	**Current reference external**						
	External armature current reference. External armature current reference in percent of 99.11 M1 nominal current. **Note**: 27.23 Current reference external is only valid, if 27.22 Current reference source = 27.23 Current reference external.						
	-325.00 … 325.00	0.00	%	100 = 1 %	y	y	Parameter
27.24	**Current reference slope**						
	Armature current reference slope. Armature current reference slope in percent of 99.11 M1 nominal current per 1 ms. The di/dt limitation is located at the input of the armature current controller. **Example:** For 200 % nominal motor current in 100 ms set 27.24 Current reference slope = 2.0 %/ms.						
	0.2 … 120.0	10.0	%/ms	100 = 1 %/ms	n	y	Parameter
27.27	**Current control mode**						
	Armature current control mode. Armature current controller mode selection. 0: **Standard**; PI-controller with RL compensation from EMF calculation based on 27.05 Motor current and feed forward from 99.01 Mains voltage. 1: **Feed forward + reference**; PI-controller with RL compensation from EMF calculation based on current reference, see 27.22 Current reference source, and feed forward from 99.01 Mains voltage. More stable since a current reference is used.						

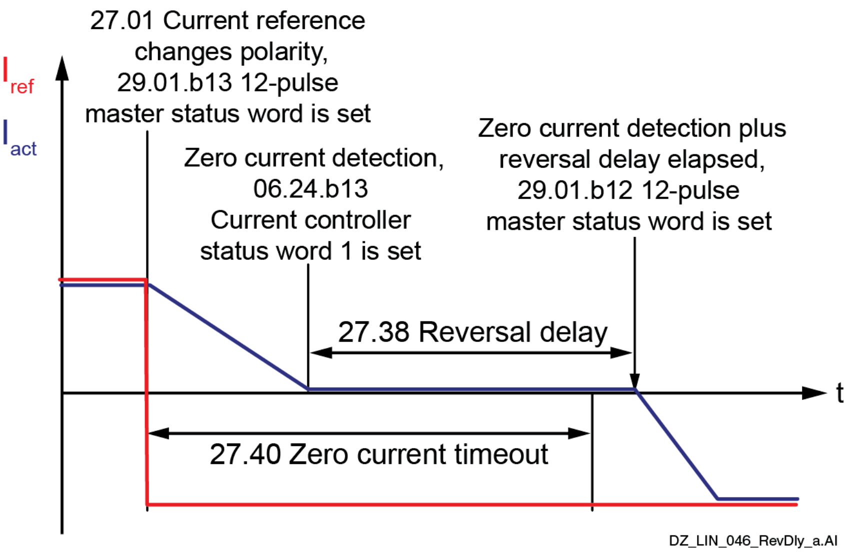
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">2: **No feed forward**; PI-controller without RL compensation from EMF calculation and feed forward from 99.01 Mains voltage. Do not use for motor applications.
5: **Feed forward + dev**; same control type as selection Standard, but improved performance and stability, thus faster current control (higher p-part and lower i-part in current controller possible).</td></tr>
<tr><td>0 … 5</td><td>Standard</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**27.28**</td><td colspan="7">**Current control feedback mode**</td></tr>
<tr><td colspan="7">Proportional gain (K_P) feedback mode.
Chooses the armature current feedback type for the proportional gain of the armature current controller.
0: **Peak current**; peak current measurement is used.
1: **Average current**; average current measurement is used.</td></tr>
<tr><td>0 … 1</td><td>Peak current</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**27.29**</td><td colspan="7">**M1 current proportional gain**</td></tr>
<tr><td colspan="7">Proportional gain (K_P) of the armature current controller.
Example: The controller generates 15 % of motor nominal current with 27.29 M1 current proportional gain = 3, if the armature current error is 5 % of 99.11 M1 nominal current.</td></tr>
<tr><td>0.00 … 325.00</td><td>0.10</td><td>-</td><td>100 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**27.30**</td><td colspan="7">**M1 current integration time**</td></tr>
<tr><td colspan="7">Integration time (T_I) of the armature current controller.
Setting the integration time to zero disables the integral part of the armature current controller and resets the integrator.
The integration time defines the time within the integral part of the armature current controller achieves the same value as the proportional part, when the error value is constant.
Example: The controller generates 15 % of motor nominal current with 27.29 M1 current proportional gain = 3, if the armature current error is 5 % of 99.11 M1 nominal current. On that condition and with 27.30 M1 current integration time = 50 ms follows:
– The controller generates 30 % of motor nominal current, if the armature current error is constant, after 50 ms are elapsed. 15 % derive from the proportional part and 15 % derive from the integral part.</td></tr>
<tr><td>0.0 … 32500.0</td><td>50.0</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**27.31**</td><td colspan="7">**M1 discontinuous current limit**</td></tr>
<tr><td colspan="7">Motor 1 discontinuous current limit.
Threshold continuous/discontinuous current in percent of 99.11 M1 nominal current. The measured continuous/discontinuous current state can be read from 06.24.b12 Current controller status word 1.</td></tr>
<tr><td>0.00 … 325.00</td><td>100.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**27.32**</td><td colspan="7">**M1 armature resistance**</td></tr>
<tr><td colspan="7">Motor 1 armature resistance.
Resistance of the armature circuit in mΩ. Used for the EMF calculation/compensation:
$EMF = U_A - R_A \times I_A - L_A \times \frac{dI_A}{dt}$
27.32 M1 armature resistance can be obtained by means of autotuning, see 99.20 Tuning request, or from the motor data sheet.
Note: Do not change the default values of 27.32 M1 armature resistance and 27.33 M1 armature inductance before autotuning! Changing them will falsify the autotuning results.</td></tr>
<tr><td>0 … 65500</td><td>0</td><td>mOhm</td><td>1 = 1 mOhm</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">27.33</td><td colspan="7">M1 armature inductance</td></tr>
<tr><td colspan="7">Motor 1 armature inductance.
Inductance of the armature circuit in mH.
27.33 M1 armature inductance can be obtained by means of autotuning, see 99.20 Tuning request, or from the motor data sheet.
Note: Do not change the default values of 27.32 M1 armature resistance and 27.33 M1 armature inductance before autotuning! Changing them will falsify the autotuning results.
Attention: 27.33 M1 armature inductance is not used for the EMF calculation/compensation.</td></tr>
<tr><td>0.0 … 3250.0</td><td>0.0</td><td>mH</td><td>10 = 1 mH</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">27.34</td><td colspan="7">Mains compensation time</td></tr>
<tr><td colspan="7">Mains compensation filter time constant.
Mains voltage compensation filter time constant. Is used for the mains voltage compensation at the current controller output.
Setting the mains compensation filter time constant to 32500 ms disables the mains voltage compensation.</td></tr>
<tr><td>0 … 32500</td><td>10</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">27.36</td><td colspan="7">Block bridge 1 source</td></tr>
<tr><td colspan="7">Block bridge 1 source.
Binary signal to block bridge 1. See 27.19 Selected bridge.
0 = Release bridge 1.
1 = Block bridge 1.
Other [bit]; source selection.
0: Release bridge 1; 0, release bridge 1. Normal operation.
1: Block bridge 1; 1, block bridge 1.
3: DI1; 10.02.b00 DI delayed status.
4: DI2; 10.02.b01 DI delayed status.
5: DI3; 10.02.b02 DI delayed status.
6: DI4; 10.02.b03 DI delayed status.
7: DI5; 10.02.b04 DI delayed status.
8: DI6; 10.02.b05 DI delayed status.
11: DIO1; 11.02.b00 DIO delayed status.
12: DIO2; 11.02.b01 DIO delayed status.
19: DIL; 10.02.b15 DI delayed status.</td></tr>
<tr><td>0 … 19</td><td>Release bridge 1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">27.37</td><td colspan="7">Block bridge 2 source</td></tr>
<tr><td colspan="7">Block bridge 2 source.
Binary signal to block bridge 2. See 27.19 Selected bridge.
0 = Release bridge 2.
1 = Block bridge 2.
Other [bit]; source selection.
0: Release bridge 2; 0, release bridge 2. Normal operation.
1: Block bridge 2; 1, block bridge 2.
3: DI1; 10.02.b00 DI delayed status.
4: DI2; 10.02.b01 DI delayed status.
5: DI3; 10.02.b02 DI delayed status.
6: DI4; 10.02.b03 DI delayed status.
7: DI5; 10.02.b04 DI delayed status.
8: DI6; 10.02.b05 DI delayed status.</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status.						
	0 … 19	Release bridge 2	-	1 = 1	n	y	Parameter

27.38 **Reversal delay**

Reversal delay during a bridge reversal (bridge changeover/change armature current direction).
The reversal delay defines the delay time during a bridge reversal.



The reversal delay starts after a bridge reversal command has been given and zero current has been detected. See 27.01 Current reference, 29.01.b13 12-pulse master status word and 06.24.b13 Current controller status word 1.
After a bridge reversal command, zero current must be reached before 27.40 Zero current timeout elapses otherwise the event generates fault F557 Reversal time.
The setting of the reversal delay depends on the discontinuous current limit:

27.31 M1 discontinuous current limit	27.38 Reversal delay	Delta	27.40 Zero current timeout
≤ 50.00 %	5.0 ms	15 ms	20 ms
≤ 35.00 %	10.0 ms	25 ms	35 ms
≤ 20.00 %	15.0 ms	35 ms	50 ms
≤ 10.00 %	20.0 ms	50 ms	70 ms

Notes:

- 29.06 12-pulse reversal timeout must be longer than 27.40 Zero current timeout and 27.40 Zero current timeout must be longer than 27.38 Reversal delay.
- 27.38 Reversal delay must have the same setting in 12-pulse master and 12-pulse slave with one exception only:
  If there is no current measurement in the 12-pulse serial slave, set 27.38 Reversal delay in the 12-pulse serial slave to 0 ms. Then, the 12-pulse serial slave uses the reversal command of the 12-pulse master for its own bridge reversal. See 29.01.b12 12-pulse master status word.

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	0.0 … 32500.0	5.0	ms	1 = 1 ms	n	y	Parameter
27.39	**Zero current detection**						
	Zero current detection method. Selects the zero-current detection method. Use a binary signal, if the zero-current detection is done by another drive. 0 = Current not zero. 1 = Zero current detected. **Notes**: – Zero current is detected if the thyristor voltage is either ≤ 10 V or ≤ 10 % of 99.01 Mains voltage. – With 27.39 Zero current detection = DIx the zero-current detection flag is set, in case the mains contactor is switched off and the synchronization to the mains is interrupted. **Other [bit]**; source selection. 0: **Current**; based on the drive’s own zero current detection resistors. Normal operation. 1: **Voltage**; based on the drive’s own thyristor voltages. Not valid when galvanic isolation is used. 2: **Current and voltage**; based on discontinuous current and thyristor voltages. Not valid when galvanic isolation is used. 3: **DI1**; 10.02.b00 DI delayed status. 4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status.						
	0 … 19	Current	-	1 = 1	n	y	Parameter
27.40	**Zero current timeout**						
	Zero current timeout during a bridge reversal (bridge changeover/change armature current direction). The zero-current timeout defines the time during a bridge reversal, while zero current must be reached. Otherwise, the event generates fault F557 Reversal time. See 27.38 Reversal delay. **Notes**: – 29.06 12-pulse reversal timeout must be longer than 27.40 Zero current timeout and 27.40 Zero current timeout must be longer than 27.38 Reversal delay. – 27.40 Zero current timeout must have the same setting in 12-pulse master and 12-pulse slave.						
	0 … 32500	20	ms	1 = 1 ms	n	y	Parameter
27.41	**Reversal mode**						
	Reversal mode for a bridge reversal (bridge changeover/change armature current direction). Reversal mode defines the behavior of the speed ramp and speed controller during a bridge reversal or a field reversal (torque reversal). **Note**: 27.41 Reversal mode is automatically set to Hard when 27.38 Reversal delay ≤ 25 ms. 0: **Soft**; the speed ramp and speed controller are frozen during reversal. Leading to a bumpless reversal (no speed steps). **Attention**: Do not use for hanging loads (e.g. cranes). 1: **Hard**; the speed ramp and speed controller are released during reversal. Thus, the drive follows the ramp.						

Index	Name Text Range		Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	0 … 1		Hard	-	1 = 1	n	y	Parameter

27.42 **Reversal volt margin**

Reversal volt safety margin. **Note**: Typically left at default.

The reversal volt margin in percent of 99.10 Nominal mains voltage is a safety margin for the motor voltage during regenerative mode. Setting the reversal volt margin to zero removes the protection against commutation faults (shooting through).

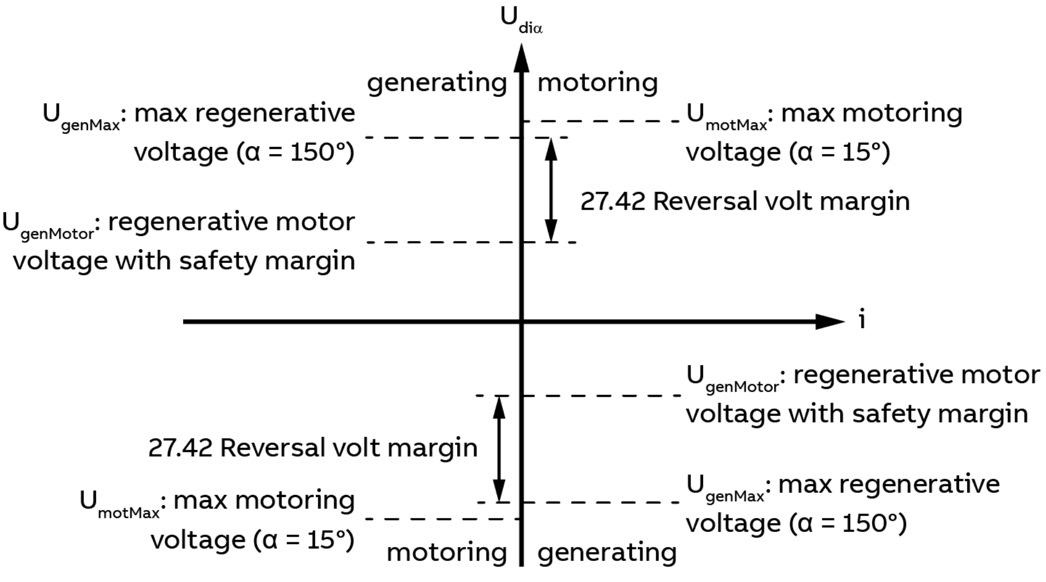
The margin for the reversal volt function is doing the following:

To prevent the drive from blowing fuses when going from motoring to generating the armature voltage must be lower than the corresponding mains voltage, because thyristors are line commutated. This is automatically checked by the drive and the reverse bridge is blocked if the armature voltage is too high. To lower the armature voltage two ways are possible:

– Lowering the motor speed by idling.
– Adapting the flux by lowering the field current. For this option set 28.17 M1 EMF/field control mode = EMF.

Both options take time and thus delaying the current/torque reversal. For faster adapting of the armature voltage, activate the field weakening function.

This can be supervised with 06.25.b03 Current controller status word 2 and 31.60 Reversal volt function.



DZ_LIN_047_RevVoltMargin_b.ai

For regenerative mode is valid:

$$U_{genMotor} = |U_{genMax}| - U_{Safety}$$

$$\textit{with} \quad U_{genMax} = 1.35 \bullet \cos\alpha_{\max} \bullet P01.20$$

$$U_{genMax} = 1.35 \bullet \cos P30.45 \bullet P01.20$$

$$\textit{and} \quad U_{Safety} = P27.42$$

$$\textit{follows:}$$

$$U_{genMotor} = |1.35 \bullet \cos P30.45 \bullet P01.20| - P27.42 \bullet P01.20$$

Example: With 30.45 Maximum firing angle = 150° and 27.42 Reversal volt margin = 10 % follows:

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	$U_{genMotor} = \lvert 1.35 \bullet \cos 150^\circ \bullet P01.20) \rvert - 0.1 \bullet P01.20$ $U_{genMotor} = \lvert -1.16 \bullet P01.20 \rvert - 0.1 \bullet P01.20$ $follows:$ $U_{genMotor} = 1.06 \bullet P01.20$ Thus, the bridge reversal is only possible if 01.21 Armature voltage in V < 01.06 • 01.20 Mains voltage in V.						
	0.00 … 20.00	6.00	%	100 = 1 %	n	y	Parameter
27.45	**Firing angle follower reference**						
	reserved						
	0 … 18	Zero	-	1 = 1	n	y	Parameter
27.46	**Firing angle external reference**						
	reserved						
	0.00 … 180.00	0.00	°	100 = 1°	n	y	Parameter
27.50	**M1 armature inductance current controller**						
	Motor 1 armature inductance. **Note**: Typically left at default. Inductance of the armature circuit in mH. Used for the feed forward (EMF compensation) of the current controller.						
	0.0 … 3250.0	0.0	mH	10 = 1 mH	n	y	Parameter
27.51	**M1 armature inductance EMF speed feedback**						
	Motor 1 armature inductance. **Note**: Typically left at default. Inductance of the armature circuit in mH. Used for the EMF calculation.						
	0.0 … 3250.0	0.0	mH	10 = 1 mH	n	y	Parameter

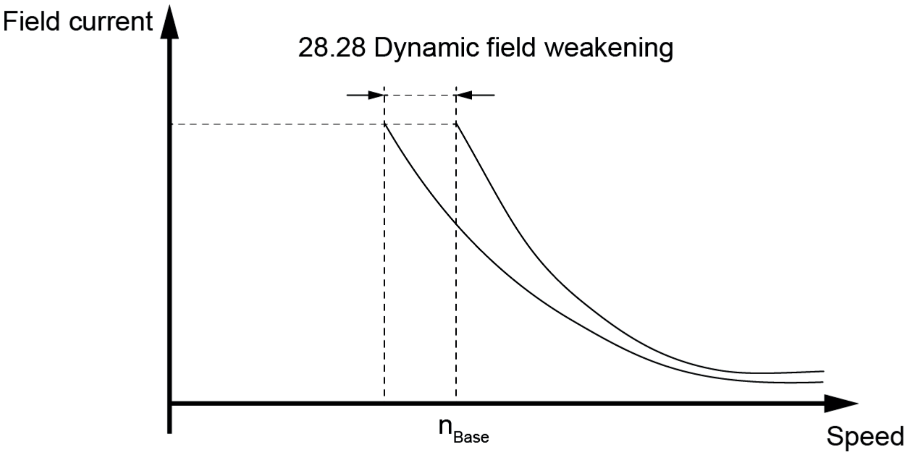
28 EMF and field current control

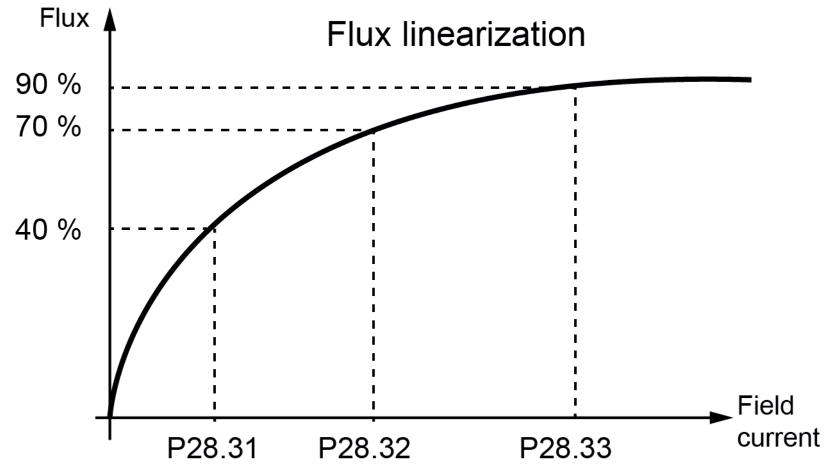
Settings for the EMF and field current control chain.

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
28.01	**EMF voltage reference 1**						
	EMF voltage reference after source selection. Displays the EMF voltage reference in percent of 99.12 M1 nominal voltage after EMF reference source. See 28.18 EMF reference source.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
28.02	**EMF voltage reference 2**						
	EMF voltage reference after source selection. Displays the EMF voltage reference in percent of 99.12 M1 nominal voltage after voltage correction and ramp (slope). This is an input for the EMF controller. See 28.21 EMF voltage correction and 28.22 EMF voltage reference slope.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
28.05	**Armature voltage**						
	Armature voltage. Measured armature voltage in in percent of 99.12 M1 nominal voltage. This value is also influenced by 95.34 DC voltage measurement adjust and 95.35 DC voltage measurement offset.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
28.06	**EMF voltage**						
	EMF voltage. Displays the EMF voltage in percent of 99.12 M1 nominal voltage after the EMF calculation. A filter time constant is defined by 28.23 EMF voltage filter time. This is an input for the EMF controller.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
28.09	**Flux reference after EMF control**						
	Flux reference after the EMF controller. Displays the EMF part of the flux reference in percent of nominal flux. Nominal flux is generated with 100 % field current. **Note**: 28.09 Flux reference after EMF control is set to zero, if 28.17 M1 EMF/field control mode = Fix.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
28.10	**Flux reference field weakening**						
	Flux reference from field weakening. Displays the field weakening part of the flux reference in percent of nominal flux. Nominal flux is generated with 100 % field current. **Note**: 28.10 Flux reference field weakening is set to 100 %, if 28.17 M1 EMF/field control mode = Fix.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
28.11	**Flux reference sum**						
	Flux reference sum. Displays the sum of the flux reference in percent of nominal flux. Nominal flux is generated with 100 % field current. 28.11 Flux reference sum = 28.09 Flux reference after EMF control + 28.10 Flux reference field weakening.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
28.14	**M1 field current reference**						
	Motor 1 field current reference. Displays motor 1 field current reference in percent of 99.13 M1 nominal field current.						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
28.15	**M1 field current**						
	Motor 1 field current. Motor 1 measured field current in percent of 99.13 M1 nominal field current.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
28.17	**M1 EMF/field control mode**						
	Motor 1 EMF/field control mode. Motor 1 EMF/field control mode selection. **Note**: It is not possible to go into field weakening range when 90.41 M1 feedback selection = EMF. 0: **Fix**; constant field (no field weakening), EMF controller blocked, field reversal blocked, optitorque blocked. 1: **EMF**; field weakening active, EMF controller released, field reversal blocked, optitorque blocked. 2: **Fix/reversal**; constant field (no field weakening), EMF controller blocked, field reversal active, optitorque blocked. 3: **EMF/reversal**; field weakening active, EMF controller released, field reversal active, optitorque blocked. 4: **Fix/optitorque**; constant field (no field weakening), EMF controller blocked, field reversal blocked, optitorque active. 5: **EMF/optitorque**; field weakening active, EMF controller released, field reversal blocked, optitorque active. 6: **Fix/reversal/optitorque**; constant field (no field weakening), EMF controller blocked, field reversal active, optitorque active. 7: **EMF/reversal/optitorque**; field weakening active, EMF controller released, field reversal active, optitorque active.						
	0 … 7	Fix	-	1 = 1	n	y	Parameter
28.18	**EMF reference source**						
	Selects the EMF voltage reference source. Selects the source for the EMF voltage reference. **Other**; source selection. 0: **Zero**; 0, not in use. 1: **Internal**; internally calculated EMF voltage reference. 2: **EMF voltage external reference**; 28.19 EMF voltage external reference. 4: **AI1 scaled**; 12.12 AI1 scaled value. 5: **AI2 scaled**; 12.22 AI2 scaled value. 6: **AI3 scaled**; 12.32 AI3 scaled value. 7: **FBA A reference 1**; 03.05 FBA A reference 1. 8: **FBA A reference 2**; 03.06 FBA A reference 2. 9: **FBA B reference 1**; 03.07 FBA B reference 1. 10: **FBA B reference 2**; 03.08 FBA B reference 2. 11: **EFB reference 1**; 03.09 EFB reference 1. 12: **EFB reference 2**; 03.10 EFB reference 2. 13: **DDCS controller ref1**; 03.11 DDCS controller ref1. 14: **DDCS controller ref2**; 03.12 DDCS controller ref2. 15: **M/F or D2D ref1**; 03.13 M/F or D2D ref1. 16: **M/F or D2D ref2**; 03.14 M/F or D2D ref2.						
	0 … 16	Internal	-	1 = 1	n	y	Parameter

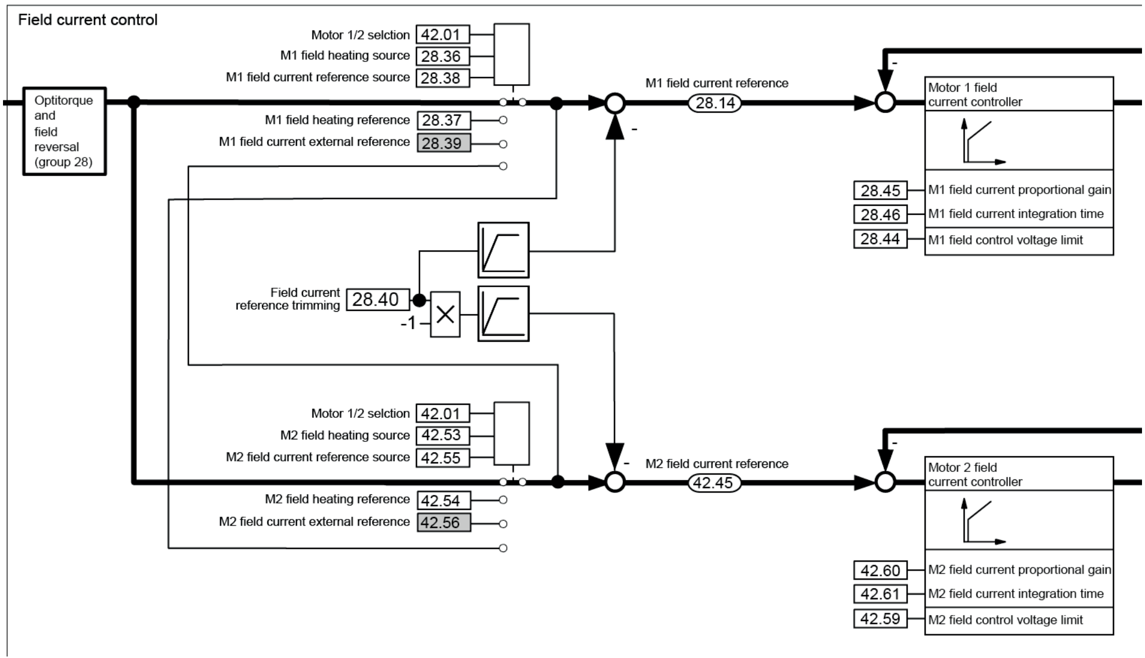
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">28.19</td><td colspan="7">EMF voltage external reference</td></tr>
<tr><td colspan="7">External EMF voltage reference input.
External EMF voltage reference input of the drive in percent of 99.12 M1 nominal voltage. Can be connected via 28.18 EMF reference source.</td></tr>
<tr><td>-325.00 … 325.00</td><td>0.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">28.20</td><td colspan="7">EMF voltage correction source</td></tr>
<tr><td colspan="7">Selects the EMF voltage correction source.
Selects the source for the EMF voltage correction.
Other; source selection.
0: Zero; 0, not in use.
1: EMF voltage correction; 28.21 EMF voltage correction.
4: AI1 scaled; 12.12 AI1 scaled value.
5: AI2 scaled; 12.22 AI2 scaled value.
6: AI3 scaled; 12.32 AI3 scaled value.
7: FBA A reference 1; 03.05 FBA A reference 1.
8: FBA A reference 2; 03.06 FBA A reference 2.
9: FBA B reference 1; 03.07 FBA B reference 1.
10: FBA B reference 2; 03.08 FBA B reference 2.
11: EFB reference 1; 03.09 EFB reference 1.
12: EFB reference 2; 03.10 EFB reference 2.
13: DDCS controller ref1; 03.11 DDCS controller ref1.
14: DDCS controller ref2; 03.12 DDCS controller ref2.
15: M/F or D2D ref1; 03.13 M/F or D2D ref1.
16: M/F or D2D ref2; 03.14 M/F or D2D ref2.</td></tr>
<tr><td>0 … 16</td><td>Zero</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">28.21</td><td colspan="7">EMF voltage correction</td></tr>
<tr><td colspan="7">EMF voltage correction input.
EMF voltage correction input of the drive in percent of 99.12 M1 nominal voltage. Can be connected via 28.20 EMF voltage correction source.</td></tr>
<tr><td>-325.00 … 325.00</td><td>0.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">28.22</td><td colspan="7">EMF voltage reference slope</td></tr>
<tr><td colspan="7">EMF voltage reference slope.
EMF voltage reference slope in percent of 99.12 M1 nominal voltage per 1 ms. The dv/dt limitation is located at the input of the EMF controller.</td></tr>
<tr><td>0.01 … 100.00</td><td>30.00</td><td>%/ms</td><td>100 = 1 %/ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">28.23</td><td colspan="7">EMF voltage filter time</td></tr>
<tr><td colspan="7">EMF voltage filter time constant.
EMF voltage filter time constant for 28.06 EMF voltage.</td></tr>
<tr><td>0 … 32500</td><td>10</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">28.24</td><td colspan="7">EMF proportional gain</td></tr>
<tr><td colspan="7">Proportional gain (KP) of the EMF controller.
Example: The controller generates 15 % of motor nominal EMF with 28.24 EMF proportional gain = 3, if the EMF error is 5 % of 99.12 M1 nominal voltage.</td></tr>
<tr><td>0.00 … 325.00</td><td>0.50</td><td></td><td>100 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">28.25</td><td colspan="7">EMF integration time</td></tr>
<tr><td colspan="7">Integration time (T_I) of the EMF controller.
Setting the integration time to zero disables the integral part of the EMF controller and resets the integrator.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">The integration time defines the time within the integral part of the EMF controller achieves the same value as the proportional part, when the error value is constant.
Example: The controller generates 15 % of motor nominal EMF with 28.24 EMF proportional gain = 3, if the EMF error is 5 % of 99.12 M1 nominal voltage. On that condition and with 28.25 EMF integration time = 50 ms follows:
– The controller generates 30 % of motor nominal EMF, if the EMF error is constant, after 50 ms are elapsed. 15 % derive from the proportional part and 15 % derive from the integral part.</td></tr>
<tr><td>0 … 32500</td><td>50</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**28.28**</td><td colspan="7">**Dynamic field weakening**</td></tr>
<tr><td colspan="7">Dynamic field weakening.
If the motor speed passes the base speed (field weakening point) quickly, armature voltage overshoot may occur. To solve this problem the field weakening point can be lowered by means of dynamic field weakening. 28.28 Dynamic field weakening is set in percent of 99.14 M1 nominal (base) speed.

DZ_LIN_043_FldWeakDyn_a.ai
Note: The lowered field weakening point is compensated by the EMF controller in case of constant speed or slow speed change. 30.50 Maximum EMF limit must be set high enough to allow the EMF controller to compensate.</td></tr>
<tr><td>80.00 … 100.00</td><td>100.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**28.29**</td><td colspan="7">**Flux correction source**</td></tr>
<tr><td colspan="7">Selects the flux correction source.
Selects the source for the flux correction.
Other; source selection.
0: **Zero**; 0, not in use.
1: **Flux correction**; 28.29 Flux correction.
4: **AI1 scaled**; 12.12 AI1 scaled value.
5: **AI2 scaled**; 12.22 AI2 scaled value.
6: **AI3 scaled**; 12.32 AI3 scaled value.
7: **FBA A reference 1**; 03.05 FBA A reference 1.
8: **FBA A reference 2**; 03.06 FBA A reference 2.
9: **FBA B reference 1**; 03.07 FBA B reference 1.
10: **FBA B reference 2**; 03.08 FBA B reference 2.</td></tr>
</table>

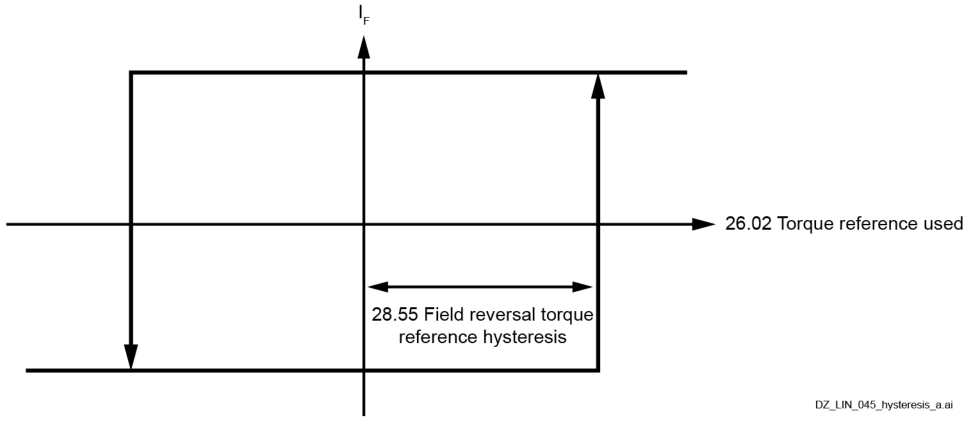
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">11: **EFB reference 1**; 03.09 EFB reference 1.
12: **EFB reference 2**; 03.10 EFB reference 2.
13: **DDCS controller ref1**; 03.11 DDCS controller ref1.
14: **DDCS controller ref2**; 03.12 DDCS controller ref2.
15: **M/F or D2D ref1**; 03.13 M/F or D2D ref1.
16: **M/F or D2D ref2**; 03.14 M/F or D2D ref2.</td></tr>
<tr><td></td><td>0 … 16</td><td>Zero</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**28.30**</td><td colspan="7">**Flux correction**</td></tr>
<tr><td></td><td colspan="7">Flux correction input.
Flux correction input of the drive, in percent of nominal flux. Nominal flux is generated with 100 % field current. Can be connected via 28.29 Flux correction source.</td></tr>
<tr><td></td><td>-100.00 … 100.00</td><td>0.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**28.31**</td><td colspan="7">**Field current at 40 % flux**</td></tr>
<tr><td></td><td colspan="7">Field current at 40 % flux.


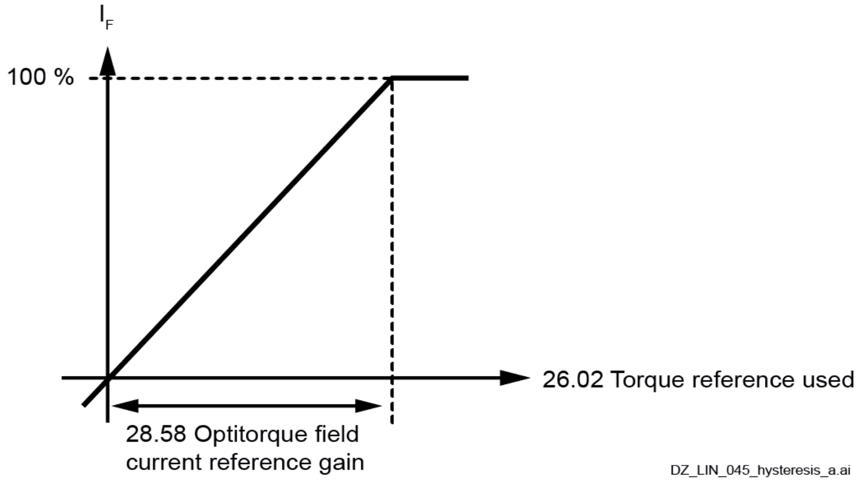
DZ_LIN_044_Flux linear_b.ai
Field current in percent of 99.13 M1 nominal field current needed to generate 40 % of nominal flux. It is used to compensate the non-linearity between flux and field current.</td></tr>
<tr><td></td><td>0.00 … 100.00</td><td>40.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**28.32**</td><td colspan="7">**Field current at 70 % flux**</td></tr>
<tr><td></td><td colspan="7">Field current at 70 % flux.
Field current in percent of 99.13 M1 nominal field current needed to generate 70 % of nominal flux. It is used to compensate the non-linearity between flux and field current.</td></tr>
<tr><td></td><td>0.00 … 100.00</td><td>70.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**28.33**</td><td colspan="7">**Field current at 90 % flux**</td></tr>
<tr><td></td><td colspan="7">Field current at 90 % flux.
Field current in percent of 99.13 M1 nominal field current needed to generate 90 % of nominal flux. It is used to compensate the non-linearity between flux and field current.</td></tr>
<tr><td></td><td>0.00 … 100.00</td><td>90.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**28.36**</td><td colspan="7">**M1 field heating source**</td></tr>
<tr><td></td><td colspan="7">Motor 1 and motor 2 (motor 1/2) field heating source.
Selects the source of motor 1/2 field heating On/Off command.
0 = Disable field heating.
1 = Enable with On.
Notes:</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">– Field heating is disabled if:
  – Safe torque off (STO) is active.
  – Switch-on inhibited is active.
  – A fault is active. Not valid for 28.36 M1 field heating source = Other [bit], DI1 … DI6, DIO1, DIO2 or DIL.
  – Off2 (emergency off/fast current off) is active. Not valid for 28.36 M1 field heating source = Other [bit], DI1 … DI6, DIO1, DIO2 or DIL.
  – Off3 (emergency stop) is active. Not valid for 28.36 M1 field heating source = Other [bit], DI1 … DI6, DIO1, DIO2 or DIL.
  – When the drive is in state Ready reference (Run command).
– Motor 1 field heating reference is set with 28.37 M1 field heating reference. Motor 1 field heating can be disabled, when the reference is set to zero. Motor 1 field nominal current is set with 99.13 M1 nominal field current.
– Motor 2 field heating reference is set with 42.54 M2 field heating reference. Motor 2 field heating can be disabled, when the reference is set to zero. Motor 2 field nominal current is set with 42.10 M2 nominal field current.
– In case motor 1/2 field exciter is not connected via a separate field contactor following settings apply for motor 1/2 field heating:
  – 20.33 Mains contactor control mode = On.
  – 28.36 M1 field heating source = Enable with On.
– When two motors in shared motion are used and field economy is needed for motor 1/2, set 28.36 M1 field heating source = Disable field heating or Enable field heating. See also 28.37 M1 field heating reference and 42.54 M2 field heating reference.
– When 28.36 M1 field heating source = Enable with On, 100 % field current for motor 1/2 is kept, while the procedure to close the brake is active.
Other [bit]; source selection.
0: **Disable field heating**; 0, motor 1/2 field heating is off. Normal operation.
1: **Enable with On**; 1, enable motor 1/2 field heating with On/Off1 control = 1 and Run = 0.
2: **Enable field heating**; enable motor 1/2 field heating if On/Off1 control = 0 and Run = 0.
3: **DI1**; 10.02.b00 DI delayed status. Enable motor 1/2 field heating with DI1 = 1 and Run = 0.
4: **DI2**; 10.02.b01 DI delayed status. Enable motor 1/2 field heating with DI2 = 1 and Run = 0.
5: **DI3**; 10.02.b02 DI delayed status. Enable motor 1/2 field heating with DI3 = 1 and Run = 0.
6: **DI4**; 10.02.b03 DI delayed status. Enable motor 1/2 field heating with DI4 = 1 and Run = 0.
7: **DI5**; 10.02.b04 DI delayed status. Enable motor 1/2 field heating with DI5 = 1 and Run = 0.
8: **DI6**; 10.02.b05 DI delayed status. Enable motor 1/2 field heating with DI6 = 1 and Run = 0.
11: **DIO1**; 11.02.b00 DIO delayed status. Enable motor 1/2 field heating with DIO1 = 1 and Run = 0.
12: **DIO2**; 11.02.b01 DIO delayed status. Enable motor 1/2 field heating with DO2 = 1 and Run = 0.
19: **DIL**; 10.02.b15 DI delayed status. Enable field motor 1/2 heating with DIL = 1 and Run = 0.</td></tr>
<tr><td></td><td>0 … 19</td><td>Disable field heating</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**28.37**</td><td colspan="7">**M1 field heating reference**</td></tr>
<tr><td></td><td colspan="7">Motor 1 field heating current reference.
Field current reference in percent of 99.13 M1 nominal field current for field heating and field economy.
Field heating:
– Field heating is enabled according to 28.36 M1 field heating source.
– Field heating is disabled when 28.37 M1 field heating reference = 0.
Field economy:</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">– Field economy is only available when 2 motors with 2 independent field exciters are connected to the drive.
– Field economy for motor 1 is enabled, if:
  – 28.37 M1 field heating reference < 100 %.
  – 28.36 M1 field heating source = Disable field heating or Enable field heating.
– Field economy for motor 1 is activated, if:
  – The On command is given for longer than 10 s.
  – Motor 2 is selected via 42.01 Motor 1/2 selection.
  – Motor 2 is active. See 06.18.b05 Drive status word 3.
  – 28.38 M1 field current reference source = 42.55 M2 field current reference source = Internal.</td></tr>
<tr><td>0.00 … 100.00</td><td>0.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">28.38</td><td colspan="7">M1 field current reference source</td></tr>
<tr><td colspan="7">Motor 1 field current reference source.
Selector for motor 1 field current reference.
0: Internal; motor 1 field current reference according to field heating or shared motion. See 28.36 M1 Field heating source and 42.01 Motor 1/2 selection.
1: Motor 2 reference; motor 2 field current reference is taken.
2: Motor 1 external; 28.39 M1 field current external reference.

 </td></tr>
<tr><td>0 … 2</td><td>Internal</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">28.39</td><td colspan="7">M1 field current external reference</td></tr>
<tr><td colspan="7">Motor 1 external field current reference.
External field current reference input of the drive, in percent of 99.13 M1 nominal field current. Can be connected via 28.38 M1 field current reference source.</td></tr>
<tr><td>-100.00 … 100.00</td><td>0.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">28.40</td><td colspan="7">Field current reference trimming</td></tr>
<tr><td colspan="7">Field current reference trimming.</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	The field current of motor 1 and motor 2 can be corrected by means of 28.40 Field current reference trimming in percent of 99.13 M1 nominal field current or 42.10 M2 nominal field current respectively. See drawing in 28.38 M1 field current reference source.						
	-100.00 … 100.00	0.00	%	100 = 1 %	n	y	Parameter
28.44	**M1 field control voltage limit**						
	Motor 1 voltage limit for the field exciter. Positive voltage limit for motor 1 field exciter in percent of the maximum possible field exciter output voltage. **Example**: With a 3-phase supply voltage of 400 V_{AC} the field current controller can generate a maximum average output voltage of 521 V_{DC}. In case the rated field supply voltage is 200 V_{DC} it is possible to limit the field exciter output voltage. E.g. to get a maximum average output voltage of 240 V_{DC} set the limit to 46 %. This is achieved by limiting the firing angle of the field current controller. **Note**: 4-Q field exciters that can reverse the field current will use the setting for positive and negative voltage limit.						
	0.00 … 100.00	100.00	%	100 = 1 %	n	y	Parameter
28.45	**M1 field current proportional gain**						
	Motor 1 proportional gain (K_P) of the field current controller. **Example**: The controller generates 15 % of motor nominal field voltage (see motor nameplate) with 28.45 M1 field current proportional gain = 3, if the field current error is 5 % of 99.13 M1 nominal field current.						
	0.00 … 325.00	0.20	-	100 = 1	n	y	Parameter
28.46	**M1 field current integration time**						
	Motor 1 integration time (T_I) of the field current controller. Setting the integration time to zero disables the integral part of the filed current controller and resets the integrator. The integration time defines the time within the integral part of the field current controller achieves the same value as the proportional part, when the error value is constant. **Example**: The controller generates 15 % of motor nominal field voltage (see motor nameplate) with 28.45 M1 field current proportional gain = 3, if the field current error is 5 % of 99.13 M1 nominal field current. On that condition and with 28.46 M1 field current integration time = 200 ms follows: – The controller generates 30 % of motor nominal field voltage, if the field current error is constant, after 200 ms are elapsed. 15 % derive from the proportional part and 15 % derive from the integral part.						
	0 … 32500	200	ms	1 = 1 ms	n	y	Parameter
28.54	**Field current force direction**						
	Force field current direction. Selects the field current direction. 0: **Forward**; field current direction is forced to forward direction. 1: **Reverse**; field current direction is forced to reverse direction. 2: **None**; inactive. Field current force direction is disabled. Normal operation. 10: **Force smart**; the field current direction is depending on the sign of 23.01 Speed reference ramp input: – 23.01 Speed reference ramp input ≥ 0 rpm = Forward. – 23.01 Speed reference ramp input < 0 rpm = Reverse. – In case of an Off1 command, Stop command or Off3 (emergency stop) command = None (field forcing disabled).						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	20: **External reverse**; in case an external contactor in the field current loop is used to change the field direction, 28.54 Field current force direction must be switched between Forward and External reverse. External reverse adapts the armature voltage and speed supervision. The external contactor interlocking and the control of 28.54 Field current force direction must be done by means of Adaptive Program, application program or overriding control, **not implemented yet**.						
	0 … 20	None	-	1 = 1	n	y	Parameter
28.55	**Field reversal torque reference hysteresis**						
	Torque reference hysteresis for field reversal. To prevent the field reversal from continuous toggling at a small 26.02 Torque reference used, a hysteresis in percent of 99.02 M1 nominal torque is available. The hysteresis is symmetrical and is set by 28.55 Field reversal torque reference hysteresis. The field reversal itself is controlled by the sign of 26.02 Torque reference used.  **Note**: The hysteresis is only effective for 28.17 M1 EMF/field control mode = Fix/reversal or EMF/reversal.						
	0.00 … 325.00	2.00	%	See 46.04	n	y	Parameter
28.56	**Field reversal field current hysteresis**						
	Field current hysteresis for field reversal. The sign of 28.15 M1 field current is used to generate the acknowledge signal for the field reversal. To avoid signal noise problems a small hysteresis in percent of 99.13 M1 nominal field current is needed. **Note**: The hysteresis is only effective for 28.17 M1 EMF/field control mode = Fix/reversal, EMF/reversal, Fix/reversal/optitorque or EMF/reversal/optitorque.						
	0.00 … 100.00	2.00	%	100 = 1 %	n	y	Parameter
28.57	**Field reversal flux monitoring delay**						
	Flux monitoring delay for field reversal. Maximum allowed time within the sign of 28.15 M1 field current and the internal motor flux do not correspond to each other during field reversal. During this time, faults 7301 Motor speed feedback and 73A1 Load speed feedback are disabled. **Note**: The delay is only effective for 28.17 M1 EMF/field control mode = Fix/reversal, EMF/reversal, Fix/reversal/optitorque or EMF/reversal/optitorque.						
	0 … 32500	0	ms	1 = 1 ms	n	y	Parameter
28.58	**Optitorque field current reference gain**						
	Field current reference gain for optitorque. Optitorque calculates the field current reference depending on the torque reference. See 26.02 Torque reference used. The field current is reduced to a smaller value in case of low torque						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">references. Thus, for low torque references the field reversal is faster. Optitorque is activated by means of 28.17 M1 EMF/field control mode.
The relation between 26.02 Torque reference used and 28.14 M1 field current reference is linear and without offset. The gradient is defined by means of 28.58 Optitorque field current reference gain.

Example: With 28.58 Optitorque field current reference gain = 20 %, 100 % field current is generated at 26.02 Torque reference used = 20 %.
Note: The gain is only effective for 28.17 M1 EMF/field control mode = Fix/optitorque, EMF/optitorque, Fix/reversal/optitorque or EMF/reversal/optitorque.</td></tr>
<tr><td>0.00 … 100.00</td><td>50.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">28.59</td><td colspan="7">Voltage residual magnetism</td></tr>
<tr><td colspan="7">Series wound motor, armature voltage caused by the residual magnetism.
Armature voltage caused by the residual magnetism of a series wound motor in percent of 99.12 M1 nominal voltage.
See DCS880 Series wound motor control (3ADW000xxx).</td></tr>
<tr><td>0.00 … 100.00</td><td>0.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">28.61</td><td colspan="7">Set: M1 field exciter current scaling</td></tr>
<tr><td colspan="7">Set: Motor 1 field exciter scaling factor.
If the scaling is changed, the new value is taken over immediately.
To use 28.61 Set: M1 field exciter current scaling following inequation must be valid:
– 99.13 M1 nominal field current ≤ 28.61 Set: M1 field exciter current scaling ≤ maximum field current of the used field exciter.
Notes:
– For 28.61 Set: M1 field exciter current scaling > maximum field current of the used field exciter warning A132 Parameter setting conflict is generated.
– For 99.13 M1 nominal field current > 28.61 Set: M1 field exciter current scaling the scaling is set automatically.
– The scaling factor is released when 99.13 M1 nominal field current < 28.61 Set: M1 field exciter current scaling and 99.07 M1 used field exciter type = OnBoard … DCF804-0060.</td></tr>
<tr><td>0.00 … 60.00</td><td>0.00</td><td>A</td><td>100 = 1 A</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">28.62</td><td colspan="7">M1 field exciter freewheeling level</td></tr>
<tr><td colspan="7">Motor 1 field exciter freewheeling level.</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	The freewheeling level is shown in percent per 1 ms of the measured field exciter supply voltage. If 2 successive AC-voltage measurements differ more than 28.62 M1 field exciter freewheeling level, the freewheeling function is activated. **Note**: The freewheeling level is only valid, for 99.07 M1 used field exciter type = DCF804-0050 … DCF804-0060.						
	0.00 … 100.00	20.00	%/ms	100 = 1 %/ms	n	y	Parameter
28.63	**M1 field exciter operation mode**						
	Motor 1 operation mode for certain field exciters. The field exciters DCF803-0016, FEX-425-Int and DCF803-0035 can be connected to either a 3-phase supply or a single-phase supply. 0: **1-phase**; single-phase supply for the field exciter. 1: **3-phase**; 3-phase supply for the field supply.						
	0 … 1	3-phase	-	1 = 1	n	y	Parameter

29 12-pulse/Hardparallel

Settings for 12-pulse and hardparallel.

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
29.01	**12-pulse master status word**						
	12-pulse master status word. Displays the 12-pulse master status word send from the 12-pulse master to the 12-pulse slave, when 20.01 Command location = 12-pulse link. **Note**: The status word is valid in 12-pulse master and slave. Bit assignment:						

Bit	Name	Value	Remarks
0	On/Off1 control	1	On command for the 12-pulse slave.
		0	Off1 command for the 12-pulse slave.
1	Off2 control	1	Normal operation (Off2 inactive) for the 12-pulse slave.
		0	Off2 (emergency off/fast current off) command for the 12-pulse slave.
2	Field heating	1	Field heating active.
		0	Field heating inactive.
3	Run	1	Run command for the 12-pulse slave.
		0	Stop command for the 12-pulse slave.
4	Field exciter	1	Field exciter On command for the 12-pulse slave.
		0	Field exciter Off command for the 12-pulse slave.
5	Dynamic braking	1	Dynamic braking active/started.
		0	Dynamic braking inactive.
6	12-pulse type	1	12-pulse serial operation in the 12-pulse master. See 99.06 Operation mode.
		0	12-pulse parallel operation in the 12-pulse master. See 99.06 Operation mode.

Index	**Name** **Text** **Range**	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**

Bit	Name	Value	Remarks
7	Reset	0 → 1	Acknowledge fault indications in the 12-pulse slave with the positive edge.
8	reserved		
9	reserved		
10	Waiting for EMF reduction	1	Waiting for reduction of EMF to match the mains voltage. See 27.42 Reversal volt margin.
11	Autotuning current controller	1	Autotuning armature current controller active.
12	Zero current + reversal delay	1	Zero current detection plus reversal delay elapsed. See 06.24.b13 Current controller status word 1 and 27.38 Reversal delay.
13	Change current direction	1	Command to change the direction of the armature current. Bridge changeover is active.
14	Blocked current controller	1	06.25 Current controller status word 2 > 0. Thus, the armature current controller is blocked.
15	Current direction	1	27.02 Used current reference is negative.
		0	27.02 Used current reference is positive.

Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

29.02 **12-pulse slave status word**

12-pulse slave status word.
Displays the 12-pulse slave status word send from the 12-pulse slave to the 12-pulse master, when 20.01 Command location = 12-pulse link.
Note: The status word is valid in 12-pulse master and slave.
Bit assignment:

Bit	**Name**	**Value**	**Remarks**
0	reserved		
1	reserved		
2	reserved		
3	12-pulse slave tripped	1	12-pulse slave is tripped.
4	12-pulse slave blocked	1	The 12-pulse slave is preventing the 12-pulse master from starting. See warning A596 12-pulse slave blocked.
5	reserved		
6	12-pulse type	1	12-pulse serial operation in the 12-pulse slave. See 99.06 Operation mode.
		0	12-pulse parallel operation in the 12-pulse slave. See 99.06 Operation mode.
7	reserved		
8	reserved		
9	reserved		
10	reserved		

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**

11	reserved		
12	reserved		
13	Change current direction	1	Command to change the direction of the armature current. Bridge changeover is active.
14	Blocked current controller	1	6.25 Current controller status word 2 > 0. Thus, the armature current controller is blocked.
15	Current direction	1	27.02 Used current reference is negative.
		0	27.02 Used current reference is positive.

Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

29.03 **12-pulse slave firing angle**

12-pulse slave firing angle.
Displays the firing angle reference send from the 12-pulse master to the 12-pulse slave in degrees.
Note: Valid in the 12-pulse master only.

Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
0.00 … 180.00	-	°	100 = 1°	y	n	Signal

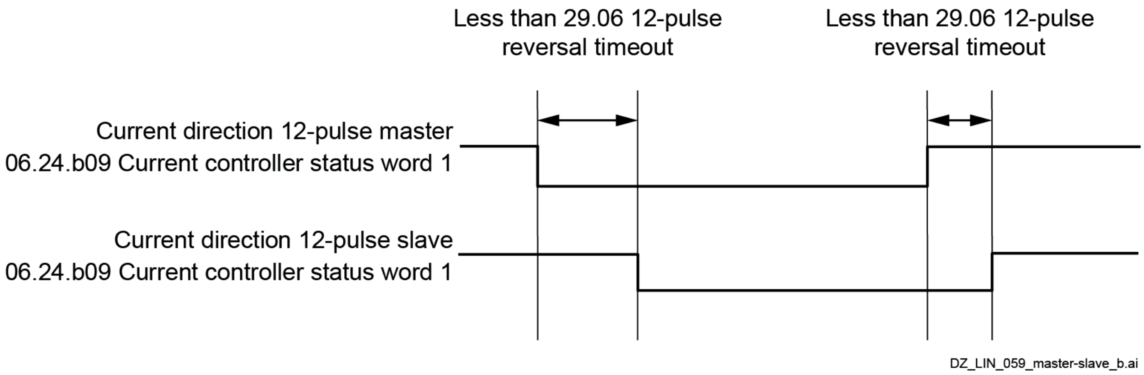
29.05 **12-pulse mode**

12-pulse mode.
The setting of 99.06 Operation mode determines the reaction of 29.05 12-pulse mode. 29.05 12-pulse mode must have the same setting in both master and slave.
Note: The setting Diode bridge is only valid in the master.

	29.05 12-pulse mode		
99.06 Operation mode	Normal	Difference	Diode bridge
12-pulse parallel master/slave	Valid	Valid	-
12-pulse serial master/slave	Valid	-	Valid
6-pulse serial master/slave	Valid	-	Valid
All other	Valid	-	-

12-pulse parallel
99.06 Operation mode = 12-pulse parallel master or 12-pulse parallel slave:
0: **Normal**; 12-pulse parallel master and 12-pulse parallel slave use their own current controller independently.
1: **Difference**; the 12-pulse parallel slave calculates the difference between the 12-pulse parallel master actual current and its own actual current and controls this difference to zero by means of its current controller, **not implemented yet**.
2: **Diode bridge**; only used for 12-pulse serial/6-pulse serial mode.
12-pulse serial
99.06 Operation mode = 12-pulse serial master/6-pulse serial master or 12-pulse serial slave/6-pulse serial slave:
0: **Normal**; Both 12-pulse serial master/6-pulse serial master and 12-pulse serial slave/6-pulse serial slave are controlled by the same firing angle.
1: **Difference**; only used for 12-pulse parallel mode.
3: **Diode bridge**; the 12-pulse serial slave/6-pulse serial slave unit is a diode bridge, **not implemented yet**.

Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
0 … 2	Normal	-	1 = 1	n	n	Parameter

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">29.06</td><td colspan="7">12-pulse reversal timeout</td></tr>
<tr><td colspan="7">12-pulse reversal timeout.

In 12-pulse mode the current direction of both - master and slave - units is monitored. Fault F533 12-pulse reversal timeout is generated, if the 2 units have different bridges fired for longer than 29.06 12-pulse reversal timeout.
Notes:
– Fault F533 12-pulse reversal timeout is inactive, if 29.06 12-pulse reversal timeout is set to 1000 ms.
– 29.06 12-pulse reversal timeout must be longer than 27.40 Zero current timeout and 27.40 Zero current timeout must be longer than 27.38 Reversal delay.
– Valid in the 12-pulse master only.</td></tr>
<tr><td>0 … 1000</td><td>100</td><td>ms</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">29.07</td><td colspan="7">12-pulse parallel current difference level</td></tr>
<tr><td colspan="7">12-pulse parallel current difference level.
Permitted current difference between the units in 12-pulse parallel configuration in percent of 99.11 M1 nominal current.
Depending on the setting of 29.09 12-pulse parallel current difference type event 12-pulse current difference is generated, if 29.07 12-pulse parallel current difference level is still exceeded when 29.08 12-pulse parallel current difference delay is elapsed.
Note: Valid in the 12-pulse master only.</td></tr>
<tr><td>1 … 50</td><td>10</td><td>%</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">29.08</td><td colspan="7">12-pulse parallel current difference delay</td></tr>
<tr><td colspan="7">12-pulse parallel current difference delay.
29.08 12-pulse parallel current difference delay delays event 12-pulse current difference. If the current difference becomes smaller than 29.07 12-pulse parallel current difference level before the delay is elapsed event 12-pulse current difference will be disregarded. See 29.09 12-pulse parallel current difference type.
Note: Valid in the 12-pulse master only.</td></tr>
<tr><td>10 … 64000</td><td>500</td><td>ms</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">29.09</td><td colspan="7">12-pulse parallel current difference type</td></tr>
<tr><td colspan="7">Type of event 12-pulse current difference.
Selects the type of event 12-pulse current difference.
0: No action; none, disable 12-pulse current difference.
1: Fault; the event generates fault F534 12-pulse current difference.
2: Warning; the event generates warning A534 12-pulse current difference.
Note: Valid in the 12-pulse master only.</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	0 … 2	Fault	-	1 = 1	n	y	Parameter
29.10	**Ch1 power unit current calculated**						
	Channel1 power unit calculated current. Calculated total current of the power unit connected to channel1 of the SDCS-OPL-H01 in percent of 99.11 M1 nominal current. The used formula is: 29.10 = (29.11 + 29.12) / 2.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
29.11	**Ch1 power unit current terminal C1**						
	Channel1 power unit current flowing through terminal C1. Measured current flowing through terminal C1 of the power unit connected to channel1 of the SDCS-OPL-H01 in percent of 99.11 M1 nominal current. This signal is used to monitor the current balance between the hardparallel connected power units.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
29.12	**Ch1 power unit current terminal D1**						
	Channel1 power unit current flowing through terminal D1. Measured current flowing through terminal D1 of the power unit connected to channel1 of the SDCS-OPL-H01 in percent of 99.11 M1 nominal current. This signal is used to monitor the current balance between the hardparallel connected power units.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
29.17	**Ch1 power unit unbalanced current word**						
	Channel1 power unit unbalanced current word. Displays the thyristors of the power unit connected to channel1 which are affected by unbalanced current, if 29.65 Power unit unbalanced current level is exceeded. Any high bit means, that all thyristors of the power unit are in operation, but one or more thyristors do not conduct the full current. **Note**: The bits are not latched in case of 29.63 Power unit unbalanced current function = Warning. Bit assignment:						

Bit	Name	Value	Remarks
0	reserved		
1	Thyristor V11	1	Current is unbalanced, this thyristor is not conducting the full current.
2	Thyristor V12	1	Current is unbalanced, this thyristor is not conducting the full current.
3	Thyristor V13	1	Current is unbalanced, this thyristor is not conducting the full current.
4	Thyristor V14	1	Current is unbalanced, this thyristor is not conducting the full current.
5	Thyristor V15	1	Current is unbalanced, this thyristor is not conducting the full current.
6	Thyristor V16	1	Current is unbalanced, this thyristor is not conducting the full current.
7	reserved		

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

8	reserved		
9	Thyristor V21	1	Current is unbalanced, this thyristor is not conducting the full current.
10	Thyristor V22	1	Current is unbalanced, this thyristor is not conducting the full current.
11	Thyristor V23	1	Current is unbalanced, this thyristor is not conducting the full current.
12	Thyristor V24	1	Current is unbalanced, this thyristor is not conducting the full current.
13	Thyristor V25	1	Current is unbalanced, this thyristor is not conducting the full current.
14	Thyristor V26	1	Current is unbalanced, this thyristor is not conducting the full current.
15	reserved		

	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	0000h … FFFFh	-	-	1 = 1	y	n	Signal

29.18 **Ch1 power unit thyristor loss word**

Channel1 power unit thyristor/branch fuse loss word.
Displays the thyristors/branch fuses of the power unit connected to channel1 which are lost, in other words not conducting any current. See 29.68 Power unit thyristor loss function.
Any high bit means, that at least one thyristor/branch fuse of the power unit is out of operation.
Note: The bits are not latched in case of 29.68 Power unit thyristor loss function = Warning.
Bit assignment:

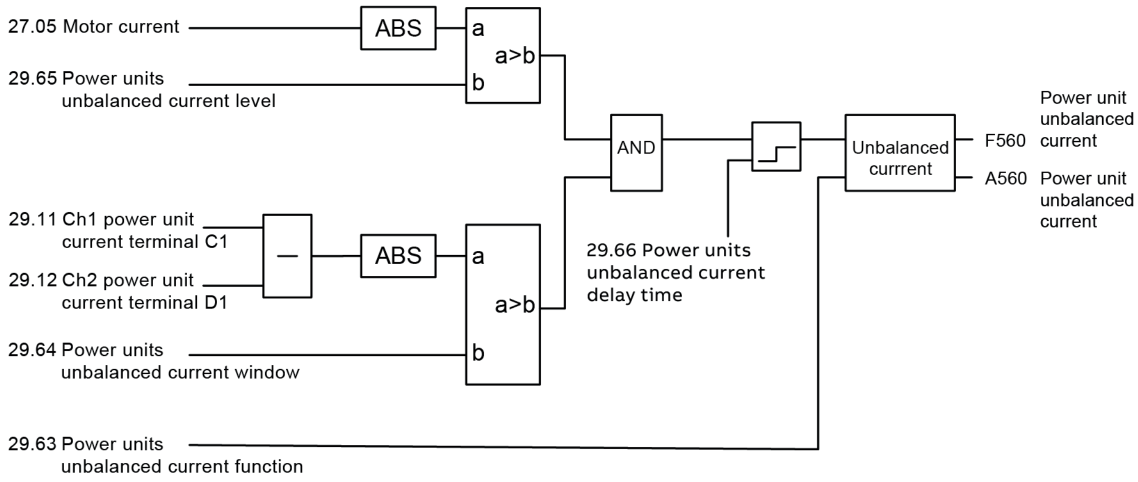
Bit	Name	Value	Remarks
0	reserved		
1	Thyristor V11	1	This thyristor/branch fuse is not conducting current.
2	Thyristor V12	1	This thyristor/branch fuse is not conducting current.
3	Thyristor V13	1	This thyristor/branch fuse is not conducting current.
4	Thyristor V14	1	This thyristor/branch fuse is not conducting current.
5	Thyristor V15	1	This thyristor/branch fuse is not conducting current.
6	Thyristor V16	1	This thyristor/branch fuse is not conducting current.
7	reserved		
8	reserved		
9	Thyristor V21	1	This thyristor/branch fuse is not conducting current.
10	Thyristor V22	1	This thyristor/branch fuse is not conducting current.
11	Thyristor V23	1	This thyristor/branch fuse is not conducting current.
12	Thyristor V24	1	This thyristor/branch fuse is not conducting current.
13	Thyristor V25	1	This thyristor/branch fuse is not conducting current.
14	Thyristor V26	1	This thyristor/branch fuse is not conducting current.
15	reserved		

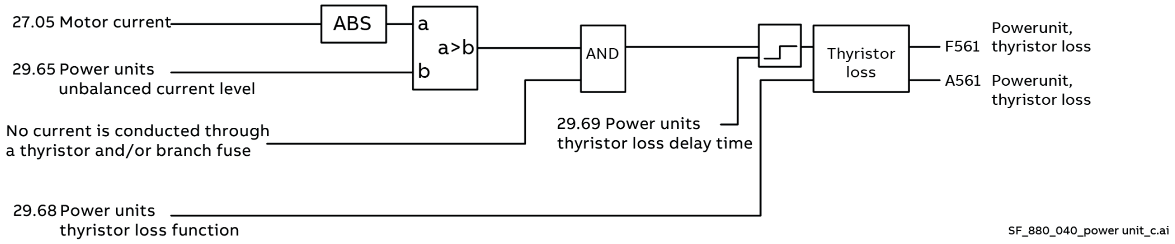
Index	Name						
	Text						
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
29.20	**Ch2 power unit current calculated**						
	Channel2 power unit calculated current. Calculated total current of the power unit connected to channel2 of the SDCS-OPL-H01 in percent of 99.11 M1 nominal current. The used formula is: 29.20 = (29.21 + 29.22) / 2						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
29.21	**Ch2 power unit current terminal C1**						
	Channel2 power unit current flowing through terminal C1. Measured current flowing through terminal C1 of the power unit connected to channel2 of the SDCS-OPL-H01 in percent of 99.11 M1 nominal current. This signal is used to monitor the current balance between the hardparallel connected power units.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
29.22	**Ch2 power unit current terminal D1**						
	Channel2 power unit current flowing through terminal D1. Measured current flowing through terminal D1 of the power unit connected to channel2 of the SDCS-OPL-H01 in percent of 99.11 M1 nominal current. This signal is used to monitor the current balance between the hardparallel connected power units.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
29.27	**Ch2 power unit unbalanced current word**						
	Channel2 power unit unbalanced current word. Displays the thyristors of the power unit connected to channel2 which are affected by unbalanced current, if 29.65 Power unit unbalanced current level is exceeded. Any high bit means, that all thyristors of the power unit are in operation, but one or more thyristors do not conduct the full current. **Note**: The bits are not latched in case of 29.63 Power unit unbalanced current function = Warning. See 29.17 Ch1 power unit unbalanced current word.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
29.28	**Ch2 power unit thyristor loss word**						
	Channel2 power unit thyristor/branch fuse loss word. Displays the thyristors/branch fuses of the power unit connected to channel2 which are lost, in other words not conducting any current. See 29.68 Power unit thyristor loss function. Any high bit means, that at least one thyristor/branch fuse of the power unit is out of operation. **Note**: The bits are not latched in case of 29.68 Power unit thyristor loss function = Warning. See 29.18 Ch1 power unit thyristor loss word.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
29.30	**Ch3 power unit current calculated**						
	Channel3 power unit calculated current. Calculated total current of the power unit connected to channel3 of the SDCS-OPL-H01 in percent of 99.11 M1 nominal current. The used formula is: 29.30 = (29.31 + 29.32) / 2.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
29.31	**Ch3 power unit current terminal C1**						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	Channel3 power unit current flowing through terminal C1. Measured current flowing through terminal C1 of the power unit connected to channel3 of the SDCS-OPL-H01 in percent of 99.11 M1 nominal current. This signal is used to monitor the current balance between the hardparallel connected power units.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
29.32	**Ch3 power unit current terminal D1**						
	Channel3 power unit current flowing through terminal D1. Measured current flowing through terminal D1 of the power unit connected to channel3 of the SDCS-OPL-H01 in percent of 99.11 M1 nominal current. This signal is used to monitor the current balance between the hardparallel connected power units.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
29.37	**Ch3 power unit unbalanced current word**						
	Channel3 power unit unbalanced current word. Displays the thyristors of the power unit connected to channel3 which are affected by unbalanced current, if 29.65 Power unit unbalanced current level is exceeded. Any high bit means, that all thyristors of the power unit are in operation, but one or more thyristors do not conduct the full current. **Note**: The bits are not latched in case of 29.63 Power unit unbalanced current function = Warning. See 29.17 Ch1 power unit unbalanced current word.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
29.38	**Ch3 power unit thyristor loss word**						
	Channel3 power unit thyristor/branch fuse loss word. Displays the thyristors/branch fuses of the power unit connected to channel3 which are lost, in other words not conducting any current. See 29.68 Power unit thyristor loss function. Any high bit means, that at least one thyristor/branch fuse of the power unit is out of operation. **Note**: The bits are not latched in case of 29.68 Power unit thyristor loss function = Warning. See 29.18 Ch1 power unit thyristor loss word.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
29.40	**Ch4 power unit current calculated**						
	Channel4 power unit calculated current. Calculated total current of the power unit connected to channel4 of the SDCS-OPL-H01 in percent of 99.11 M1 nominal current. The used formula is: 29.40 = (29.41 + 29.42) / 2.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
29.41	**Ch4 power unit current terminal C1**						
	Channel4 power unit current flowing through terminal C1. Measured current flowing through terminal C1 of the power unit connected to channel4 of the SDCS-OPL-H01 in percent of 99.11 M1 nominal current. This signal is used to monitor the current balance between the hardparallel connected power units.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
29.42	**Ch4 power unit current terminal D1**						
	Channel4 power unit current flowing through terminal D1.						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	Measured current flowing through terminal D1 of the power unit connected to channel4 of the SDCS-OPL-H01 in percent of 99.11 M1 nominal current. This signal is used to monitor the current balance between the hardparallel connected power units.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
29.47	**Ch4 power unit unbalanced current word**						
	Channel4 power unit unbalanced current word. Displays the thyristors of the power unit connected to channel4 which are affected by unbalanced current, if 29.65 Power unit unbalanced current level is exceeded. Any high bit means, that all thyristors of the power unit are in operation, but one or more thyristors do not conduct the full current. **Note**: The bits are not latched in case of 29.63 Power unit unbalanced current function = Warning. See 29.17 Ch1 power unit unbalanced current word.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
29.48	**Ch4 power unit thyristor loss word**						
	Channel4 power unit thyristor/branch fuse loss word. Displays the thyristors/branch fuses of the power unit connected to channel4 which are lost, in other words not conducting any current. See 29.68 Power units thyristor loss function. Any high bit means, that at least one thyristor/branch fuse of the power unit is out of operation. **Note**: The bits are not latched in case of 29.68 Power units thyristor loss function = Warning. See 29.18 Ch1 power unit thyristor loss word.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
29.60	**Power units status word**						
	Power units status word. Displays the status of all hardparallel connected power units. **Note**: The bits are latched in case of 29.68 Power unit thyristor loss function = Warning. Bit assignment:						

Bit	Name	Value	Remarks
0	reserved		
1	Ch1 power unit unbalanced current	1	All thyristors of the power unit connected to channel1 are in operation, but one or more thyristors do not conduct the full current.
2	Ch2 power unit unbalanced current	1	All thyristors of the power unit connected to channel2 are in operation, but one or more thyristors do not conduct the full current.
3	Ch3 power unit unbalanced current	1	All thyristors of the power unit connected to channel3 are in operation, but one or more thyristors do not conduct the full current.
4	Ch4 power unit unbalanced current	1	All thyristors of the power unit connected to channel4 are in operation, but one or more thyristors do not conduct the full current.
5	reserved		
6	reserved		
7	reserved		

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7"><table>
<tr><td>8</td><td>reserved</td><td></td><td></td></tr>
<tr><td>9</td><td>Ch1 power unit thyristor loss</td><td>1</td><td>At least one thyristor/branch fuse of the power unit connected to channel1 is out of operation.</td></tr>
<tr><td>10</td><td>Ch2 power unit thyristor loss</td><td>1</td><td>At least one thyristor/branch fuse of the power unit connected to channel2 is out of operation.</td></tr>
<tr><td>11</td><td>Ch3 power unit thyristor loss</td><td>1</td><td>At least one thyristor/branch fuse of the power unit connected to channel3 is out of operation.</td></tr>
<tr><td>12</td><td>Ch4 power unit thyristor loss</td><td>1</td><td>At least one thyristor/branch fuse of the power unit connected to channel4 is out of operation.</td></tr>
<tr><td>13</td><td>reserved</td><td></td><td></td></tr>
<tr><td>14</td><td>reserved</td><td></td><td></td></tr>
<tr><td>15</td><td>reserved</td><td></td><td></td></tr>
</table></td></tr>
<tr><td></td><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">29.62</td><td colspan="7">Alternate firing</td></tr>
<tr><td colspan="7">reserved</td></tr>
<tr><td>0 … 1</td><td>Continuous</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">29.63</td><td colspan="7">Power units unbalanced current function</td></tr>
<tr><td colspan="7">Power units unbalanced current.
Selects the type of event power unit, unbalanced current. The drive reacts according to 29.63 Power unit unbalanced current function if 27.05 Motor current exceeds 29.65 Power unit unbalanced current level and the unbalanced current is outside the window defined by 29.64 Power unit unbalanced current window.
Example: |27.05| > 29.65 AND current outside window of 29.64 (e.g. |29.11 Ch1 power unit current terminal C1 - 29.12 Ch2 power unit current terminal C1| > 29.64.

SF_880_040_power unit_c.ai
0: No action; none, disable event power unit, unbalanced current.
1: Fault; the event generates fault F560 Power unit, unbalanced current.
2: Warning; the event generates warning A560 Power unit, unbalanced current.</td></tr>
<tr><td>0 … 2</td><td>Warning</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">29.64</td><td colspan="7">Power units unbalanced current window</td></tr>
<tr><td colspan="7">Power units unbalanced current window.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Power units unbalanced current window in percent of 99.11 M1 nominal current. If the current of all power units is inside the window (default -25.00 % … 25.00 %) event power units, unbalanced current is disabled. See 29.63 Power unit unbalanced current function.</td></tr>
<tr><td>0.00 … 325.00</td><td>25.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**29.65**</td><td colspan="7">**Power units unbalanced current level**</td></tr>
<tr><td colspan="7">Power units unbalanced current/thyristor loss level.
Power units unbalanced current tripping level in percent of 99.11 M1 nominal current. See 29.63 Power units unbalanced current function.</td></tr>
<tr><td>0.00 … 325.00</td><td>15.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**29.66**</td><td colspan="7">**Power units unbalanced current delay time**</td></tr>
<tr><td colspan="7">Delay time of event power unit, unbalanced current.
29.66 Power units unbalanced current delay time delays either fault F560 Power unit, unbalanced current or warning A560 Power unit, unbalanced current, depending on 29.63 Power units unbalanced current function. If the unbalanced current recovers before the delay elapses, the event will be disregarded.</td></tr>
<tr><td>0 … 32500</td><td>100</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**29.68**</td><td colspan="7">**Power units thyristor loss function**</td></tr>
<tr><td colspan="7">Power units, thyristor loss.
Selects the type of event power unit, thyristor loss. The drive reacts according to 29.68 Power units thyristor loss function if 27.05 Motor current exceeds 29.65 Power unit unbalanced current level and no current is conducted through a thyristor and/or branch fuse.
Example: |27.05| > 29.65 AND no current is conducted through a thyristor and/or branch fuse.

0: **No action**; none, disable event power unit, thyristor loss.
1: **Fault**; the event generates fault F561 Power unit, thyristor loss.
2: **Warning**; the event generates warning A561 Power unit, thyristor loss.</td></tr>
<tr><td>0 … 2</td><td>Fault</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**29.69**</td><td colspan="7">**Power units thyristor loss delay time**</td></tr>
<tr><td colspan="7">Delay time of event power unit, thyristor loss.
29.69 Power units thyristor loss delay time delays either fault F561 Power unit, thyristor loss or warning A561 Power unit, thyristor loss, depending on 29.68 Power units thyristor loss function. If the thyristor loss recovers before the delay elapses, the event will be disregarded.</td></tr>
<tr><td>0 … 32500</td><td>10</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**29.70**</td><td colspan="7">**Power units test**</td></tr>
<tr><td colspan="7">Power units test.
29.69 Power units test is used to simulate events power units unbalanced current and power units thyristor loss. This is executed by removing firing pulses from thyristors V11 and V21.
Note: Motor should not rotate during test.
0: **Normal mode**; normal operating mode.
1: **Ch1 power unit**; remove channel1 power unit firing pulses from thyristors V11 and V21.
2: **Ch2 power unit**; remove channel2 power unit firing pulses from thyristors V11 and V21.
3: **Ch3 power unit**; remove channel3 power unit firing pulses from thyristors V11 and V21.</td></tr>
</table>

Index	Name					
	Text					
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	4: **Ch4 power unit**; remove channel4 power unit firing pulses from thyristors V11 and V21.						
	0 … 4	Normal mode	-	1 = 1	n	n	Parameter

30 Control limits

Drive operation limits.

Index	Name						
	Text						
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
30.01	**Limit word 1**						
	Drive limit word 1. Displays the limit word 1 of the drive. Bit assignment:						

Bit	Name	Value	Remarks
0	Negative speed	1	Speed reference is limited by 20.24 Negative speed enable.
1	Positive speed	1	Speed reference is limited by 20.23 Positive speed enable.
2	Min speed	1	Speed reference is limited by 30.11 M1 Minimum speed.
3	Max speed	1	Speed reference is limited by 30.12 M1 Maximum speed.
4	Bridge 2 current	1	Armature current reference is limited by 30.34 M1 current limit bridge 2.
5	Bridge 1 current	1	Armature current reference is limited by 30.35 M1 current limit bridge 1.
6	Speed 1 current	1	Armature current reference is limited by 30.37 Current limit at speed 1.
7	Speed 2 current	1	Armature current reference is limited by 30.38 Current limit at speed 2.
8	Speed 3 current	1	Armature current reference is limited by 30.39 Current limit at speed 3.
9	Speed 4 current	1	Armature current reference is limited by 30.40 Current limit at speed 4.
10	Speed 5 current	1	Armature current reference is limited by 30.41 Current limit at speed 5.
11	Min firing angle	1	Firing angle is limited by 30.44 Minimum firing angle.
12	Max firing angle	1	Firing angle is limited by 30.45 Maximum firing angle.
13	Min EMF controller	1	EMF controller output is limited by 30.49 Minimum EMF limit.
14	Max EMF controller	1	EMF controller output is limited by 30.50 Maximum EMF limit.
15	reserved		

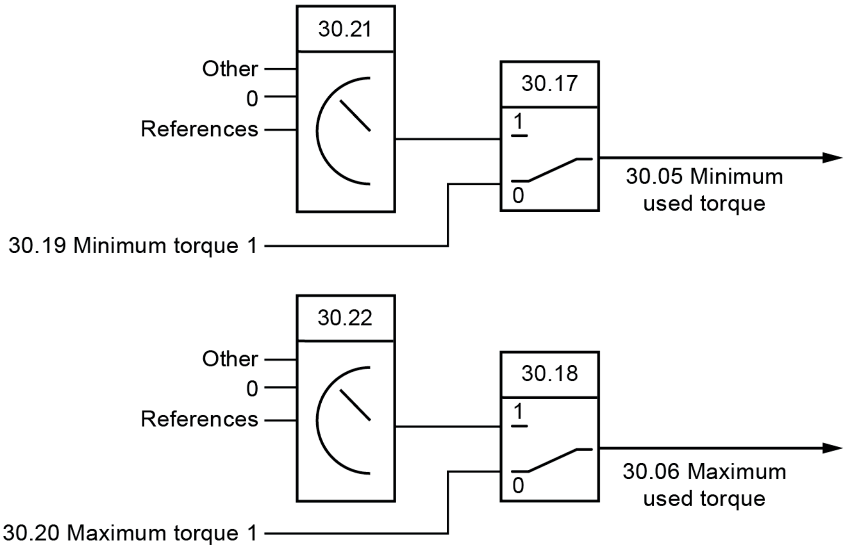
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
30.02	**Torque limit status**						
	Torque limit word.						

Index	Name						
	Text						
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	Displays the torque word of the drive. Bit assignment:						

Bit	Name	Value	Remarks
0	Min 2-Q operation	1	Torque/current reference is limited by 2-Q operation. See 07.61 Drive block bridge 2 set = Block bridge 2.
1	Min speed controller	1	Speed controller output is limited by 30.13 Speed control min torque.
2	Max speed controller	1	Speed controller output is limited by 30.14 Speed control max torque.
3	Min external	1	External torque reference is limited by 30.15 Minimum torque reference.
4	Max external	1	External torque reference is limited by 30.16 Maximum torque reference.
5	Min 1	1	Torque reference is limited by 30.19 Minimum torque 1.
6	Max 1	1	Torque reference is limited by 30.20 Maximum torque 1.
7	Min 2	1	Torque reference is limited by 30.23 Minimum torque 2.
8	Max 2	1	Torque reference is limited by 30.24 Maximum torque 2.
9	Max regenerating	1	Torque reference is limited by 30.27 Max torque during regenerating.
10	Min emergency stop	1	Speed controller output is limited by 30.30 Minimum torque emergency stop.
11	Max emergency stop	1	Speed controller output is limited by 30.31 Maximum torque emergency stop.
12	reserved		
13	reserved		
14	reserved		
15	reserved		

Index	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
30.03	**Minimum torque all limits**						
	Combination of all minimum torque/current limits. Largest of all minimum torque/current limits in percent of 99.02 M1 nominal torque. Evaluated from 07.61 Drive block bridge 2 set, 30.05 Minimum used torque and 30.34 M1 current limit bridge 2.						
	-325.00 … 325.00	-	%	See 46.04	y	n	Signal
30.04	**Maximum torque all limits**						
	Combination of all maximum torque/current limits. Smallest of all maximum torque/current limits in percent of 99.02 M1 nominal torque. Evaluated from 30.06 Maximum used torque and 30.35 M1 current limit bridge 1.						
	-325.00 … 325.00	-	%	See 46.04	y	n	Signal
30.05	**Minimum used torque**						
	Minimum used torque reference limit. Minimum torque limit in percent of 99.02 M1 nominal torque. The source is selected with 30.17 Minimum torque sel.						

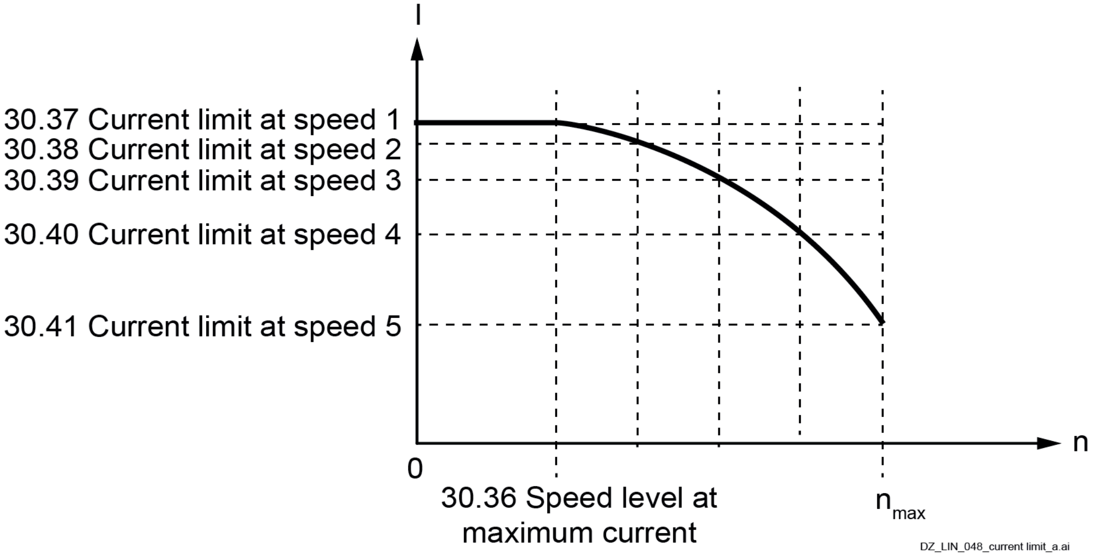
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Connected to the torque limiter after 26.01 Torque reference to limitation.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>See 46.04</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">**30.06**</td><td colspan="7">**Maximum used torque**</td></tr>
<tr><td colspan="7">Maximum used torque reference limit.
Maximum torque limit in percent of 99.02 M1 nominal torque. The source is selected with 30.18 Maximum torque sel.
Connected to the torque limiter after 26.01 Torque reference to limitation.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>See 46.04</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">**30.11**</td><td colspan="7">**M1 minimum speed**</td></tr>
<tr><td colspan="7">Motor 1 minimum speed limit.
Motor 1 minimum speed reference limit in rpm for 23.01 Speed reference ramp input and 24.01 Used speed reference. The unit is selected by 96.03 Unit for speed control.
Notes:
– 30.11 M1 minimum speed is applied to 24.01 Used speed reference to avoid falling below the speed limits by means of 24.11 Speed correction.
– To be able to overspeed the drive (e.g. for winders) it is possible to switch off the speed limit for 24.01 Used speed reference by means of 06.10.b02 Auxiliary control word 1.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>-1500.00</td><td>rpm, % or V</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**30.12**</td><td colspan="7">**M1 maximum speed**</td></tr>
<tr><td colspan="7">Motor 1 maximum speed limit.
Motor 1 maximum speed reference limit in rpm for 23.01 Speed reference ramp input and 24.01 Used speed reference. The unit is selected by 96.03 Unit for speed control.
Notes:
– 30.12 M1 maximum speed is applied to 24.01 Used speed reference to avoid exceeding the speed limits by means of 24.11 Speed correction.
– To be able to overspeed the drive (e.g. for winders) it is possible to switch off the speed limit for 24.01 Used speed reference by means of 06.10.b02 Auxiliary control word 1.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>1500.00</td><td>rpm, % or V</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**30.13**</td><td colspan="7">**Speed control min torque**</td></tr>
<tr><td colspan="7">Minimum speed controller output torque limit.
Minimum speed controller output torque limit in percent of 99.02 M1 nominal torque. See 25.01 Torque reference speed control.
Notes:
– The used torque limit depends also on the drive‘s actual limitation situation (other torque limits, current limits and field weakening). The limit with the largest value is valid.
– No need to change the default setting of 30.13 Speed control min torque for 2-Q operation, because the minimum torque limit is internally set to -1 %. See 07.61 Drive block bridge 2 set = Block bridge 2.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-325.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**30.14**</td><td colspan="7">**Speed control max torque**</td></tr>
<tr><td colspan="7">Maximum speed controller output torque limit.
Maximum speed controller output torque limit in percent of 99.02 M1 nominal torque. See 25.01 Torque reference speed control.
Note: The used torque limit depends also on the drive‘s actual limitation situation (other torque limits, current limits and field weakening). The limit with the smallest value is valid.</td></tr>
<tr><td>-325.00 … 325.00</td><td>325.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">30.15</td><td colspan="7">Minimum torque reference</td></tr>
<tr><td colspan="7">Minimum external torque reference limit.
Minimum external torque reference limit in percent of 99.02 M1 nominal torque for external references. See 26.11 Torque reference 1 source and 26.12 Torque reference 2 source.
Notes:
– The used torque limit depends also on the drive‘s actual limitation situation (other torque limits, current limits and field weakening). The limit with the largest value is valid.
– No need to change the default setting of 30.13 Speed control min torque for 2-Q operation, because the minimum torque limit is internally set to -1 %. See 07.61 Drive block bridge 2 set = Block bridge 2.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-325.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">30.16</td><td colspan="7">Maximum torque reference</td></tr>
<tr><td colspan="7">Maximum external torque reference limit.
Maximum external torque reference limit in percent of 99.02 M1 nominal torque for external references. See 26.11 Torque reference 1 source and 26.12 Torque reference 2 source.
Note: The used torque limit depends also on the drive‘s actual limitation situation (other torque limits, current limits and field weakening). The limit with the smallest value is valid.</td></tr>
<tr><td>-325.00 … 325.00</td><td>325.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">30.17</td><td colspan="7">Minimum torque sel</td></tr>
<tr><td colspan="7">Minimum torque reference limit selector.
Selects a source that switches between two different predefined minimum torque limits. The user can define two sets of torque limits and switch between the sets using a binary source such as a digital input.
30.17 Minimum torque sel is independent of 30.18 Maximum torque sel.
The first set of limits is defined by 30.19 Minimum torque 1 and 30.20 Maximum torque 1.
The second set has selector parameters for both minimum and maximum limit. See 30.21 Minimum torque 2 source and 30.22 Maximum torque 2 source. Thus, it is possible to select e.g. analog inputs.
0 = Minimum torque 1.
1 = Minimum torque 2.

SF_880_026_torque_b.ai
Other [bit]; source selection.
0: Minimum torque 1; 30.19 Minimum torque 1 is active. Normal operation.</td></tr>
</table>

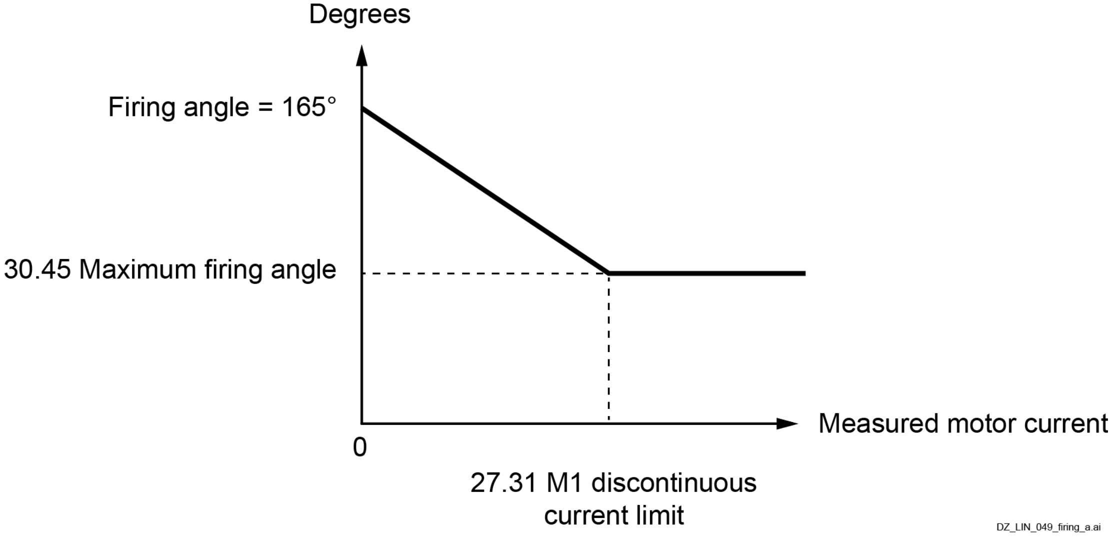
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">1: Minimum torque 2; the source selected by 30.21 Minimum torque 2 source is active.
3: DI1; 10.02.b00 DI delayed status.
4: DI2; 10.02.b01 DI delayed status.
5: DI3; 10.02.b02 DI delayed status.
6: DI4; 10.02.b03 DI delayed status.
7: DI5; 10.02.b04 DI delayed status.
8: DI6; 10.02.b05 DI delayed status.
11: DIO1; 11.02.b00 DIO delayed status.
12: DIO2; 11.02.b01 DIO delayed status.
19: DIL; 10.02.b15 DI delayed status.</td></tr>
<tr><td>0 … 19</td><td>Minimum torque 1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">30.18</td><td colspan="7">Maximum torque sel</td></tr>
<tr><td colspan="7">Maximum torque reference limit selector.
Selects a source that switches between two different predefined maximum torque limits. See 30.17 Minimum torque sel.
0 = Maximum torque 1.
1 = Maximum torque 2.
Other [bit]; source selection.
0: Maximum torque 1; 30.20 Maximum torque 1 is active. Normal operation.
1: Maximum torque 2; the source selected by 30.22 Maximum torque 2 source is active.
3: DI1; 10.02.b00 DI delayed status.
4: DI2; 10.02.b01 DI delayed status.
5: DI3; 10.02.b02 DI delayed status.
6: DI4; 10.02.b03 DI delayed status.
7: DI5; 10.02.b04 DI delayed status.
8: DI6; 10.02.b05 DI delayed status.
11: DIO1; 11.02.b00 DIO delayed status.
12: DIO2; 11.02.b01 DIO delayed status.
19: DIL; 10.02.b15 DI delayed status.</td></tr>
<tr><td>0 … 19</td><td>Maximum torque 1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">30.19</td><td colspan="7">Minimum torque 1</td></tr>
<tr><td colspan="7">Minimum torque reference limit 1.
Minimum torque reference limit 1 in percent of 99.02 M1 nominal torque for the torque limiter. See 30.17 Minimum torque sel.
Notes:
– The used torque limit depends also on the drive‘s actual limitation situation (other torque limits, current limits and field weakening). The limit with the largest value is valid.
– No need to change the default setting of 30.19 Minimum torque 1 for 2-Q operation, because the minimum torque limit is internally set to -1 %. See 07.61 Drive block bridge 2 set = Block bridge 2.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-325.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">30.20</td><td colspan="7">Maximum torque 1</td></tr>
<tr><td colspan="7">Maximum torque reference limit 1.
Maximum torque reference limit 1 in percent of 99.02 M1 nominal torque for the torque limiter. See 30.17 Minimum torque sel.
Note: The used torque limit depends also on the drive‘s actual limitation situation (other torque limits, current limits and field weakening). The limit with the smallest value is valid.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td>-325.00 … 325.00</td><td>325.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**30.21**</td><td colspan="7">**Minimum torque 2 source**</td></tr>
<tr><td colspan="7">Minimum torque reference limit 2 source.
Selects the source for the minimum torque reference limit 2 in percent 99.02 M1 nominal torque. See 30.17 Minimum torque sel.
Other; source selection.
0: **Zero**; 0, not in use.
1: **Minimum torque 2**; 30.23 Minimum torque 2.
2: **Negate maximum torque 2**; 30.24 Maximum torque 2 multiplied by -1.
4: **AI1 scaled**; 12.12 AI1 scaled value.
5: **AI2 scaled**; 12.22 AI2 scaled value.
6: **AI3 scaled**; 12.32 AI3 scaled value.
18: **Process PID output actual**; 40.01 Process PID output actual.</td></tr>
<tr><td>0 … 18</td><td>Minimum torque 2</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**30.22**</td><td colspan="7">**Maximum torque 2 source**</td></tr>
<tr><td colspan="7">Maximum torque reference limit 2 source.
Selects the source for the Maximum torque reference limit 2 in percent 99.02 M1 nominal torque. See 30.17 Minimum torque sel.
Other; source selection.
0: **Zero**; 0, not in use.
1: **Maximum torque 2**; 30.24 Maximum torque 2.
2: **Negate minimum torque 2**; 30.23 Minimum torque 2 multiplied by -1.
4: **AI1 scaled**; 12.12 AI1 scaled value.
5: **AI2 scaled**; 12.22 AI2 scaled value.
6: **AI3 scaled**; 12.32 AI3 scaled value.
18: **Process PID output actual**; 40.01 Process PID output actual.</td></tr>
<tr><td>0 … 18</td><td>Maximum torque 2</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**30.23**</td><td colspan="7">**Minimum torque 2**</td></tr>
<tr><td colspan="7">Minimum torque reference limit 2.
Minimum torque reference limit 2 in percent of 99.02 M1 nominal torque for the torque limiter. See 30.17 Minimum torque sel.
Notes:
– The used torque limit depends also on the drive‘s actual limitation situation (other torque limits, current limits and field weakening). The limit with the largest value is valid.
– No need to change the default setting of 30.23 Minimum torque 2 for 2-Q operation, because the minimum torque limit is internally set to -1 %. See 07.61 Drive block bridge 2 set = Block bridge 2.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-325.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**30.24**</td><td colspan="7">**Maximum torque 2**</td></tr>
<tr><td colspan="7">Maximum torque reference limit 2.
Maximum torque reference limit 2 in percent of 99.02 M1 nominal torque for the torque limiter. See 30.17 Minimum torque sel.
Note: The used torque limit depends also on the drive‘s actual limitation situation (other torque limits, current limits and field weakening). The limit with the smallest value is valid.</td></tr>
<tr><td>-325.00 … 325.00</td><td>325.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**30.27**</td><td colspan="7">**Max torque during regenerating**</td></tr>
<tr><td colspan="7">Maximum torque limit during regeneration.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Maximum and torque limit in percent of 99.02 M1 nominal torque only during regenerating.
Note: The used torque limit depends also on the drive‘s actual limitation situation (other torque limits, current limits and field weakening).</td></tr>
<tr><td>-325.00 … 325.00</td><td>325.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**30.30**</td><td colspan="7">**Minimum torque emergency stop**</td></tr>
<tr><td colspan="7">Minimum speed controller output torque limit for a ramped Off3 (emergency stop) command.
Minimum speed controller output torque limit when a ramped Off3 (emergency stop) command is active and 30.30 Minimum torque emergency stop is ≠ zero. Otherwise the value of 30.13 Speed control min torque is taken. See 21.03 Emergency stop mode, 06.20.b11 Run inhibit status word and 06.20.b13 Run inhibit status word.
Notes:
– The emergency stop torque limit overrides all other minimum torque limits. Minimum current limits remain valid.
– No need to change the default setting of 30.30 Minimum torque emergency stop for 2-Q operation, because the minimum torque limit is internally set to -1 %. See 07.61 Drive block bridge 2 set = Block bridge 2.</td></tr>
<tr><td>-325.00 … 325.00</td><td>0.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**30.31**</td><td colspan="7">**Maximum torque emergency stop**</td></tr>
<tr><td colspan="7">Maximum speed controller output torque limit for a ramped Off3 (emergency stop) command.
Maximum speed controller output torque limit when a ramped Off3 (emergency stop) command is active and 30.31 Maximum torque emergency stop is ≠ zero. Otherwise the value of 30.14 Speed control max torque is taken. See 21.03 Emergency stop mode, 06.20.b11 Run inhibit status word and 06.20.b13 Run inhibit status word.
Note: The emergency stop torque limit overrides all other maximum torque limits. Maximum current limits remain valid.</td></tr>
<tr><td>-325.00 … 325.00</td><td>0.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**30.34**</td><td colspan="7">**M1 current limit bridge 2**</td></tr>
<tr><td colspan="7">Motor 1 armature current limit for bridge 2.
Current limit bridge 2 in percent of 99.11 M1 nominal current. Setting 30.34 M1 current limit bridge 2 = 0 % disables bridge 2.
Notes:
– The used current limit depends also on the drive‘s actual limitation situation (other torque limits, current limits and field weakening). The limit with the largest value is valid.
– No need to change the default setting of 30.34 M1 current limit bridge 2 for 2-Q operation, because the minimum current limit is internally set to -1 %. See 07.61 Drive block bridge 2 set = Block bridge 2.</td></tr>
<tr><td>-325.00 … 0.00</td><td>-100.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**30.35**</td><td colspan="7">**M1 current limit bridge 1**</td></tr>
<tr><td colspan="7">Motor 1 armature current limit for bridge 1.
Current limit bridge 1 in percent of 99.11 M1 nominal current. Setting 30.35 M1 current limit bridge 1 = 0 % disables bridge 1.
Note: The used current limit depends also on the drive‘s actual limitation situation (other torque limits, current limits and field weakening). The limit with the smallest value is valid.</td></tr>
<tr><td>0.00 … 325.00</td><td>100.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**30.36**</td><td colspan="7">**Speed level at maximum current**</td></tr>
<tr><td colspan="7">Speed level for the speed depending current limit.
Speed level where the armature current reduction begins.</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	 n_{max} = maximum absolute value of 30.11 M1 minimum speed and 30.12 M1 maximum speed.						
	0.00 … 30000.00	1500.00	rpm	See 46.02	n	y	Parameter
30.37	**Current limit at speed 1**						
	Speed depending current limit at speed 1. Armature current limit in percent of 99.11 M1 nominal current at 30.36 Speed level at maximum current. Should be set to the maximum absolute value of 30.34 M1 current limit bridge 2 and 30.35 M1 current limit bridge. **Note**: The used current limit depends also on the drive‘s actual limitation situation (other torque limits, current limits and field weakening). The limit with the smallest value is valid.						
	0.00 … 325.00	325.00	%	100 = 1 %	n	y	Parameter
30.38	**Current limit at speed 2**						
	Speed depending current limit at speed 2. Armature current limit in percent of 99.11 M1 nominal current at speed: $(30.36) + \frac{1}{4} \times [n_{max} - (30.36)]$ $With: n_{max} = Max[\lvert(30.11)\rvert, \lvert(30.12)\rvert]$ **Note**: The used current limit depends also on the drive‘s actual limitation situation (other torque limits, current limits and field weakening). The limit with the smallest value is valid.						
	0.00 … 325.00	325.00	%	100 = 1 %	n	y	Parameter
30.39	**Current limit at speed 3**						
	Speed depending current limit at speed 3. Armature current limit in percent of 99.11 M1 nominal current at speed: $(30.36) + \frac{1}{2} \times [n_{max} - (30.36)]$ $With: n_{max} = Max[\lvert(30.11)\rvert, \lvert(30.12)\rvert]$ **Note**: The used current limit depends also on the drive‘s actual limitation situation (other torque limits, current limits and field weakening). The limit with the smallest value is valid.						
	0.00 … 325.00	325.00	%	100 = 1 %	n	y	Parameter
30.40	**Current limit at speed 4**						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	Speed depending current limit at speed 4. Armature current limit in percent of 99.11 M1 nominal current at speed: $(30.36) + \frac{3}{4} \times [n_{max} - (30.36)]$ $With: n_{max} = Max[\vert(30.11)\vert, \vert(30.12)\vert]$ **Note**: The used current limit depends also on the drive‘s actual limitation situation (other torque limits, current limits and field weakening). The limit with the smallest value is valid.						
	0.00 … 325.00	325.00	%	100 = 1 %	n	y	Parameter
30.41	**Current limit at speed 5**						
	Speed depending current limit at speed 5. Armature current limit in percent of 99.11 M1 nominal current at n_{max}: $With: n_{max} = Max[\vert(30.11)\vert, \vert(30.12)\vert]$ **Note**: The used current limit depends also on the drive‘s actual limitation situation (other torque limits, current limits and field weakening). The limit with the smallest value is valid.						
	0.00 … 325.00	325.00	%	100 = 1 %	n	y	Parameter
30.44	**Minimum firing angle**						
	Minimum firing angle. Minimum firing angle in degrees.						
	0.00 … 165.00	15.00	°	100 = 1°	n	y	Parameter
30.45	**Maximum firing angle**						
	Maximum firing angle. Maximum firing angle in degrees. The maximum firing angel can be forced using 06.10.b10 Auxiliary control word 1.						
	0.00 … 172.00	150.00	°	100 = 1°	n	n	Parameter
30.46	**Maximum firing angle mode**						
	Maximum firing angle mode. Selects the strategy for the maximum firing angle. 0: **Fix**; the maximum firing angle limit is defined by 30.45 Maximum firing angle. 1: **Fix + single**; the maximum firing angle limit is defined by 30.45 Maximum firing angle. When the maximum firing angle is reached, single firing pulses to suppress the DC current are fired. 2: **Calculated**; the maximum firing limit is automatically reduced from 165° to 30.45 Maximum firing angle depending on the measured motor current and 27.31 M1 discontinuous current limit. 3: **Calculated + single**; same function as Calculated, but single pulses fired are given, when the maximum firing angle is reached.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">
Note: Single firing pulses force discontinuous current automatically to zero.</td></tr>
<tr><td>0 … 3</td><td>Fix + single</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**30.49**</td><td colspan="7">**Minimum EMF limit**</td></tr>
<tr><td colspan="7">Minimum EMF limit.
Negative limit for EMF controller in percent of nominal flux.</td></tr>
<tr><td>-100.00 … 0.00</td><td>-100.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**30.50**</td><td colspan="7">**Maximum EMF limit**</td></tr>
<tr><td colspan="7">Maximum EMF limit.
Positive limit for EMF controller in percent of nominal flux.</td></tr>
<tr><td>0.00 … 100.00</td><td>5.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

31 Fault functions and fault levels

Configuration of external events. Selection of the drive behavior in fault situations.

Index	**Name** **Text** **Range**	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
31.01	**External event 1 source**						
	Source of external event 1. Defines the source of external event 1. See 31.02 External event 1 type. The external event is low active, thus: 0 = Trigger event. 1 = Normal operation. **Other [bit]**; source selection. 0: **Active (false)**; trigger event. 1: **Inactive (true)**; no trigger event. Normal operation. 3: **DI1**; 10.02.b00 DI delayed status. 4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status.						
	0 … 19	Inactive (true)	-	1 = 1	n	y	Parameter
31.02	**External event 1 type**						
	Type of external event 1. Selects the type of external event 1. 0: **No action**; none, disable external event 1. 1: **Fault**; the event generates fault 9081 External fault 1. 2: **Warning**; the event generates warning A981 External warning 1. 3: **Warning or fault**; if the drive is in state Ready reference, the event generates fault 9081 External fault 1. Otherwise, the event generates warning A981 External warning 1. 4: **Inactive or fault**; if the drive is in state Ready reference, the event generates fault 9081 External fault 1. Otherwise, the event is inactive. 5: **Inactive or warning**; if the drive is in state Ready reference, the event generates warning A981 External warning 1. Otherwise, the event is inactive.						
	0 … 5	No action	-	1 = 1	n	y	Parameter
31.03	**External event 2 source**						
	Source of external event 2. Defines the source of external event 2. See 31.04 External event 2 type and 31.01 External event 1 source.						
	0 … 19	Inactive (true)	-	1 = 1	n	y	Parameter
31.04	**External event 2 type**						
	Type of external event 2. Selects the type of external event 2. See 31.02 External event 1 type.						
	0 … 5	No action	-	1 = 1	n	y	Parameter
31.05	**External event 3 source**						
	Source of external event 3. Defines the source of external event 3. See 31.06 External event 3 type and 31.01 External event 1 source.						
	0 … 19	Inactive (true)	-	1 = 1	n	y	Parameter

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">31.06</td><td colspan="7">External event 3 type</td></tr>
<tr><td colspan="7">Type of external event 3.
Selects the type of external event 3. See 31.02 External event 1 type.</td></tr>
<tr><td>0 … 5</td><td>No action</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">31.07</td><td colspan="7">External event 4 source</td></tr>
<tr><td colspan="7">Source of external event 4.
Defines the source of external event 4. See 31.08 External event 4 type and 31.01 External event 1 source.</td></tr>
<tr><td>0 … 19</td><td>Inactive (true)</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">31.08</td><td colspan="7">External event 4 type</td></tr>
<tr><td colspan="7">Type of external event 4.
Selects the type of external event 4. See 31.02 External event 1 type.</td></tr>
<tr><td>0 … 5</td><td>No action</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">31.09</td><td colspan="7">External event 5 source</td></tr>
<tr><td colspan="7">Source of external event 5.
Defines the source of external event 5. See 31.10 External event 5 type and 31.01 External event 1 source.</td></tr>
<tr><td>0 … 19</td><td>Inactive (true)</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">31.10</td><td colspan="7">External event 5 type</td></tr>
<tr><td colspan="7">Type of external event 4.
Selects the type of external event 4. See 31.02 External event 1 type.</td></tr>
<tr><td>0 … 5</td><td>No action</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">31.13</td><td colspan="7">Fault stop mode communication</td></tr>
<tr><td colspan="7">Stop mode for communication losses.
Selects the way the motor is stopped for all communication losses (local, fieldbus communication, master-follower link, DDCS and DCSLink) causing a fault.
0: Coast stop; the motor coasts to a stop. The firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current as fast as possible. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.
1: Ramp stop; the input of the drive ramp is set to zero. Thus, the motor stops along the emergency stop ramp. See 23.23 Emergency stop time. When reaching 21.08 M1 zero speed level the firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.
In case 19.20 Follower force ramp stop = Force speed control the torque selector is bypassed, and the drive is forced to speed control.
3: Torque limit; the output of the drive ramp is set to zero. Thus, the motor stops at the active torque limit. When reaching 21.08 M1 zero speed level the firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.
In case 19.20 Follower force ramp stop = Force speed control the torque selector is bypassed, and the drive is forced to speed control.
4: Dynamic braking; the motor stops by means of dynamic braking. After dynamic braking is finished the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.</td></tr>
<tr><td>0 … 4</td><td>Ramp stop</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>31.14</td><td colspan="7">Fault stop mode fault level 3</td></tr>
</table>

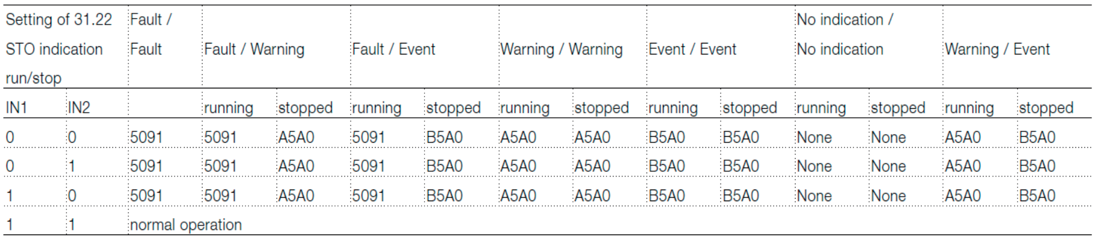
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">Stop mode for faults with fault level 3.
Selects the way the motor is stopped for all faults with fault level 3.
Note: 31.14 Fault stop mode fault level 3 does not apply to communication faults.
0: Coast stop; the motor coasts to a stop. The firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current as fast as possible. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.
4: Dynamic braking; the motor stops by means of dynamic braking. After dynamic braking is finished the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.</td></tr>
<tr><td></td><td>0 … 4</td><td>Coast stop</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>31.15</td><td colspan="7">Fault stop mode fault level 4</td></tr>
<tr><td></td><td colspan="7">Stop mode for faults with fault level 4.
Selects the way the motor is stopped for all faults with fault level 4.
Note: 31.15 Fault stop mode fault level 4 does not apply to communication faults.
0: Coast stop; the motor coasts to a stop. The firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current as fast as possible. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.
1: Ramp stop; the input of the drive ramp is set to zero. Thus, the motor stops along the emergency stop ramp. See 23.23 Emergency stop time. When reaching 21.08 M1 zero speed level the firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.
In case 19.20 Follower force ramp stop = Force speed control the torque selector is bypassed, and the drive is forced to speed control.
3: Torque limit; the output of the drive ramp is set to zero. Thus, the motor stops at the active torque limit. When reaching 21.08 M1 zero speed level the firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.
In case 19.20 Follower force ramp stop = Force speed control the torque selector is bypassed, and the drive is forced to speed control.
4: Dynamic braking; the motor stops by means of dynamic braking. After dynamic braking is finished the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.</td></tr>
<tr><td></td><td>0 … 4</td><td>Ramp stop</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>31.21</td><td colspan="7">Mains phase loss</td></tr>
<tr><td></td><td colspan="7">Type of event mains phase loss.
Selects the type of event mains phase loss.
0: No action; none, disable mains phase loss.
1: Fault; the event generates fault 3130 Mains phase loss.
2: Warning; the event generates warning A130 Mains phase loss.</td></tr>
<tr><td></td><td>0 … 2</td><td>Warning</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>31.22</td><td colspan="7">STO indication run/stop</td></tr>
<tr><td></td><td colspan="7">Safe torque off, type of event when safe torque off is active.
Selects which events are given when one or both safe torque off signals are switched off or are lost. The events also depend on whether the drive is running or stopped, when they occur.
In case a fault occurs, the load switching device (mains breaker, DC-breaker, ...) is opened by the relay output XSMC:1/2.</td></tr>
</table>

Index	**Name**					
	Text					
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**

The tables below show the events generated depending on 31.22 STO indication run/stop.

Notes:

- 31.22 STO indication run/stop does not affect the operation of the safe torque off function itself. The safe torque off function will operate regardless of the setting of 31.22 STO indication run/stop. A running drive will stop when removing either one or both safe torque off signals. It will not start until both safe torque off signals are restored and all faults are reset.
  The loss of only one signal causes either fault FA81 Safe torque off 1 loss or fault FA82 Safe torque off 2 loss.
- For more information on the safe torque off, see safety supplement for functional safety converter DCS880 (3ADW000452).



Setting of 31.22 STO indication run/stop		Fault / Fault	Fault / Warning		Fault / Event		Warning / Warning		Event / Event		No indication / No indication		Warning / Event	
IN1	IN2		running	stopped	running	stopped	running	stopped	running	stopped	running	stopped	running	stopped
0	0	5091	5091	A5A0	5091	B5A0	A5A0	A5A0	B5A0	B5A0	None	None	A5A0	B5A0
0	1	5091	5091	A5A0	5091	B5A0	A5A0	A5A0	B5A0	B5A0	None	None	A5A0	B5A0
1	0	5091	5091	A5A0	5091	B5A0	A5A0	A5A0	B5A0	B5A0	None	None	A5A0	B5A0
1	1	normal operation												

- The normal safe torque off operation (IN1 = IN2 = 0) has different, selectable events.

0: **Fault/Fault**;

Inputs		**Event**
IN1	**IN2**	**Running/Stopped**
0	0	Fault 5091 Safe torque off.
0	1	Faults 5091 Safe torque off and FA81 Safe torque off 1 loss fault.
1	0	Faults 5091 Safe torque off and FA82 Safe torque off 2 loss fault.
1	1	Normal operation.

1: **Fault/Warning**;

Inputs		**Event**	
IN1	**IN2**	**Running**	**Stopped**
0	0	Fault 5091 Safe torque off.	Warning A5A0 Safe torque off.
0	1	Faults 5091 Safe torque off and FA81 Safe torque off 1 loss fault.	Warning A5A0 Safe torque off and FA81 Safe torque off 1 loss fault.
1	0	Faults 5091 Safe torque off and FA82 Safe torque off 2 loss fault.	Warning A5A0 Safe torque off and FA82 Safe torque off 2 loss fault.
1	1	Normal operation.	

2: **Fault/Event**;

Inputs		**Event**	
IN1	**IN2**	**Running**	**Stopped**
0	0	Fault 5091 Safe torque off.	Event B5A0 Safe torque off.
0	1	Faults 5091 Safe torque off and FA81 Safe torque off 1 loss fault.	Event B5A0 Safe torque off and FA81 Safe torque off 1 loss fault.
1	0	Faults 5091 Safe torque off and FA82 Safe torque off 2 loss fault.	Event B5A0 Safe torque off and FA82 Safe torque off 2 loss fault.
1	1	Normal operation.	

3: **Warning/Warning**;

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

Inputs		Event
IN1	**IN2**	**Running/Stopped**
0	0	Warning A5A0 Safe torque off.
0	1	Warning A5A0 Safe torque off and FA81 Safe torque off 1 loss fault.
1	0	Warning A5A0 Safe torque off and FA82 Safe torque off 2 loss fault.
1	1	Normal operation.

4: **Event/Event**;

Inputs		Event
IN1	**IN2**	**Running/Stopped**
0	0	Event B5A0 Safe torque off.
0	1	Event B5A0 Safe torque off and FA81 Safe torque off 1 loss fault.
1	0	Event B5A0 Safe torque off and FA82 Safe torque off 2 loss fault.
1	1	Normal operation.

5: **No indication/No indication**;

Inputs		Event
IN1	**IN2**	**Running/Stopped**
0	0	STO is performed, but not indicated.
0	1	FA81 Safe torque off 1 loss fault.
1	0	FA82 Safe torque off 2 loss fault.
1	1	Normal operation.

6: **Warning/Event**;

Inputs		Event	
IN1	**IN2**	**Running**	**Stopped**
0	0	Warning A5A0 Safe torque off.	Event B5A0 Safe torque off.
0	1	Warning A5A0 Safe torque off and FA81 Safe torque off 1 loss fault.	Event B5A0 Safe torque off and FA81 Safe torque off 1 loss fault.
1	0	Warning A5A0 Safe torque off and FA82 Safe torque off 2 loss fault.	Event B5A0 Safe torque off and FA82 Safe torque off 2 loss fault.
1	1	Normal operation.	

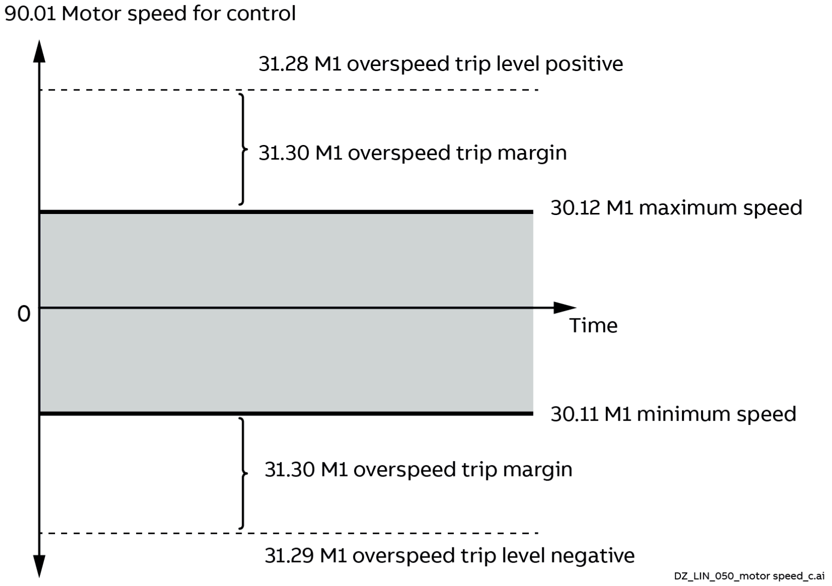
	0 … 6	Fault/Fault	-	1 = 1	n	n	Parameter
31.24	**Stall function**						

Stall, function.
Selects the type of event stall. The drive reacts according to 31.24 Stall function if the torque exceeds 31.25 Stall torque level and undershoots 31.26 Stall speed level for 31.28 Stall time.
0: **No action**; none, disable stall supervision.
1: **Fault**; the event generates fault 7121 Motor stall.
2: **Warning**; the event generates warning A780 Motor stall.

	0 … 2	No action	-	1 = 1	n	y	Parameter
31.25	**Stall torque level**						

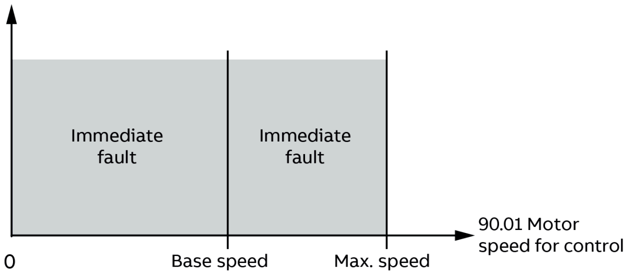
Stall, torque level.
Stall torque level in percent of 99.02 M1 nominal torque.

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	0.00 … 325.00	75.00	%	See 46.04	n	y	Parameter
31.26	**Stall speed level**						
	Stall, speed level. Stall speed level.						
	0.00 … 30000.00	5.00	rpm	See 46.02	n	y	Parameter
31.27	**Stall time**						
	Stall, delay. Time delay for the stall function event.						
	0.0 … 3250.0	0.0	s	10 = 1 s	n	y	Parameter
31.28	**M1 overspeed trip level positive**						
	Motor 1 overspeed trip level positive. If the positive (maximum) trip level for overspeed is exceeded, fault 7310 Overspeed is generated. **Example**: If the maximum speed is 1100 rpm and overspeed trip margin is 300 rpm, the drive trips at 1400 rpm. See 31.30 M1 overspeed trip margin.						
	-30000.00 … 30000.00	-	rpm	See 46.02	y	n	Signal
31.29	**M1 overspeed trip level negative**						
	Motor 1 overspeed trip level negative. If the negative (minimum) trip level for overspeed is exceeded, fault 7310 Overspeed is generated. **Example**: If the minimum speed is -1420 rpm and overspeed trip margin is 300 rpm, the drive trips at -1720 rpm. See 31.30 M1 overspeed trip margin.						
	-30000.00 … 30000.00	-	rpm	See 46.02	y	n	Signal
31.30	**M1 overspeed trip margin**						
	Motor 1 overspeed trip margin. Defines, together with 30.11 M1 minimum speed and 30.12 M1 maximum speed, the maximum allowed speed of the motor (overspeed protection). The event generates fault 7310 Overspeed, if the speed feedback, see 90.01 Motor speed for control, exceeds the speed limit defined by 30.11 M1 minimum speed or 30.12 M1 maximum speed by more than the overspeed trip margin. It is recommended to set 31.30 M1 overspeed trip margin at least to 20 % of the maximum motor speed. **Examples**: – If the maximum speed is 1100 rpm and overspeed trip margin is 300 rpm, the drive trips at 1400 rpm. See 31.28 M1 overspeed trip level positive. – If the minimum speed is -1420 rpm and overspeed trip margin is 300 rpm, the drive trips at -1720 rpm. See 31.29 M1 overspeed trip level negative. **Note**: The overspeed fault for motor 1 is inactive, if 31.30 M1 overspeed trip margin = 0.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7"> </td></tr>
<tr><td>0.00 … 30000.00</td><td>300.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">31.31</td><td colspan="7">Emergency ramp supervision</td></tr>
<tr><td colspan="7">Maximum deviation from the expected deceleration rate.
31.32 Emergency ramp supervision, 31.33 Emergency ramp supervision delay and 01.07 Speed change rate, provide a supervision function for a ramped Off3 (emergency stop) command. See 21.03 Emergency stop mode, 06.20.b11 Run inhibit status word and 06.20.b13 Run inhibit status word.
The supervision is based on either observing the time within which the motor stops or comparing the actual and expected deceleration rates.
Maximum ramp-down time
If 31.31 Emergency ramp supervision = 0.00 %, the maximum stop time is directly set in 31.32 Emergency ramp supervision delay.
Comparing deceleration rates
Otherwise, 31.31 Emergency ramp supervision defines the maximum allowed deviation from the expected deceleration rate, which is calculated from parameters 23.11 … 23.19 for Off3 stop mode 1 (21.03 Emergency stop mode = Ramp stop) or 23.23 Emergency stop time for Off3 stop mode 2 (21.03 Emergency stop mode = Emergency ramp stop). If 1.07 Speed change rate deviates too much from the expected rate, the event generates fault 73B0 Emergency ramp stop. Additionally, 06.17.b08 Drive status word 2 is set and the motor coasts to a stop.
Note: The emergency stop ramp supervision is disabled, if 31.31 Emergency ramp supervision = 0.00 % and 31.32 Emergency ramp supervision delay = 0.0 s.</td></tr>
<tr><td>0.00 … 325.00</td><td>0.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">31.32</td><td colspan="7">Emergency ramp supervision delay</td></tr>
<tr><td colspan="7">Maximum ramp-down time or supervision activation delay.
Maximum ramp-down time
If 31.31 Emergency ramp supervision = 0.00 %, 31.32 Emergency ramp supervision delay defines the maximum time a ramped Off3 (emergency stop) command can take. If the motor has not stopped when the time elapses, the event generates fault 73B0 Emergency ramp stop, sets 06.17.b08 Drive status word 2 and the motor coasts to a stop.
Supervision activation delay</td></tr>
</table>

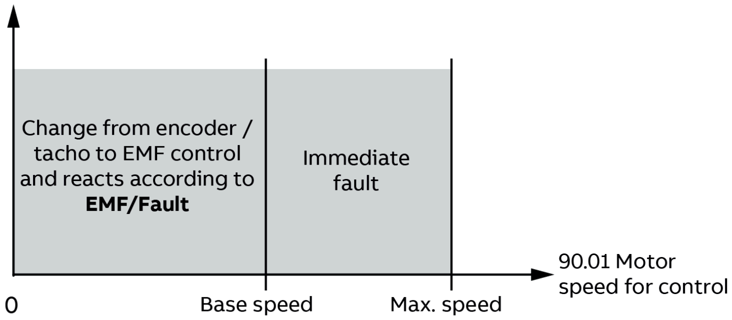
<table>
<tr><td rowspan="3">Index</td><td colspan="7">Name</td></tr>
<tr><td colspan="7">Text</td></tr>
<tr><td>Range</td><td>Default</td><td>Unit</td><td>Scale/ FbEq16</td><td>Volatile</td><td>Change running</td><td>Type</td></tr>
<tr><td rowspan="2"></td><td colspan="7">If 31.31 Emergency ramp supervision > 0.00 %, 31.32 Emergency ramp supervision delay defines a delay between the receipt of a ramped Off3 (emergency stop) command and the activation of the supervision. It is recommended to specify a short delay to allow the speed change rate to stabilize.
Note: The emergency stop ramp supervision is disabled, if 31.31 Emergency ramp supervision = 0.00 % and 31.32 Emergency ramp supervision delay = 0.0 s.</td></tr>
<tr><td>0.0 … 3250.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">31.33</td><td colspan="7">Ramp stop supervision</td></tr>
<tr><td colspan="7">Maximum deviation the from expected deceleration rate.
31.33 Ramp stop supervision, 31.34 Ramp stop supervision delay and 01.07 Speed change rate, provide a supervision function for a normal (non-emergency) ramp stop. See 06.09.b03 Used main control word.
The supervision is based on either observing the time within which the motor stops or comparing the actual and expected deceleration rates.
Maximum ramp-down time
If 31.33 Ramp stop supervision = 0.00 %, the maximum stop time is directly set in 31.34 Ramp stop supervision delay.
Comparing deceleration rates
Otherwise, 31.33 Ramp stop supervision defines the maximum allowed deviation from the expected deceleration rate, which is calculated from parameters 23.11 … 23.19. If 01.07 Speed change rate deviates too much from the expected rate, the event generates fault 73B1 Normal ramp stop. Additionally, 06.17.b14 Drive status word 2 is set and the motor coasts to a stop.
Note: The ramp stop supervision is disabled, if 31.33 Ramp stop supervision = 0.00 % and 31.34 Ramp stop supervision delay = 0.0 s.</td></tr>
<tr><td>0.00 … 325.00</td><td>0.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">31.34</td><td colspan="7">Ramp stop supervision delay</td></tr>
<tr><td colspan="7">Maximum ramp-down time or supervision activation delay.
Maximum ramp-down time
If 31.33 Ramp stop supervision = 0.00 %, 31.34 Ramp stop supervision delay defines the maximum time a normal ramp stop can take. If the motor has not stopped when the time elapses, the event generates fault 73B1 Normal ramp stop, sets 06.17.b14 Drive status word 2 and the motor coasts to a stop.
Supervision activation delay
If 31.33 Ramp stop supervision > 0.00 %, 31.34 Ramp stop supervision delay defines a delay between the receipt of the stop command and the activation of the supervision. It is recommended to specify a short delay to allow the speed change rate to stabilize.
Note: The ramp stop supervision is disabled, if 31.33 Ramp stop supervision = 0.00 % and 31.34 Ramp stop supervision delay = 0.0 s.</td></tr>
<tr><td>0.0 … 3250.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">31.35</td><td colspan="7">Motor feedback fault</td></tr>
<tr><td colspan="7">Motor feedback fault.
Selects how the drive reacts to a loss of a speed feedback measured with an encoder or tacho. See 90.41 M1 feedback selection.
0: No action; none, disable motor feedback fault.
1: Fault; the event generates fault 7301 Motor speed feedback, or 7381 Speed feedback device and the motor stops according to 31.14 Fault stop mode fault level 3.</td></tr>
</table>

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**



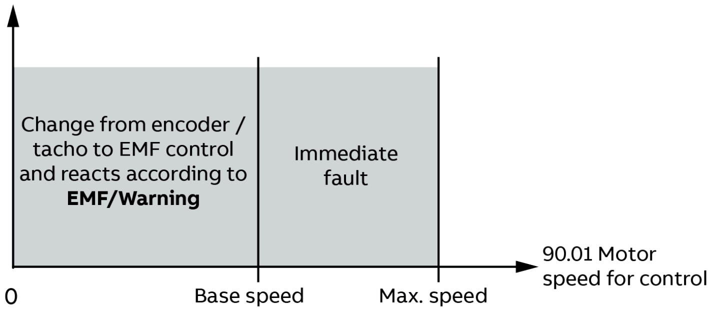
DZ_LIN_050_motor speed_c.ai

2: **EMF/Fault**; the event changes the speed feedback to EMF and stops the motor at the emergency stop ramp. Then the event generates fault 7301 Motor speed feedback or 7381 Speed feedback device.
In case speed actual is greater than base speed the event generates fault 7301 Motor speed feedback, or 7381 Speed feedback device and the motor stops according to 31.14 Fault stop mode fault level 3.



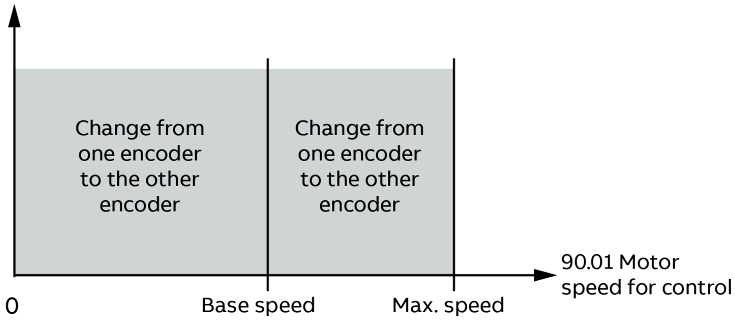
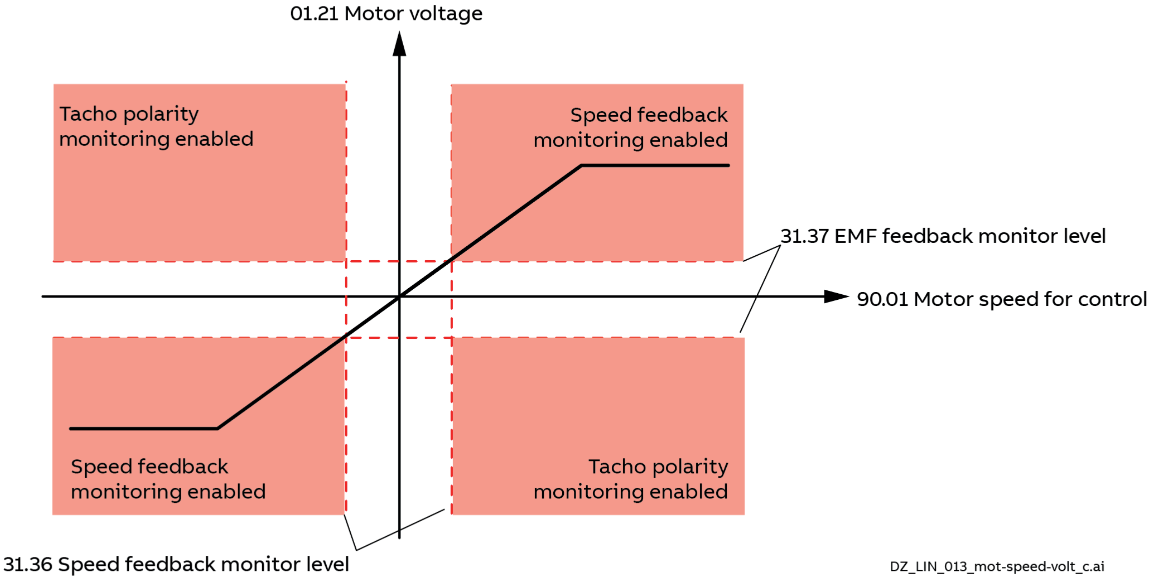
DZ_LIN_050_motor speed_c.ai

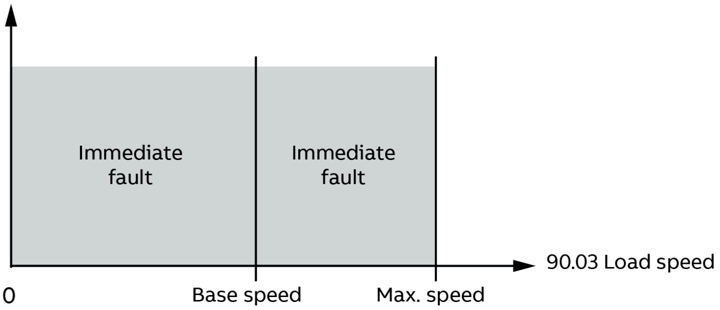
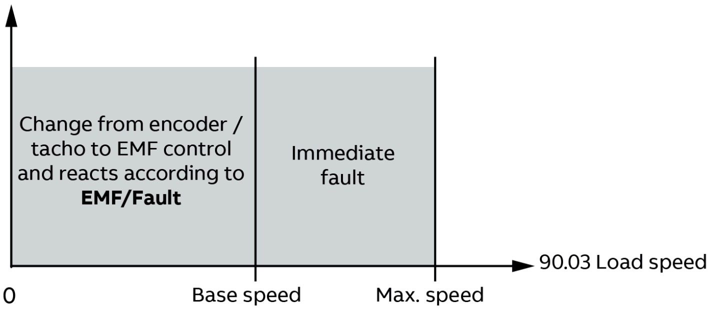
3: **EMF/Warning**; the event changes the speed feedback to EMF and generates warning A798 Encoder interface communication, A7B0 Motor speed feedback or A7E1 Speed feedback device.
Attention: The warning can only be reset by setting 96.27 Control board boot = Reboot or by cycling the auxiliary power.
In case speed actual is greater than base speed the event generates fault 7301 Motor speed feedback, or 7381 Speed feedback device and the motor stops according to 31.14 Fault stop mode fault level 3.

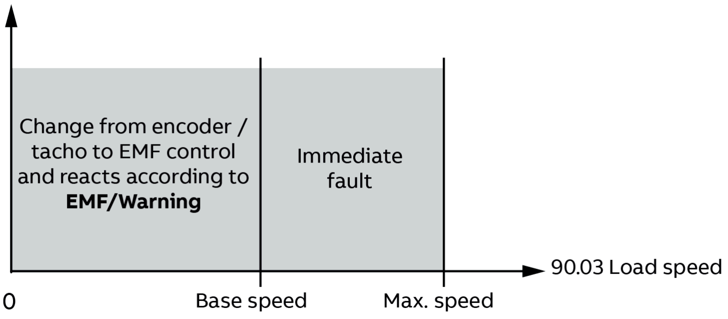
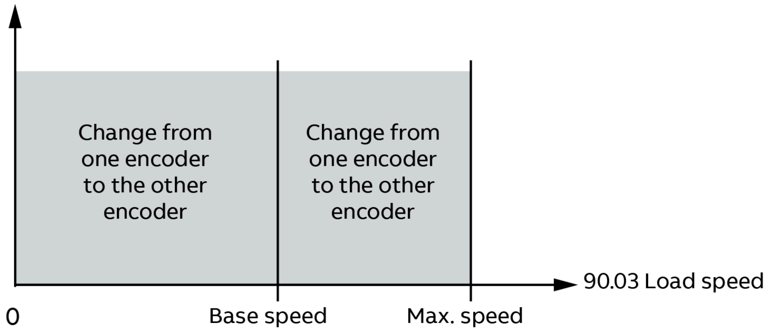


DZ_LIN_050_motor speed_c.ai

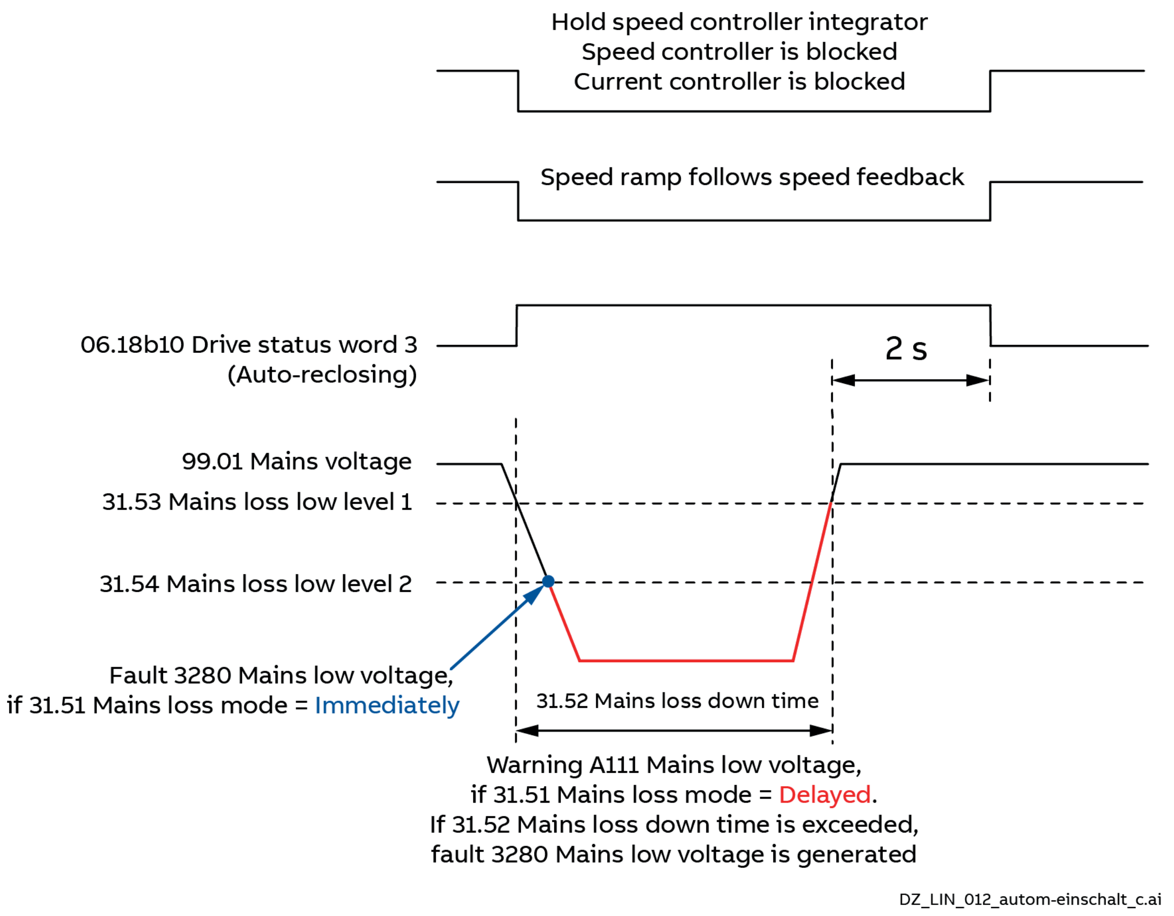
4: **Encoder/Warning**; This selection is only valid if 2 pulse encoders are connected. Depending on the setting of 90.41 M1 feedback selection, the speed feedback is changed from one encoder to the other encoder, in case of a problem. Additionally, the event generates warning

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">A798 Encoder interface communication, A7B0 Motor speed feedback or A7E1 Speed feedback device.
Attention: The warning can only be reset by setting 96.27 Control board boot = Reboot or by cycling the auxiliary power.

DZ_LIN_050_motor speed_c.ai</td></tr>
<tr><td>0 … 4</td><td>Fault</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">31.36</td><td colspan="7">Speed feedback monitor level</td></tr>
<tr><td colspan="7">Speed feedback monitor level.
The speed feedback monitor compares a measured speed feedback from an encoder or a tacho with the measured armature voltage. 31.36 Speed feedback monitor level and 31.37 EMF feedback monitor level set the levels and activate the monitor.
The drive reacts according to 31.35 Motor feedback fault and generates either warning A7B0 Motor speed feedback or fault 7301 Motor speed feedback, if the measured speed feedback, see 90.01 Motor speed for control, does not exceed 31.36 Speed feedback monitor level while the measured armature voltage, see 01.21 Armature voltage in V, exceeds 31.37 EMF feedback monitor level.
Example: With 31.36 Speed feedback monitor level = 15 rpm and 31.37 EMF feedback monitor level = 50 V_{DC} the drive trips when the armature voltage, see 01.21 Armature voltage in V, is > 50 V_{DC}, while the speed feedback, see 90.01 Motor speed for control, is ≤ 15 rpm.

DZ_LIN_013_mot-speed-volt_c.ai</td></tr>
<tr><td>0.00 … 30000.00</td><td>15.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>31.37</td><td colspan="7">EMF feedback monitor level</td></tr>
</table>

<table>
<tr><td rowspan="3">Index</td><td colspan="7">Name</td></tr>
<tr><td colspan="7">Text</td></tr>
<tr><td>Range</td><td>Default</td><td>Unit</td><td>Scale/ FbEq16</td><td>Volatile</td><td>Change running</td><td>Type</td></tr>
<tr><td rowspan="2"></td><td colspan="7">EMF feedback monitor level.
See 31.36 Speed feedback monitor level.</td></tr>
<tr><td>0.0 … 3250.0</td><td>50.0</td><td>V</td><td>10 = 1 V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">31.38</td><td colspan="7">Load feedback fault</td></tr>
<tr><td colspan="7">Load feedback fault.
Selects how the drive reacts to a loss of a load feedback. See 90.51 Load feedback selection.
0: No action; none, disable load feedback fault.
1: Fault; the event generates fault 73A1 Load speed feedback and the motor stops according to 31.14 Fault stop mode fault level 3.

DZ_LIN_050_motor speed_c.ai
2: EMF/Fault; the event changes the speed feedback to EMF and stops the motor at the emergency stop ramp. Then the event generates fault 73A1 Load speed feedback.
In case speed actual is greater than base speed the event generates fault 73A1 Load speed feedback and the motor stops according to 31.14 Fault stop mode fault level 3.

DZ_LIN_050_motor speed_c.ai
3: EMF/Warning; the event changes the speed feedback to EMF and generates warning A798 Encoder interface communication or A7B1 Load speed feedback.
Attention: The warning can only be reset by setting 96.27 Control board boot = Reboot or by cycling the auxiliary power.
In case speed actual is greater than base speed the event generates fault 73A1 Load speed feedback and the motor stops according to 31.14 Fault stop mode fault level 3.</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	 DZ_LIN_050_motor speed_c.ai 4: **Encoder/Warning**; This selection is only valid if 2 pulse encoders are connected. Depending on the setting of 90.41 M1 feedback selection, the speed feedback is changed from one encoder to the other encoder, in case of a problem. Additionally, the event generates warning A798 Encoder interface communication or A7B1 Load speed feedback. **Attention:** The warning can only be reset by setting 96.27 Control board boot = Reboot or by cycling the auxiliary power.  DZ_LIN_050_motor speed_c.ai						
	0 … 4	Fault	-	1 = 1	n	y	Parameter
31.41	**Drive fan fault function**						
	Type of event drive cooling fan fault. Selects the type of event drive cooling fan fault. See also 20.38 Drive fan acknowledge source. 0: **No action**; none, disable drive cooling fan fault. 1: **Fault**; the event generates fault 5080 Drive fan acknowledge. 2: **Warning**; the event generates warning A581 Drive fan acknowledge.						
	0 … 2	Fault	-	1 = 1	n	y	Parameter
31.44	**Armature overcurrent level**						
	Armature overcurrent level. The event generates fault 2310 Armature overcurrent, if 31.44 Overcurrent level in percent of 99.11 M1 nominal current is exceeded. It is recommended to set 31.44 Overcurrent level at least 25 % higher than e.g. 30.35 M1 current limit bridge 1. **Example**: With 99.11 M1 nominal current = 850 A_{DC} and 31.44 Overcurrent level = 250 % the drive trips with armature currents > 2125 A_{DC}.						
	0.00 … 400.00	250.00	%	100 = 1 %	n	y	Parameter
31.45	**Maximum current rise level**						
	Maximum armature current rise level. The event generates fault F539 Fast current rise, if 31.45 Maximum current rise level in percent of 99.11 M1 nominal current per 1 ms is exceeded. **Note**: This trip opens the mains contactor and the DC-breaker, if present.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td>0.00 … 325.00</td><td>325.00</td><td>%/ms</td><td>100 = 1 %/ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">31.46</td><td colspan="7">Current ripple function</td></tr>
<tr><td colspan="7">Type of event armature current ripple.
Selects the type of event armature current ripple, if 31.47 Current ripple level is reached. The current ripple function detects broken fuses, thyristors, current transformers (T51, T52) or a too high gain of the current controller.
0: No action; none, disable current ripple.
1: Fault; the event generates fault F517 Armature current ripple.
2: Warning; the event generates warning A117 Armature current ripple.
3: Fault method 2; the event generates fault F517 Armature current ripple.
4: Warning method 2; the event generates warning A117 Armature current ripple.</td></tr>
<tr><td>0 … 4</td><td>Fault method 2</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">31.47</td><td colspan="7">Current ripple level</td></tr>
<tr><td colspan="7">Level for armature current ripple level.
Threshold for 31.46 Current ripple function in percent of 01.40 Drive current.
Typical values when a thyristor is missing.
– About 300 % of 01.40 Drive current for an armature drive.
– About 90 % of 01.40 Drive current for high inductive loads (e.g. field exciter).</td></tr>
<tr><td>0.0 … 1000.0</td><td>150.0</td><td>%</td><td>10 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">31.50</td><td colspan="7">Armature overvoltage level</td></tr>
<tr><td colspan="7">Armature overvoltage level.
The event generates fault F503 Armature overvoltage, if 31.50 Overvoltage level in percent of 99.12 M1 nominal voltage is exceeded. It is recommended to set 31.50 Overvoltage level at least 20 % higher than 99.12 M1 nominal voltage.
Example: With 99.12 M1 nominal voltage = 525 V_{DC} and 31.50 Overvoltage level = 120 % the drive trips with armature voltages > 630 V_{DC}.
Note:
The overvoltage supervision is inactive, if 31.50 Overvoltage level = 1000.0 %.</td></tr>
<tr><td>0.0 … 1000.0</td><td>120.0</td><td>%</td><td>10 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">31.51</td><td colspan="7">Mains loss mode</td></tr>
<tr><td colspan="7">Type of event mains loss (ride through).
Selects the type of event mains loss.
0: Immediately;
– The event generates warning A111 Mains low voltage, if 31.53 Mains loss low level 1 is undershoot. The warning is removed when the mains voltage recovers before 31.52 Mains loss down time elapses.
– The event generates fault 3280 Mains low voltage, if 31.53 Mains loss low level 1 is undershoot for longer than 31.52 Mains loss down time.
– The event immediately generates fault 3280 Mains low voltage, if 31.54 Mains loss low level 2 is undershoot.
1: Delayed;
– The event generates warning A111 Mains low voltage, if 31.53 Mains loss low level 1 and/or 31.54 Mains loss low level 2 is undershoot. The warning is removed when the mains voltage recovers before 31.52 Mains loss down time elapses.
– The event generates fault 3280 Mains low voltage, if 31.53 Mains loss low level 1 and/or 31.54 Mains loss low level 2 is undershoot for longer than 31.52 Mains loss down time.
– Thus, undershooting 31.54 Mains loss low level 2 generates no immediate fault.</td></tr>
</table>

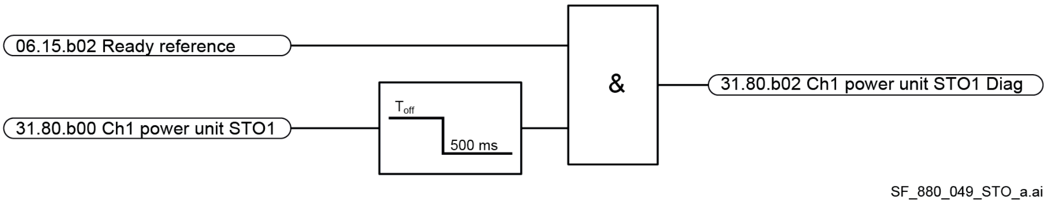
Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
							
	0 … 1	Immediately	-	1 = 1	n	y	Parameter
31.52	**Mains loss down time**						
	Down time of event mains loss (ride through). The mains voltage must recover over both levels within 31.52 Mains loss down time. Otherwise, the event generates fault 3280 Mains low voltage.						
	0 … 32500	500	ms	1 = 1 ms	n	y	Parameter
31.53	**Mains loss low level 1**						
	Low level 1 of event mains loss (ride through). 1st (upper) level for the mains undervoltage monitoring in percent of 99.10 Nominal mains voltage. If the mains voltage undershoots 31.53 Mains loss low level 1 following actions take place. – The firing angle is set to 30.45 Maximum firing angle. – Single firing pulses are applied to extinguish the DC current as fast as possible. – The controllers are frozen. – The speed ramp output is updated from the speed feedback. – Warning A111 Mains low voltage is generated. The warning is removed when the mains voltage recovers before 31.52 Mains loss down time elapses. The drive will start again after 2 seconds, if On and Start commands are maintained. – Fault 3280 Mains low voltage is generated, if 31.53 Mains loss low level 1 is undershoot for longer than 31.52 Mains loss down time. **Notes**:						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">– In case an On command is given and the measured mains voltage is too low for longer than 500 ms A111 Mains low voltage is generated. If the problem persists for longer than 10 s 3280 Mains low voltage is generated.
– 31.54 Mains loss low level 2 is not monitored, unless the mains voltage drops below 31.53 Mains loss low level 1 first. Thus, for a proper function of the mains undervoltage monitoring 31.53 Mains loss low level 1 must be higher than 31.54 Mains loss low level 2.</td></tr>
<tr><td>0.00 … 150.00</td><td>80.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**31.54**</td><td colspan="7">**Mains loss low level 2**</td></tr>
<tr><td colspan="7">Low level 2 of event mains loss (ride through).
2^{nd} (lower) limit for the mains undervoltage monitoring in percent of 99.10 Nominal mains voltage. If the mains voltage undershoots 31.54 Mains loss low level 2 following actions take place:
– If 31.51 Mains loss mode = Immediately:
    – Fault 3280 Mains low voltage is generated immediately.
– If 31.51 Mains loss mode = Delayed:
    – The field acknowledge signals are ignored.
    – The firing angle is set to 30.45 Maximum firing angle.
    – Single firing pulses are applied to extinguish the DC current as fast as possible.
    – The controllers are frozen.
    – The speed ramp output is from the speed feedback.
    – Warning A111 Mains low voltage is generated. The warning is removed when the mains voltage recovers before 31.52 Mains loss down time elapses. The drive will start again after 2 seconds, if On and Start commands are maintained.
    – Fault 3280 Mains low voltage is generated, if 31.53 Mains loss low level 2 is undershoot for longer than 31.52 Mains loss down time.
    – Thus, undershooting 31.54 Mains loss low level 2 generates **no** immediate fault.
Notes:
– In case an On command is given and the measured mains voltage is too low for longer than 500 ms A111 Mains low voltage is generated. If the problem persists for longer than 10 s 3280 Mains low voltage is generated.
– 31.54 Mains loss low level 2 is not monitored, unless the mains voltage drops below 31.53 Mains loss low level 1 first. Thus, for a proper function of the mains undervoltage monitoring 31.53 Mains loss low level 1 must be higher than 31.54 Mains loss low level 2.</td></tr>
<tr><td>0.00 … 150.00</td><td>60.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**31.57**</td><td colspan="7">**Minimum field current trip delay**</td></tr>
<tr><td colspan="7">Delay time of event minimum field current.
31.57 Minimum field current trip delay delays fault F541 M1 field exciter low current. If the field current recovers before the delay elapses, fault F541 M1 field exciter low current will be disregarded. See 31.58 M1 field current low level.
Note: 31.57 Minimum field current trip delay is blocked when 99.06 Operation mode = Large field exciter.</td></tr>
<tr><td>0 … 32500</td><td>2000</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**31.58**</td><td colspan="7">**M1 field current low level**</td></tr>
<tr><td colspan="7">Motor 1 field current low level.
The event generated fault F541 M1 field exciter low current, if 31.58 M1 field current low level in percent of 99.13 M1 nominal field current is still undershot when 31.57 Minimum field current trip delay elapses.</td></tr>
</table>

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	Notes: – 31.58 M1 field current low level is not valid during field heating and field economy. In these cases, the fault level is automatically set to 50 % of 28.37 M1 field heating reference. The event generates fault F541 M1 field exciter low current, if 50 % of 28.37 M1 field heating reference is still undershot when 31.57 Minimum field current trip delay elapses. – 31.58 M1 field current low level is not valid for 28.17 M1 EMF/field control mode = Fix/optitorque, EMF/optitorque, Fix/reversal/optitorque and EMF/reversal/optitorque. In these cases, the fault level is automatically set to 50 % of 28.14 M1 field current reference. The event generates fault F541 M1 field exciter low current, if 50 % of 28.14 M1 field current reference is still undershot when 31.57 Minimum field current trip delay elapses.						
	0.00 … 325.00	50.00	%	100 = 1 %	n	y	Parameter
31.59	**M1 field overcurrent level**						
	Motor 1 field overcurrent level. The event generates fault F515 M1 field exciter overcurrent, if 31.59 M1 field overcurrent level in percent of 99.13 M1 nominal field current is exceeded. It is recommended to set 31.59 M1 field overcurrent level at least 25 % higher than 99.13 M1 nominal field current. **Notes**: – The field overcurrent fault is inactive, if 31.59 M1 field overcurrent level = 325 %. – During field boost, the internal field overcurrent level is set to field overcurrent level plus field boost current.						
	0.00 … 325.00	125.00	%	100 = 1 %	n	y	Parameter
31.60	**Reversal volt function**						
	Reversal volt (high armature voltage before braking) function. The reversal volt function becomes active, when the armature voltage is too high compared to the mains voltage, before braking (switching from motoring to generating). 31.60 Reversal volt function selects the type of event for the reversal volt function. See 27.42 Reversal volt margin and 06.25.b03 Current controller status word 2. The drive reacts according to 31.60 Reversal volt function, when the reversal volt function is active and taking longer than specified in 31.61 Reversal volt delay. 0: **No action**; none, disable reversal volt function supervision. 1: **Fault**; the event generates fault F504 Reversal volt function. 2: **Warning**; the event generates warning A104 Reversal volt function. **Attention:** For hanging loads 31.60 Reversal volt function must be set to Fault.						
	0 … 2	Warning	-	1 = 1	n	y	Parameter
31.61	**Reversal volt delay**						
	Reversal volt (high armature voltage before braking) delay. Time delay for event reversal volt function.						
	0 … 32500	500	ms	1 = 1 ms	n	y	Parameter
31.62	**Isolation monitor event source**						
	reserved						
	0 … 19	Inactive (true)	-	1 = 1	n	y	Parameter
31.63	**Isolation monitor event type**						
	reserved						
	0 … 2	No action	-	1 = 1	n	y	Parameter
31.80	**Power units STO status word**						
	Safe torque off, power unit(s) status word. Displays the safe torque off status word of the power units (H7, H8) connected to channel1 and channel2 of the SDCS-DSL-H12 or channel1 … channel4 of the SDCS-DSL-H14.						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

Relationship between Chx power unit STOx and Chx power unit STOx Diag:



See safety supplement for functional safety converter DCS880 (3ADW000452).
Bit assignment:

Bit	Name	Value	Remarks
0	Ch1 power unit STO1	1	Channel1 power unit: The state of V11 (STO1) at the SDCS-OPL-H01 is high, normal operation.
		0	Channel1 power unit: The state of V11 (STO1) at the SDCS-OPL-H01 is low, save torque off is requested.
1	Ch1 power unit STO2	1	Channel1 power unit: The state of V12 (STO2) at the SDCS-OPL-H01 is high, normal operation.
		0	Channel1 power unit: The state of V12 (STO2) at the SDCS-OPL-H01 is low, save torque off is requested.
2	Ch1 power unit STO1 Diag	1	Channel1 power unit: Upper part of the B6-bridge is released.
		0	Channel1 power unit: Upper part of the B6-bridge is blocked.
3	Ch1 power unit STO2 Diag	1	Channel1 power unit: Lower part of the B6-bridge is released.
		0	Channel1 power unit: Lower part of the B6-bridge is blocked.
4	Ch2 power unit STO1		See bit 0 Ch1 power unit STO1.
5	Ch2 power unit STO2		See bit 1 Ch1 power unit STO2.
6	Ch2 power unit STO1 Diag		See bit 2 Ch1 power unit STO1 Diag.
7	Ch2 power unit STO2 Diag		See bit 3 Ch1 power unit STO2 Diag.
8	Ch3 power unit STO1		See bit 0 Ch1 power unit STO1.
9	Ch3 power unit STO2		See bit 1 Ch1 power unit STO2.
10	Ch3 power unit STO1 Diag		See bit 2 Ch1 power unit STO1 Diag.
11	Ch3 power unit STO2 Diag		See bit 3 Ch1 power unit STO2 Diag.
12	Ch4 power unit STO1		See bit 0 Ch1 power unit STO1.
13	Ch4 power unit STO2		See bit 1 Ch1 power unit STO2.
14	Ch4 power unit STO1 Diag		See bit 2 Ch1 power unit STO1 Diag.
15	Ch4 power unit STO2 Diag		See bit 3 Ch1 power unit STO2 Diag.

	0000h … FFFFh	-	-	1 = 1	y	n	Signal

31.81 **Power units XSMC:STO status word**

Safe torque off, power unit(s) XSMC:STO status word.
Displays the XSMC:STO status word of the power units (H7, H8) connected to channel1 and channel2 of the SDCS-DSL-H12 or channel1 … channel4 of the SDCS-DSL-H14.

See safety supplement for functional safety converter DCS880 (3ADW000452).
Bit assignment:

Bit	Name	Value	Remarks
0	Ch1 power unit XSMC:STO	1	Channel1 power unit: The relay output XSMC:STO at the SDCS-OPL-H01 is closed, normal operation.
		0	Channel1 power unit: The relay output XSMC:STO at the SDCS-OPL-H01 is open. The fault shutdown path is active.
1	Ch2 power unit XSMC:STO		See bit 0 Ch1 power unit XSMC:STO.
2	Ch3 power unit XSMC:STO		See bit 0 Ch1 power unit XSMC:STO.
3	Ch4 power unit XSMC:STO		See bit 0 Ch1 power unit XSMC:STO.
4 … 15	reserved		

Index	Name	Text	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
			0000h … FFFFh	-	-	1 = 1	y	n	Signal
31.82	**Ch1 power unit STO time 1**	Safe torque off, STO1 execution time of channel1 power unit (V11). Time it takes after V11 at the SDCS-OPL-H01 has been switched from 1 to 0 until the firing pulses are blocked for STO1. Thus, the time difference between 31.80.b00 Power units STO status word and 31.80.b02. See safety supplement for functional safety converter DCS880 (3ADW000452).	0 … 65535	-	ms	1 = 1 ms	y	n	Signal
31.83	**Ch1 power unit STO time 2**	Safe torque off, STO2 execution time of channel1 power unit (V12). Time it takes after V12 at the SDCS-OPL-H01 has been switched from 1 to 0 until the firing pulses are blocked for STO2. Thus, the time difference between 31.80.b01 Power units STO status word and 31.80.b03. See safety supplement for functional safety converter DCS880 (3ADW000452).	0 … 65535	-	ms	1 = 1 ms	y	n	Signal
31.84	**Ch2 power unit STO time 1**	See 31.82 Ch1 power unit STO time 1.	0 … 65535	-	ms	1 = 1 ms	y	n	Signal
31.85	**Ch2 power unit STO time 2**	See 31.83 Ch1 power unit STO time 2.	0 … 65535	-	ms	1 = 1 ms	y	n	Signal
31.86	**Ch3 power unit STO time 1**	See 31.82 Ch1 power unit STO time 1.	0 … 65535	-	ms	1 = 1 ms	y	n	Signal
31.87	**Ch3 power unit STO time 2**	See 31.83 Ch1 power unit STO time 2.	0 … 65535	-	ms	1 = 1 ms	y	n	Signal
31.88	**Ch4 power unit STO time 1**	See 31.82 Ch1 power unit STO time 1.	0 … 65535	-	ms	1 = 1 ms	y	n	Signal

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">31.89</td><td colspan="7">Ch4 power unit STO time 2</td></tr>
<tr><td colspan="7">See 31.83 Ch1 power unit STO time 2.</td></tr>
<tr><td>0 … 65535</td><td>-</td><td>ms</td><td>1 = 1 ms</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">31.90</td><td colspan="7">XSMC:STO indication</td></tr>
<tr><td colspan="7">Safe torque off, XSMC:STO indication (zero current time out indication).
The DCS880 has the possibility to open the mains contactor using a hardware supervision of the DC current in case of a safe torque off request.
In case safe torque off is requested and current zero is detected in less than 300 ms the XSMC:STO relay is kept closed and no action is required.
In case safe torque off is requested and current zero is not detected in less than 300 ms the XSMC:STO relay is opened and the drive reacts according to 31.90 XSMC:STO indication.
See safety supplement for functional safety converter DCS880 (3ADW000452).
0: Fault; the event generates fault 5093 Safe off mains contactor XSMC:STO.
1: Warning; the event generates warning A5A0 Safe off mains contactor XSMC:STO.
2: Event; the event generates event B5A0 Safe off mains contactor XSMC:STO.
Notes:
– The status of XSMC:STO can be supervised in 31.91b04 STO status word.
– Reset is only possible by activating 96.27 Control board boot or by cycling the power.</td></tr>
<tr><td>0 … 2</td><td>Fault</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">31.91</td><td colspan="7">STO status word</td></tr>
<tr><td colspan="7">Safe torque off, drive/control unit status word.
Displays the safe torque off status word of the drive (H1 … H6) or control unit (H7, H8).
See safety supplement for functional safety converter DCS880 (3ADW000452).
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">STO State (0: Active)</td><td>1</td><td>Safe torque off is inactive, normal operation.</td></tr>
<tr><td>0</td><td>Safe torque off is active.</td></tr>
<tr><td>1</td><td>reserved</td><td></td><td></td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">XSTO:IN1</td><td>1</td><td>The state of XSTO:IN1 is high, normal operation.</td></tr>
<tr><td>0</td><td>The state of XSTO:IN1 is low, save torque off is requested.</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">XSTO:IN2</td><td>1</td><td>The state of XSTO:IN2 is high, normal operation.</td></tr>
<tr><td>0</td><td>The state of XSTO:IN2 is low, save torque off is requested.</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">XSMC:STO</td><td>1</td><td>The relay output XSMC:STO is closed, normal operation.</td></tr>
<tr><td>0</td><td>The relay output XSMC:STO is open. The fault shutdown path is active.</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">STO Sum Fault</td><td>1</td><td>5092 STO overall fault is active.</td></tr>
<tr><td>0</td><td>5092 STO overall fault is inactive, normal operation.</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">STO Input OFF</td><td>1</td><td>The state of both XSTO:IN1 and XSTO:IN2 is low, safe torque off is requested.</td></tr>
<tr><td>0</td><td>The state of both XSTO:IN1 and XSTO:IN2 is high, normal operation.
If the state of XSTO:IN1 and XSTO:IN2 is different, either fault FA81 Safe torque off 1 loss fault or fault FA82 Safe torque off 2 loss fault is generated.</td></tr>
<tr><td>7</td><td>STO Reset Indication</td><td>1</td><td>This bit becomes high when no safe torque off related fault is active, see 5092 STO overall fault, and bit STO Input OFF signal is high, see 31.91b06 STO status word.</td></tr>
</table></td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

			Active: It is possible to reset the safety relay.
		0	Inactive: It is not possible to reset the safety relay, normal operation.
8	Current Zero	1	Zero armature current detected. See 06.24.b13 Current controller status word 1.
		0	Armature current not zero. See 06.24.b13 Current controller status word 1.
9 … 15	reserved		

0000h … FFFFh	-	-	1 = 1	y	n	Signal

31.94 **STO time 1**

Safe torque off, time XSTO:IN1 of the drive (H1 … H6) or control unit (H7, H8).
Time it takes after XSTO:IN1 has been switched from 1 to 0 until the firing pulses are blocked for safe torque off 1.
See safety supplement for functional safety converter DCS880 (3ADW000452).

0 … 65535	-	ms	1 = 1 ms	y	n	Signal

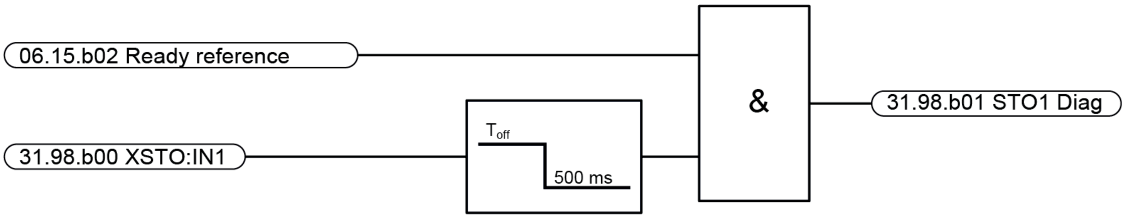
31.95 **STO time 2**

Safe torque off, time XSTO:IN2 of the drive (H1 … H6) or control unit (H7, H8).
Time it takes after XSTO:IN2 has been switched from 1 to 0 until the firing pulses are blocked for safe torque off 2.
See safety supplement for functional safety converter DCS880 (3ADW000452).

0 … 65535	-	ms	1 = 1 ms	y	n	Signal

31.98 **STO actual status**

Safe torque off, drive/control unit actual status word.
Displays the safe torque off actual status word of the drive (H1 … H6) or control unit (H7, H8).
Relationship between XSTO:INx and Chx power unit STOx Diag:



SF_880_049_STO_a.ai

See safety supplement for functional safety converter DCS880 (3ADW000452).
Bit assignment:

Bit	Name	Value	Remarks
0	XSTO:IN1	1	The state of XSTO:IN1 is high, normal operation.
		0	The state of XSTO:IN1 is low, save torque off is requested.
1	STO1 Diag	1	Upper part of the B6-bridge is released.
		0	Upper part of the B6-bridge is blocked.
2	XSTO:IN2	1	The state of XSTO:IN2 is high, normal operation.
		0	The state of XSTO:IN2 is low, save torque off is requested.
3	STO2 Diag	1	Lower part of the B6-bridge is released.
		0	Lower part of the B6-bridge is blocked.
4	reserved		
5	reserved		
6	reserved		

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

7	reserved		
8	Current Not Zero	1	Armature current not zero. See 06.24.b13 Current controller status word 1.
		0	Zero armature current detected. See 06.24.b13 Current controller status word 1.
9	XSMC:STO	1	The relay output XSMC:STO is closed, normal operation.
		0	The relay output XSMC:STO is open. The fault shutdown path is active.
10	STO Active	1	Safe torque off is active.
		0	Safe torque off is inactive, normal operation.
11	STO Reset Indication	1	This bit becomes high when no safe torque off related fault is active, see 5092 STO overall fault, and bit STO Input OFF signal is high, see 31.91b06 STO status word. Active: It is possible to reset the safety relay.
		0	Inactive: It is not possible to reset the safety relay, normal operation.
12 … 15	reserved		

Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

31.99 **STO fault diagnostic**

Safe torque off, fault diagnostic status word.
Displays the safe torque off fault diagnostic status word.
See safety supplement for functional safety converter DCS880 (3ADW000452).
Bit assignment:

Bit	Name	Value	Remarks
0	XSTO:IN1	1	The state of XSTO:IN1 is high, normal operation.
		0	The state of XSTO:IN1 is low, save torque off is requested.
1	STO1 Diag	1	Upper part of the B6-bridge is released.
		0	Upper part of the B6-bridge is blocked.
2	XSTO:IN2	1	The state of XSTO:IN2 is high, normal operation.
		0	The state of XSTO:IN2 is low, save torque off is requested.
3	STO2 Diag	1	Lower part of the B6-bridge is released.
		0	Lower part of the B6-bridge is blocked.
4	Bridge 2	1	Bridge 2 selected. See 27.19 Selected bridge.
		0	Bridge 1 selected. See 27.19 Selected bridge.
5	Generating	1	Drive is generating. See 06.24.b09 Current controller status word 1.
		0	Drive is motoring. See 06.24.b09 Current controller status word 1.
6	Single pulses	1	Single firing pulses.
		0	No firing pulses or normal firing pulses.
7	Enabled	1	Drive is in state Ready reference. See 06.15.b02 Main status word.
		0	Drive is not in state Ready reference. See 06.15.b02 Main status word.
8	Current Not Zero	1	Armature current not zero. See 06.24.b13 Current controller status word 1.

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**

		0	Zero armature current detected. See 06.24.b 13 Current controller status word 1.
9	XSMC:STO	1	The relay output XSMC:STO is closed, normal operation.
		0	The relay output XSMC:STO is open. The fault shutdown path is active.
10	reserved		
11	reserved		
12	Ch1 power unit Current Not Zero	1	Channel1 power unit current not zero.
		0	Channel1 power unit zero current detected.
13	Ch2 power unit Current Not Zero	1	Channel2 power unit current not zero.
		0	Channel2 power unit zero current detected.
14	Ch3 power unit Current Not Zero	1	Channel3 power unit current not zero.
		0	Channel3 power unit zero current detected.
15	Ch4 power unit Current Not Zero	1	Channel4 power unit current not zero.
		0	Channel4 power unit zero current detected.

	0000h … FFFFh	-	-	1 = 1	y	n	Signal
31.100	**STO test mode**						
	Safe torque off, test mode. Contains modes for testing the safe torque off function. See safety supplement for functional safety converter DCS880 (3ADW000452). 0: **None**; normal safe torque off behavior. 1: **No Block**; the firmware does not respond to a safe torque off request. After the safe torque off request was executed by hardware 31.91.b00 STO status word is set to zero and 31.98.b10 STO actual status is set to one. Then the test mode is automatically reset to None. 2: **Trigger XSMC:STO**; manually triggers the XSMC:STO relay. The fault shutdown path is active. Then the test mode is automatically reset to None.						
	0 … 2	None	-	1 = 1	y	y	Parameter

32 Supervision

Configuration of signal supervision functions 1 … 3. Three values can be monitored. A warning or fault is generated whenever predefined limits are exceeded.

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
32.xx	**Not yet part of the manual.**						
32.xx							

33 Generic timer & counter

Configuration of maintenance timers/counters.

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
33.xx	**Not yet part of the manual.**						
33.xx							

35 Motor thermal protection

Motor thermal protection settings such as temperature measurement configuration and load curve definition.

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
35.01	**Estimated temperature 1**						
	Estimated motor temperature 1. Displays the motor temperature as estimated by the motor thermal model based on the armature current. See parameters 35.50 … 35.55. The unit is selected by 96.02 Unit selection.						
	-80.0 … 1000.0	-	°C or °F	1 = 1°C or °F	n	n	Signal
35.02	**Measured temperature 1**						
	Measured motor temperature 1. Displays the motor temperature received through the source defined by 35.11 Temperature 1 source. The unit is selected by 96.02 Unit selection. **Note**: With a PTC sensor, the unit is Ω.						
	-80.0 … 1000.0 -76 … 1832 or 0 … 5000	-	°C, °F or Ohm	1 = 1°C, °F or Ohm	y	n	Signal
35.03	**Estimated temperature 2**						
	Estimated motor temperature 2. Displays the motor temperature as estimated by the motor thermal model based on the armature current. See parameters 35.58 … 35.63. The unit is selected by 96.02 Unit selection.						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	-80.0 … 1000.0	-	°C or °F	1 = 1°C or °F	n	n	Signal
35.04	**Measured temperature 2**						
	Measured motor temperature 2. Displays the motor temperature received through the source defined by 35.21 Temperature 2 source. The unit is selected by 96.02 Unit selection. **Note**: With a PTC sensor, the unit is Ω.						
	-80.0 … 1000.0 -76 … 1832 or 0 … 5000	-	°C, °F or Ohm	1 = 1°C, °F or Ohm	y	n	Signal
35.07	**FPTC status word**						
	FPTC-xx module status word. Displays the status of the FPTC-xx thermistor protection modules. 35.30 FPTC status word can be used as the source for e.g. external events. **Note:** The “module found” bits are updated regardless of whether the corresponding module is activated. However, the “fault active” and “warning active” bits are not updated if the module is not activated. Modules are activated by 35.30 FPTC configuration word. Bit assignment:						

Bit	Name	Value	Remarks
0	Module found in slot 1	1	An FPTC-xx module has been detected in slot 1.
1	Fault active in slot 1	1	The module in slot 1 generates fault 4991 Motor temperature slot 1 measured.
2	Warning active in slot 1	1	The module in slot 1 generates warning A497 Motor temperature slot 1 measured.
3	Module found in slot 2	1	An FPTC-xx module has been detected in slot 2.
4	Fault active in slot 2	1	The module in slot 2 generates fault 4992 Motor temperature slot 2 measured.
5	Warning active in slot 2	1	The module in slot 2 generates warning A498 Motor temperature slot 2 measured.
6	Module found in slot 3	1	An FPTC-xx module has been detected in slot 3.
7	Fault active in slot 3	1	The module in slot 3 generates fault 4993 Motor temperature slot 3 measured.
8	Warning active in slot 3	1	The module in slot 3 generates warning A499 Motor temperature slot 3 measured.
9 … 15	reserved		

	0000h … FFFFh	-	-	1 = 1	y	n	Signal
35.11	**Temperature 1 source**						
	Temperature 1 feedback channel source. Selects the source for 35.01 Estimated temperature 1 and 35.02 Measured temperature 1. 0: **Disable**; disable temperature 1 feedback channel. 1: **Estimated temperature 1**; Estimated motor temperature 1. To setup use parameters 35.50 … 35.55. The result is shown in 35.01 Motor estimated temperature 1. See also chapter Motor thermal protection of this manual.						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	2: **KTY84 analog I/O**; 1 KTY84 sensor connected to an analog input selected by 35.14 Temperature 1 AI source and an analog output. The input and output can be on the SDCS-CON-H01 or on an I/O extension module. For wiring examples, parameter-, jumper- and switch settings see chapter Motor thermal protection of this manual. 3: **KTY84 encoder module 1**; 1 KTY84 sensor connected to encoder module 1. See 91.21 Module 1 temp sensor type and 91.22 Module 1 temp filter time. 4: **KTY84 encoder module 2**; 1 KTY84 sensor connected to encoder module 2. See 91.24 Module 2 temp sensor type and 91.25 Module 2 temp filter time. 5: **1 • PT100 analog I/O**; 1 PT100 sensor connected to an analog input selected by 35.14 Temperature 1 AI source and an analog output. The input and output can be on the SDCS-CON-H01 or on an I/O extension module. For wiring examples, parameter-, jumper- and switch settings see chapter Motor thermal protection of this manual. 6: **2 • PT100 analog I/O**; as selection 1 • PT100 analog I/O, but with 2 sensors connected in series. 7: **3 • PT100 analog I/O**; as selection 1 • PT100 analog I/O, but with 3 sensors connected in series. 8: **PTC DI6**; PTC sensor connected to digital input DI6. Either 0 Ω, normal temperature, or 4000 Ω, excessive temperature, will be shown in 35.02 Measured temperature 1. 9: **PTC encoder module 1**; 1 PTC sensor connected to encoder interface 1. See 91.21 Module 1 temp sensor type and 91.22 Module 1 temp filter time. 10: **PTC encoder module 2**; 1 PTC sensor connected to encoder interface 2. See 91.24 Module 2 temp sensor type and 91.25 Module 2 temp filter time. 11: **Direct temperature**; the temperature is taken from the source selected by 35.14 Temperature 1 AI source. The value of the source is assumed to be in the unit of temperature specified by 96.02 Unit selection. 13: **1 • PT1000 analog I/O**; 1 PT1000 sensor connected to an analog input selected by 35.14 Temperature 1 AI source and an analog output. The input and output can be on the SDCS-CON-H01 or on an I/O extension module. For wiring examples, parameter-, jumper- and switch settings see chapter Motor thermal protection of this manual. 14: **2 • PT1000 analog I/O**; as selection 1 • PT1000 analog I/O, but with 2 sensors connected in series. 15: **3 • PT1000 analog I/O**; as selection 1 • PT1000 analog I/O, but with 3 sensors connected in series. 20: **PTC analog I/O**; 1 … 3 • PTC sensors connected to an analog input selected by 35.14 Temperature 1 AI source and an analog output. The input and output can be on the SDCS-CON-H01 or on an I/O extension module. For wiring examples, parameter-, jumper- and switch settings see chapter Motor thermal protection of this manual. Either 0 Ω, normal temperature, or 4000 Ω, excessive temperature, will be shown in 35.02 Measured temperature 1. 21: **Estimated temperature motor 1**; estimated temperature for motor 1 during shared motion. To setup use parameters 35.50 … 35.55. the result is shown in 35.01 Motor estimated temperature 1. See also chapter Motor thermal protection of this manual.						
	0 … 21	Disable	-	1 = 1	n	y	Parameter
35.12	**Temperature 1 fault level**						
	Fault level for motor temperature monitoring function 1.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Defines the fault level for motor temperature monitoring function 1. When the measured motor temperature 1 exceeds the level, the event generates fault 4981 Motor temperature 1 measured/estimated.
The unit is selected by 96.02 Unit selection.
Note: With a PTC sensor, the unit is Ω.</td></tr>
<tr><td>-80.0 … 1000.0
-76 … 1832 or
0 … 5000</td><td>130,
266 or
4500</td><td>°C,
°F or
Ohm</td><td>1 = 1°C,
°F or
Ohm</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">35.13</td><td colspan="7">Temperature 1 warning level</td></tr>
<tr><td colspan="7">Warning level for motor temperature monitoring function 1.
Defines the warning level for motor temperature monitoring function 1. When the measured motor temperature 1 exceeds the level, the event generates warning A491 Motor temperature 1 measured/estimated.
The unit is selected by 96.02 Unit selection.
Note: With a PTC sensor, the unit is Ω.</td></tr>
<tr><td>-80.0 … 1000.0
-76 … 1832 or
0 … 5000</td><td>125,
257 or
4500</td><td>°C,
°F or
Ohm</td><td>1 = 1°C,
°F or
Ohm</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">35.14</td><td colspan="7">Temperature 1 AI source</td></tr>
<tr><td colspan="7">Analog input source for motor temperature monitoring function 1.
Specifies an analog input when required by 35.11 Temperature 1 source.
For wiring examples, parameter-, jumper- and switch settings see chapter Motor thermal protection of this manual.
Other; source selection.
0: Not selected; not in use.
1: AI1 actual value; standard analog input AI1.
2: AI2 actual value; standard analog input AI2.
3: AI3 actual value; standard analog input AI3.
Note: Examples for FAIO-01 and FIO-11 see Motor thermal protection.</td></tr>
<tr><td>0 … 3</td><td>Not selected</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">35.15</td><td colspan="7">Supervision 1 klixon source</td></tr>
<tr><td colspan="7">Klixon source for motor temperature monitoring function 1.
The event generates fault 4981 Motor temperature 1 measured/estimated if a digital input is selected and the klixon is open.
0 = Klixon open.
1 = Klixon closed.
Note: It is possible to connect several klixons in series.
0: Klixon open; klixon is open. Generates fault 4981 Motor temperature 1 measured/estimated.
1: Klixon closed; klixon is closed. Normal operation.
2: None; inactive. Supervision 1 klixon is disabled.
3: DI1; 10.02.b00 DI delayed status.
4: DI2; 10.02.b01 DI delayed status.
5: DI3; 10.02.b02 DI delayed status.
6: DI4; 10.02.b03 DI delayed status.
7: DI5; 10.02.b04 DI delayed status.
8: DI6; 10.02.b05 DI delayed status.
11: DIO1; 11.02.b00 DIO delayed status.
12: DIO2; 11.02.b01 DIO delayed status.</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	19: **DIL**; 10.02.b15 DI delayed status.						
	0 … 19	None	-	1 = 1	n	y	Parameter
35.21	**Temperature 2 source**						
	Temperature 2 feedback channel source. Selects the source for 35.03 Motor estimated temperature 2 and 35.04 Measured temperature 2. 0: **Disable**; disable temperature 2 feedback channel. 1: **Estimated temperature 2**; Estimated motor temperature 2. To setup use parameters 35.58 … 35.63. The result is shown in 35.03 Motor estimated temperature 2. See also chapter Motor thermal protection of this manual. 2: **KTY84 analog I/O**; 1 KTY84 sensor connected to the analog input selected by 35.24 Temperature 2 AI source and an analog output. The input and output can be on the SDCS-CON-H01 or on an I/O extension module. For wiring examples, parameter-, jumper- and switch settings see chapter Motor thermal protection of this manual. 3: **KTY84 encoder module 1**; 1 KTY84 sensor connected to encoder module 1. See 91.21 Module 1 temp sensor type and 91.22 Module 1 temp filter time. 4: **KTY84 encoder module 2**; 1 KTY84 sensor connected to encoder module 2. See 91.24 Module 2 temp sensor type and 91.25 Module 2 temp filter time. 5: **1 • PT100 analog I/O**; PT100 sensor connected to a standard analog input selected by 35.24 Temperature 2 AI source and an analog output. The input and output can be on the SDCS-CON-H01 or on an I/O extension module. For wiring examples, parameter-, jumper- and switch settings see chapter Motor thermal protection of this manual. 6: **2 • PT100 analog I/O**; as selection 1 • PT100 analog I/O, but with 2 sensors connected in series. 7: **3 • PT100 analog I/O**; as selection 1 • PT100 analog I/O, but with 3 sensors connected in series. 8: **PTC DI6**; PTC sensor connected to digital input DI6. Either 0 Ω, normal temperature, or 4000 Ω, excessive temperature, will be shown in 35.04 Measured temperature 2. 9: **PTC encoder module 1**; 1 PTC sensor connected to encoder interface 1. See 91.21 Module 1 temp sensor type and 91.22 Module 1 temp filter time. 10: **PTC encoder module 2**; 1 PTC sensor connected to encoder interface 2. See 91.24 Module 2 temp sensor type and 91.25 Module 2 temp filter time. 11: **Direct temperature**; the temperature is taken from the source selected by 35.24 Temperature 2 AI source. The value of the source is assumed to be in the unit of temperature specified by 96.02 Unit selection. 13: **1 • PT1000 analog I/O**; PT1000 sensor connected to a standard analog input selected by 35.24 Temperature 2 AI source and an analog output. The input and output can be on the SDCS-CON-H01 or on an I/O extension module. For wiring examples, parameter-, jumper- and switch settings see chapter Motor thermal protection of this manual. 14: **2 • PT1000 analog I/O**; as selection 1 • PT1000 analog I/O, but with 2 sensors connected in series. 15: **3 • PT1000 analog I/O**; as selection 1 • PT1000 analog I/O, but with 3 sensors connected in series.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">20: PTC analog I/O; 1 … 3 • PTC sensors connected to an analog input selected by 35.24 Temperature 2 AI source and an analog output. The input and output can be on the SDCS-CON-H01 or on an I/O extension module.
For wiring examples, parameter-, jumper- and switch settings see chapter Motor thermal protection of this manual.
Either 0 Ω, normal temperature, or 4000 Ω, excessive temperature, will be shown in 35.04 Measured temperature 2.
21: Estimated temperature motor 2; estimated temperature for motor 2 during shared motion. To setup use parameters 35.58 … 35.63. the result is shown in 35.03 Motor estimated temperature 2. See also chapter Motor thermal protection of this manual.</td></tr>
<tr><td>0 … 21</td><td>Disable</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">35.22</td><td colspan="7">Temperature 2 fault level</td></tr>
<tr><td colspan="7">Fault level for motor temperature monitoring function 2.
Defines the fault level for motor temperature monitoring function 2. When the measured motor temperature 2 exceeds the level, the event generates fault 4982 Motor temperature 2 measured/estimated.
The unit is selected by 96.02 Unit selection.
Note: With a PTC sensor, the unit is Ω.</td></tr>
<tr><td>-80.0 … 1000.0
-76 … 1832 or
0 … 5000</td><td>130,
266 or
4500</td><td>°C,
°F or
Ohm</td><td>1 = 1°C,
°F or
Ohm</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">35.23</td><td colspan="7">Temperature 2 warning level</td></tr>
<tr><td colspan="7">Warning level for motor temperature monitoring function 2.
Defines the warning level for motor temperature monitoring function 2. When the measured motor temperature 2 exceeds the level, the event generates warning A492 Motor temperature 2 measured/estimated.
The unit is selected by 96.02 Unit selection.
Note: With a PTC sensor, the unit is Ω.</td></tr>
<tr><td>-80.0 … 1000.0
-76 … 1832 or
0 … 5000</td><td>125,
257 or
4500</td><td>°C,
°F or
Ohm</td><td>1 = 1°C,
°F or
Ohm</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">35.24</td><td colspan="7">Temperature 2 AI source</td></tr>
<tr><td colspan="7">Analog input source for motor temperature monitoring function 2.
Specifies an analog input when required by 35.21 Temperature 2 source.
For wiring examples, parameter-, jumper- and switch settings see chapter Motor thermal protection of this manual.
Other; source selection.
0: Not selected; not in use.
1: AI1 actual value; standard analog input AI1.
2: AI2 actual value; standard analog input AI2.
3: AI3 actual value; standard analog input AI3.
Note: Examples for FAIO-01 and FIO-11 see Motor thermal protection.</td></tr>
<tr><td>0 … 3</td><td>Not selected</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">35.25</td><td colspan="7">Supervision 2 klixon source</td></tr>
<tr><td colspan="7">Klixon source for motor temperature monitoring function 2.
The event generates fault 4982 Motor temperature 2 measured/estimated if a digital input is selected and the klixon is open.
0 = Klixon open.</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

1 = Klixon closed.
Note: It is possible to connect several klixons in series.
0: **Klixon open**; klixon is open. Generates fault 4982 Motor temperature 2 measured/estimated.
1: **Klixon closed**; klixon is closed. Normal operation.
2: **None**; inactive. Supervision 2 klixon is disabled.
3: **DI1**; 10.02.b00 DI delayed status.
4: **DI2**; 10.02.b01 DI delayed status.
5: **DI3**; 10.02.b02 DI delayed status.
6: **DI4**; 10.02.b03 DI delayed status.
7: **DI5**; 10.02.b04 DI delayed status.
8: **DI6**; 10.02.b05 DI delayed status.
11: **DIO1**; 11.02.b00 DIO delayed status.
12: **DIO2**; 11.02.b01 DIO delayed status.
19: **DIL**; 10.02.b15 DI delayed status.

Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
0 … 19	None	-	1 = 1	n	y	Parameter

35.30 **FPTC configuration word**

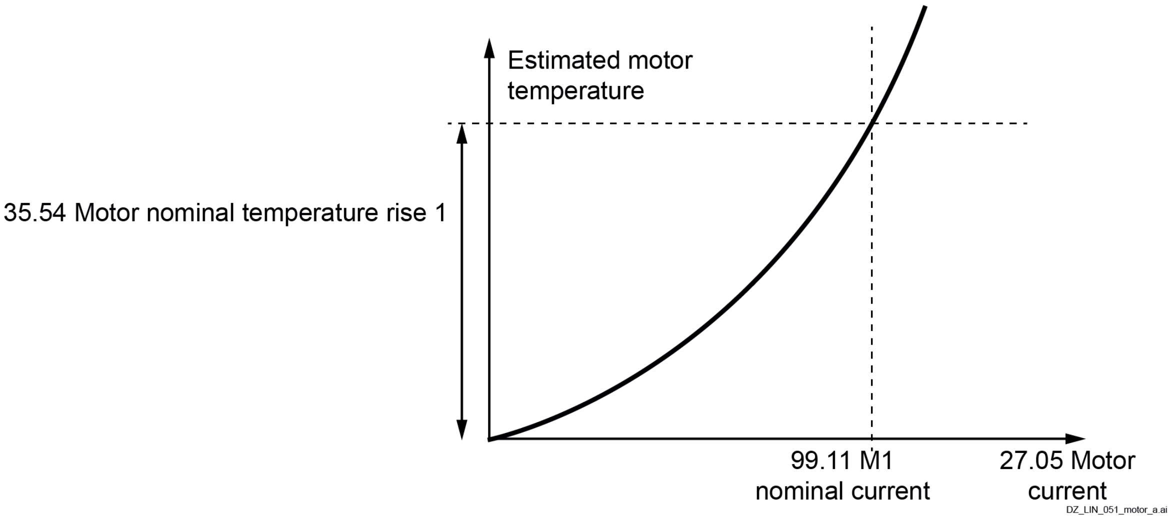
FPTC-xx module configuration word.
Activates the FPTC-xx thermistor protection modules. With this word, it is possible to suppress the warnings, but not the faults, of each module.
Bit assignment:

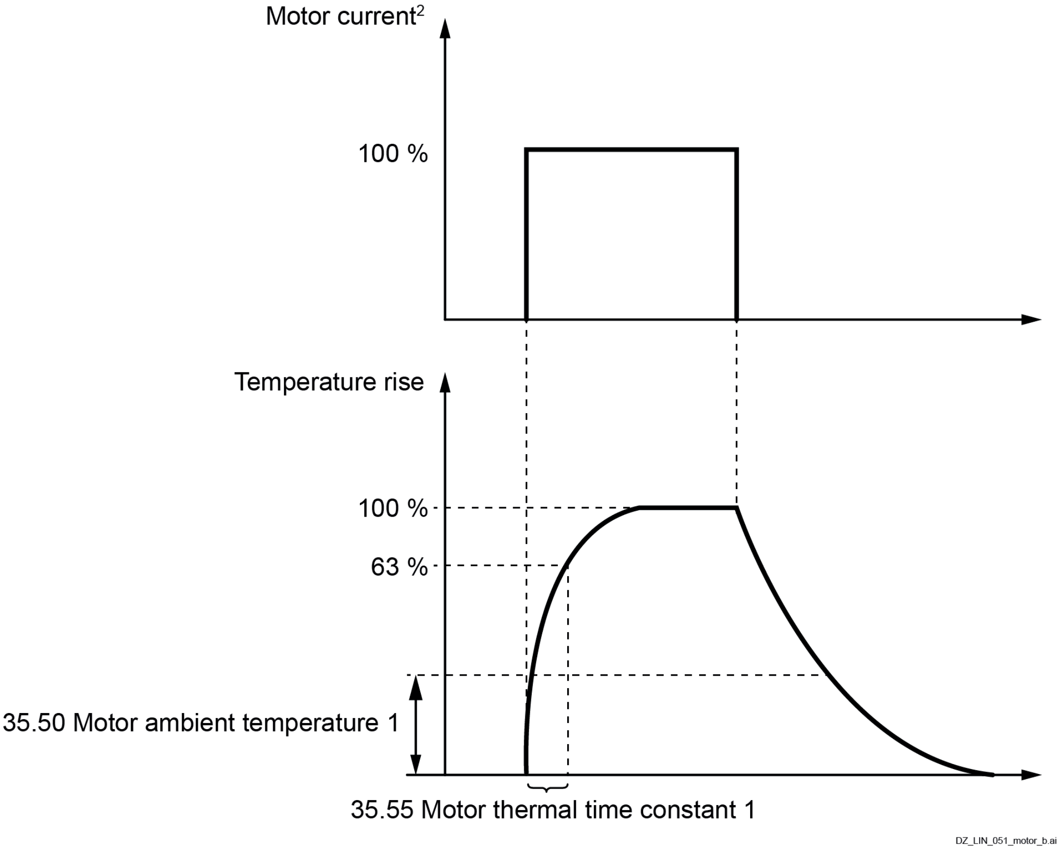
Bit	Name	Value	Remarks
0	Module in slot 1	1	A module is installed in slot 1.
		0	No Module is installed in slot 1.
1	Disable slot 1 warning	1	Warnings from module in slot 1 are inactive.
		0	Warnings from module in slot 1 are active.
2	Module in slot 2	1	A module is installed in slot 2.
		0	No Module is installed in slot 2.
3	Disable slot 2 warning	1	Warnings from module in slot 2 are inactive.
		0	Warnings from module in slot 2 are active.
4	Module in slot 3	1	A module is installed in slot 3.
		0	No Module is installed in slot 3.
5	Disable slot 3 warning	1	Warnings from module in slot 3 are inactive.
		0	Warnings from module in slot 3 are active.
6 … 15	reserved		

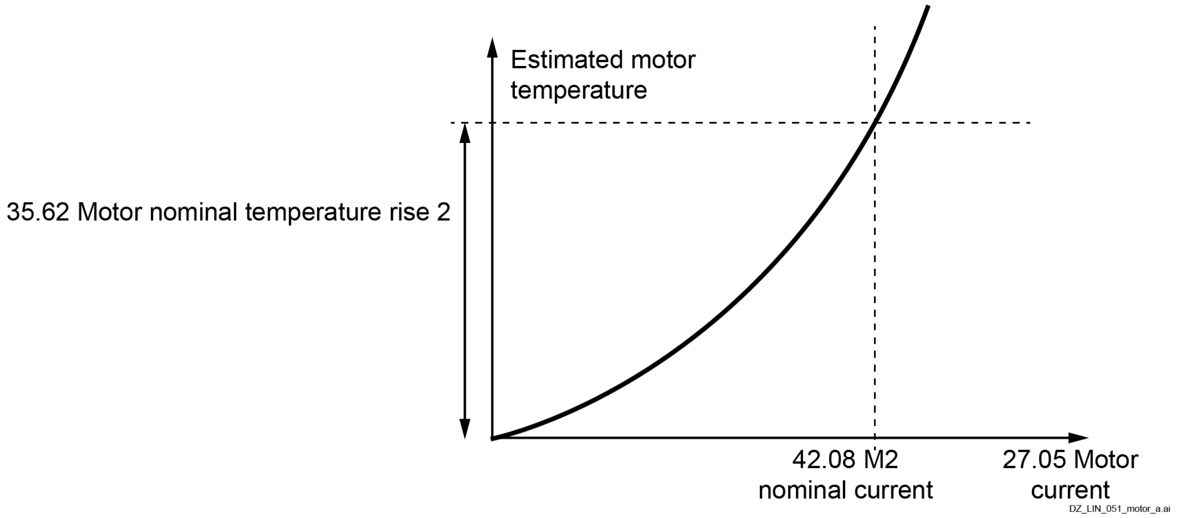
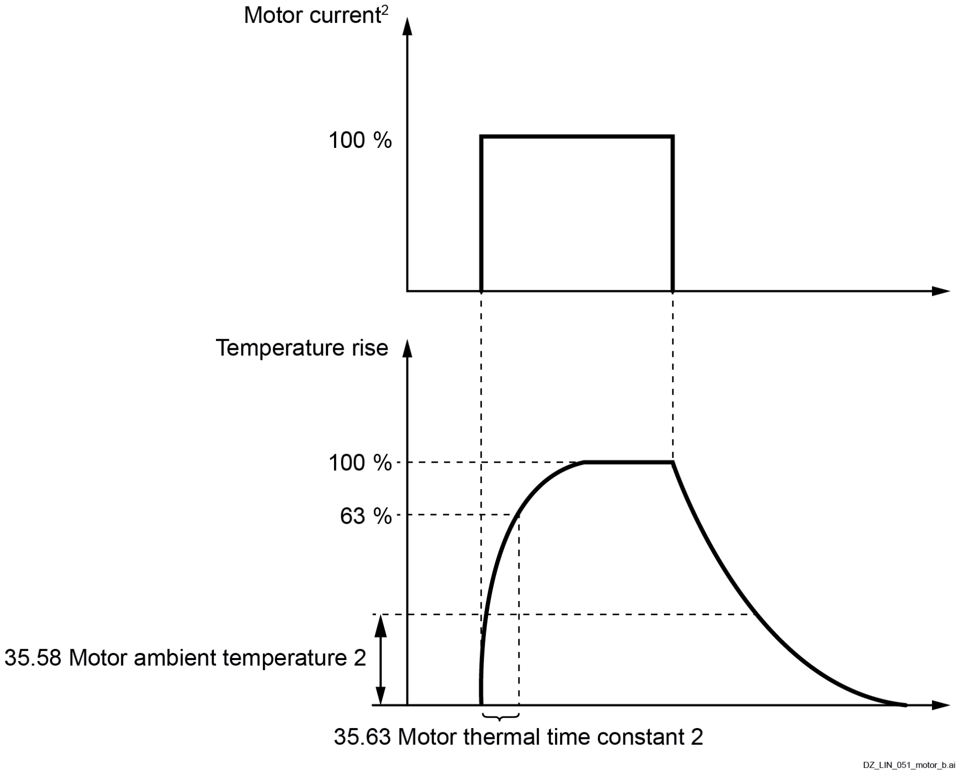
Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
0000h … FFFFh	2Ah	-	1 = 1	n	y	Parameter

35.50 **Motor ambient temperature 1**

Ambient temperature for motor thermal model 1.
Defines the ambient temperature of the motor for the motor thermal model. Diagram see chapter Motor thermal protection. The motor thermal model 1 estimates the motor temperature based on parameters 35.50 … 35.55.
The unit is selected by 96.02 Unit selection.
WARNING

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">The model cannot protect the motor if the motor does not cool properly because of dust, dirt, etc.</td></tr>
<tr><td>-80.0 … 1000.0</td><td>35 or 95</td><td>°C or °F</td><td>1 = 1°C or °F</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">35.54</td><td colspan="7">Motor nominal temperature rise 1</td></tr>
<tr><td colspan="7">Temperature rise for motor thermal model 1.
Defines the temperature rise of the motor, when the motor is loaded with 99.11 M1 nominal current. This is basically the scaling from square of current to the rated motor temperature. See the motor manufacturer's recommendations in the motor data sheet.
The unit is selected by parameter 96.02 Unit selection.
 </td></tr>
<tr><td>-80.0 … 1000.0</td><td>80 or 176</td><td>°C or °F</td><td>1 = 1°C or °F</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">35.55</td><td colspan="7">Motor thermal time constant 1</td></tr>
<tr><td colspan="7">Motor thermal time constant for motor thermal model 1.
Defines the thermal time constant for the motor thermal model 1. It is the time to reach 63 % of nominal motor temperature when the motor is loaded with 99.11 M1 nominal current. See the motor manufacturer's recommendations in the motor data sheet.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">
</td></tr>
<tr><td>0 … 32500</td><td>256</td><td>s</td><td>1 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**35.58**</td><td colspan="7">**Motor ambient temperature 2**</td></tr>
<tr><td colspan="7">Ambient temperature for motor thermal model 2.
Defines the ambient temperature of the motor for the motor thermal model. Diagram see chapter Motor thermal protection. The motor thermal model 2 estimates the motor temperature based on parameters 35.58 … 35.63.
The unit is selected by 96.02 Unit selection.
WARNING
The model cannot protect the motor if the motor does not cool properly because of dust, dirt, etc.</td></tr>
<tr><td>-80.0 … 1000.0</td><td>35 or 95</td><td>°C or °F</td><td>1 = 1°C or °F</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**35.62**</td><td colspan="7">**Motor nominal temperature rise 2**</td></tr>
<tr><td colspan="7">Temperature rise for motor thermal model 2.
Defines the temperature rise of the motor, when the motor is loaded with 42.08 M2 nominal current. This is basically the scaling from square of current to the rated motor temperature. See the motor manufacturer's recommendations in the motor data sheet.
The unit is selected by parameter 96.02 Unit selection.</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
							
	-80.0 … 1000.0	80 or 176	°C or °F	1 = 1°C or °F	n	y	Parameter
35.63	**Motor thermal time constant 2**						
	Motor thermal time constant for motor thermal model 2. Defines the thermal time constant for the motor thermal model 2. It is the time to reach 63 % of nominal motor temperature when the motor is loaded with 42.08 M2 nominal current. See the motor manufacturer's recommendations in the motor data sheet.						
							
	0 … 32500	256	s	1 = 1 s	n	y	Parameter

36 Load analyzer

Peak value and amplitude logger settings.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">**36.xx**</td><td colspan="7">**Not yet part of the manual.**</td></tr>
<tr><td colspan="7"></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">**36.xx**</td><td colspan="7"></td></tr>
<tr><td colspan="7"></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

37 User load curve

Settings for user load curve.

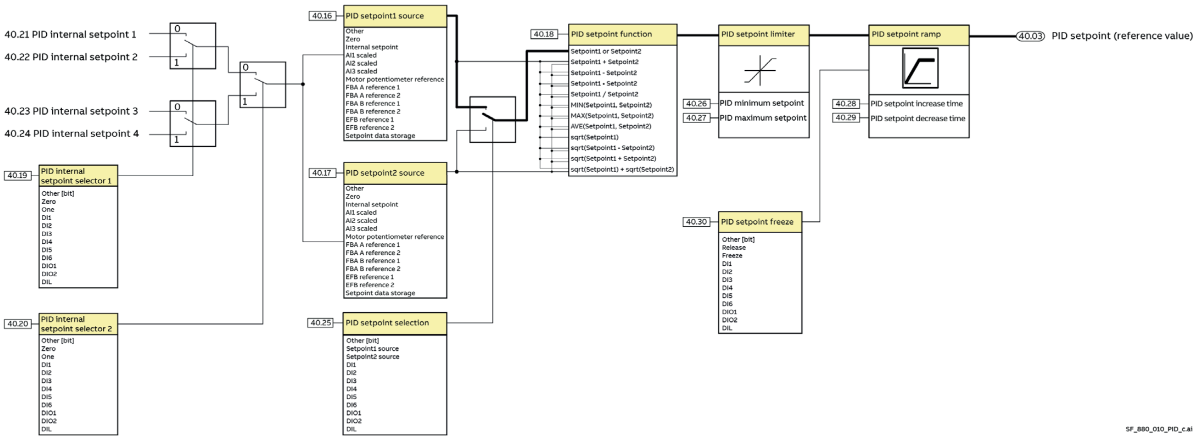
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">**37.xx**</td><td colspan="7">**Not yet part of the manual.**</td></tr>
<tr><td colspan="7"></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">**37.xx**</td><td colspan="7"></td></tr>
<tr><td colspan="7"></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

40 Process PID

Parameter values for process PID controller.

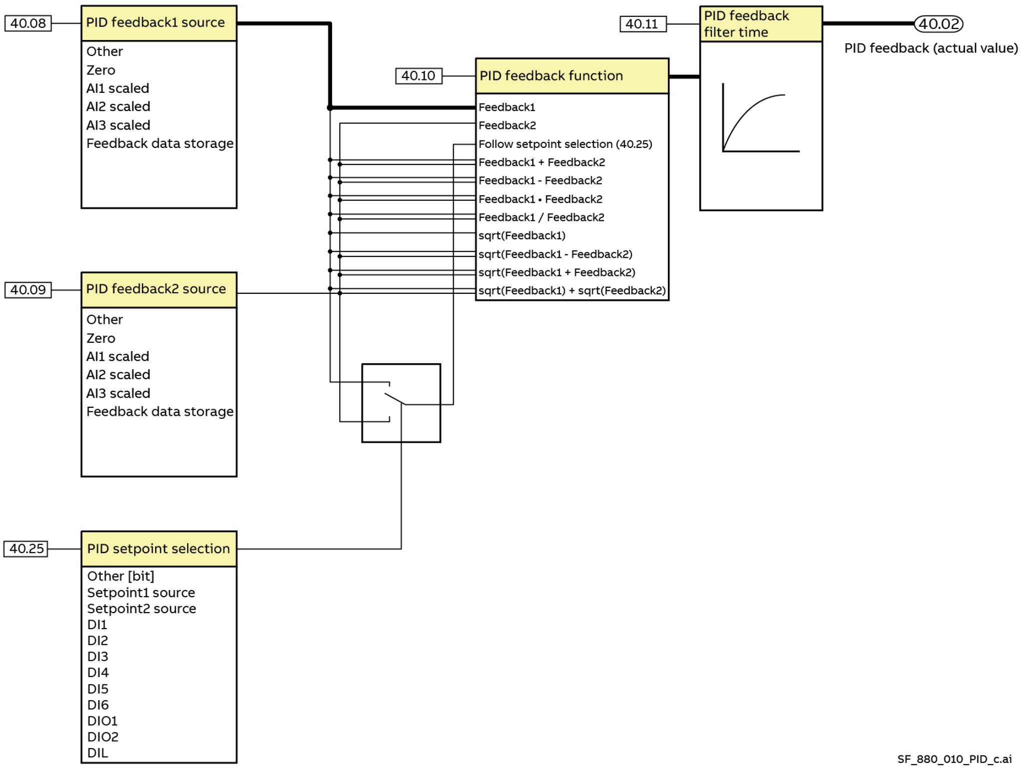
Index	Name						
	Text						
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

PID controller setpoint (reference value) selection:

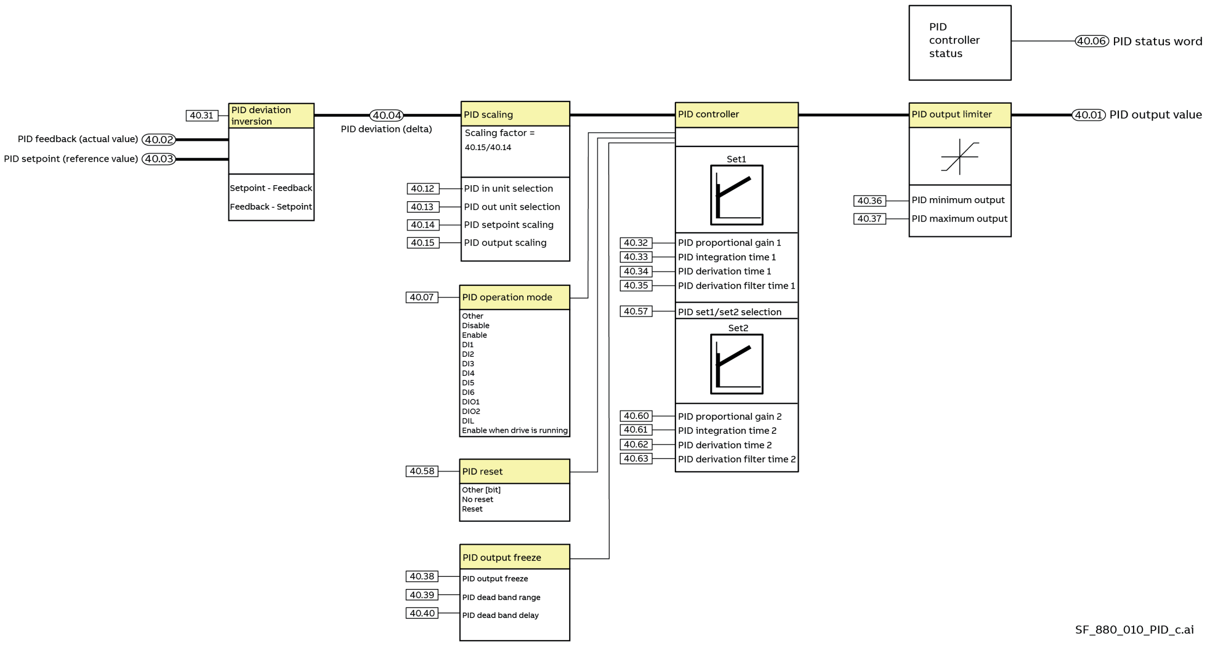


SF_880_010_PID_c.ai

PID controller feedback (actual value) selection:



SF_880_010_PID_c.ai

Index	**Name** **Text** **Range**	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	PID controller function:  SF_880_010_PID_c.ai						
40.01	**PID output value**						
	Process PID, output. Process PID, output. Displays the PID controller output. Scaling depends on the setting of 40.14 PID setpoint scaling and 40.15 PID output scaling (scaling factor = 40.15/40.14).						
	-32768.0 … 32767.0	-	See 40.13	1 = 1 (40.13)	y	n	Signal
40.02	**PID feedback (actual value)**						
	Process PID, feedback (actual value). Displays the PID controller feedback after source selection and filtering.						
	-32768.00 … 32767.00	-	See 40.12	1 = 1 (40.12)	y	n	Signal
40.03	**PID setpoint (reference value)**						
	Process PID, setpoint (reference value). Displays the PID controller setpoint after source selection, limitation and ramping.						
	-32768.00 … 32767.00	-	See 40.12	1 = 1 (40.12)	y	n	Signal
40.04	**PID deviation (delta)**						
	Process PID, deviation (delta) . Displays the PID controller deviation. By default, it is Setpoint - Feedback, but it can be inverted using 40.31 PID deviation inversion.						
	-32768.00 … 32767.00	-	See 40.12	1 = 1 (40.12)	y	n	Signal
40.06	**PID status word**						
	Process PID, status word. Displays the PID controller status information. Bit assignment:						

Index	Name						
	Text						
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

Bit	Name	Value	Remarks
0	Active	1	The PID controller is active. See 40.07 PID operation mode.
		0	The PID controller is inactive.
1	Setpoint frozen	1	The PID controller setpoint is frozen. See 40.30 PID setpoint freeze.
		0	The PID controller setpoint is released.
2	Output frozen	1	The PID controller output is frozen. See 40.38 PID output freeze.
		0	The PID controller output is released.
3 ... 6	reserved		
7	Output limited at maximum	1	The PID controller output is limited by 40.37 PID maximum output.
		0	The PID controller output is not limited.
8	Output limited at minimum	1	The PID controller output is limited by 40.36 PID minimum output.
		0	The PID controller output is not limited.
9	Dead band control	1	The PID controller dead band is active. See 41.39 PID dead band range.
		0	The PID controller dead band is inactive.
10	PID set1/set2	1	The PID controller set2 is used. See 40.57 PID set1/set2 selection.
		0	The PID controller set1 is used.
11	reserved		
12	PID internal setpoint	1	The PID controller Internal setpoint is active. See 40.16 PID setpoint 1 source or 40.17 PID setpoint 2 source.
		0	An external setpoint is active.
13 ... 15	reserved		

Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

40.07 **PID operation mode**

Process PID, operation mode.
Enable/Disable the PID controller.
Other; source selection.
0: **Disable**; 0, disable the process PID.
1: **Enable**; 1, enable the process PID.
3: **DI1**; 10.02 DI delayed status bit 0.
4: **DI2**; 10.02 DI delayed status bit 1.
5: **DI3**; 10.02 DI delayed status bit 2.
6: **DI4**; 10.02 DI delayed status bit 3.
7: **DI5**; 10.02 DI delayed status bit 4.
8: **DI6**; 10.02 DI delayed status bit 5.
11: **DIO1**; 11.02 DIO delayed status bit 0.
12: **DIO2**; 11.02 DIO delayed status bit 1.
19: **DIL**; 10.02 DI delayed status bit 15.
21: **Enable when drive is running**; the process PID controller is enabled when the drive is running. See 06.15.b02 Main status word.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td>0 … 21</td><td>Disable</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**40.08**</td><td colspan="7">**PID feedback1 source**</td></tr>
<tr><td colspan="7">Process PID, feedback (actual value) sources.
Selects the first source of the PID controller feedback.
Other; source selection.
0: **Zero**; output is set to zero.
1: **AI1 scaled**; 12.12 AI1 scaled value.
2: **AI2 scaled**; 12.22 AI2 scaled value.
3: **AI3 scaled**; 12.32 AI3 scaled value.
10: **Feedback data storage**; 40.91 PID feedback data storage.</td></tr>
<tr><td>0 … 10</td><td>AI1 scaled</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**40.09**</td><td colspan="7">**PID feedback2 source**</td></tr>
<tr><td colspan="7">Process PID, feedback (actual value) sources.
Selects the second source of the PID controller feedback.
Other; source selection.
0: **Zero**; output is set to zero.
1: **AI1 scaled (12.12)**; 12.12 AI1 scaled value.
2: **AI2 scaled (12.22)**; 12.22 AI2 scaled value.
3: **AI3 scaled (12.32)**; 12.32 AI3 scaled value.
10: **Feedback data storage**; 40.91 PID feedback data storage.</td></tr>
<tr><td>0 … 10</td><td>Zero</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**40.10**</td><td colspan="7">**PID feedback function**</td></tr>
<tr><td colspan="7">Process PID, feedback (actual value) function.
Selects a mathematical function between 40.08 PID feedback1 source and 40.09 PID feedback2 source.
0: **Feedback1**; feedback1 selected by 40.08 PID feedback1 source.
1: **Feedback1 + Feedback2**; the sum of the two feedback sources is used.
2: **Feedback1 - Feedback2**; the result of feedback1 source minus feedback2 source is used.
3: **Feedback1 • Feedback2**; the multiplication of the two feedback sources is used.
4: **Feedback1 / Feedback2**; the result of feedback1 source divided by feedback2 source is used.
5: **MIN(Feedback1, Feedback2)**; the smaller of the two feedback sources is used.
6: **MAX(Feedback1, Feedback2)**; the greater of the two feedback sources is used.
7: **AVE(Feedback1, Feedback2)**; the average of the two feedback sources is used.
8: **sqrt(Feedback1)**; square root of feedback1 source.
9: **sqrt(Feedback1 - Feedback2)**; square root of (feedback1 source minus feedback2 source).
10: **sqrt(Feedback1 + Feedback2)**; square root of (feedback1 source plus feedback2 source).
11: **sqrt(Feedback1) + sqrt(Feedback2)**; square root of feedback1 source plus square root of feedback2 source.
20: **Follow setpoint selection (40.25)**; selection of the feedback source is dependent on the selection of the source selection. See 40.25 PID setpoint selection.
21: **Feedback2**; feedback2 selected by 40.09 PID feedback2 source.</td></tr>
<tr><td>0 … 21</td><td>Feedback1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**40.11**</td><td colspan="7">**PID feedback filter time**</td></tr>
<tr><td colspan="7">Process PID, feedback (actual value) filter.
Defines the filter time constant for the PID controller feedback.</td></tr>
<tr><td>0.000 … 30.000</td><td>0.000</td><td>s</td><td>1000 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**40.12**</td><td colspan="7">**PID unit selection**</td></tr>
<tr><td colspan="7">Process PID, input values unit selection.</td></tr>
</table>

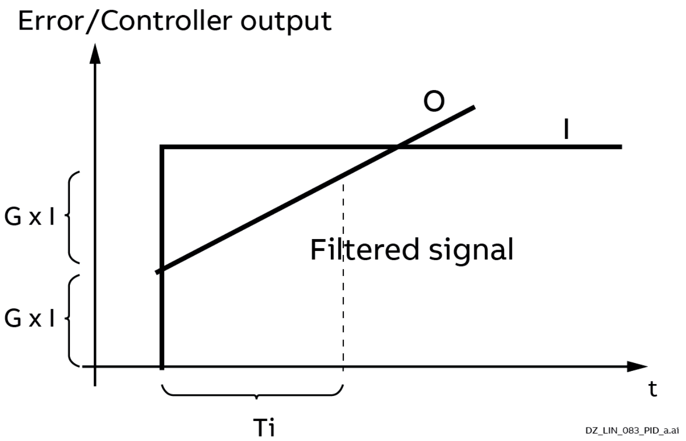
Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	Defines the unit for signals/parameters 40.02 … 40.04 and 40.21 … 40.24. 0: **No Unit**; no unit used. 3: **Hz**; hertz. 4: **%**; percent. 7: **rpm**; rpm. 250: **PID customer unit**; User definable unit for 40.12 PID in unit selection. The name of the unit can be edited using the control panel: Menu - Settings - Edit texts - PID customer unit.						
	0 … 250	%	-	1 = 1	n	y	Parameter
40.13	**PID out unit selection**						
	Process PID, output value unit selection. Defines the unit for 40.01 PID output value. 0: **No Unit**; no unit used. 3: **Hz**; hertz. 4: **%**; percent. 7: **rpm**; rpm. 249: **PID out unit**; User definable unit for parameters 40.01, 40.36 and 40.37. The name of the unit can be edited using the control panel: Menu - Settings - Edit texts - PID out unit.						
	0 … 250	%	-	1 = 1	n	y	Parameter
40.14	**PID setpoint scaling**						
	Process PID, setpoint (reference value) scaling. Defines, together with 40.15 PID output scaling, a general scaling factor for the PID controller control chain. The output of the PID controller has no unit. Following formula is valid: $\text{Scaling factor} = \frac{40.15}{40.14}$						
	-32768.00 … 32767.00	100.00	-	1 = 1	n	y	Parameter
40.15	**PID output scaling**						
	Process PID, output scaling. See 40.14 PID setpoint scaling.						
	-32768.00 … 32767.00	1500.00	-	1 = 1	n	y	Parameter
40.16	**PID setpoint1 source**						
	Process PID, setpoint (reference value) sources. Selects the first source of the PID controller setpoint. Available in 40.25 PID setpoint selection as setpoint1 source. **Other**; source selection. 0: **Zero**; 0 %, setpoint is set to zero. 2: **Internal setpoint**; depending on the setting of 40.19 PID internal setpoint selector 1 and 40.20 PID internal setpoint selector 2. 3: **AI1 scaled**; 12.12 AI1 scaled value. 4: **AI2 scaled**; 12.22 AI2 scaled value. 5: **AI3 scaled**; 12.32 AI3 scaled value. 7: **FBA A reference 1**; 03.05 FBA A reference 1. 8: **FBA A reference 2**; 03.06 FBA A reference 2. 9: **FBA B reference 1**; 03.07 FBA B reference 1. 10: **FBA B reference 2**; 03.08 FBA B reference 2. 11: **EFB reference 1**; 03.09 EFB reference 1. 12: **EFB reference 2**; 03.10 EFB reference 2.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">17: Motor potentiometer reference; 22.80 Motor potentiometer reference.
24: Setpoint data storage; 40.92 PID setpoint data storage.</td></tr>
<tr><td>0 … 24</td><td>Zero</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">40.17</td><td colspan="7">PID setpoint2 source</td></tr>
<tr><td colspan="7">Process PID, setpoint (reference value) sources.
Selects the second source of the PID controller setpoint. Available in 40.25 PID setpoint selection as setpoint2 source.
See 40.16 PID setpoint 1 source.</td></tr>
<tr><td>0 … 24</td><td>Zero</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">40.18</td><td colspan="7">PID setpoint function</td></tr>
<tr><td colspan="7">Process PID, setpoint (reference value) function.
Selects a mathematical function between 40.16 PID setpoint1 source, 40.17 PID setpoint2 source and 40.25 PID setpoint selection.
0: Setpoint1 or Setpoint2; setpoint source is selected by 40.25 PID setpoint selection.
1: Setpoint1 + Setpoint2; the sum of the two setpoint sources is used.
2: Setpoint1 - Setpoint2; the result of setpoint1 source minus setpoint2 source is used.
3: Setpoint1 • Setpoint2; the multiplication of the two setpoint sources is used.
4: Setpoint1 / Setpoint2; the result of setpoint1 source divided by setpoint2 source is used.
5: MIN(Setpoint1, Setpoint2); the smaller of the two setpoint sources is used.
6: MAX(Setpoint1, Setpoint2); the greater of the two setpoint sources is used.
7: AVE(Setpoint1, Setpoint2); the average of the two setpoint sources is used.
8: sqrt(Setpoint1); square root of setpoint1 source.
9: sqrt(Setpoint1 - Setpoint2); square root of (setpoint1 source minus setpoint2 source).
10: sqrt(Setpoint1 + Setpoint2); square root of (setpoint1 source plus setpoint2 source).
11: sqrt(Setpoint1) + sqrt(Setpoint2); square root of setpoint1 source plus square root of setpoint2 source.</td></tr>
<tr><td>0 … 11</td><td>Setpoint1 or Setpoint2</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">40.19</td><td colspan="7">PID internal setpoint selector 1</td></tr>
<tr><td colspan="7">Process PID, internal setpoint selection.
40.19 PID internal setpoint selector 1 and 40.20 PID internal setpoint selector 2 choose the internal setpoint out of parameters 40.21 … 40.24.
<table>
<tr><td>40.19 PID internal setpoint selector 1</td><td>40.20 PID internal setpoint selector 2</td><td>Selected internal setpoint</td></tr>
<tr><td>Zero</td><td>Zero</td><td>40.21 PID internal setpoint 1</td></tr>
<tr><td>One</td><td>Zero</td><td>40.22 PID internal setpoint 2</td></tr>
<tr><td>Zero</td><td>One</td><td>40.23 PID internal setpoint 3</td></tr>
<tr><td>One</td><td>One</td><td>40.24 PID internal setpoint 4</td></tr>
</table>
Other [bit]; source selection.
0: Zero; 0, choose zero.
1: One; 1, choose one.
3: DI1; 10.02 DI delayed status bit 0.
4: DI2; 10.02 DI delayed status bit 1.
5: DI3; 10.02 DI delayed status bit 2.
6: DI4; 10.02 DI delayed status bit 3.</td></tr>
</table>

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	7: **DI5**; 10.02 DI delayed status bit 4. 8: **DI6**; 10.02 DI delayed status bit 5. 11: **DIO1**; 11.02 DIO delayed status bit 0. 12: **DIO2**; 11.02 DIO delayed status bit 1. 19: **DIL**; 10.02 DI delayed status bit 15.						
	0 … 19	Zero	-	1 = 1	n	y	Parameter
40.20	**PID internal setpoint selector 2**						
	Process PID, internal setpoint selection. 40.19 PID internal setpoint selector 1 and 40.20 PID internal setpoint selector 2 choose the internal setpoint out of parameters 40.21 … 40.24. See 40.19 PID internal setpoint selector 1						
	0 … 19	Zero	-	1 = 1	n	y	Parameter
40.21	**PID internal setpoint 1**						
	Process PID, internal setpoint 1. Defines the PID controller internal setpoint 1.						
	-32768.00 … 32767.00	0.00	See 40.12	1 = 1 (40.12)	n	y	Parameter
40.22	**PID internal setpoint 2**						
	Process PID, internal setpoint 2. Defines the PID controller internal setpoint 2.						
	-32768.00 … 32767.00	0.00	See 40.12	1 = 1 (40.12)	n	y	Parameter
40.23	**PID internal setpoint 3**						
	Process PID, internal setpoint 3. Defines the PID controller internal setpoint 3.						
	-32768.00 … 32767.00	0.00	See 40.12	1 = 1 (40.12)	n	y	Parameter
40.24	**PID internal setpoint 4**						
	Process PID, internal setpoint 4. Defines the PID controller internal setpoint 4.						
	-32768.00 … 32767.00	0.00	See 40.12	1 = 1 (40.12)	n	y	Parameter
40.25	**PID setpoint selection**						
	Process PID, setpoint selection. Configures the selection between 40.16 PID setpoint1 source and 40.17 PID setpoint2 source. This parameter is only effective when 40.18 PID setpoint function = Setpoint1 or Setpoint2. **Other [bit]**; source selection. 0: **Setpoint1 source**; 0, 40.16 PID setpoint1 source. 1: **Setpoint2 source**; 1, 40.17 PID setpoint2 source. 3: **DI1**; 10.02 DI delayed status bit 0. 4: **DI2**; 10.02 DI delayed status bit 1. 5: **DI3**; 10.02 DI delayed status bit 2. 6: **DI4**; 10.02 DI delayed status bit 3. 7: **DI5**; 10.02 DI delayed status bit 4. 8: **DI6**; 10.02 DI delayed status bit 5. 11: **DIO1**; 11.02 DIO delayed status bit 0. 12: **DIO2**; 11.02 DIO delayed status bit 1. 19: **DIL**; 10.02 DI delayed status bit 15.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td>0 … 19</td><td>Setpoint1 source</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">40.26</td><td colspan="7">PID minimum setpoint</td></tr>
<tr><td colspan="7">Process PID, minimum setpoint limit.
Defines the minimum limit for the PID controller setpoint.</td></tr>
<tr><td>-32768.00 … 32767.00</td><td>0.00</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">40.27</td><td colspan="7">PID maximum setpoint</td></tr>
<tr><td colspan="7">Process PID, maximum setpoint limit.
Defines the maximum limit for the PID controller setpoint.</td></tr>
<tr><td>-32768.00 … 32767.00</td><td>32767.00</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">40.28</td><td colspan="7">PID setpoint increase time</td></tr>
<tr><td colspan="7">Process PID, setpoint increase time.
Defines the minimum time it takes for the setpoint to increase from 0 units to 100 units. The unit depend on the setting of 40.12 PID unit selection.</td></tr>
<tr><td>0.00 … 325.00</td><td>0.00</td><td>s</td><td>100 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">40.29</td><td colspan="7">PID setpoint decrease time</td></tr>
<tr><td colspan="7">Process PID, setpoint decrease time.
Defines the minimum time it takes for the setpoint to decrease from 100 units to 0 units. The unit depend on setting of 40.12 PID unit selection.</td></tr>
<tr><td>0.00 … 325.00</td><td>0.00</td><td>s</td><td>100 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">40.30</td><td colspan="7">PID setpoint freeze</td></tr>
<tr><td colspan="7">Process PID, freeze setpoint selection.
Freezes, or defines a source that can be used to freeze, the setpoint of the PID controller. This feature is useful when the setpoint is based on a process feedback connected to an analog input and the connected sensor must be e.g. serviced without stopping the process.
Other [bit]; source selection.
0: Release; 0, release the PID controller setpoint.
1: Freeze; 1, freeze the PID controller setpoint.
3: DI1; 10.02 DI delayed status bit 0.
4: DI2; 10.02 DI delayed status bit 1.
5: DI3; 10.02 DI delayed status bit 2.
6: DI4; 10.02 DI delayed status bit 3.
7: DI5; 10.02 DI delayed status bit 4.
8: DI6; 10.02 DI delayed status bit 5.
11: DIO1; 11.02 DIO delayed status bit 0.
12: DIO2; 11.02 DIO delayed status bit 1.
19: DIL; 10.02 DI delayed status bit 15.</td></tr>
<tr><td>0 … 19</td><td>Release</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">40.31</td><td colspan="7">PID deviation inversion</td></tr>
<tr><td colspan="7">Process PID, deviation (delta) inversion.
Inverts the input of the PID controller.
Other [bit]; source selection.
0: Setpoint - Feedback; 0, normal deviation (deviation = setpoint - feedback).
1: Feedback - Setpoint; 1, invert the deviation(deviation = feedback - setpoint).</td></tr>
<tr><td>0 … 1</td><td>Setpoint - Feedback</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>40.32</td><td colspan="7">PID proportional gain 1</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Process PID, gain 1.
Defines gain 1 of the PID controller. See 40.33 PID integration time 1.</td></tr>
<tr><td>0.10 … 100.00</td><td>1.00</td><td>-</td><td>100 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">40.33</td><td colspan="7">PID integration time 1</td></tr>
<tr><td colspan="7">Process PID, integration time 1.
Defines the integration time 1 of the PID controller. This time needs to be set to the same order of magnitude as the reaction time of the process. Otherwise, it will cause instability.

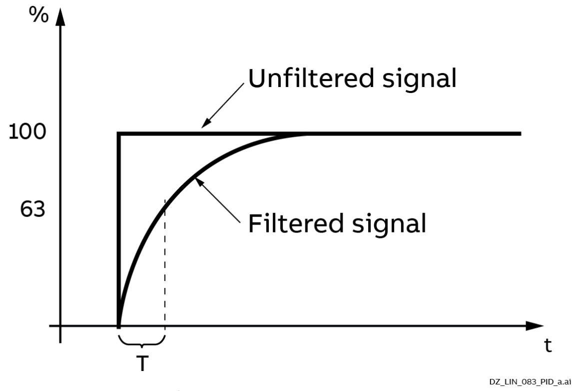


I = controller input (error)
O = controller output
G = gain
Ti = integraqtion time

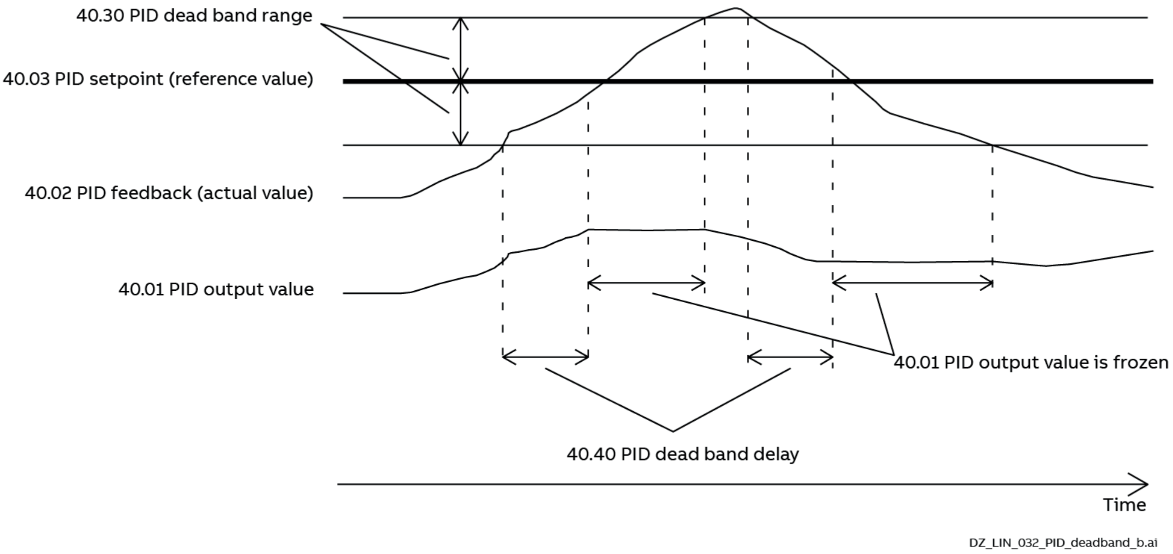
Note: Setting 40.33 PID integration time 1 = 0 disables the integration time 1 and turns the PID controller into a PD controller.</td></tr>
<tr><td>0.00 … 325.00</td><td>1.00</td><td>s</td><td>100 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">40.34</td><td colspan="7">PID derivation time 1</td></tr>
<tr><td colspan="7">Process PID, derivation time 1.
Defines the derivation time 1 of the PID controller. The derivative component at the controller output is calculated on basis of two consecutive error values, E_{K-1} and E_K, according to following formula:

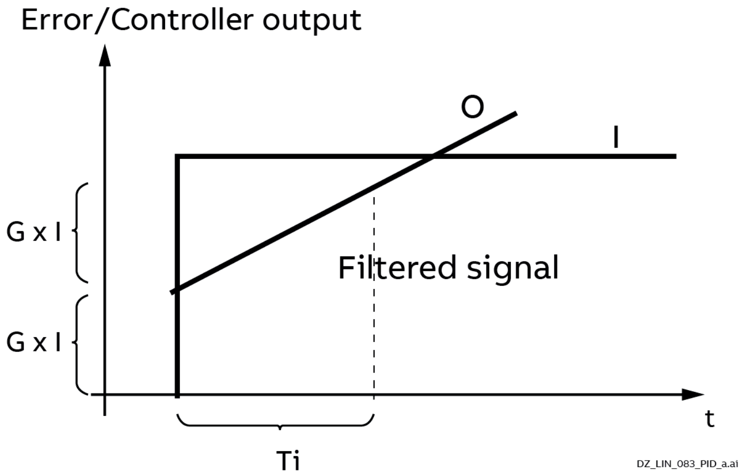
$$\frac{(40.34) \bullet (E_K - E_{K-1})}{T_S}$$

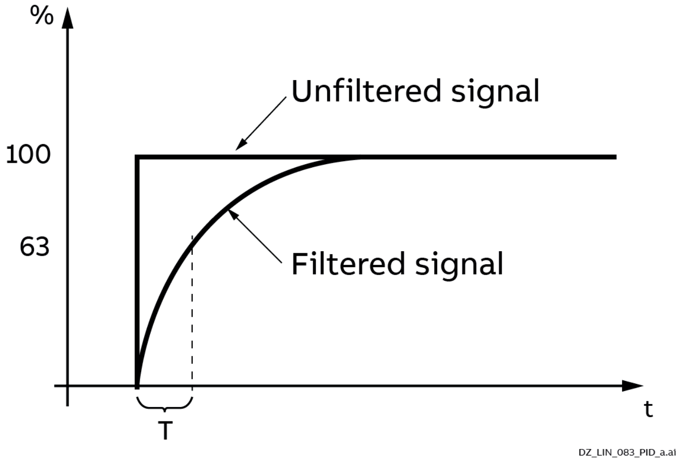
T_S = 2 ms sample time.
Error = E = setpoint - feedback.</td></tr>
<tr><td>0.000 … 32.500</td><td>0.000</td><td>s</td><td>1000 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">40.35</td><td colspan="7">PID derivation filter time 1</td></tr>
<tr><td colspan="7">Process PID, derivation filter time 1.
Defines the derivation filter time 1 of the PID controller. Filter time of the 1-pole filter is used to smooth the derivative component 1 of the PID controller.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/
FbEq16</th><th>Volatile</th><th>Change
running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">
O = I x (1-e$^{t/T}$)

I = filter input (step)
O = filter output
t = time
T = filter time constant</td></tr>
<tr><td>0.000 … 32.500</td><td>0.000</td><td>s</td><td>1000 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">40.36</td><td colspan="7">PID minimum output</td></tr>
<tr><td colspan="7">Process PID, minimum output limit.
Defines the minimum limit for the PID controller output. Using the minimum and maximum limits restricts the operation range.</td></tr>
<tr><td>-32768.0 … 32767.0</td><td>0.0</td><td>-</td><td>1 = 1
(40.13)</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">40.37</td><td colspan="7">PID maximum output</td></tr>
<tr><td colspan="7">Process PID, maximum output limit.
Defines the maximum limit for the PID controller output. Using the minimum and maximum limits restricts the operation range.</td></tr>
<tr><td>-32768.0 … 32767.0</td><td>1500.0</td><td>-</td><td>1 = 1
(40.13)</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">40.38</td><td colspan="7">PID output freeze</td></tr>
<tr><td colspan="7">Process PID, freeze output selection.
Freezes, or defines a source that can be used to freeze, the output of the PID controller. This feature can be used when e.g. a sensor providing process feedback must to be serviced without stopping the process.
Other [bit]; source selection.
0: Release; 0, release the PID controller output.
1: Freeze; 1, freeze the PID controller output.
3: DI1; 10.02 DI delayed status bit 0.
4: DI2; 10.02 DI delayed status bit 1.
5: DI3; 10.02 DI delayed status bit 2.
6: DI4; 10.02 DI delayed status bit 3.
7: DI5; 10.02 DI delayed status bit 4.
8: DI6; 10.02 DI delayed status bit 5.
11: DIO1; 11.02 DIO delayed status bit 0.
12: DIO2; 11.02 DIO delayed status bit 1.
19: DIL; 10.02 DI delayed status bit 15.</td></tr>
<tr><td>0 … 19</td><td>Release</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>40.39</td><td colspan="7">PID dead band range</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Process PID, dead band range.
Defines a dead band around the setpoint. Whenever the process feedback enters the dead band, a delay timer starts. If the feedback remains within the dead band longer than the delay in 40.40 PID dead band delay, the PID controller output is frozen. Normal operation resumes after the feedback value leaves the dead band.
 </td></tr>
<tr><td>0.0 … 32767.0</td><td>0.0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">40.40</td><td colspan="7">PID dead band delay</td></tr>
<tr><td colspan="7">Process PID, delay for the dead band.
Delay for the dead band. See 40.39 PID dead band range.</td></tr>
<tr><td>0.0 … 3600.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">40.57</td><td colspan="7">PID set1/set2 selection</td></tr>
<tr><td colspan="7">Process PID, set selection.
Configures the selection between the PID 1 controller set1, parameters 40.32 … 40.35, and PID controller set2, parameters 40.60 … 40.63.
Other [bit]; source selection.
0: Select set1; 0, select PID controller set1.
1: Select set2; 1, select PID controller set2.
3: DI1; 10.02 DI delayed status bit 0.
4: DI2; 10.02 DI delayed status bit 1.
5: DI3; 10.02 DI delayed status bit 2.
6: DI4; 10.02 DI delayed status bit 3.
7: DI5; 10.02 DI delayed status bit 4.
8: DI6; 10.02 DI delayed status bit 5.
11: DIO1; 11.02 DIO delayed status bit 0.
12: DIO2; 11.02 DIO delayed status bit 1.
19: DIL; 10.02 DI delayed status bit 15.</td></tr>
<tr><td>0 … 19</td><td>Select set1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">40.58</td><td colspan="7">PID reset</td></tr>
<tr><td colspan="7">Process PID, reset selection.
Reset the PID controller.
Other [bit]; source selection.</td></tr>
</table>

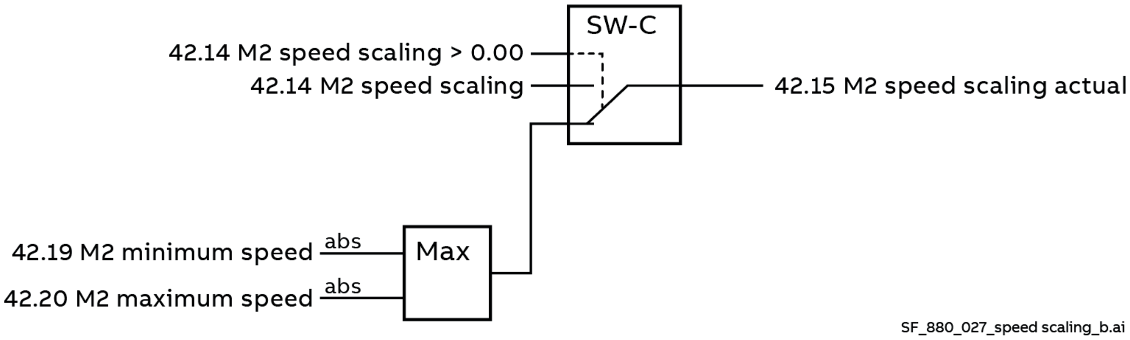
Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	0: **No Reset**; 0. 1: **Reset**; 1.						
	0 ... 1	No Reset	-	1 = 1	n	y	Parameter
40.60	**PID proportional gain 2**						
	Process PID, gain 2. Defines gain 2 of the PID controller. See 40.61 PID integration time 2.						
	0.00 … 100.00	1.00	-	100 = 1	n	y	Parameter
40.61	**PID integration time 2**						
	Process PID, integration time 2. Defines the integration time 2 of the PID controller. This time needs to be set to the same order of magnitude as the reaction time of the process. Otherwise, it will cause instability.  I = controller input (error) O = controller output G = gain Ti = integraqtion time **Note:** Setting 40.61 PID integration time 2 = 0 disables the integration time 2 and turns the PID controller into a PD controller.						
	0.00 … 325.00	1.00	s	100 = 1 s	n	y	Parameter
40.62	**PID derivation time 2**						
	Process PID, derivation time 2. Defines the derivation time 2 of the PID controller. The derivative component at the controller output is calculated on basis of two consecutive error values, E_{K-1} and E_K, according to following formula: $\frac{(40.62) \bullet (E_K\text{-}E_{K-1})}{T_S}$ T_S = 2 ms sample time. Error = E = setpoint - feedback.						
	0.000 … 32.500	0.000	s	1000 = 1 s	n	y	Parameter
40.63	**PID derivation filter time 2**						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	Process PID, derivation filter time 1. Defines the derivation filter time 2 of the PID controller. Filter time of the 1-pole filter is used to smooth the derivative component 2 of the PID controller.  O = I x (1-$e^{t/T}$) I = filter input (step) O = filter output t = time T = filter time constant						
	0.000 … 32.500	0.000	s	1000 = 1 s	n	y	Parameter
40.91	**PID feedback data storage**						
	Process PID, storage parameter for feedback data. Storage parameter for receiving a process feedback value e.g. through the embedded fieldbus interface. The value can be sent to the drive as Modbus I/O data. Set the target selection parameter of that particular data (58.101 … 58.124) to Feedback data storage. In 40.08 PID feedback1 source or 40.09 PID feedback2 source select Feedback data storage.						
	-327.68 … 327.67	0.00	-	10 = 1	n	y	Parameter
40.92	**PID setpoint data storage**						
	Process PID, storage parameter for setpoint data. Storage parameter for receiving a process setpoint value e.g. through the embedded fieldbus interface. The value can be sent to the drive as Modbus I/O data. Set the target selection parameter of that particular data (58.101…58.124) to Setpoint data storage. In 40.16 PID setpoint1 source or 40.17 PID setpoint1 source select Setpoint data storage.						
	-327.68 … 327.67	0.00	-	10 = 1	n	y	Parameter

42 Shared motion (2nd motor)

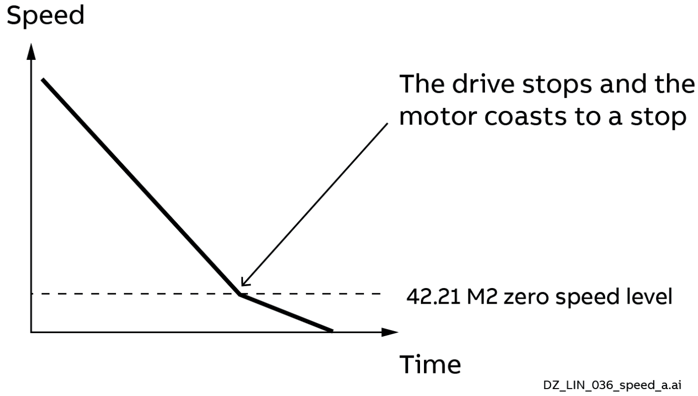
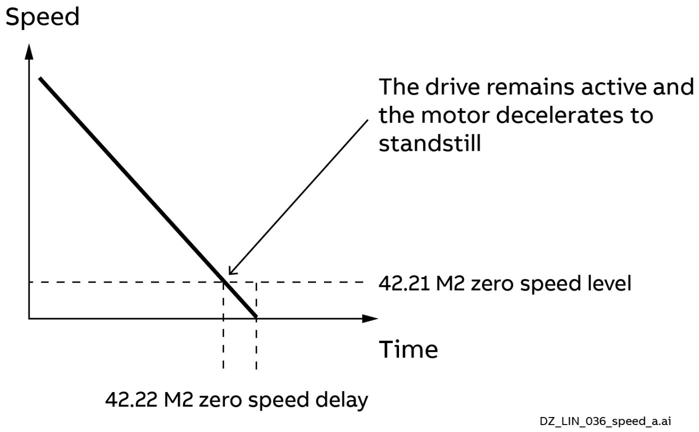
Configuration of 2nd motor.

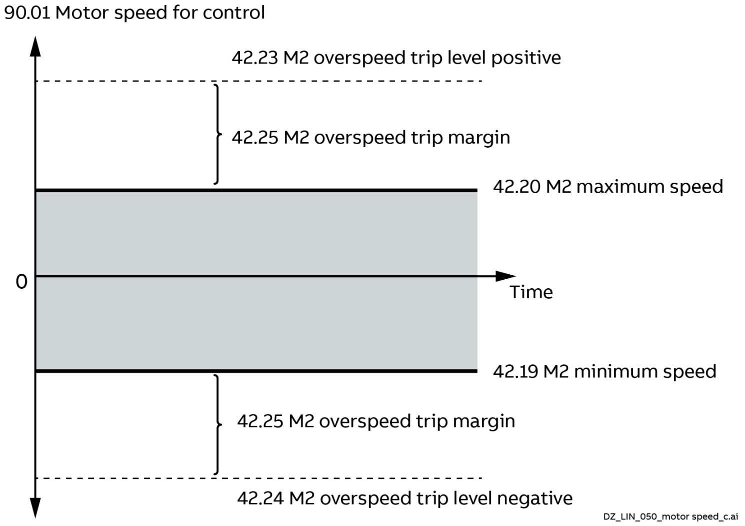
Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
42.01	**Motor 1/2 selection**						
	Source of motor 1/2 selection. Defines the source of the selection between motor 1 (M1) and motor 2 (M2). Result see 06.14 Selected motor. 0 = Motor 1. 1 = Motor 2. **Other [bit]**; source selection. 0: **Motor 1**; motor 1 is active. Normal operation. 1: **Motor 2**; motor 2 is active. 3: **DI1**; 10.02.b00 DI delayed status. 4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status.						
	0 … 19	Motor 1	-	1 = 1	n	n	Parameter
42.04	**M2 nominal torque**						
	Motor 2, calculated nominal torque. Motor 2 nominal torque is calculated the following way: $41.04\ M2\ nominal\ torque = \frac{60}{2\pi} \times \frac{[42.09\ M2\ nominal\ voltage - 24.08\ M2\ nominal\ current \times 42.39\ M2\ armature\ resistance] \times 42.08\ M2\ nominal\ current}{42.11\ M2\ nominal\ (base)\ speed}$ The unit is selected by 96.02 Unit selection.						
	0 … 200000000	-	Nm or Lb ft	1 = 1 Nm or Lb ft	y	n	Signal
42.05	**M2 nominal power**						
	Motor 2, calculated nominal power (electrical). Motor 2 nominal power (electrical) is calculated the following way: $42.05\ M2\ nominal\ power = \frac{42.09\ M2\ nominal\ voltage \times 42.08\ M2\ nominal\ current}{1000}$ The unit is selected by 96.02 Unit selection.						
	0.00 … 32500.00	-	kW or hp	1 = 1 kW or hp	y	n	Signal
42.08	**M2 nominal current**						
	Motor 2 nominal current. Motor 2 nominal armature current (DC) from the motor rating plate. **Note:** For 12-pulse parallel mode, see DCS880 12-pulse manual (3ADW000533). The allowable range for the motor nominal current is 10 % … 230 % of the nominal drive current. See 07.62 Drive DC current scaling set.						
	0 … 32500	0	A	1 = 1 A	n	y	Parameter
42.09	**M2 nominal voltage**						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	Motor 2 nominal voltage. Motor 2 nominal armature voltage (DC) from the motor rating plate. **Note:** For 12-pulse serial mode or serial sequential mode, see DCS880 12-pulse manual (3ADW000533).						
	0.0 … 3250.0	350.0	V	10 = 1 V	n	y	Parameter
42.10	**M2 nominal field current**						
	Motor 2 nominal field current. Motor 2 nominal field current from the motor rating plate.						
	0.3 … 3250.0	0.3	A	10 = 1 A	n	y	Parameter
42.11	**M2 nominal (base) speed**						
	Motor 2 nominal (base) speed. Motor 2 nominal (base) speed from the motor rating plate, usually the field weak point.						
	0.00 … 30000.00	1500.00	rpm	See 42.15	n	y	Parameter
42.14	**M2 speed scaling**						
	Motor 2 speed scaling. Sets the 16-bit scaling of all speed related parameters in rpm. The set scaling value corresponds to 20000 speed units in e.g. fieldbus or master-follower link communication. 42.14 M2 speed scaling is valid for values greater than 0 rpm. For a value equal to 0 rpm, the maximum absolute value of 42.19 M2 minimum speed and 42.20 M2 maximum speed is taken. See 42.15 M2 speed scaling actual.  **Notes**: – 42.14 M2 speed scaling must be set in case the speed is read or written by means of an overriding control (e.g. fieldbus). – The maximum amount of speed units is 32000. **Commissioning hints:** – Set 42.11 M2 nominal (base) speed to the base speed of motor 1. – Set 42.19 M2 minimum speed and 42.20 M2 maximum speed to ± maximum speed. – Set 42.14 M2 speed scaling to the maximum absolute speed value of 42.19 M2 minimum speed and 42.20 M2 maximum speed. – Make sure that the setting of the following parameters is less than or equal to 1.6 • 42.15 M2 speed scaling actual (1.6 = 32000/20000): 42.19 M2 minimum speed. 42.20 M2 maximum speed. 42.25 M2 overspeed trip margin. 42.14 M2 speed scaling. 42.11 M2 nominal (base) speed. If the scaling is out of range warning A124 Speed scaling is generated.						

Index	Name						
	Text						
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	0.0 … 30000.0	0.0	rpm	See 42.15	n	y	Parameter
42.15	**M2 speed scaling actual**						
	Motor 2 speed scaling actual and acceleration/deceleration ramp rate. Shows the 16-bit scaling of all speed related parameters in rpm. The scaling value corresponds to 20000 speed units in e.g. fieldbus or master-follower link communication. See 42.14 M2 speed scaling. Defines the acceleration/ deceleration ramp rate. See 23.12 Acceleration time 1 and 23.13 Deceleration time 1. The speed acceleration and deceleration ramp times are therefore related to 42.15 M2 speed scaling actual and not to 42.19 M2 minimum speed or 42.20 M2 Maximum speed.						
	0.0 … 30000.0	-	rpm	1 = 1 rpm	y	n	Signal
42.16	**M2 torque scaling**						
	Motor 2 torque scaling. Sets the 16-bit scaling of all torque related parameters in percent of 42.04 M2 nominal torque. The set scaling value corresponds to 10000 in e.g. fieldbus or master-follower link communication.						
	0.00 … 325.00	100.00	%	See 42.17	n	y	Parameter
42.17	**M2 torque scaling actual**						
	Motor 2 torque scaling actual. Shows the 16-bit scaling of all torque related parameters in percent of 42.04 M2 nominal torque. The scaling value corresponds to 10000 in e.g. fieldbus or master-follower link communication. See 46.03 M1 torque scaling. Motor 2 nominal torque in Nm or lb ft can be seen in 42.04 M2 nominal torque.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
42.18	**M2 feedback selection**						
	Motor 2 speed feedback selection. Selects the motor speed feedback for motor control. **Other**; source selection. 1: **OnBoard encoder**; the speed feedback is measured by means of a pulse encoder connected to the SDCS-CON-H01. See group 94. 2: **Encoder 1**; the speed feedback is measured by encoder 1. See group 92. 3: **Encoder 2**; the speed feedback is measured by encoder 2. See group 93. 4: **Tacho**; the speed feedback is measured by means of an analog tacho connected to the SDCS-CON-H01. See group 94. 5: **EMF**; the speed feedback is calculated from the EMF (base speed area) and field current (field weakening area). Thus, it is possible to go into the field weakening range, but with a low performance compared to encoder or analog tacho feedback. **Commissioning hint**: The flux linearization must be tuned manually. 6: **External**; the speed feedback is connected using 90.39 External speed source. 7: **EMF voltage**; the speed feedback is calculated from the EMF only. Thus, no field weakening is possible.						
	1 … 7	EMF	-	1 = 1	n	y	Parameter
42.19	**M2 minimum speed**						
	Motor 2 minimum speed limit. Motor 2 minimum speed reference limit in rpm for 23.01 Speed reference ramp input and 24.01 Used speed reference. **Notes**:						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	– 42.19 M2 minimum speed is applied to 24.01 Used speed reference to avoid falling below the speed limits by means of 24.11 Speed correction. – To be able to overspeed the drive (e.g. for winders) it is possible to switch off the speed limit for 24.01 Used speed reference by means of 06.10.b02 Auxiliary control word 1.						
	-30000.00 … 30000.00	-1500.00	rpm	See 42.15	n	y	Parameter
42.20	**M2 maximum speed**						
	Motor 2 maximum speed limit. Motor 2 maximum speed reference limit in rpm for 23.01 Speed reference ramp input and 24.01 Used speed reference. **Notes**: – 42.20 M2 maximum speed is applied to 24.01 Used speed reference to avoid exceeding the speed limits by means of 24.11 Speed correction. – To be able to overspeed the drive (e.g. for winders) it is possible to switch off the speed limit for 24.01 Used speed reference by means of 06.10.b02 Auxiliary control word 1.						
	-30000.00 … 30000.00	1500.00	rpm	See 42.15	n	y	Parameter
42.21	**M2 zero speed level**						
	Motor 2 zero speed level. Depending on the situation, the following is happening: – When a Stop command is given, the motor decelerates along a speed ramp or at torque limit until the zero-speed level is reached and 42.22 M2 zero speed delay is elapsed. See 21.04 Stop mode. Afterwards the motor will coast. At that moment, existing brakes are closed (applied). – When an emergency stop request (SS1) is given by a fieldbus safety module (FSPS-21/FSO-21), the motor decelerates according to 23.23 Emergency stop time until the zero-speed level is reached and 42.22 M2 zero speed delay is elapsed. At that moment, existing brakes are closed (applied) and the STO command is applied by the safety fieldbus module (FSPS-21/FSO-21). See 21.03 Emergency stop mode. While the speed feedback is in the level, Zero speed is set high. See 06.21.b00 Speed control status word. **Notes**: – In case 21.01 Start mode = Start from zero and in case the restart command comes before zero speed is reached, warning A137 Start condition conflict is generated. Setting 42.21 M2 zero speed level = 30000.00 rpm disables the zero-speed supervision.						
	0.00 … 30000.00	75.00	rpm	See 42.15	n	y	Parameter
42.22	**M2 zero speed delay**						
	Motor 2 zero speed delay. The zero-speed delay compensates for the time the motor needs to decelerate from 42.21 M2 zero speed level to standstill. Until 42.22 M2 zero speed delay elapses the drive remains active and the brake is kept open (lifted). Without zero speed delay: The drive receives a Stop command and decelerates along a speed ramp or at torque limit. When the motor speed feedback falls below 42.21 M2 zero speed level, the drive stops and the motor coasts to standstill.						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	 With zero speed delay: The drive receives a Stop command and decelerates along a speed ramp or at torque limit. When the motor speed feedback falls below 42.21 M2 zero speed level the zero-speed delay is activated. Until the zero speed delay elapses, the drive keeps on working and thus the motor can decelerate to standstill.  Is also used for the SS1 function with a fieldbus safety module (FSPS-21/FSO-21). See 42.21 M2 zero speed level.						
	0.0 … 3250.0	0.2	s	10 = 1 s	n	y	Parameter
42.23	**M2 overspeed trip level positive**						
	Motor 2 overspeed trip level positive. If the positive (maximum) trip level for overspeed is exceeded, fault 7310 Overspeed is generated. **Example**: If the maximum speed is 1100 rpm and overspeed trip margin is 300 rpm, the drive trips at 1400 rpm. See 42.25 M2 overspeed trip margin.						
	-30000.00 … 30000.00	-	rpm	See 42.15	y	n	Signal
42.24	**M2 overspeed trip level negative**						
	Motor 2 overspeed trip level negative. If the negative (minimum) trip level for overspeed is exceeded, fault 7310 Overspeed is generated. **Example**: If the minimum speed is -1420 rpm and overspeed trip margin is 300 rpm, the drive trips at -1720 rpm. See 42.25 M2 overspeed trip margin.						
	-30000.00 … 30000.00	-	rpm	See 42.15	y	n	Signal

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">**42.25**</td><td colspan="7">**M2 overspeed trip margin**</td></tr>
<tr><td colspan="7">Motor 2 overspeed trip margin.
Defines, together with 42.19 M2 minimum speed and 42.20 M2 maximum speed, the maximum allowed speed of the motor (overspeed protection). The event generates fault 7310 Overspeed, if the speed feedback, see 90.01 Motor speed for control, exceeds the speed limit defined by 42.19 M2 minimum speed or 42.20 M2 maximum speed by more than the overspeed trip margin.
It is recommended to set 42.25 M2 overspeed trip margin at least to 20 % of the maximum motor speed.
Examples:
– If the maximum speed is 1100 rpm and overspeed trip margin is 300 rpm, the drive trips at 1400 rpm. See 42.23 M2 overspeed trip level positive.
– If the minimum speed is -1420 rpm and overspeed trip margin is 300 rpm, the drive trips at -1720 rpm. See 42.24 M2 overspeed trip level negative.
Note: The overspeed fault for motor 1 is inactive, if 42.25 M2 overspeed trip margin= 0.
 </td></tr>
<tr><td>0.00 … 30000.00</td><td>300.00</td><td>rpm</td><td>See 42.15</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**42.28**</td><td colspan="7">**M2 tacho type**</td></tr>
<tr><td colspan="7">Motor 2 type of connected tacho.
Depending on the type of the connected tacho, a hardware filter of 40 ms is activated.
0: **DC tacho**; disable filter.
1: **AC tacho**; enable filter.</td></tr>
<tr><td>0 … 1</td><td>DC tacho</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**42.29**</td><td colspan="7">**M2 tacho voltage at 1000 rpm**</td></tr>
<tr><td colspan="7">Motor 2 tacho voltage at 1000 rpm.
A tacho generates this voltage at a speed of 1000 rpm, see tacho nameplate. It is used to calculate 42.31 M2 tacho tuning gain. Measure and set the value using 99.20 Tuning requested = Speed feedback assistant.
– 42.29 M2 tacho voltage at 1000 rpm ≥ 1.0 V, the value is set by hand.
– 42.29 M2 tacho voltage at 1000 rpm = 0.0 V, the value is to be measured by means of the speed feedback assistant.
– 42.29 M2 tacho voltage at 1000 rpm ≤ -1.0 V, the value was successfully measured and set by means of the speed feedback assistant.</td></tr>
<tr><td>-270.0 … 270.0</td><td>0.0</td><td>V</td><td>10 = 1 V</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

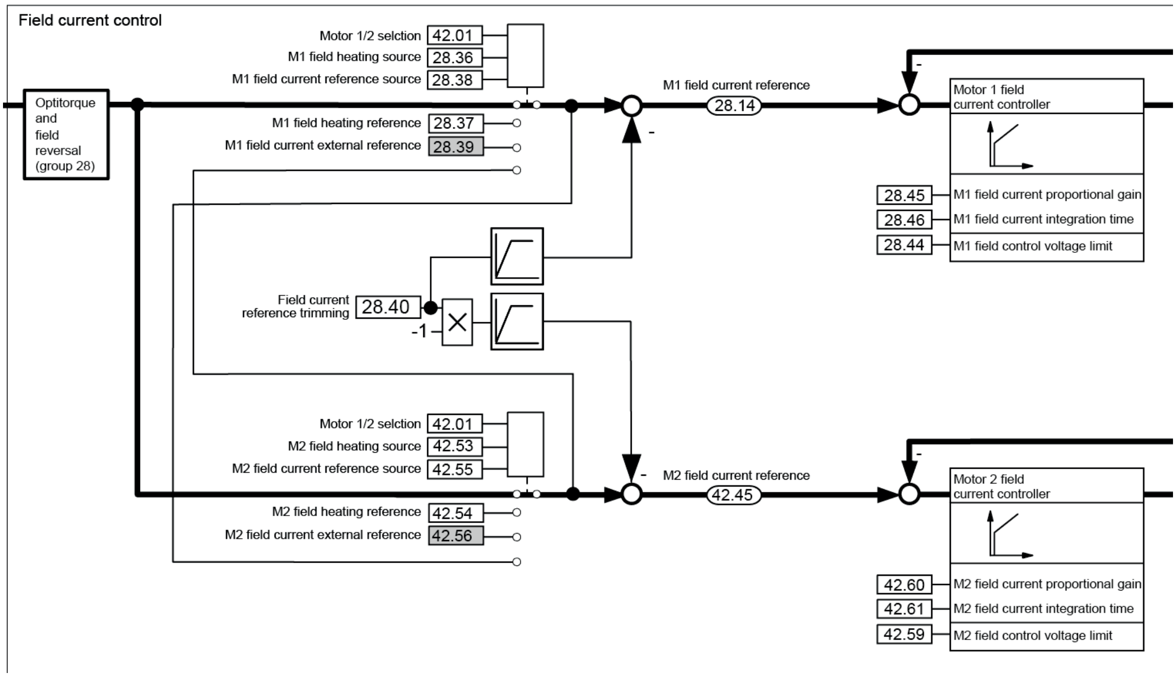
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">42.30</td><td colspan="7">M2 tacho max displayable speed</td></tr>
<tr><td colspan="7">Motor 2 maximum displayable speed.
Internally used maximum tacho speed for motor 2. This value is depending on the tacho output voltage, see 42.29 M2 tacho voltage at 1000 rpm, and the maximum speed of the drive system. For maximum speed, see 42.15 M2 speed scaling actual, 42.19 M2 minimum speed, 42.20 M2 maximum speed, 42.25 M2 overspeed trip margin and 42.11 M2 nominal (base) speed.
The value is only valid if written to by:
– Via 99.20 Tuning requested = Speed feedback assistant.
– Via 42.29 M2 tacho voltage at 1000 rpm.
– Via parameter download.</td></tr>
<tr><td>0.00 … 30000.00</td><td>0.00</td><td>rpm</td><td>See 42.15</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">42.31</td><td colspan="7">M2 tacho tuning gain</td></tr>
<tr><td colspan="7">Motor 2 tacho tuning gain.
Internally used tacho gain tuning for motor 2.
The value is only valid if written to by:
– Via 99.20 Tuning requested = Speed feedback assistant.
– Via 42.29 M2 tacho voltage at 1000 rpm.
– Via parameter download.</td></tr>
<tr><td>0 … 5</td><td>5</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">42.32</td><td colspan="7">M2 tacho fine-tuning adjust</td></tr>
<tr><td colspan="7">Motor 2 tacho fine-tuning adjust.
Internally used fine-tuning adjust of the tacho for motor 2. The value equals the speed feedback measured by means of a handheld tacho. Set the value of 42.32 M2 tacho fine-tuning adjust to the measured speed feedback of a handheld tacho.
The value is only valid if written to by:
– Via 99.20 Tuning requested = Tacho fine-tuning. During the tacho fine-tuning 42.18 M2 feedback selection is automatically forced to EMF.
– Via parameter download.
Attention: The value of 42.32 M2 tacho fine-tuning adjust must be the measured speed feedback of a handheld tacho and not to the delta between speed reference and measured speed in the drive.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>0.00</td><td>rpm</td><td>See 42.15</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">42.33</td><td colspan="7">M2 tacho fine-tuning factor</td></tr>
<tr><td colspan="7">Motor 2 tacho fine-tuning factor.
Internally used tacho fine-tuning factor for motor 2.</td></tr>
<tr><td>0.30 … 3.00</td><td>1.00</td><td>-</td><td>100 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">42.34</td><td colspan="7">M2 tacho offset</td></tr>
<tr><td colspan="7">Motor 2 tacho offset.
Adds an offset to 94.03 Tacho speed.</td></tr>
<tr><td>-10.00 … 10.00</td><td>0.00</td><td>rpm</td><td>See 42.15</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">42.36</td><td colspan="7">M2 current proportional gain</td></tr>
<tr><td colspan="7">Motor 2 proportional gain (K_P) of the armature current controller.
Example: The controller generates 15 % of motor nominal current with 42.36 M2 current proportional gain = 3, if the armature current error is 5 % of 42.08 M2 nominal current.</td></tr>
<tr><td>0.00 … 325.00</td><td>0.10</td><td>-</td><td>100 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>42.37</td><td colspan="7">M2 current integration time</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Motor 2 integration time (T_I) of the armature current controller.
Setting the integration time to zero disables the integral part of the armature current controller and resets the integrator.
The integration time defines the time within the integral part of the armature current controller achieves the same value as the proportional part, when the error value is constant.
Example: The controller generates 15 % of motor nominal current with 42.36 M2 current proportional gain = 3, if the armature current error is 5 % of 42.08 M2 nominal current. On that condition and with 42.37 M2 current integration time = 50 ms follows:
The controller generates 30 % of motor nominal current, if the armature current error is constant, after 50 ms are elapsed. 15 % derive from the proportional part and 15 % derive from the integral part.</td></tr>
<tr><td>0.0 … 32500.0</td><td>50.0</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">42.38</td><td colspan="7">M2 discontinuous current limit</td></tr>
<tr><td colspan="7">Motor 2 discontinuous current limit.
Threshold continuous/discontinuous current in percent of 42.08 M2 nominal current. The measured continuous/discontinuous current state can be read from 06.24.b12 Current controller status word 1.</td></tr>
<tr><td>0.00 … 325.00</td><td>100.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">42.39</td><td colspan="7">M2 armature resistance</td></tr>
<tr><td colspan="7">Motor 2 armature resistance.
Resistance of the armature circuit in mΩ. Used for the EMF calculation/compensation:
$EMF = U_A - R_A \times I_A - L_A \times \frac{dI_A}{dt}$
42.39 M2 armature resistance can be obtained by means of autotuning, see 99.20 Tuning request, or from the motor data sheet.
Note: Do not change the default values of 42.39 M2 armature resistance and 42.40 M2 armature inductance before autotuning! Changing them will falsify the autotuning results.</td></tr>
<tr><td>0 … 65500</td><td>0</td><td>mOhm</td><td>1 = 1 mOhm</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">42.40</td><td colspan="7">M2 armature inductance</td></tr>
<tr><td colspan="7">Motor 2 armature inductance.
Inductance of the armature circuit in mH.
42.40 M2 armature inductance can be obtained by means of autotuning, see 99.20 Tuning request, or from the motor data sheet.
Note: Do not change the default values of 42.39 M2 armature resistance and 42.40 M2 armature inductance before autotuning! Changing them will falsify the autotuning results.
Attention: 42.40 M2 armature inductance is not used for the EMF calculation/compensation.</td></tr>
<tr><td>0.0 … 3250.0</td><td>0.0</td><td>mH</td><td>10 = 1 mH</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">42.41</td><td colspan="7">M2 current limit bridge 2</td></tr>
<tr><td colspan="7">Motor 2 armature current limit for bridge 2.
Current limit bridge 2 in percent of 42.08 M2 nominal current. Setting 42.41 M2 current limit bridge 2 = 0 % disables bridge 2.
Notes:
– The used current limit depends also on the drive‘s actual limitation situation (other torque limits, current limits and field weakening). The limit with the largest value is valid.
– No need to change the default setting of 42.41 M2 current limit bridge 2 for 2-Q operation, because the minimum current limit is internally set to -1 %. See 07.61 Drive block bridge 2 set = Block bridge 2.</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	-325.00 … 0.00	-100.00	%	100 = 1 %	n	y	Parameter
42.42	**M2 current limit bridge 1**						
	Motor 2 armature current limit for bridge 1. Current limit bridge 1 in percent of 42.08 M2 nominal current. Setting 42.42 M2 current limit bridge 1 = 0 % disables bridge 1. **Note**: The used current limit depends also on the drive‘s actual limitation situation (other torque limits, current limits and field weakening). The limit with the smallest value is valid.						
	0.00 … 325.00	100.00	%	100 = 1 %	n	y	Parameter
42.43	**M2 armature inductance current controller**						
	Motor 2 armature inductance. **Note**: Typically left at default. Inductance of the armature circuit in mH. Used for the feed forward (EMF compensation) of the current controller.						
	0.0 … 3250.0	0.0	mH	10 = 1 mH	n	y	Parameter
42.44	**M2 armature inductance EMF speed feedback**						
	Motor 2 armature inductance. **Note**: Typically left at default. Inductance of the armature circuit in mH. Used for the EMF calculation.						
	0.0 … 3250.0	0.0	mH	10 = 1 mH	n	y	Parameter
42.45	**M2 field current reference**						
	Motor 2 field current reference. Displays motor 2 field current reference in percent of 42.10 M2 nominal field current.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
42.46	**M2 field current**						
	Motor 2 field current. Motor 2 measured field current in percent of 42.10 M2 nominal field current.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
42.49	**M2 used field exciter type**						
	Motor 2 field exciter type. 42.49 M2 used field exciter type ≠ None, activates motor 2 field exciter. Now it reacts to an On command and generates field current. **Note**: To activate both field exciters (motor 1 and motor 2) set also 99.07 M1 used field exciter type ≠ None. 0: **None**; no or third-party field exciter connected. 1: **OnBoard**; integrated 1-Q field exciter (for sizes H1 … H4 only). 2: **DCF803-0016**; external 1-Q 16 A field exciter used for field currents from 0.3 A ... 16 A. 3: **FEX-425-Int**; internal 1-Q 25 A field exciter (for size H5 and H6 only) used for field currents from 0.3 A ... 25 A. 4: **DCF803-0035**; external 1-Q 35 A field exciter used for field currents from 0.3 A ... 35 A. 5: **DCF803 terminal 5 A**; external 1-Q 16 A field exciter (DCF803-0016), internal 1-Q 25 A field exciter (FEX-425-Int) or external 1-Q 35 A field exciter (DCF803-0035) used for field currents from 0.3 A ... 5 A. **Note:** Use 5 A terminals. 6: **DCF803-0050**; external 1-Q 50 A field exciter. 7: **DCF804-0050**; external 4-Q 50 A field exciter. 8: **DCF803-0060**; external 1-Q 60 A field exciter. 9: **DCF804-0060**; external 4-Q 60 A field exciter. 10: **DCS880-S01**; external 2-Q standard DCS880 module. 11: **DCS880-S02**; external 4-Q standard DCS880 module. 16: **External field exciter via AI1**; third party field exciter, acknowledge via AI1.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">17: External field exciter via AI2; third party field exciter, acknowledge via AI2.
18: External field exciter via AI3; third party field exciter, acknowledge via AI3.
19: Multiple field exciters; reserved.</td></tr>
<tr><td>0 … 19</td><td>OnBoard</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3">42.50</td><td colspan="7">M2 EMF/field control mode</td></tr>
<tr><td colspan="7">Motor 2 EMF/field control mode.
Motor 2 EMF/field control mode selection.
Note: It is not possible to go into field weakening range when 42.18 M2 feedback selection = EMF.
0: Fix; constant field (no field weakening), EMF controller blocked, field reversal blocked, optitorque blocked.
1: EMF; field weakening active, EMF controller released, field reversal blocked, optitorque blocked.
2: Fix/reversal; constant field (no field weakening), EMF controller blocked, field reversal active, optitorque blocked.
3: EMF/reversal; field weakening active, EMF controller released, field reversal active, optitorque blocked.
4: Fix/optitorque; constant field (no field weakening), EMF controller blocked, field reversal blocked, optitorque active.
5: EMF/optitorque; field weakening active, EMF controller released, field reversal blocked, optitorque active.
6: Fix/reversal/optitorque; constant field (no field weakening), EMF controller blocked, field reversal active, optitorque active.
7: EMF/reversal/optitorque; field weakening active, EMF controller released, field reversal active, optitorque active.</td></tr>
<tr><td>0 … 7</td><td>Fix</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">42.53</td><td colspan="7">M2 field heating source</td></tr>
<tr><td colspan="7">reserved
– Field heating is disabled if:
– Motor 2 field heating reference is set with 42.54 M2 field heating reference. Motor 2 field heating can be disabled, when the reference is set to zero. Motor 2 field nominal current is set with 42.10 M2 nominal field current.
– In case motor 2 field exciter is not connected via a separate field contactor following settings apply for motor 2 field heating:
– When two motors in shared motion are used and field economy is needed for motor 2, set 42.53 M2 field heating source = Disable field heating. See also 42.54 M2 field heating reference.
– When 42.53 M2 field heating source = Enable with On, 100 % field current for motor 2 is kept, while the procedure to close the brake is active.</td></tr>
<tr><td>0 … 19</td><td>Disable field heating</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">42.54</td><td colspan="7">M2 field heating reference</td></tr>
<tr><td colspan="7">Motor 2 field heating current reference.
Field current reference in percent of 42.10 M2 nominal field current for field heating and field economy.
Field heating:
– Field heating is enabled according to 28.36 M1 field heating source.
– Field heating is disabled when 42.54 M2 field heating reference = 0.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Field economy:
– Field economy is only available when 2 motors with 2 independent field exciters are connected to the drive.
– Field economy for motor 2 is enabled, if:
  – 42.54 M2 field heating reference < 100 %.
  – 28.36 M1 field heating source = Disable field heating or Enable field heating.
– Field economy for motor 2 is activated, if:
  – The On command is given for longer than 10 s.
  – Motor 1 is selected via 42.01 Motor 1/2 selection.
  – Motor 1 is active. See 06.18.b04 Drive status word 3.
  – 28.38 M1 field current reference source = 42.55 M2 field current reference source = Internal.Field heating is enabled according to 42.53 M2 field heating source.
– Field heating is disabled when 42.54 M2 field heating reference = 0.
– Field economy is only available when 2 motors with 2 independent field exciters are connected to the drive.
– Field economy for motor 2 is enabled, if:
– Field economy for motor 2 is activated, if:
  –</td></tr>
<tr><td>0.00 … 100.00</td><td>0.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">42.55</td><td colspan="7">M2 field current reference source</td></tr>
<tr><td colspan="7">Motor 2 field current reference source.
Selector for motor 2 field current reference.
0: Internal; motor 2 field current reference according to field heating or shared motion. See 42.53 M2 field heating source and 42.01 Motor 1/2 selection.
1: Motor 1 reference; motor 1 field current reference is taken.
2: Motor 2 external; 42.56 M2 field current external reference.



</td></tr>
<tr><td>0 … 2</td><td>Internal</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>42.56</td><td colspan="7">M2 field current external reference</td></tr>
</table>

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	Motor 2 external field current reference. External field current reference input of the drive, in percent of 42.10 M2 nominal field current. Can be connected via 42.55 M2 field current reference source.						
	-100.00 … 100.00	0.00	%	100 = 1 %	n	y	Parameter
42.59	**M2 field control voltage limit**						
	Motor 2 voltage limit for the field exciter. Positive voltage limit for motor 2 field exciter in percent of the maximum possible field exciter output voltage. **Example**: With a 3-phase supply voltage of 400 V_{AC} the field current controller can generate a maximum average output voltage of 521 V_{DC}. In case the rated field supply voltage is 200 V_{DC} it is possible to limit the field exciter output voltage. E.g. to get a maximum average output voltage of 240 V_{DC} set the limit to 46 %. This is achieved by limiting the firing angle of the field current controller. **Note**: 4-Q field exciters that can reverse the field current will use the setting for positive and negative voltage limit.						
	0.00 … 100.00	100.00	%	100 = 1 %	n	y	Parameter
42.60	**M2 field current proportional gain**						
	Proportional gain (K_P) of the field current controller. **Example**: The controller generates 15 % of motor nominal field voltage (see motor nameplate) with 42.60 M2 field current proportional gain = 3, if the field current error is 5 % of 42.10 M2 nominal field current.						
	0.00 … 325.00	0.20	-	100 = 1	n	y	Parameter
42.61	**M2 field current integration time**						
	Integration time (T_I) of the field current controller. Setting the integration time to zero disables the integral part of the filed current controller and resets the integrator. The integration time defines the time within the integral part of the field current controller achieves the same value as the proportional part, when the error value is constant. **Example**: The controller generates 15 % of motor nominal field voltage (see motor nameplate) with 42.60 M2 field current proportional gain = 3, if the field current error is 5 % of 42.10 M2 nominal field current. On that condition and with 42.61 M2 field current integration time = 200 ms follows: The controller generates 30 % of motor nominal field voltage, if the field current error is constant, after 200 ms are elapsed. 15 % derive from the proportional part and 15 % derive from the integral part.						
	0 … 32500	200	ms	1 = 1 ms	n	y	Parameter
42.62	**M2 field current low level**						
	Motor 2 field current low level. The event generated fault F541 M1 field exciter low current, if 42.62 M2 field current low level in percent of 42.10 M2 nominal field current is still undershot when 31.57 Minimum field current trip delay elapses. **Notes**: – 42.62 M2 field current low level is not valid during field heating and field economy. In these cases, the fault level is automatically set to 50 % of 42.54 M2 field heating reference. The event generates fault F542 M2 field exciter low current, if 50 % of 42.54 M2 field heating reference is still undershot when 31.57 Minimum field current trip delay elapses. – 42.62 M2 field current low level is not valid for 42.50 M2 EMF/field control mode = Fix/optitorque, EMF/optitorque, Fix/reversal/optitorque and EMF/reversal/optitorque. In these cases, the fault level is automatically set to 50 % of 42.45 M2 field current reference.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">The event generates fault F542 M2 field exciter low current, if 50 % of 42.45 M2 field current reference is still undershot when 31.57 Minimum field current trip delay elapses.</td></tr>
<tr><td>0.00 … 325.00</td><td>50.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**42.63**</td><td colspan="7">**M2 field overcurrent level**</td></tr>
<tr><td colspan="7">Motor 2 field overcurrent level.
The event generates fault F518 M2 field exciter overcurrent, if 42.63 M2 field overcurrent level in percent of 42.10 M2 nominal field current is exceeded. It is recommended to set 42.63 M2 field overcurrent level at least 25 % higher than 42.10 M2 nominal field current.
Notes:
– The field overcurrent fault is inactive, if 42.63 M2 field overcurrent level = 325 %.
– During field boost, the internal field overcurrent level is set to field overcurrent level plus field boost current.</td></tr>
<tr><td>0.00 … 325.00</td><td>125.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**42.66**</td><td colspan="7">**Set: M2 field exciter current scaling**</td></tr>
<tr><td colspan="7">Set: Motor 2 field exciter scaling factor.
If the scaling is changed, the new value is taken over immediately.
To use 42.66 Set: M2 field exciter current scaling following inequation must be valid:
– 42.10 M2 nominal field current ≤ 42.66 Set: M2 field exciter current scaling ≤ maximum field current of the used field exciter.
Notes:
– For 42.66 Set: M2 field exciter current scaling > maximum field current of the used field exciter warning A132 Parameter setting conflict is generated.
– For 42.10 M2 nominal field current > 42.66 Set: M2 field exciter current scaling the scaling is set automatically.
– The scaling factor is released when 42.10 M2 nominal field current < 42.66 Set: M2 field exciter current scaling and 42.49 M2 used field exciter type = OnBoard … DCF804-0060.</td></tr>
<tr><td>0.00 … 60.00</td><td>0.00</td><td>A</td><td>100 = 1 A</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**42.67**</td><td colspan="7">**M2 field exciter freewheeling level**</td></tr>
<tr><td colspan="7">Motor 2 field exciter freewheeling level.
The freewheeling level is shown in percent per 1 ms of the measured field exciter supply voltage. If 2 successive AC-voltage measurements differ more than 42.67 M2 field exciter freewheeling level, the freewheeling function is activated.
Note: The freewheeling level is only valid, for 42.49 M2 used field exciter type = DCF804-0050 … DCF804-0060.</td></tr>
<tr><td>0.00 … 100.00</td><td>20.00</td><td>%/ms</td><td>100 = 1 %/ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**42.68**</td><td colspan="7">**M2 field exciter operation mode**</td></tr>
<tr><td colspan="7">Motor 2 operation mode for certain field exciters.
The field exciters DCF803-0016, FEX-425-Int and DCF803-0035 can be connected to either a 3-phase supply or a single-phase supply.
0: **1-phase**; single-phase supply for the field exciter.
1: **3-phase**; 3-phase supply for the field supply.</td></tr>
<tr><td>0 … 1</td><td>3-phase</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td></td><td colspan="7">**Motor 2 mechanical brake control**
For more information see group 44 Mechanical brake control.</td></tr>
<tr><td rowspan="2">**42.71**</td><td colspan="7">**M2 brake control status**</td></tr>
<tr><td colspan="7">Motor 2 mechanical brake control status word.
Displays the mechanical brake control status word of motor 2.</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

Bit assignment:

Bit	Name	Value	Remarks
0	Brake open command	1	Brake Open command. Connect this bit to the desired digital output.
		0	Brake Close command.
1	Brake open torque requested	1	Brake open torque requested from the drive logic.
		0	Brake open torque not requested.
2	Ramp output zero during opening	1	Force the ramp output to zero during opening the brake.
		0	Ramp output not forced.
3	Stop ramp requested	1	Ramp down to zero speed requested from the drive logic.
		0	Ramp down not requested.
4	Brake control enabled	1	Brake control is enabled.
		0	Brake control is disabled.
5	Brake closed	1	Brake is closed.
		0	Brake is open.
6	Brake opening	1	Brake is currently opening.
		0	Brake is either open or closed.
7	Brake open	1	Brake is open.
		0	Brake is closed.
8	Brake closing	1	Brake is currently closing.
		0	Brake is either open or closed.
9	reserved		
10	reserved		
11	reserved		
12	Torque proving request	1	Torque proving requested.
		0	Torque proving not requested.
13	Torque proving OK	1	Torque proving is OK.
		0	Torque proving failed.
14	Torque proving not OK	1	Torque proving failed.
		0	Torque proving is OK.
15	Brake acknowledge failed	1	Brake acknowledge failed.
		0	Brake acknowledge OK.

Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

42.72 **M2 brake torque memory**

Motor 2 brake torque memory.
Displays the saved torque at the instant of the previous brake Close command. See 42.71.b00 M2 brake control status. This value can be used as reference for the brake open torque. See 42.79 M2 brake open torque source and 42.80 M2 brake open torque.
42.72 M2 brake torque memory can be reset using 06.11.b05 Auxiliary control word 2.

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	-325.0 … 325.0	0.0	%	10 = 1 %	y	n	Signal
42.73	**M2 brake open torque reference**						
	Motor 2 currently active brake open torque. Displays the currently active brake open torque. See 42.79 M2 brake open torque source and 42.80 M2 brake open torque. The value presets integration time 1 (TI) of the speed controller.						
	-325.0 … 325.0	0.0	%	10 = 1 %	y	n	Signal
42.76	**M2 brake control enable**						
	Motor 2 enable the brake control. Enables/Disables the mechanical brake control. 0 = Disable the mechanical brake control. 1 = Enable the mechanical brake control. **Other [bit]**; source selection. 0: **Not selected**; 0, Disable the mechanical brake control. 1: **Selected**; 1, enable the mechanical brake control. 3: **DI1**; 10.02.b00 DI delayed status. 4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status.						
	0 … 19	Not selected	-	1 = 1	n	n	Parameter
42.77	**M2 brake acknowledge source**						
	Motor 2 brake acknowledge source. Enables/Disables the brake open/close acknowledge. When a brake control error, unexpected state of the brake acknowledge, is detected, the drive reacts as defined by 42.87 M2 brake fault function. 0 = Brake closed. 1 = Brake open. **Other [bit]**; source selection. 0: **No acknowledge**; 0. Disable the brake acknowledge. 1: **Acknowledge**; 1. Force the brake acknowledge to open. 2: **None**; inactive. Disable brake acknowledge. 3: **DI1**; 10.02.b00 DI delayed status. 4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status.						
	0 … 12	None	-	1 = 1	n	y	Parameter
42.78	**M2 brake open delay**						
	Motor 2 brake open delay.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	Defines the delay between the brake Open command, see 42.71.b00 M2 brake control status, and the release of the speed controller. Thus, the output of the speed ramp is forced to zero. The delay time starts when the drive has increased the motor torque to the level required for the brake release. See 42.73.M2 brake open torque reference. Simultaneously with the start of the timer, the brake control logic energizes the brake control output and the brake starts to open. Set 42.78 M2 brake open delay to the value of the mechanical opening delay specified by the brake manufacturer.						
	0.00 … 5.00	0.00	s	100 = 1 s	n	y	Parameter
42.79	**M2 brake open torque source**						
	Motor 2 brake open torque source. Defines a source that is used as motor 2 brake open torque reference. The value of the source is only taken if: – The absolute value is greater than the setting of 42.80 M2 brake open torque. – The sign is the same as the setting of 42.80 M2 brake open torque. Otherwise the value of 42.80 M2 brake open torque is used. **Other**; source selection. 0: **Zero**; 0 %, brake open torque is set to zero. 1: **AI1 scaled**; 12.12 AI1 scaled value. 2: **AI2 scaled**; 12.22 AI2 scaled value. 3: **FBA A reference 1**; 03.05 FBA A reference 1. 4: **FBA A reference 2**; 03.06 FBA A reference 2. 7: **M2 brake torque memory**; 44.72 M2 brake torque memory. 8: **M2 brake open torque**; 42.80 M2 brake open torque. **Attention:** For the hoist in a crane use only positive values.						
	0 … 8	M2 brake open torque	-	1 = 1	n	y	Parameter
42.80	**M2 brake open torque**						
	Motor 2 brake open torque. Defines the sign, e.g. for the direction of rotation, and the minimum absolute value of the brake open torque in percent of 42.04 M2 nominal torque. Input value for 42.79 M2 brake open torque source. **Note:** The value of the source selected by 42.79 M2 brake open torque source is used as the brake open torque only if it has the same sign as 42.80 M2 brake open torque and has a greater absolute value.						
	-325.0 … 325.0	0.0	%	10 = 1 %	n	y	Parameter
42.81	**M2 keep brake closed**						
	Motor 2 keep brake closed. Selects a source that prevents the brake from opening. See 42.71 b00 M2 brake control status. 0 = Normal brake operation. 1 = Keep brake closed or force brake to close. **Other [bit]**; source selection. 0: **Not selected**; 0, normal brake operation. 1: **Selected**; 1, keep brake closed or force brake to close. 3: **DI1**; 10.02.b00 DI delayed status. 4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">8: **DI6**; 10.02.b05 DI delayed status.
11: **DIO1**; 11.02.b00 DIO delayed status.
12: **DIO2**; 11.02.b01 DIO delayed status.
19: **DIL**; 10.02.b15 DI delayed status.</td></tr>
<tr><td>0 … 19</td><td>Not selected</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3">**42.82**</td><td colspan="7">**M2 brake close request**</td></tr>
<tr><td colspan="7">reserved</td></tr>
<tr><td>0 … 19</td><td>Not selected</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3">**42.83**</td><td colspan="7">**M2 brake close delay**</td></tr>
<tr><td colspan="7">Motor 2 brake close delay.
Defines the delay between the brake Close command, see 42.71.b00 M2 brake control status, and the moment when the drive is being switched off. The speed controller is kept active with zero speed reference until the brake actually closes and the brake acknowledge is received.
Set 42.83 M2 brake close delay to the value of the mechanical make-up time/close delay specified by the brake manufacturer.</td></tr>
<tr><td>0.00 … 60.00</td><td>0.00</td><td>s</td><td>100 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**42.87**</td><td colspan="7">**M2 brake fault function**</td></tr>
<tr><td colspan="7">Motor 2 brake fault function.
Determines how the drive reacts upon a mechanical brake control error. It is the reaction of a delayed or missing brake acknowledge. See 42.77 M2 brake acknowledge source.
Note: When 42.77 M2 brake acknowledge source = No acknowledge, the brake acknowledge is disabled and will generate no warnings or faults.
0: **Warning**;
– After a brake Close command the event generates warning A7A1 Mechanical brake closing failed if the brake close acknowledge is not set within 44.18 M1 brake fault delay.
– After a brake Open command the event generates warning A7A2 Mechanical brake opening failed if the brake open acknowledge is not set within 42.88 M2 brake fault delay.
– The event generates warning A7A5 Mechanical brake opening not allowed if the brake open conditions cannot be fulfilled. E.g. the required motor starting torque is not reached.
1: **Fault**;
– After a brake Close command the event generates fault 71A2 Mechanical brake closing failed if the brake close acknowledge is not set within 42.88 M2 brake fault delay.
– After a brake Open command the event generates fault 71A3 Mechanical brake opening failed if the brake open acknowledge is not set within 42.88 M2 brake fault delay.
– The event generates fault 71A5 Mechanical brake opening not allowed if the brake open conditions cannot be fulfilled. E.g. the required motor starting torque is not reached.
3: **Crane**;
– After a brake Close command the event generates warning A116 Brake long falling if the brake close acknowledge is not received within 42.90 M2 brake long time. The speed controller remains active with zero speed reference until the brake close acknowledge is received. After the brake close acknowledge has been received fault 71A2 Mechanical brake closing failed is generated.
If the brake close acknowledge is not received at all, the drive can only be stopped using the Off2 (emergency off) command. See 20.04.Off2 source 1 (emergency off).
– After a brake Open command the event generates fault 71A3 Mechanical brake opening failed if the brake open acknowledgement is not set within 42.88 M2 brake fault delay.
– The event generates fault 71A5 Mechanical brake opening not allowed if the brake open conditions cannot be fulfilled. E.g. the required motor starting torque is not reached.</td></tr>
</table>

Index	Name Text Range		Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	0 … 3		Warning	-	1 = 1	n	y	Parameter
42.88	**M2 brake fault delay**							
	Motor 2 delay time for all events brake acknowledge. 42.88 M2 brake fault delay delays: – Warning A7A1 Mechanical brake closing failed. – Warning A7A2 Mechanical brake opening failed. – Warning A7A5 Mechanical brake opening not allowed. – Fault 71A2 Mechanical brake closing failed. – Fault 71A3 Mechanical brake opening failed. – Fault 71A5 Mechanical brake opening not allowed. If the brake acknowledge is correct before the delay elapses, all brake events will be disregarded. **Note:** The delay time must be set longer than the feedback time at normal operation.							
	0.00 … 60.00		0.00	s	100 = 1 s	n	y	Parameter
42.90	**M2 brake long time**							
	Motor 2 brake long falling. In case 42.87 M2 brake fault function = Crane and a brake close acknowledge is not received within 42.90 M2 brake long time warning A116 Brake long falling is generated. The speed controller remains active with zero speed reference until the brake close acknowledge is received. After the brake close acknowledge has been received fault 71A2 Mechanical brake closing failed is generated. If the brake close acknowledge is not received at all, the drive can only be stopped using the Off2 (emergency off) command. See 20.04.Off2 source 1 (emergency off).							
	0.00 … 60.00		4.00	s	100 = 1 s	n	y	Parameter
42.95	**M2 brake torque proving time**							
	Motor 2 brake torque proving time. The drive trips with F556 Torque proving if the Run command is set and 42.71.b13 M2 brake control status is not high before 42.95 M2 brake torque proving time is elapsed. **Note:** Torque proving is inactive, if 42.95 M2 brake torque proving time = 0.							
	0.00 … 100.00		0.00	s	100 = 1 s	n	y	Parameter
42.96	**M2 Torque proving reference**							
	Motor 2 Torque proving reference. Reference selection for torque proving. **Notes:** – External/Internal torque proving is inactive, if 42.95 M2 brake torque proving time = 0. – The brake stays closed during torque proving. **Other**; source selection. 0: **None/External proving**; external torque proving is enabled, if 42.95 M2 brake torque proving time > 0. 1: **AI1 scaled**; 12.12 AI1 scaled value. Internal torque proving is enabled, if 42.95 M2 brake torque proving time > 0. 2: **AI2 scaled**; 12.22 AI2 scaled value. Internal torque proving is enabled, if 42.95 M2 brake torque proving time > 0. 3: **FBA A reference 1**; 03.05 FBA A reference 1. Internal torque proving is enabled, if 42.95 M2 brake torque proving time > 0. 4: **FBA A reference 2**; 03.06 FBA A reference 2. Internal torque proving is enabled, if 42.95 M2 brake torque proving time > 0. 7: **M2 brake torque memory**; 42.72 M2 brake torque memory. Internal torque proving is enabled, if 42.95 M2 brake torque proving time > 0.							

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	8: **M2 brake open torque**; 42.80 M2 brake open torque. Internal torque proving is enabled, if 42.95 M2 brake torque proving time > 0. 9: **Fix value 25 %**;torque reference is set to 25 % of 42.04 M2 nominal torque. Internal torque proving is enabled, if 42.95 M2 brake torque proving time > 0. **External torque proving procedure:** – In the drive set 42.95 M2 brake torque proving time > 0. – In the drive set 42.96 M2 Torque proving reference = None/External proving. – The overriding control gives a Run command. – The drive sets bit Torque proving request, see 42.71.b12 M2 brake control status. – The overriding control reads that bit, switches the drive to torque control and sends a torque reference. – The overriding control executes the torque proving. – The overriding control sets bit Torque proving OK, see 06.11.b04 Auxiliary control word 2, when the torque proving is finished without problems. Then the drive is switched back to speed control. – The drive sets bit Torque proving OK, see 42.71.b13 M2 brake control status. – The drive continues with the brake open sequence. **Internal torque proving procedure:** – In the drive set 42.95 M2 brake torque proving time > 0. – In the drive set 42.96 M2 Torque proving reference = AI1 scaled, ..., Fix value 25 %. – The drive starts with the internal torque proving after a Run command is set. – The drive sets bit Torque proving OK, see 42.11.b13 M brake control status, if 01.18 Motor torque 100 ms filtered has reached 80 % of the given torque reference. – The drive continues with the brake open sequence.						
	0 … 9	Fix value 25 %	-	1 = 1	n	y	Parameter

44 Mechanical brake control

Configuration of the mechanical brake control.

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	Mechanical brake control The DCS880 mechanical brake control provides the function to open (lift) and close (apply) the brake in cooperation with the speed controller, see group 25 Speed control, and the speed ramp, see group 23 Speed reference ramp. The incorporation provides a smooth operation with a minimum brake wear due to friction, even for hanging loads. The best stop behavior is utilized using the S-ramp. See group 23 Speed reference ramp. The mechanical brake control is equipped with additional monitoring functions for the brake acknowledge feedback to avoid further damage in case of aging or mechanical problems of the brake. **Attention:** – The mechanical brake control is activated with the Run command, see 06.09.b03 Main control word. – The mechanical brake control requires a continuous On command, see 06.09.b00 Main control word, thus, the motor maintains the full excitation current. – The use of the Start command in local mode via Drive composer or Control panel sets both, the On and Run commands, at the same time. That means, local mode is forbidden to be used together with the mechanical brake control and hanging loads.						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

Reason: The full field current needs time to be established.

44.01 **M1 brake control status**

Motor 1 mechanical brake control status word.
Displays the mechanical brake control status word of motor 1.
Bit assignment:

Bit	Name	Value	Remarks
0	Brake open command	1	Brake Open command. Connect this bit to the desired digital output.
		0	Brake Close command.
1	Brake open torque requested	1	Brake open torque requested from the drive logic.
		0	Brake open torque not requested.
2	Ramp output zero during opening	1	Force the ramp output to zero during opening the brake.
		0	Ramp output not forced.
3	Stop ramp requested	1	Ramp down to zero speed requested from the drive logic.
		0	Ramp down not requested.
4	Brake control enabled	1	Brake control is enabled.
		0	Brake control is disabled.
5	Brake closed	1	Brake is closed.
		0	Brake is open.
6	Brake opening	1	Brake is currently opening.
		0	Brake is either open or closed.
7	Brake open	1	Brake is open.
		0	Brake is closed.
8	Brake closing	1	Brake is currently closing.
		0	Brake is either open or closed.
9	reserved		
10	reserved		
11	reserved		
12	Torque proving request	1	Torque proving requested.
		0	Torque proving not requested.
13	Torque proving OK	1	Torque proving is OK.
		0	Torque proving failed.
14	Torque proving not OK	1	Torque proving failed.
		0	Torque proving is OK.
15	Brake acknowledge failed	1	Brake acknowledge failed.
		0	Brake acknowledge OK.

Range	Default	Unit	Scale/FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

44.02 **M1 brake torque memory**

Motor 1 brake torque memory.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Displays the saved torque at the instant of the previous brake Close command. See 44.01.b00 M1 brake control status. This value can be used as reference for the brake open torque. See 44.09 M1 brake open torque source and 44.10 M1 brake open torque.
44.02 M1 brake torque memory can be reset using 06.11.b05 Auxiliary control word 2.</td></tr>
<tr><td>-325.0 … 325.0</td><td>0.0</td><td>%</td><td>10 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">44.03</td><td colspan="7">M1 brake open torque reference</td></tr>
<tr><td colspan="7">Motor 1 currently active brake open torque.
Displays the currently active brake open torque. See 44.09 M1 brake open torque source and 44.10 M1 brake open torque.
The value presets integration time 1 (TI) of the speed controller.</td></tr>
<tr><td>-325.0 … 325.0</td><td>0.0</td><td>%</td><td>10 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">44.06</td><td colspan="7">M1 brake control enable</td></tr>
<tr><td colspan="7">Motor 1 enable the brake control.
Enables/Disables the mechanical brake control.
0 = Disable the mechanical brake control.
1 = Enable the mechanical brake control.
Other [bit]; source selection.
0: Not selected; 0, Disable the mechanical brake control.
1: Selected; 1, enable the mechanical brake control.
3: DI1; 10.02.b00 DI delayed status.
4: DI2; 10.02.b01 DI delayed status.
5: DI3; 10.02.b02 DI delayed status.
6: DI4; 10.02.b03 DI delayed status.
7: DI5; 10.02.b04 DI delayed status.
8: DI6; 10.02.b05 DI delayed status.
11: DIO1; 11.02.b00 DIO delayed status.
12: DIO2; 11.02.b01 DIO delayed status.
19: DIL; 10.02.b15 DI delayed status.</td></tr>
<tr><td>0 … 19</td><td>Not selected</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="2">44.07</td><td colspan="7">M1 brake acknowledge source</td></tr>
<tr><td colspan="7">Motor 1 brake acknowledge source.
Enables/Disables the brake open/close acknowledge.
When a brake control error, unexpected state of the brake acknowledge, is detected, the drive reacts as defined by 44.17 M1 brake fault function.
0 = Brake closed.
1 = Brake open.
Other [bit]; source selection.
0: No acknowledge; 0. Disable the brake acknowledge.
1: Acknowledge; 1. Force the brake acknowledge to open.
2: None; inactive. Disable brake acknowledge.
3: DI1; 10.02.b00 DI delayed status.
4: DI2; 10.02.b01 DI delayed status.
5: DI3; 10.02.b02 DI delayed status.
6: DI4; 10.02.b03 DI delayed status.
7: DI5; 10.02.b04 DI delayed status.
8: DI6; 10.02.b05 DI delayed status.
11: DIO1; 11.02.b00 DIO delayed status.
12: DIO2; 11.02.b01 DIO delayed status.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td>0 … 12</td><td>None</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">44.08</td><td colspan="7">M1 brake open delay</td></tr>
<tr><td colspan="7">Motor 1 brake open delay.
Defines the delay between the brake Open command, see 44.01.b00 M1 brake control status, and the release of the speed controller. Thus, the output of the speed ramp is forced to zero. The delay time starts when the drive has increased the motor torque to the level required for the brake release. See 44.03.M1 brake open torque reference.
Simultaneously with the start of the timer, the brake control logic energizes the brake control output and the brake starts to open.
Set 44.08 M1 brake open delay to the value of the mechanical opening delay specified by the brake manufacturer.</td></tr>
<tr><td>0.00 … 5.00</td><td>0.00</td><td>s</td><td>100 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">44.09</td><td colspan="7">M1 brake open torque source</td></tr>
<tr><td colspan="7">Motor 1 brake open torque source.
Defines a source that is used as motor 1 brake open torque reference. The value of the source is only taken if:
– The absolute value is greater than the setting of 44.10 M1 brake open torque.
– The sign is the same as the setting of 44.10 M1 brake open torque.
Otherwise the value of 44.10 M1 brake open torque is used.
Other; source selection.
0: Zero; 0 %, brake open torque is set to zero.
1: AI1 scaled; 12.12 AI1 scaled value.
2: AI2 scaled; 12.22 AI2 scaled value.
3: FBA A reference 1; 03.05 FBA A reference 1.
4: FBA A reference 2; 03.06 FBA A reference 2.
7: M1 brake torque memory; 44.02 M1 brake torque memory.
8: M1 brake open torque; 44.10 M1 brake open torque.
Attention: For the hoist in a crane use only positive values.</td></tr>
<tr><td>0 … 8</td><td>M1 brake open torque</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">44.10</td><td colspan="7">M1 brake open torque</td></tr>
<tr><td colspan="7">Motor 1 brake open torque.
Defines the sign, e.g. for the direction of rotation, and the minimum absolute value of the brake open torque in percent of 99.02 M1 nominal torque.
Input value for 44.09 M1 brake open torque source.
Note: The value of the source selected by 44.09 M1 brake open torque source is used as the brake open torque only if it has the same sign as 44.10 M1 brake open torque and has a greater absolute value.</td></tr>
<tr><td>-325.0 … 325.0</td><td>0.0</td><td>%</td><td>10 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">44.11</td><td colspan="7">M1 keep brake closed</td></tr>
<tr><td colspan="7">Motor 1 keep brake closed.
Selects a source that prevents the brake from opening. See 44.01 b00 M1 brake control status.
0 = Normal brake operation.
1 = Keep brake closed or force brake to close.
Other [bit]; source selection.
0: Not selected; 0, normal brake operation.
1: Selected; 1, keep brake closed or force brake to close.
3: DI1; 10.02.b00 DI delayed status.
4: DI2; 10.02.b01 DI delayed status.</td></tr>
</table>

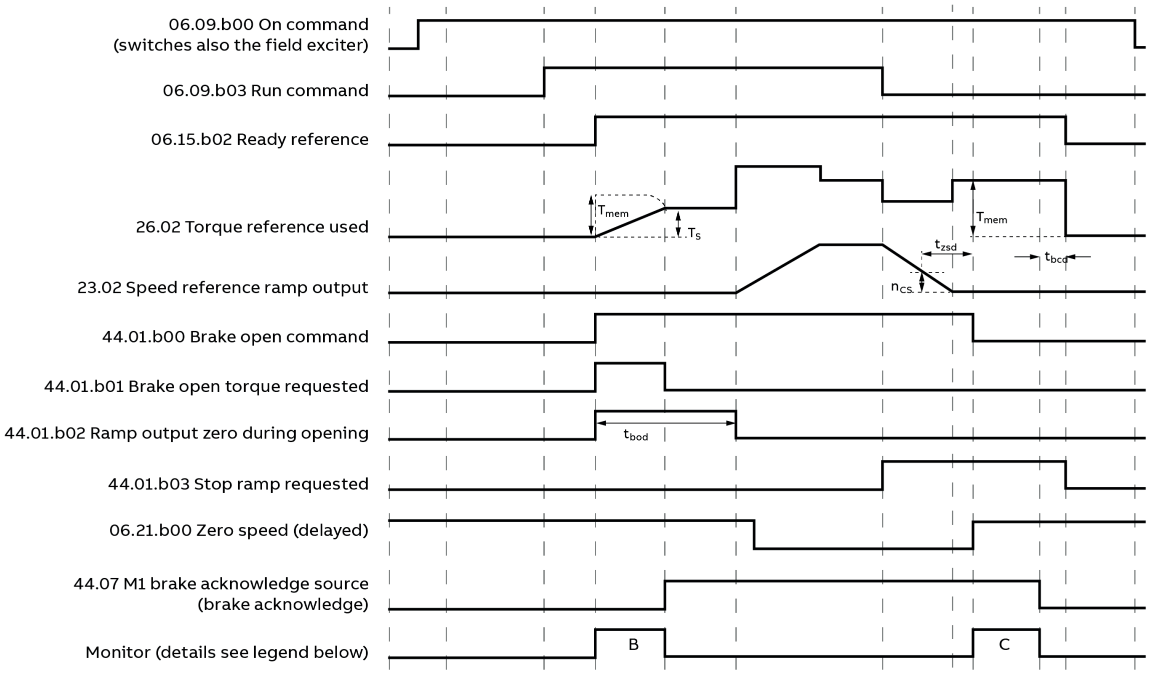
Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status.						
	0 … 19	Not selected	-	1 = 1	n	n	Parameter
44.12	**M1 brake close request**						
	reserved						
	0 … 19	Not selected	-	1 = 1	n	n	Parameter
44.13	**M1 brake close delay**						
	Motor 1 brake close delay. Defines the delay between the brake Close command, see 44.01.b00 M1 brake control status, and the moment when the drive is being switched off. The speed controller is kept active with zero speed reference until the brake actually closes and the brake acknowledge is received. Set 44.13 M1 brake close delay to the value of the mechanical make-up time/close delay specified by the brake manufacturer.						
	0.00 … 60.00	0.00	s	100 = 1 s	n	y	Parameter
44.17	**M1 brake fault function**						
	Motor 1 brake fault function. Determines how the drive reacts upon a mechanical brake control error. It is the reaction of a delayed or missing brake acknowledge. See 44.07 M1 brake acknowledge source. **Note:** When 44.07 M1 brake acknowledge source = No acknowledge, the brake acknowledge is disabled and will generate no warnings or faults. 0: **Warning**; – After a brake Close command the event generates warning A7A1 Mechanical brake closing failed if the brake close acknowledge is not set within 44.18 M1 brake fault delay. – After a brake Open command the event generates warning A7A2 Mechanical brake opening failed if the brake open acknowledge is not set within 44.18 M1 brake fault delay. – The event generates warning A7A5 Mechanical brake opening not allowed if the brake open conditions cannot be fulfilled. E.g. the required motor starting torque is not reached. 1: **Fault**; – After a brake Close command the event generates fault 71A2 Mechanical brake closing failed if the brake close acknowledge is not set within 44.18 M1 brake fault delay. – After a brake Open command the event generates fault 71A3 Mechanical brake opening failed if the brake open acknowledge is not set within 44.18 M1 brake fault delay. – The event generates fault 71A5 Mechanical brake opening not allowed if the brake open conditions cannot be fulfilled. E.g. the required motor starting torque is not reached. 3: **Crane**; – After a brake Close command the event generates warning A116 Brake long falling if the brake close acknowledge is not received within 44.20 M1 brake long time. The speed controller remains active with zero speed reference until the brake close acknowledge is received. After the brake close acknowledge has been received fault 71A2 Mechanical brake closing failed is generated. If the brake close acknowledge is not received at all, the drive can only be stopped using the Off2 (emergency off) command. See 20.04.Off2 source 1 (emergency off).						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	– After a brake Open command the event generates fault 71A3 Mechanical brake opening failed if the brake open acknowledgement is not set within 44.18 M1 brake fault delay. – The event generates fault 71A5 Mechanical brake opening not allowed if the brake open conditions cannot be fulfilled. E.g. the required motor starting torque is not reached.						
	0 … 3	Warning	-	1 = 1	n	y	Parameter
44.18	**M1 brake fault delay**						
	Motor 1 delay time for all events brake acknowledge. 44.18 M1 brake fault delay delays: – Warning A7A1 Mechanical brake closing failed. – Warning A7A2 Mechanical brake opening failed. – Warning A7A5 Mechanical brake opening not allowed. – Fault 71A2 Mechanical brake closing failed. – Fault 71A3 Mechanical brake opening failed. – Fault 71A5 Mechanical brake opening not allowed. If the brake acknowledge is correct before the delay elapses, all brake events will be disregarded. **Note:** The delay time must be set longer than the feedback time at normal operation.						
	0.00 … 60.00	0.00	s	100 = 1 s	n	y	Parameter
44.20	**M1 brake long time**						
	Motor 1 brake long falling. In case 44.17 M1 brake fault function = Crane and a brake close acknowledge is not received within 44.20 M1 brake long time warning A116 Brake long falling is generated. The speed controller remains active with zero speed reference until the brake close acknowledge is received. After the brake close acknowledge has been received fault 71A2 Mechanical brake closing failed is generated. If the brake close acknowledge is not received at all, the drive can only be stopped using the Off2 (emergency off) command. See 20.04.Off2 source 1 (emergency off).						
	0.00 … 60.00	4.00	s	100 = 1 s	n	y	Parameter
44.25	**M1 brake torque proving time**						
	Motor 1 brake torque proving time. The drive trips with F556 Torque proving if the Run command is set and 44.01.b13 M1 brake control status is not high before 44.25 M1 brake torque proving time is elapsed. **Note:** Torque proving is inactive, if 44.25 M1 brake torque proving time = 0.						
	0.00 … 100.00	0.00	s	100 = 1 s	n	y	Parameter
44.26	**M1 Torque proving reference**						
	Motor 1 Torque proving reference. Reference selection for torque proving. **Notes:** – External/Internal torque proving is inactive, if 44.25 M1 brake torque proving time = 0. – The brake stays closed during torque proving. **Other**; source selection. 0: **None/External proving**; external torque proving is enabled, if 44.25 M1 brake torque proving time > 0. 1: **AI1 scaled**; 12.12 AI1 scaled value. Internal torque proving is enabled, if 44.25 M1 brake torque proving time > 0. 2: **AI2 scaled**; 12.22 AI2 scaled value. Internal torque proving is enabled, if 44.25 M1 brake torque proving time > 0. 3: **FBA A reference 1**; 03.05 FBA A reference 1. Internal torque proving is enabled, if 44.25 M1 brake torque proving time > 0.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">4: **FBA A reference 2**; 03.06 FBA A reference 2. Internal torque proving is enabled, if 44.25 M1 brake torque proving time > 0.
7: **M1 brake torque memory**; 44.02 M1 brake torque memory. Internal torque proving is enabled, if 44.25 M1 brake torque proving time > 0.
8: **M1 brake open torque**; 44.10 M1 brake open torque. Internal torque proving is enabled, if 44.25 M1 brake torque proving time > 0.
9: **Fix value 25 %**;torque reference is set to 25 % of 99.02 M1 nominal torque. Internal torque proving is enabled, if 44.25 M1 brake torque proving time > 0.
External torque proving procedure:
– In the drive set 44.25 M1 brake torque proving time > 0.
– In the drive set 44.26 M1 Torque proving reference = None/External proving.
– The overriding control gives a Run command.
– The drive sets bit Torque proving request, see 44.01.b12 M1 brake control status.
– The overriding control reads that bit, switches the drive to torque control and sends a torque reference.
– The overriding control executes the torque proving.
– The overriding control sets bit Torque proving OK, see 06.11.b04 Auxiliary control word 2, when the torque proving is finished without problems. Then the drive is switched back to speed control.
– The drive sets bit Torque proving OK, see 44.01.b13 M1 brake control status.
– The drive continues with the brake open sequence.
Internal torque proving procedure:
– In the drive set 44.25 M1 brake torque proving time > 0.
– In the drive set 44.26 M1 Torque proving reference = AI1 scaled, ..., Fix value 25 %.
– The drive starts with the internal torque proving after a Run command is set.
– The drive sets bit Torque proving OK, see 44.01.b13 M1 brake control status, if 01.18 Motor torque 100 ms filtered has reached 80 % of the given torque reference.
– The drive continues with the brake open sequence.</td></tr>
<tr><td>0 … 9</td><td>Fix value 25 %</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td></td><td colspan="7">**Start without torque proving**</td></tr>
</table>

Index	Name						
	Text						
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

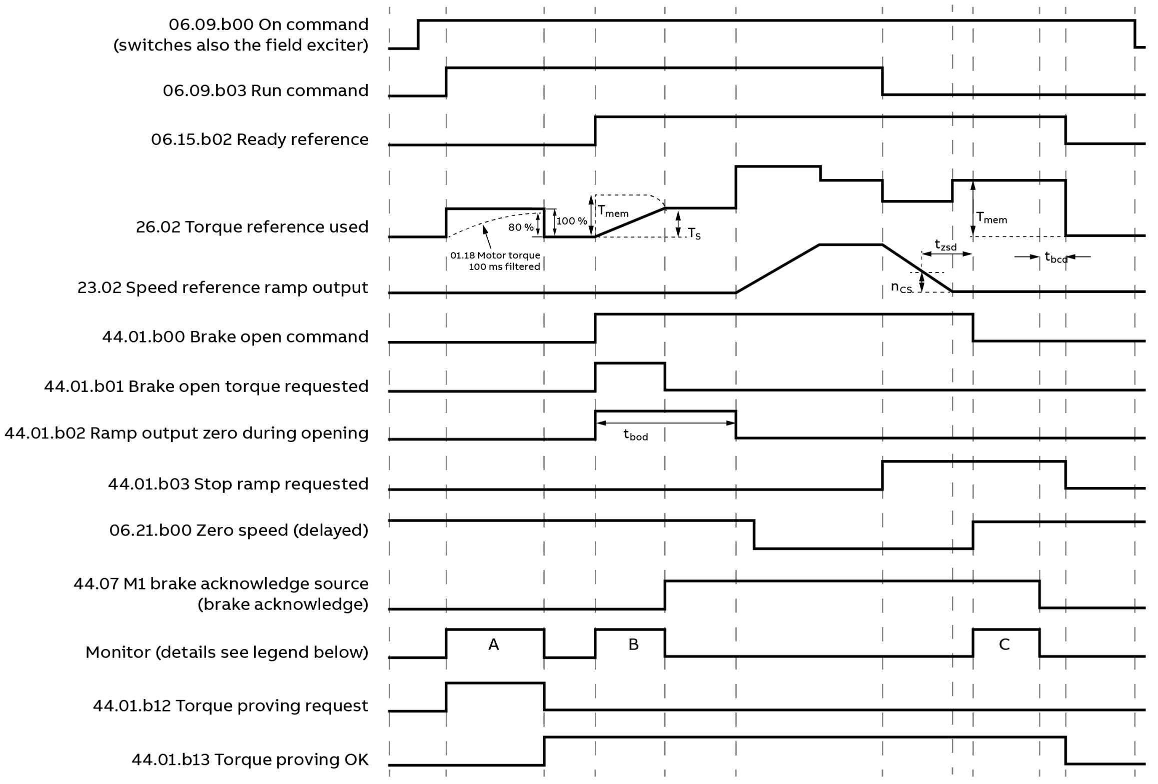
Start without torque proving



DZ_LIN_071_brake control _c.ai

Start with torque proving

Start with torque proving



DZ_LIN_071_brake control _c.ai

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

Legend

T_{bod}:	Brake open delay.	44.08 M1 brake open delay.
T_{mem}:	Torque memory.	44.02 M1 brake torque memory.
T_s:	Active start torque.	44.03 M1 brake open torque reference.
t_{zsd}:	Zero speed level.	21.08 M1 zero speed level.
n_{cs}:	Zero speed delay.	21.09 M1 zero speed delay.
t_{bcd}:	Brake close delay.	44.13 M1 brake close delay.
Monitor A	External torque proving: Acknowledge from PLC. Internal torque proving: 80 % of the torque reference reached.	44.25 M1 brake torque proving time.
Monitor B	Brake open acknowledge.	44.18 M1 brake fault delay.
Monitor C	Brake close acknowledge.	44.18 M1 brake fault delay or 44.20 M1 brake long time.

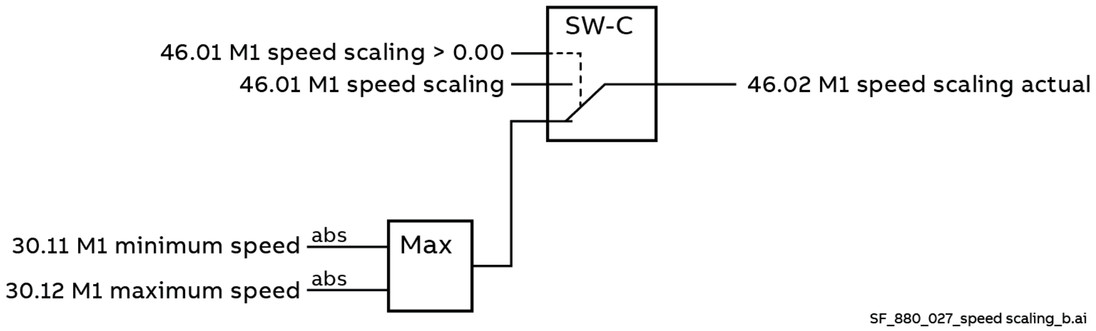
45 Energy efficiency

Settings for the energy saving calculators.

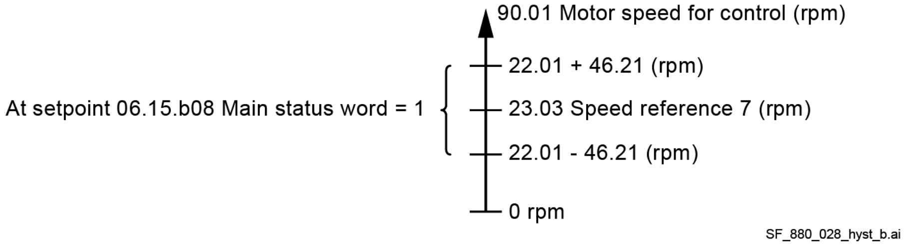
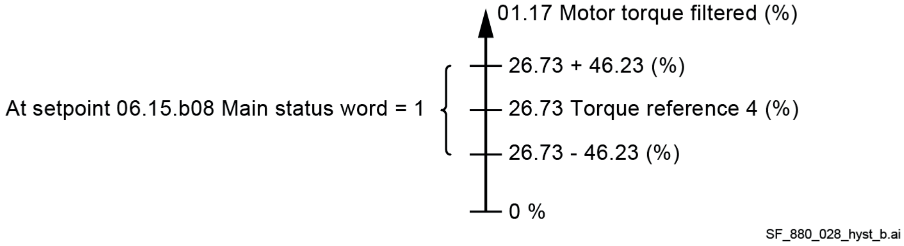
Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
45.xx	**Not yet part of the manual.**						
45.xx							

46 Monitoring/Scaling settings

Speed supervision settings, signal filtering and general scaling settings.

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
46.01	**M1 speed scaling**						
	Motor 1 speed scaling. Sets the 16-bit scaling of all speed related parameters in rpm. The set scaling value corresponds to 20000 speed units in e.g. fieldbus or master-follower link communication. 46.01 M1 speed scaling is valid for values greater than 0 rpm. For a value equal to 0 rpm, the maximum absolute value of 30.11 M1 minimum speed and 30.12 M1 maximum speed is taken. See 46.02 M1 speed scaling actual.  SF_880_027_speed scaling_b.ai The unit is selected by 96.03 Unit for speed control. **Notes**: – 46.01 M1 speed scaling must be set in case the speed is read or written by means of an overriding control (e.g. fieldbus). – The maximum amount of speed units is 32000. **Commissioning hints:** – Set 99.14 M1 nominal (base) speed to the base speed of motor 1. – Set 30.11 M1 minimum speed and 30.12 M1 maximum speed to ± maximum speed. – Set 46.01 M1 speed scaling to the maximum absolute speed value of 30.11 M1 minimum speed and 30.12 M1 maximum speed. – Make sure that the setting of the following parameters is less than or equal to 1.6 • 46.02 M1 speed scaling actual (1.6 = 32000/20000): 30.11 M1 minimum speed. 30.12 M1 maximum speed. 31.30 M1 overspeed trip margin.						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	46.01 M1 speed scaling. 99.14 M1 nominal (base) speed. – If the scaling is out of range warning A124 Speed scaling is generated.						
	0.0 … 30000.0	0.0	rpm, % or V	See 46.02	n	y	Parameter
46.02	**M1 speed scaling actual**						
	Motor 1 speed scaling actual and acceleration/deceleration ramp rate. Shows the 16-bit scaling of all speed related parameters in rpm. The scaling value corresponds to 20000 speed units in e.g. fieldbus or master-follower link communication. See 46.01 M1 speed scaling. Defines the acceleration/ deceleration ramp rate. See 23.12 Acceleration time 1 and 23.13 Deceleration time 1. The speed acceleration and deceleration ramp times are therefore related to 46.02 M1 speed scaling actual and not to 30.11 M1 minimum speed or 30.12 M1 Maximum speed. The unit is selected by 96.03 Unit for speed control.						
	0.0 … 30000.0	-	rpm, % or V	1 = 1 rpm, % or V	y	n	Signal
46.03	**M1 torque scaling**						
	Motor 1 torque scaling. Sets the 16-bit scaling of all torque related parameters in percent of 99.02 M1 nominal torque. The set scaling value corresponds to 10000 in e.g. fieldbus or master-follower link communication.						
	0.00 … 325.00	100.00	%	See 46.04	n	y	Parameter
46.04	**M1 torque scaling actual**						
	Motor 1 torque scaling actual. Shows the 16-bit scaling of all torque related parameters in percent of 99.02 M1 nominal torque. The scaling value corresponds to 10000 in e.g. fieldbus or master-follower link communication. See 46.03 M1 torque scaling. Motor 1 nominal torque in Nm or lb ft can be seen in 99.02 M1 nominal torque.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
46.11	**Filter time motor speed**						
	Motor speed feedback filter time constant. Filter time constant for 01.01 Used motor speed filtered, 01.02 EMF speed filtered, 01.03 OnBoard tacho speed filtered, 01.04 OnBoard encoder speed filtered, 01.05 Encoder 1 speed filtered and 01.06 Encoder 2 speed filtered. **Note**: This filter is used for speed feedback signals to be displayed e.g. in door meters. It does not influence the speed feedback for the drive control.						
	0 … 32500	500	ms	1 = 1 ms	n	y	Parameter
46.13	**Filter time motor torque**						
	Motor torque signal filter time constant. Filter time constant for 01.17 Motor torque filtered. Is used for the EMF controller and the EMF feed forward.						
	0 … 32500	1000	ms	1 = 1 ms	n	y	Parameter
46.14	**Filter time power output**						
	Output power signal filter time constant. Filter time constant for 01.24 Output power in kW.						
	0 … 32500	500	ms	1 = 1 ms	n	y	Parameter

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">46.21</td><td colspan="7">At speed hysteresis</td></tr>
<tr><td colspan="7">Levels for At setpoint indication in speed control.
Defines the At setpoint levels for a speed-controlled drive.
When the absolute difference between 23.03 Speed reference 7 and 90.01 Motor speed for control is in the 46.21 At speed hysteresis, the drive sets 06.15.b08 Main status word.
 </td></tr>
<tr><td>0.00 … 30000.00</td><td>20.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">46.23</td><td colspan="7">At torque hysteresis</td></tr>
<tr><td colspan="7">Levels for At setpoint indication in torque control.
Defines the At setpoint levels for a torque-controlled drive.
When the absolute difference between 26.73 Torque reference 4 and 01.17 Motor torque filtered is in the 46.23 At torque hysteresis, the drive sets 06.15.b08 Main status word.
 </td></tr>
<tr><td>0.00 … 325.00</td><td>10.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">46.31</td><td colspan="7">Above speed level</td></tr>
<tr><td colspan="7">Above level indication for speed control.
Defines the level for the Above level indication in a speed-controlled drive. When 90.01 Motor speed for control exceeds the level, the drive sets 06.17.b10 Drive status word 2.
Note: With 46.31 Above speed level it is possible to automatically switch between two 2 sets of acceleration/deceleration times for the speed ramp or two sets of proportional gain and integration time for the speed controller. See 23.11 Ramp set selection = Speed level and 25.13 Speed controller set selection = Speed level or Speed error.</td></tr>
<tr><td>0.00 … 30000.00</td><td>1500.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">46.33</td><td colspan="7">Above torque level</td></tr>
<tr><td colspan="7">Above level indication for torque control.
Defines the level for the Above level indication in a torque-controlled drive. When 01.17 Motor torque filtered exceeds the level, the drive sets 06.17.b10 Drive status word 2.</td></tr>
<tr><td>0.00 … 325.00</td><td>300.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

47 Data storage

Data storage parameters that can be written to and read from using other parameters’ source and target settings.

Note: There are different storage parameters for different data types. Integer-type storage parameters 47.11 … 47.28 cannot be used as source for other parameters. No Other; source selection possible.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">47.01</td><td colspan="7">Data storage 1 real32</td></tr>
<tr><td colspan="7">Data storage parameter 1.
Storage parameters 47.01 … 47.08:
– Are 32-bit real (floating-point) numbers that can be used as source values for other parameters, e.g. as Other; source selection.
– Can be used as the target for received 16-bit data. See group 62 D2D and DDCS receive data.
– Can be used as the source of transmitted 16-bit data. See group 61 D2D and DDCS transmit data.
– Scaling and range are defined by parameters 47.31 … 47.38.
This data storage parameter is of is of the type retain. Its value will be saved when the drive is de-energized. Thus, it will not lose its value.</td></tr>
<tr><td>See 47.31</td><td>0.000</td><td>-</td><td>See 47.31</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">47.02</td><td colspan="7">Data storage 2 real32</td></tr>
<tr><td colspan="7">Data storage parameter 2.
See 47.01 Data storage 1 real32.</td></tr>
<tr><td>See 47.32</td><td>0.000</td><td>-</td><td>See 47.32</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">47.03</td><td colspan="7">Data storage 3 real32</td></tr>
<tr><td colspan="7">Data storage parameter 3.
See 47.01 Data storage 1 real32.</td></tr>
<tr><td>See 47.33</td><td>0.000</td><td>-</td><td>See 47.33</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">47.04</td><td colspan="7">Data storage 4 real32</td></tr>
<tr><td colspan="7">Data storage parameter 4.
See 47.01 Data storage 1 real32.</td></tr>
<tr><td>See 47.34</td><td>0.000</td><td>-</td><td>See 47.34</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">47.05</td><td colspan="7">Data storage 5 real32</td></tr>
<tr><td colspan="7">Data storage parameter 5.
See 47.01 Data storage 1 real32.</td></tr>
<tr><td>See 47.35</td><td>0.000</td><td>-</td><td>See 47.35</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">47.06</td><td colspan="7">Data storage 6 real32</td></tr>
<tr><td colspan="7">Data storage parameter 6.
See 47.01 Data storage 1 real32.</td></tr>
<tr><td>See 47.36</td><td>0.000</td><td>-</td><td>See 47.36</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">47.07</td><td colspan="7">Data storage 7 real32</td></tr>
<tr><td colspan="7">Data storage parameter 7.
See 47.01 Data storage 1 real32.</td></tr>
<tr><td>See 47.37</td><td>0.000</td><td>-</td><td>See 47.37</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">47.08</td><td colspan="7">Data storage 8 real32</td></tr>
<tr><td colspan="7">Data storage parameter 8.
See 47.01 Data storage 1 real32.</td></tr>
<tr><td>See 47.38</td><td>0.000</td><td>-</td><td>See 47.38</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
47.11	**Data storage 1 int32**						
	Data storage parameter 9. 32-bit integer.						
	-2147483648 … 2147483647	0	-	-	n	y	Parameter
47.12	**Data storage 2 int32**						
	Data storage parameter 10. 32-bit integer.						
	-2147483648 … 2147483647	0	-	-	n	y	Parameter
47.13	**Data storage 3 int32**						
	Data storage parameter 11. 32-bit integer.						
	-2147483648 … 2147483647	0	-	-	n	y	Parameter
47.14	**Data storage 4 int32**						
	Data storage parameter 12. 32-bit integer.						
	-2147483648 … 2147483647	0	-	-	n	y	Parameter
47.15	**Data storage 5 int32**						
	Data storage parameter 13. 32-bit integer.						
	-2147483648 … 2147483647	0	-	-	n	y	Parameter
47.16	**Data storage 6 int32**						
	Data storage parameter 14. 32-bit integer.						
	-2147483648 … 2147483647	0	-	-	n	y	Parameter
47.17	**Data storage 7 int32**						
	Data storage parameter 15. 32-bit integer.						
	-2147483648 … 2147483647	0	-	-	n	y	Parameter
47.18	**Data storage 8 int32**						
	Data storage parameter 16. 32-bit integer.						
	-2147483648 … 2147483647	0	-	-	n	y	Parameter
47.21	**Data storage 1 int16**						
	Data storage parameter 17. 16-bit integer.						
	-32768 … 32767	0	-	1 = 1	n	y	Parameter
47.22	**Data storage 2 int16**						
	Data storage parameter 18. 16-bit integer.						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	-32768 … 32767	0	-	1 = 1	n	y	Parameter
47.23	**Data storage 3 int16**						
	Data storage parameter 19. 16-bit integer.						
	-32768 … 32767	0	-	1 = 1	n	y	Parameter
47.24	**Data storage 4 int16**						
	Data storage parameter 20. 16-bit integer.						
	-32768 … 32767	0	-	1 = 1	n	y	Parameter
47.25	**Data storage 5 int16**						
	Data storage parameter 21. 16-bit integer.						
	-32768 … 32767	0	-	1 = 1	n	y	Parameter
47.26	**Data storage 6 int16**						
	Data storage parameter 22. 16-bit integer.						
	-32768 … 32767	0	-	1 = 1	n	y	Parameter
47.27	**Data storage 7 int16**						
	Data storage parameter 23. 16-bit integer.						
	-32768 … 32767	0	-	1 = 1	n	y	Parameter
47.28	**Data storage 8 int16**						
	Data storage parameter 24. 16-bit integer.						
	-32768 … 32767	0	-	1 = 1	n	y	Parameter
47.31	**Data storage 1 real32 type**						
	Data type for 47.01 Data storage 1 real32. Defines the scaling and range of 47.01 Data storage 1 real32. The scaling is used when the data storage parameter: – Receives 16-bit data. See group 62 D2D and DDCS receive data. – Transmits 16-bit data. See group 61 D2D and DDCS transmit data. 0: **Unscaled**; data storage only. Range: -2147483.264 … 2147473.264. 1: **Transparent**; Scaling: 1 = 1. Range: -32768 … 32767. 2: **General**; Scaling: 100 = 1. Range: -327.68 … 327.67. 3: **Torque**; the scaling is defined by 46.04 M1 torque scaling actual. Range: -325.00 … 325.00. 4: **Speed**; the scaling is defined by 46.02 M1 speed scaling actual. Range: -30000.00 … 30000.00. 5: **Current**; the scaling is in percent of 99.11 M1 nominal current: 100 = 1 %. Range: -325.00 … 325.00.						
	0 … 5	Unscaled	-	1 = 1	n	y	Parameter
47.32	**Data storage 2 real32 type**						
	Data type for 47.02 Data storage 2 real32. Defines the scaling and range of 47.02 Data storage 2 real32. See 47.31 Data storage 1 real32 type.						
	0 … 5	Unscaled	-	1 = 1	n	y	Parameter
47.33	**Data storage 3 real32 type**						

Index	Name						
	Text						
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	Data type for 47.03 Data storage 3 real32. Defines the scaling and range of 47.03 Data storage 3 real32. See 47.31 Data storage 1 real32 type.						
	0 … 5	Unscaled	-	1 = 1	n	y	Parameter
47.34	**Data storage 4 real32 type**						
	Data type for 47.04 Data storage 4 real32. Defines the scaling and range of 47.04 Data storage 4 real32. See 47.31 Data storage 1 real32 type.						
	0 … 5	Unscaled	-	1 = 1	n	y	Parameter
47.35	**Data storage 5 real32 type**						
	Data type for 47.05 Data storage 5 real32. Defines the scaling and range of 47.05 Data storage 5 real32. See 47.31 Data storage 1 real32 type.						
	0 … 5	Unscaled	-	1 = 1	n	y	Parameter
47.36	**Data storage 6 real32 type**						
	Data type for 47.06 Data storage 6 real32. Defines the scaling and range of 47.06 Data storage 6 real32. See 47.31 Data storage 1 real32 type.						
	0 … 5	Unscaled	-	1 = 1	n	y	Parameter
47.37	**Data storage 7 real32 type**						
	Data type for 47.07 Data storage 7 real32. Defines the scaling and range of 47.07 Data storage 7 real32. See 47.31 Data storage 1 real32 type.						
	0 … 5	Unscaled	-	1 = 1	n	y	Parameter
47.38	**Data storage 8 real32 type**						
	Data type for 47.08 Data storage 8 real32. Defines the scaling and range of 47.08 Data storage 8 real32. See 47.31 Data storage 1 real32 type.						
	0 … 5	Unscaled	-	1 = 1	n	y	Parameter

49 Panel port communication

Communication settings for the control panel port on the drive.

Index	Name						
	Text						
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	Attention: Any changed parameters must be validated by means of 49.06 Refresh settings = Refresh.						
49.01	**Node ID number**						
	Control panel/PC tool link node ID number. Defines the node ID of the drive. All drives connected to the network (panel bus) must have a unique node ID. **Note**: For drives in a network, it is advisable to reserve 49.01 Network ID number = 1 for spare/replacement drives.						
	1 … 32	1	-	1 = 1	n	y	Parameter
49.03	**Baud rate**						
	Control panel/PC tool link speed. Defines the transfer rate of the control panel/PC tool link.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	0: **9.6 kbps**; 9.6 kbit/s. 1: **38.4 kbps**; 38.4 kbit/s. 2: **57.6 kbps**; 57.6 kbit/s. 3: **86.4 kbps**; 86.4 kbit/s. 4: **115.2 kbps**; 115.2 kbit/s. 5: **230.4 kbps**; 230.4 kbit/s. 6: **460.8 kbps**; 460.8 kbit/s. 7: **921.6 kbps**; 921.6 kbit/s.						
	0 … 7	230.4 kbps	-	1 = 1	n	y	Parameter
49.04	**Communication loss time**						
	Control panel/PC tool link communication loss timeout. Defines the time delay for the control panel/PC tool communication loss, before the action defined in 49.05 Communication loss action is executed. Time count starts when the communication link fails to update the message.						
	0 … 32500	1000	ms	1 = 1 ms	n	y	Parameter
49.05	**Communication loss action**						
	Control panel/PC tool link communication loss action. Selects how the drive reacts to a control panel/PC tool communication loss. 0: **No action**; none, disable communication loss function. 1: **Fault**; the event generates fault 7081 Control panel/PC tool link communication and the motor stops due to 31.13 Fault stop mode communication. This occurs only when the drive is controlled from the control panel/PC tool (local mode). 2: **Warning**; the event generates warning A7EE Control panel/PC tool link communication. This occurs even though no control is expected from the control panel/PC tool. **WARNING** Make sure that it is safe to continue operation in case of a communication break. 3: **Last speed**; the evet generates warning A7EE Control panel/PC tool link communication and freezes the speed to the level the drive was operating at. The last speed is determined based on the speed feedback using an 850 ms low-pass filter. **WARNING** Make sure that it is safe to continue operation in case of a communication break. 4: **Speed reference safe**; the event generates warning A7EE Control panel/PC tool link communication and sets the speed to the value defined in 22.46 Speed reference safe. **WARNING** Make sure that it is safe to continue operation in case of a communication break.						
	0 … 4	Fault	-	1 = 1	n	y	Parameter
49.06	**Refresh settings**						
	Control panel/PC tool link communication refresh command. Applies the settings of parameters 49.01 … 49.05. The value reverts automatically to Done, when the refresh is done. **Note**: Refreshing may cause a communication break, so reconnecting the drive may be required. 0: **Done**; 0, normal operation or refreshing done. 1: **Refresh**; 1, refresh parameters 49.01 … 49.05.						
	0 … 1	Done	-	1 = 1	y	y	Parameter

50 Fieldbus adapter (FBA)

Fieldbus communication configuration.

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
50.01	**FBA A enable**						
	Fieldbus adapter A enable/disable. Enables/Disables communication between the drive and fieldbus adapter A. Specifies the location of the adapter in slot 1 … slot 3. 0: **Disable**; disable communication between drive and fieldbus adapter A. 1: **Slot 1**; enable communication between drive and fieldbus adapter A. The adapter is in slot 1. 2: **Slot 2**; enable communication between drive and fieldbus adapter A. The adapter is in slot 2. 3: **Slot 3**; enable communication between drive and fieldbus adapter A. The adapter is in slot 3.						
	0 … 3	Disable	-	1 = 1	n	n	Parameter
50.02	**FBA A comm loss func**						
	Fieldbus adapter A communication loss action. Selects how the drive reacts to a fieldbus communication loss. 0: **No action**; none, disable communication loss function. 1: **Fault**; the event generates fault 7510 FBA A communication and the motor stops due to 31.13 Fault stop mode communication. This occurs only when the drive is controlled from the fieldbus. 2: **Warning**; the event generates warning A7C1 FBA A communication. This occurs even though no control is expected from the fieldbus. **WARNING** Make sure that it is safe to continue operation in case of a communication break. 3: **Last speed**; the evet generates warning A7C1 FBA A communication and freezes the speed to the level the drive was operating at. The last speed is determined based on the speed feedback using an 850 ms low-pass filter. **WARNING** Make sure that it is safe to continue operation in case of a communication break. 4: **Speed reference safe**; the event generates warning A7C1 FBA A communication and sets the speed to the value defined in 22.46 Speed reference safe. **WARNING** Make sure that it is safe to continue operation in case of a communication break. 5: **Fault always**; the event generates fault 7510 FBA A communication and the motor stops due to 31.13 Fault stop mode communication. This occurs even though no control is expected from the fieldbus.						
	0 … 5	No action	-	1 = 1	n	y	Parameter
50.03	**FBA A comm loss timeout**						
	Fieldbus adapter A communication loss timeout. Defines the time delay for the fieldbus communication loss, before the action defined in 50.02 FBA A comm loss func is executed. Time count starts when the communication link fails to update the message.						
	0 … 32500	300	ms	1 = 1 ms	n	y	Parameter
50.04	**FBA A ref1 type**						
	Fieldbus adapter A reference 1 type. Selects the type and scaling of 03.05 FBA A reference 1 sent by the master (e.g. PLC) to fieldbus adapter A. 0: **Auto**; automatic type and scaling according to which reference chain the incoming reference is connected to. If the reference is not connected to any chain, setting Transparent is applied.						

Parameter	**Auto type and scaling**

22.11 Speed reference 1 source	Speed
22.12 Speed reference 2 source	
23.32 Direct speed reference	
26.11 Torque reference 1 source	Torque
26.12 Torque reference 2 source	
27.22 Current reference source	Current
28.18 EMF reference source	General
28.20 EMF voltage correction source	
28.29 Flux correction source	

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	1: **Transparent**; no scaling is applied. 2: **General**; generic reference with a scaling of 100 = 1 (e.g. integer and two decimals). 3: **Torque**; the scaling is defined by 46.04 M1 torque scaling actual. 4: **Speed**; the scaling is defined by 46.02 M1 speed scaling actual. 5: **Current**; the scaling is in percent of 99.11 M1 nominal current: 100 = 1 %.						
	0 … 5	Auto	-	1 = 1	n	y	Parameter
50.05	**FBA A ref2 type**						
	Fieldbus adapter A reference 2 type. Selects the type and scaling of 03.06 FBA A reference 2 sent by the master (e.g. PLC) to fieldbus adapter A. See 50.04 FBA A ref1 type.						
	0 … 5	Auto	-	1 = 1	n	y	Parameter
50.07	**FBA A act1 type**						
	Fieldbus adapter A actual value 1 type. Selects the type/source and scaling of actual value 1 sent by fieldbus adapter A to the master (e.g. PLC). 0: **Auto**; type/source and scaling follow the type of reference 1 selected by 50.04 FBA A ref1 type. For individual settings see below. 1: **Transparent**; the value selected by 50.10 FBA A act1 transparent source is sent as actual value 1. No scaling is applied. The 16-bit scaling is 1 = 1 unit. 2: **General**; the value selected by 50.10 FBA A act1 transparent source is sent as actual value 1 with a 16-bit scaling of 100 = 1 unit (e.g. integer and two decimals). 3: **Torque**; 01.17 Motor torque filtered is sent as actual value 1. The scaling is defined by 46.04 M1 torque scaling actual. 4: **Speed**; 01.01 Used motor speed filtered is sent as actual value 1. The scaling is defined by 46.02 M1 speed scaling actual. 5: **Current**; 27.05 Motor current is sent as actual value 1. The scaling is in percent of 99.11 M1 nominal current. 6: **Position**; the motor position is sent as actual value 1. See 90.06 Motor position scaled.						
	0 … 6	Auto	-	1 = 1	n	y	Parameter
50.08	**FBA A act2 type**						
	Fieldbus adapter A actual value 2 type. Selects the type/source and scaling of actual value 2 sent by fieldbus adapter A to the master (e.g. PLC). See 50.07 FBA A act1 type.						
	0 … 6	Auto	-	1 = 1	n	y	Parameter
50.09	**FBA A SW transparent source**						
	Fieldbus adapter A status word transparent source.						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	Selects the source of the status word when the fieldbus adapter is set to a transparent communication profile e.g. by its configuration parameters in group 51. The parameter to be used is fieldbus dependent. **Other**; source selection e.g. 06.88 FBA A profile status word. 0: **Not selected**; no source selected.						
	0 … 0	Not selected	-	1 = 1	n	y	Parameter
50.10	**FBA A act1 transparent source**						
	Fieldbus adapter A actual value 1 transparent source. Selects the source of actual value 1 sent by fieldbus adapter A to the master (e.g. PLC), when 50.07 FBA A actual 1 type = Transparent or General. **Other**; source selection e.g. a value from group 1. 0: **Not selected**; no source selected.						
	0 … 0	Not selected	-	1 = 1	n	y	Parameter
50.11	**FBA A act2 transparent source**						
	Fieldbus adapter A actual value 2 transparent source. Selects the source of actual value 2 sent by fieldbus adapter A to the master (e.g. PLC), when 50.08 FBA A actual 2 type = Transparent or General. **Other**; source selection e.g. a value from group 1. 0: **Not selected**; no source selected.						
	0 … 0	Not selected	-	1 = 1	n	y	Parameter
50.12	**FBA A debug mode**						
	Fieldbus adapter A debug mode. Enables the display of the raw (unmodified) data received by and sent from fieldbus adapter A. The data are displayed in parameters 50.13 … 50.18. **Note**: This functionality should only be used for debugging. 0: **Disable**; disable the display of raw data from fieldbus adapter A. 1: **Enable**; enable the display of raw data from fieldbus adapter A.						
	0 … 1	Disable	-	1 = 1	n	n	Parameter
50.13	**FBA A control word**						
	Fieldbus adapter A raw control word. Displays the raw (unmodified) control word sent by the master (e.g. PLC) to fieldbus adapter A if 50.12 FBA A debug mode = Enable.						
	00000000h … FFFFFFFFh	-	-	1 = 1	y	n	Signal
50.14	**FBA A reference 1**						
	Fieldbus adapter A raw reference 1. Displays the raw (unmodified) reference 1 (REF1) sent by the master (e.g. PLC) to fieldbus adapter A if 50.12 FBA A debug mode = Enable.						
	-2147483648 … 2147483647	-	-	1 = 1	y	n	Signal
50.15	**FBA A reference 2**						
	Fieldbus adapter A raw reference 2. Displays the raw (unmodified) reference 2 (REF2) sent by the master (e.g. PLC) to fieldbus adapter A if 50.12 FBA A debug mode = Enable.						
	-2147483648 … 2147483647	-	-	1 = 1	y	n	Signal
50.16	**FBA A status word**						
	Fieldbus adapter A raw status word.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Displays the raw (unmodified) status word sent by fieldbus adapter A to the master (e.g. PLC) if 50.12 FBA A debug mode = Enable.</td></tr>
<tr><td>00000000h … FFFFFFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">50.17</td><td colspan="7">FBA A actual value 1</td></tr>
<tr><td colspan="7">Fieldbus adapter A raw actual value 1.
Displays the raw (unmodified) actual value 1 (ACT1) sent by fieldbus adapter A to the master (e.g. PLC) if 50.12 FBA A debug mode = Enable.</td></tr>
<tr><td>-2147483648 … 2147483647</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">50.18</td><td colspan="7">FBA A actual value 2</td></tr>
<tr><td colspan="7">Fieldbus adapter A raw actual value 2.
Displays the raw (unmodified) actual value 2 (ACT2) sent by fieldbus adapter A to the master (e.g. PLC) if 50.12 FBA A debug mode = Enable.</td></tr>
<tr><td>-2147483648 … 2147483647</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">50.21</td><td colspan="7">FBA A timelevel sel</td></tr>
<tr><td colspan="7">Fieldbus adapter A communication time levels.
In general, lower time levels of read/write services reduce the CPU load. The table below shows the time levels of read/write services for cyclic high and cyclic low data depending on 50.21 FBA A timelevel sel:
<table>
<tr><th>50.21 FBA A timelevel sel</th><th>Cyclic high*</th><th>Cyclic low**</th></tr>
<tr><td>Normal</td><td>2 ms</td><td>10 ms</td></tr>
<tr><td>Fast</td><td>500 µs</td><td>2 ms</td></tr>
<tr><td>Very fast</td><td>250 µs</td><td>2 ms</td></tr>
<tr><td>Monitoring</td><td>10 ms</td><td>10 ms</td></tr>
</table>
*Cyclic high data consist of status word, ACT1 and ACT2 from the fieldbus.
**Cyclic low data consist of the parameter data mapped in groups 52 FBA A data in, 53 FBA A data out and acyclic data.
Control word, REF1 and REF2 from the fieldbus are handled as interrupts generated on receipt of cyclic high messages.
0: Normal; normal speed.
1: Fast; fast speed.
2: Very fast; very fast speed.
3: Monitoring; low speed. Optimized for PC tool communication and monitoring usage.</td></tr>
<tr><td>0 … 3</td><td>Normal</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="2">50.29</td><td colspan="7">FBA A profile</td></tr>
<tr><td colspan="7">Fieldbus adapter A profile.
The DCS880 only supports transparent16 profile, so profile adaption according to bus specific profile, ABB Drives profile or others are handled using 50.29 FBA A profile.
0: ABB Drives profile; speed: Value in 46.02 == 20000 speed units. Any other: 100.00 % == 10000.
1: ODVA basic; scaling see ODVA documentation. In case ODVA is used, internal fieldbus adapter parameters need to be validated after a speed feedback autotuning. When using 99.20</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Tuning request = Speed feedback assistant, validate the internal fieldbus adapter parameters by setting 51.27 FBA A par refresh = Refresh.
2: **ODVA extended**; scaling see ODVA documentation. In case ODVA is used, internal fieldbus adapter parameters need to be validated after a speed feedback autotuning. When using 99.20 Tuning request = Speed feedback assistant, validate the internal fieldbus adapter parameters by setting 51.27 FBA A par refresh = Refresh.
3: **Profidrive**; speed: Value in 46.02 == 4000h. Any other: 100.00 % == 10000. **NOT** supported.
4: **CIA 402**; **NOT** supported.
10: **DCP**; speed: value in 46.02 == 20000 speed units. Any other: 100.00 % == 10000.</td></tr>
<tr><td>0 … 10</td><td>DCP</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3">**50.31**</td><td colspan="7">**FBA B enable**</td></tr>
<tr><td colspan="7">Fieldbus adapter B enable/disable.
Enables/Disables communication between the drive and fieldbus adapter B. Specifies the location of the adapter in slot 1 … slot 3.
0: **Disable**; disable communication between drive and fieldbus adapter B.
1: **Slot 1**; enable communication between drive and fieldbus adapter B. The adapter is in slot 1.
2: **Slot 2**; enable communication between drive and fieldbus adapter B. The adapter is in slot 2.
3: **Slot 3**; enable communication between drive and fieldbus adapter B. The adapter is in slot 3.</td></tr>
<tr><td>0 … 3</td><td>Disable</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3">**50.32**</td><td colspan="7">**FBA B comm loss func**</td></tr>
<tr><td colspan="7">Fieldbus adapter B communication loss action.
Selects how the drive reacts to a fieldbus communication loss.
0: **No action**; none, disable communication loss function.
1: **Fault**; the event generates fault 7520 FBA B communication and the motor stops due to 31.13 Fault stop mode communication. This occurs only when the drive is controlled from the fieldbus.
2: **Warning**; the event generates warning A7C2 FBA B communication. This occurs even though no control is expected from the fieldbus.
WARNING
Make sure that it is safe to continue operation in case of a communication break.
3: **Last speed**; the evet generates warning A7C2 FBA B communication and freezes the speed to the level the drive was operating at. The last speed is determined based on the speed feedback using an 850 ms low-pass filter.
WARNING
Make sure that it is safe to continue operation in case of a communication break.
4: **Speed reference safe**; the event generates warning A7C2 FBA B communication and sets the speed to the value defined in 22.46 Speed reference safe.
WARNING
Make sure that it is safe to continue operation in case of a communication break.
5: **Fault always**; the event generates fault 7520 FBA B communication and the motor stops due to 31.13 Fault stop mode communication. This occurs even though no control is expected from the fieldbus.</td></tr>
<tr><td>0 … 5</td><td>No action</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**50.33**</td><td colspan="7">**FBA B comm loss timeout**</td></tr>
<tr><td colspan="7">Fieldbus adapter B communication loss timeout.
Defines the time delay for the fieldbus communication loss, before the action defined in 50.32 FBA B comm loss func is executed. Time count starts when the communication link fails to update the message.</td></tr>
<tr><td>0 … 32500</td><td>300</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
50.34	**FBA B ref1 type**						
	Fieldbus adapter B reference 1 type. Selects the type and scaling of 03.07 FBA B reference 1 sent by the master (e.g. PLC) to fieldbus adapter B. See 50.04 FBA A ref1 type.						
	0 … 5	Auto	-	1 = 1	n	y	Parameter
50.35	**FBA B ref2 type**						
	Fieldbus adapter B reference 2 type. Selects the type and scaling of 03.08 FBA B reference 2 sent by the master (e.g. PLC) to fieldbus adapter A. See 50.04 FBA A ref1 type.						
	0 … 5	Auto	-	1 = 1	n	y	Parameter
50.37	**FBA B act1 type**						
	Fieldbus adapter B actual value 1 type. Selects the type/source and scaling of actual value 1 sent by fieldbus adapter B to the master (e.g. PLC). See 50.07 FBA A act1 type.						
	0 … 6	Auto	-	1 = 1	n	y	Parameter
50.38	**FBA B act2 type**						
	Fieldbus adapter B actual value 2 type. Selects the type/source and scaling of actual value 2 sent by fieldbus adapter B to the master (e.g. PLC). See 50.07 FBA A act1 type.						
	0 … 6	Auto	-	1 = 1	n	y	Parameter
50.39	**FBA B SW transparent source**						
	Fieldbus adapter B status word transparent source. Selects the source of the status word when the fieldbus adapter is set to a transparent communication profile e.g. by its configuration parameters in group 54. The parameter to be used is fieldbus dependent. **Other**; source selection e.g. 06.89 FBA B profile status word. 0: **Not selected**; no source selected.						
	0 … 0	Not selected	-	1 = 1	n	y	Parameter
50.40	**FBA B act1 transparent source**						
	Fieldbus adapter B actual value 1 transparent source. Selects the source of actual value 1 sent by fieldbus adapter B to the master (e.g. PLC), when 50.37 FBA B actual 1 type = Transparent or General. **Other**; source selection e.g. a value from group 1. 0: **Not selected**; no source selected.						
	0 … 0	Not selected	-	1 = 1	n	y	Parameter
50.41	**FBA B act2 transparent source**						
	Fieldbus adapter B actual value 2 transparent source. Selects the source of actual value 2 sent by fieldbus adapter B to the master (e.g. PLC), when 50.38 FBA B actual 2 type = Transparent or General. **Other**; source selection e.g. a value from group 1. 0: **Not selected**; no source selected.						
	0 … 0	Not selected	-	1 = 1	n	y	Parameter
50.42	**FBA B debug mode**						
	Fieldbus adapter B debug mode. Enables the display of the raw (unmodified) data received by and sent from fieldbus adapter B. The data are displayed in parameters 50.43 … 50.48. **Note**: This functionality should only be used for debugging.						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	0: **Disable**; disable the display of raw data from fieldbus adapter B. 1: **Enable**; enable the display of raw data from fieldbus adapter B.						
	0 … 1	Disable	-	1 = 1	n	n	Parameter
50.43	**FBA B control word**						
	Fieldbus adapter B raw control word. Displays the raw (unmodified) control word sent by the master (e.g. PLC) to fieldbus adapter B if 50.42 FBA B debug mode = Enable.						
	00000000h … FFFFFFFFh	-	-	1 = 1	y	n	Signal
50.44	**FBA B reference 1**						
	Fieldbus adapter B raw reference 1. Displays the raw (unmodified) reference 1 (REF1) sent by the master (e.g. PLC) to fieldbus adapter B if 50.42 FBA B debug mode = Enable.						
	-2147483648 … 2147483647	-	-	1 = 1	y	n	Signal
50.45	**FBA B reference 2**						
	Fieldbus adapter B raw reference 2. Displays the raw (unmodified) reference 2 (REF2) sent by the master (e.g. PLC) to fieldbus adapter B if 50.42 FBA B debug mode = Enable.						
	-2147483648 … 2147483647	-	-	1 = 1	y	n	Signal
50.46	**FBA B status word**						
	Fieldbus adapter B raw status word. Displays the raw (unmodified) status word sent by fieldbus adapter B to the master (e.g. PLC) if 50.42 FBA B debug mode = Enable.						
	00000000h … FFFFFFFFh	-	-	1 = 1	y	n	Signal
50.47	**FBA B actual value 1**						
	Fieldbus adapter B raw actual value 1. Displays the raw (unmodified) actual value 1 (ACT1) sent by fieldbus adapter B to the master (e.g. PLC) if 50.42 FBA B debug mode = Enable.						
	-2147483648 … 2147483647	-	-	1 = 1	y	n	Signal
50.48	**FBA B actual value 2**						
	Fieldbus adapter B raw actual value 2. Displays the raw (unmodified) actual value 2 (ACT2) sent by fieldbus adapter B to the master (e.g. PLC) if 50.42 FBA B debug mode = Enable.						
	-2147483648 … 2147483647	-	-	1 = 1	y	n	Signal
50.51	**FBA B timelevel sel**						
	Fieldbus adapter B communication time levels. See 50.21 FBA A timelevel sel.						
	0 … 3	Normal	-	1 = 1	n	n	Parameter
50.59	**FBA B profile**						
	Fieldbus adapter B profile. The DCS880 only supports transparent16 profile, so profile adaption according to bus specific profile, ABB Drives profile or others are handled using 50.59 FBA B profile.						

Index	Name						
	Text						
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	0: **ABB Drives profile**; speed: value in 46.02 == 20000 speed units. Any other: 100.00 % == 10000. 1: **ODVA basic**; scaling see ODVA documentation. In case ODVA is used, internal fieldbus adapter parameters need to be validated after a speed feedback autotuning. When using 99.20 Tuning request = Speed feedback assistant, validate the internal fieldbus adapter parameters by setting 54.27 FBA B par refresh = Refresh. 2: **ODVA extended**; scaling see ODVA documentation. In case ODVA is used, internal fieldbus adapter parameters need to be validated after a speed feedback autotuning. When using 99.20 Tuning request = Speed feedback assistant, validate the internal fieldbus adapter parameters by setting 54.27 FBA B par refresh = Refresh. 3: **ProfiDrive**; speed: value in 46.02 == 4000h. Any other: 100.00 % == 10000. **NOT** supported. 4: **CIA 402**; **NOT** supported. 10: **DCP**; speed: value in 46.02 == 20000 speed units. Any other: 100.00 % == 10000.						
	0 … 10	DCP	-	1 = 1	n	n	Parameter

51 FBA A settings

Fieldbus adapter A configuration.

Index	Name						
	Text						
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	Attention: Any changed parameters must be validated by means of 51.27 FBA A par refresh = Refresh.						
51.01	**FBA A type**						
	Fieldbus adapter A type. Displays the type of the connected fieldbus adapter A module. 0: **None**; module is not found or is not properly connected or is disabled by 50.01 FBA A enable. 1: **FPBA**; 32: **FCAN**; 37: **FDNA**; 101: **FCNA**; 128: **FENA-11/21**; 135: **FECA**; 136: **FEPL**; 485: **FSCA**;						
	0 … 485	-	-	1 = 1	y	n	Signal
51.02 to 51.26	**FBA A Par2 … FBA A Par26**						
	Fieldbus adapter A configuration parameter. Parameters 51.02 … 51.26 are adapter module-specific. For more information, see the documentation of the fieldbus adapter module. **Note**: Not all parameters are necessarily in use.						
	0 … 65535	0	-	1 = 1	n	y	Parameter
51.27	**FBA A par refresh**						
	Fieldbus adapter A refresh. Validates any changed fieldbus adapter A module configuration settings. The value reverts to Done automatically, when the refresh is done.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">0: Done; 0, refreshing done.
1: Refresh; 1, refreshing.</td></tr>
<tr><td>0 … 1</td><td>Done</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3">51.28</td><td colspan="7">FBA A par table ver</td></tr>
<tr><td colspan="7">Fieldbus adapter A parameter table revision.
Displays the parameter table revision of the fieldbus adapter A module-mapping file (stored in the memory of the drive) in format axyz, where ax = major table revision number and yz = minor table revision number.</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">51.29</td><td colspan="7">FBA A drive type code</td></tr>
<tr><td colspan="7">Fieldbus adapter A drive type code.
Displays the drive type code in the fieldbus adapter A module-mapping file (stored in the memory of the drive).</td></tr>
<tr><td>0 … 65535</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">51.30</td><td colspan="7">FBA A mapping file ver</td></tr>
<tr><td colspan="7">Fieldbus adapter A mapping file revision.
Displays the fieldbus adapter A module-mapping file revision stored in the memory of the drive in decimal format.</td></tr>
<tr><td>0 … 65535</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">51.31</td><td colspan="7">D2FBA A comm status</td></tr>
<tr><td colspan="7">Fieldbus adapter A communication status.
Displays the status of the fieldbus adapter A module communication.
0: Not configured; fieldbus adapter A is not configured.
1: Initializing; fieldbus adapter A is initializing.
2: Time out; a timeout has occurred in the communication between fieldbus adapter A and the drive.
3: Configuration error; fieldbus adapter A configuration error. Mapping file is not found in the file system of the drive or mapping file upload has failed more than three times.
4: Off-line; fieldbus adapter A communication is off-line.
5: On-line; fieldbus adapter A communication is on-line, or fieldbus adapter A has been configured not to detect a communication break. For more information, see the documentation of the fieldbus adapter.
6: Reset; fieldbus adapter A is performing a hardware reset.</td></tr>
<tr><td>0 … 6</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">51.32</td><td colspan="7">FBA A comm SW ver</td></tr>
<tr><td colspan="7">Fieldbus adapter A, firmware patch and build versions.
Displays the patch and build versions of the adapter module A firmware in format xxyy, where xx = patch version number and yy = build version number.
Example: C802 = 200.02 (patch version 200, build version 2).</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">51.33</td><td colspan="7">FBA A appl SW ver</td></tr>
<tr><td colspan="7">Fieldbus adapter A, firmware major and minor versions.
Displays the major and minor versions of the adapter module A firmware in format xyy, where x = major revision number and yy = minor revision number.
Example: 300 = 3.00 (major version 3, minor version 00).</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
</table>

52 FBA A data in

Selection of data sent by fieldbus adapter A to the fieldbus controller (e.g. PLC).

Note: 32-bit values require two consecutive parameters. Whenever a 32-bit value is selected in a data parameter, the next parameter is automatically reserved.

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
52.01 to 52.12	**FBA A data in1 … FBA A data in12**						
	Fieldbus adapter A data from the drive to the fieldbus controller (e.g. PLC). Parameters 52.01 … 52.12 select data sent from the drive by fieldbus adapter A to the fieldbus controller (e.g. PLC). **Other**; source selection (10 ms update). 0: **None**; inactive. Disable FBA A data in. 4: **SW 16bit**; status word (16-bit) (2 ms update). Taken from 06.88 FBA A profile status word. 5: **Act1 16bit**; actual value ACT1 (16-bit) (2 ms update). Depending on 50.07 FBA A act1 type. 6: **Act2 16bit**; actual value ACT2 (16-bit) (2 ms update). Depending on 50.08 FBA A act2 type. 15: **Act1 32bit**; actual value ACT1 (32-bit) (2 ms update). Depending on 50.07 FBA A act1 type . 16: **Act2 32bit**; actual value ACT2 (32-bit) (2 ms update). Depending on 50.08 FBA A act2 type.						
	0 … 16	None	-	1 = 1	n	y	Parameter

53 FBA A data out

Selection of data sent by the fieldbus controller (e.g. PLC) to fieldbus adapter A.

Note: 32-bit values require two consecutive parameters. Whenever a 32-bit value is selected in a data parameter, the next parameter is automatically reserved.

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
53.01 to 53.12	**FBA A data out1 … FBA A data out12**						
	Fieldbus adapter A data from the fieldbus controller (e.g. PLC) to the drive. Parameters 53.01 … 53.12 select data sent from the fieldbus controller (e.g. PLC) by fieldbus adapter A to the drive. **Other**; source selection (10 ms update). 0: **None**; inactive. Disable FBA A data out. 1: **CW 16bit**; control word (16-bit) (2 ms update). Send to 06.03 FBA A transparent control word. 2: **Ref1 16bit**; reference REF1 (16-bit) (2 ms update). Send to 03.05 FBA A reference 1. 3: **Ref2 16bit**; reference REF2 (16-bit) (2 ms update). Send to 03.06 FBA A reference 2. 12: **Ref1 32bit**; reference REF1 (32-bit) (2 ms update). Send to 03.05 FBA A reference 1. 13: **Ref2 32bit**; reference REF2 (32-bit) (2 ms update). Send to 03.06 FBA A reference 2.						
	0 … 13	None	-	1 = 1	n	y	Parameter

54 FBA B settings

Description see group 51 FBA A settings.

55 FBA B data in

Description see group 52 FBA A data in.

56 FBA B data out

Description see group 53 FBA A data out.

58 Embedded fieldbus

Embedded fieldbus (EFB) configuration.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">Attention: Any changed parameters must be validated by means of 58.06 Communication control = Refresh settings.</td></tr>
<tr><td rowspan="3">58.01</td><td colspan="7">Protocol enable</td></tr>
<tr><td colspan="7">Embedded fieldbus, enable/disable.
Enables/Disables the embedded fieldbus and selects the protocol to use.
Note: When the embedded fieldbus is enabled, the device-to-device link in group 60 DDCS communication is disabled.
0: None; inactive, disable communication.
1: Modbus RTU; enable the embedded fieldbus. Modbus RTU protocol is used.</td></tr>
<tr><td>0 … 1</td><td>None</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3">58.02</td><td colspan="7">Protocol ID</td></tr>
<tr><td colspan="7">Embedded fieldbus, Protocol ID and revision.
Displays the protocol ID and revision. First 4 bits specify the protocol ID, last 12 bits specify the revision.</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">58.03</td><td colspan="7">Node address</td></tr>
<tr><td colspan="7">Embedded fieldbus, node address.
Defines the node address of the drive for the embedded fieldbus communication. All drives connected to the network must have a unique node address.
Notes:
– The address range for the embedded fieldbus is 1 … 247.
– For drives in a network, it is advisable to reserve 58.03 Node address = 1 for spare/replacement drives.
– Changes to 58.03 Node address take effect after the drive is rebooted or the new setting is validated by 58.06 Communication control.</td></tr>
<tr><td>0 … 255</td><td>1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">58.04</td><td colspan="7">Baud rate</td></tr>
<tr><td colspan="7">Embedded fieldbus, link speed.
Defines the transfer rate of the embedded fieldbus link. Use the same setting as in the master station.
Note: Changes to 58.04 Baud rate take effect after the drive is rebooted or the new setting is validated by 58.06 Communication control.
2: 9.6 kbps; 9.6 kbit/s.
3: 19.2 kbps; 19.2 kbit/s.
4: 38.4 kbps; 38.4 kbit/s.
5: 57.6 kbps; 57.6 kbit/s.
6: 76.8 kbps; 76.8 kbit/s.
7: 115.2 kbps; 115.2 kbit/s.</td></tr>
<tr><td>2 … 7</td><td>19.2 kbps</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">58.05</td><td colspan="7">Parity</td></tr>
<tr><td colspan="7">Embedded fieldbus, parity bit and stop bits.
Selects the type of parity bit and the number of stop bits. Use the same setting as in the master station.</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	Note: Changes to 58.05 Parity take effect after the drive is rebooted or the new setting is validated by 58.06 Communication control. 0: **8 NONE 1**; eight data bits, no parity bit, one stop bit. 1: **8 NONE 2**; eight data bits, no parity bit, two stop bits. 2: **8 EVEN 1**; eight data bits, even parity bit, one stop bit. 3: **8 ODD 1**; eight data bits, odd parity bit, one stop bit.						
	0 … 3	8 EVEN 1	-	1 = 1	n	y	Parameter
58.06	**Communication control**						
	Embedded fieldbus, refresh command. Applies any changed embedded fieldbus settings or activates silent mode. The value reverts automatically to Enabled, when the refresh is done. 0: **Enable**; normal operation or refreshing done. 1: **Refresh settings**; refresh changed configuration settings of the embedded fieldbus. 2: **Silent mode**; activate the silent mode. No messages are transmitted. Silent mode can be terminated by setting 58.06 Communication control = Refresh settings.						
	0 … 2	Enable	-	1 = 1	y	y	Parameter
58.07	**Communication diagnostics**						
	Embedded fieldbus, communication status word. Displays the status of the embedded fieldbus communication. Bit assignment:						

Bit	Name	Value	Remarks
0	Initialization failed	1	Embedded fieldbus initialization failed.
1	Address configuration error	1	Node address not allowed by protocol.
2	Silent mode	1	Drive not allowed transmitting.
		0	Drive allowed transmitting.
3	reserved		
4	Wiring error	1	Error detected: Possibly A/B wires swapped.
5	Parity error	1	Error detected: Check 58.04 Baud rate and 58.05 Parity.
6	Baud rate error	1	Error detected: Check 58.05 Parity and 58.04 Baud rate.
7	No bus activity	1	0 bytes received during the last 5 seconds.
8	No packets	1	0 packets (addressed to any device) detected during the last 5 seconds.
9	Noise or addressing error	1	Error detected: Interference or another drive with the same address is online.
10	Communication loss	1	0 packets addressed to the unit received within 58.16 Communication loss time.
11	CW/References loss	1	No control word or references received within 58.16 Communication loss time.
12	reserved		
13	reserved		
14	reserved		
15	reserved		

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7"></td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">58.08</td><td colspan="7">Received packets</td></tr>
<tr><td colspan="7">Embedded fieldbus, number of received packets addressed to the drive.
Displays a count of valid packets addressed to the drive. During normal operation, this number increases constantly.
Can be reset from the control panel by keeping Reset depressed for over 3 seconds.</td></tr>
<tr><td>0 … 4294967295</td><td>0</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">58.09</td><td colspan="7">Transmitted packets</td></tr>
<tr><td colspan="7">Embedded fieldbus, number of transmitted packets.
Displays a count of valid packets transmitted by the drive. During normal operation, this number increases constantly.
Can be reset from the control panel by keeping Reset depressed for over 3 seconds.</td></tr>
<tr><td>0 … 4294967295</td><td>0</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">58.10</td><td colspan="7">All packets</td></tr>
<tr><td colspan="7">Embedded fieldbus, number of all received packets.
Displays a count of valid packets addressed to any device on the bus. During normal operation, this number increases constantly.
Can be reset from the control panel by keeping Reset depressed for over 3 seconds.</td></tr>
<tr><td>0 … 4294967295</td><td>0</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">58.11</td><td colspan="7">UART errors</td></tr>
<tr><td colspan="7">Embedded fieldbus, number of UART errors.
Displays a count of character errors received by the drive. An increasing count indicates a configuration problem on the bus.
Can be reset from the control panel by keeping Reset depressed for over 3 seconds.</td></tr>
<tr><td>0 … 4294967295</td><td>0</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">58.12</td><td colspan="7">CRC errors</td></tr>
<tr><td colspan="7">Embedded fieldbus, number of CRC errors.
Displays a count of packets with a CRC error received by the drive. An increasing count indicates interference on the bus.
Can be reset from the control panel by keeping Reset depressed for over 3 seconds.</td></tr>
<tr><td>0 … 4294967295</td><td>0</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="2">58.14</td><td colspan="7">Communication loss action</td></tr>
<tr><td colspan="7">Embedded fieldbus, communication loss action.
Selects how the drive reacts to a fieldbus communication loss.
Note: Changes to 58.14 Communication loss action take effect after the drive is rebooted or the new setting is validated by 58.06 Communication control.
0: No action; none, disable communication loss function.
1: Fault; the event generates fault 6681 EFB communication and the motor stops due to 31.13 Fault stop mode communication. This occurs only when the drive is controlled from the fieldbus.
2: Last speed; the evet generates warning A7CE EFB communication and freezes the speed to the level the drive was operating at. The last speed is determined based on the speed feedback using an 850 ms low-pass filter.
WARNING
Make sure that it is safe to continue operation in case of a communication break.
3: Speed reference safe; the event generates warning A7CE EFB communication and sets the speed to the value defined in 22.46 Speed reference safe.</td></tr>
</table>

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	WARNING Make sure that it is safe to continue operation in case of a communication break. 4: **Fault always**; the event generates fault 6681 EFB communication and the motor stops due to 31.13 Fault stop mode communication. This occurs even though no control is expected from the fieldbus. 5: **Warning**; the event generates warning A7CE EFB communication. This occurs even though no control is expected from the fieldbus. **WARNING** Make sure that it is safe to continue operation in case of a communication break.						
	0 … 5	No action	-	1 = 1	n	y	Parameter
58.15	**Communication loss mode**						
	Embedded fieldbus, communication loss mode. Defines which message types reset the timeout counter detecting an embedded fieldbus communication loss. See 58.14 Communication loss action and 58.16 Communication loss time. **Note**: Changes to 58.15 Communication loss mode take effect after the drive is rebooted or the new setting is validated by 58.06 Communication control. 1: **Any message**; any message addressed to the drive resets the timeout. 2: **CW/Ref1/Ref2**; a write of the control word or a reference from the embedded fieldbus resets the timeout.						
	1 … 2	CW / Ref1 / Ref2	-	1 = 1	n	y	Parameter
58.16	**Communication loss time**						
	Embedded fieldbus, communication loss timeout. Defines the time delay for the embedded fieldbus communication loss, before the action defined in 58.14 Communication loss action is executed. See 58.15 Communication loss mode. **Note**: Changes to 58.16 Communication loss time take effect after the drive is rebooted or the new setting is validated by 58.06 Communication control.						
	0 … 32.5	0.3	s	10 = 1 s	n	y	Parameter
58.17	**Transmit delay**						
	Embedded fieldbus, minimum response delay. Defines a minimum response delay in addition to any fixed delay imposed by the protocol. **Note:** Changes to 58.17 Transmit delay take effect after the drive is rebooted or the new setting is validated by 58.06 Communication control.						
	0 … 32500	0	ms	1 = 1 ms	n	y	Parameter
58.18	**EFB control word**						
	Embedded fieldbus, raw control word. Displays the raw (unmodified) control word sent by the Modbus controller (e.g. PLC) to the drive. For debugging purposes.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
58.19	**EFB status word**						
	Embedded fieldbus, raw status word. Displays the raw (unmodified) status word sent by the drive to the Modbus controller (e.g. PLC). For debugging purposes.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
58.25	**Control profile**						
	Embedded fieldbus, control profile.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">Defines the control profile used by the protocol.
Note: Changes to 58.25 Control profile take effect after the drive is rebooted or the new setting is validated by 58.06 Communication control.
0: ABB Drives Profile; ABB Drives profile (with a 16-bit control word) with registers in the classic format for backward compatibility.
2: Transparent; transparent profile (16-bit or 32-bit control word) with registers in the classic format.</td></tr>
<tr><td></td><td>0 … 2</td><td>ABB Drives</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>58.26</td><td colspan="7">EFB ref1 type</td></tr>
<tr><td></td><td colspan="7">Embedded fieldbus, reference 1 type.
Selects the type and scaling of 03.09 EFB reference 1 sent by the Modbus controller (e.g. PLC) to the embedded fieldbus.
0: Auto; automatic type and scaling according to which reference chain the incoming reference is connected to. If the reference is not connected to any chain, setting Transparent is applied.
<table>
<tr><th>Parameter</th><th>Auto type and scaling</th></tr>
<tr><td>22.11 Speed reference 1 source</td><td rowspan="3">Speed</td></tr>
<tr><td>22.12 Speed reference 2 source</td></tr>
<tr><td>23.32 Direct speed reference</td></tr>
<tr><td>26.11 Torque reference 1 source</td><td rowspan="2">Torque</td></tr>
<tr><td>26.12 Torque reference 2 source</td></tr>
<tr><td>27.22 Current reference source</td><td>Current</td></tr>
<tr><td>28.18 EMF reference source</td><td rowspan="3">General</td></tr>
<tr><td>28.20 EMF voltage correction source</td></tr>
<tr><td>28.29 Flux correction source</td></tr>
</table>
1: Transparent; No scaling is applied.
2: General; Generic reference with a scaling of 100 = 1 (e.g. integer and two decimals).
3: Torque; the scaling is defined by 46.04 M1 torque scaling actual.
4: Speed; the scaling is defined by 46.02 M1 speed scaling actual.
5: Current; the scaling is in percent of 99.11 M1 nominal current: 100 = 1 %.</td></tr>
<tr><td></td><td>0 … 5</td><td>Auto</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>58.27</td><td colspan="7">EFB ref2 type</td></tr>
<tr><td></td><td colspan="7">Embedded fieldbus, reference 2 type.
Selects the type and scaling of 03.10 EFB reference 2 sent by the Modbus controller (e.g. PLC) to the embedded fieldbus. See 58.26 EFB ref1 type.</td></tr>
<tr><td></td><td>0 … 5</td><td>Auto</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>58.28</td><td colspan="7">EFB act1 type</td></tr>
<tr><td></td><td colspan="7">Embedded fieldbus, actual value 1 type.
Selects the type/source and scaling of actual value 1 sent by the embedded fieldbus to the Modbus controller (e.g. PLC).
0: Auto; type/source and scaling follow the type of reference 1 selected by 58.26 EFB ref1 type. For individual settings see below.
1: Transparent; The value selected by 58.31 EFB act1 transparent source is sent as actual value 1. No scaling is applied. The 16-bit scaling is 1 = 1 unit.
2: General; The value selected by parameter 58.31 EFB act1 transparent source is sent as actual value 1 with a 16-bit scaling of 100 = 1 unit (e.g. integer and two decimals).</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">3: Torque; 01.17 Motor torque filtered is sent as actual value 1. The scaling is defined by 46.04 M1 torque scaling actual.
4: Speed; 01.01 Used motor speed filtered is sent as actual value 1. The scaling is defined by 46.02 M1 speed scaling actual.
5: Current; 27.05 Motor current is sent as actual value 1. The scaling is in percent of 99.11 M1 nominal current.
6: Position; Motor position is sent as actual value 1. See 90.06 Motor position scaled.</td></tr>
<tr><td>0 … 6</td><td>Auto</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">58.29</td><td colspan="7">EFB act2 type</td></tr>
<tr><td colspan="7">Embedded fieldbus, actual value 2 type.
Selects the type/source and scaling of actual value 2 sent by the embedded fieldbus to the Modbus controller (e.g. PLC). See 58.28 EFB act1 type.</td></tr>
<tr><td>0 … 6</td><td>Auto</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">58.30</td><td colspan="7">EFB status word transparent source</td></tr>
<tr><td colspan="7">Embedded fieldbus, status word transparent source.
Selects the source of the status word when 58.25 Control profile = Transparent.
Other; source selection e.g. 06.15 Main Status Word.
0: Not selected; no source selected.</td></tr>
<tr><td>0 … 0</td><td>Not selected</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">58.31</td><td colspan="7">EFB act1 transparent source</td></tr>
<tr><td colspan="7">Embedded fieldbus, actual value 1 transparent source.
Selects the source of actual value 1 sent by the embedded fieldbus to the Modbus controller (e.g. PLC), when 58.28 EFB act1 type = Transparent or General.
Other; source selection e.g. a value from group 1.
0: Not selected; no source selected.</td></tr>
<tr><td>0 … 0</td><td>Not selected</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">58.32</td><td colspan="7">EFB act2 transparent source</td></tr>
<tr><td colspan="7">Embedded fieldbus, actual value 2 transparent source.
Selects the source of actual value 2 sent by the embedded fieldbus to the Modbus controller (e.g. PLC), when 58.29 EFB act2 type = Transparent or General.
Other; source selection e.g. a value from group 1.
0: Not selected; no source selected.</td></tr>
<tr><td>0 … 0</td><td>Not selected</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">58.33</td><td colspan="7">Addressing mode</td></tr>
<tr><td colspan="7">Embedded fieldbus, addressing mode.
Defines the mapping between parameters and holding registers in the 400101 … 465535 Modbus register range.
Note: Changes to 58.33 Addressing mode take effect after the unit is rebooted or the new setting is validated by 58.06 Communication control.
0: Mode 0; 16-bit values (groups 1 … 99, indexes 1 … 99):
Register address = 400000 + 100 × parameter group + parameter index.
For example, parameter 22.80 would be mapped to register 400000 + 2200 + 80 = 402280.
32-bit values (groups 1 … 99, indexes 1 … 99):
Register address = 420000 + 200 × parameter group + 2 × parameter index.
For example, parameter 22.80 would be mapped to register 420000 + 4400 + 160 = 424560.</td></tr>
</table>

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	1: **Mode 1**; 16-bit values (groups 1 … 255, indexes 1 … 255): Register address = 400000 + 256 × parameter group + parameter index. For example, parameter 22.80 would be mapped to register 400000 + 5632 + 80 = 405712. 2: **Mode 2**; 32-bit values (groups 1 … 127, indexes 1 … 255): Register address = 400000 + 512 × parameter group + 2 × parameter index. For example, parameter 22.80 would be mapped to register 400000 + 11264 + 160 = 411424.						
	0 … 2	Mode 0	-	1 = 1	n	y	Parameter
58.34	**Word order**						
	Embedded fieldbus, word order. Selects in which order 16-bit registers of 32-bit parameters are transferred. For each register, the first byte contains the high order byte and the second byte contains the low order byte. **Note:** Changes to 58.34 Word order take effect after the drive is rebooted or the new setting is validated by 58.06 Communication control. 0: **HI-LO**; the 1st register contains the high order word. The 2nd register contains the low order word. 1: **LO-HI**; the 1st register contains the low order word. The 2nd register contains the high order word.						
	0 … 1	LO-HI	-	1 = 1	n	y	Parameter
58.101 to 58.124	**Data I/O 1 … Data I/O 24**						
	Embedded fieldbus, I/O data. Defines the address in the drive, which the Modbus master accesses when it reads from or writes to register address 400001 … 400024. The master defines the type of the data (input/output). The value is transmitted in a Modbus frame consisting of two 16- bit words. If the value is 16-bit, it is transmitted in the LSW (least significant word). If the value is 32-bit, the subsequent parameter is also reserved for it and must be set to None. **Notes**: – Input means data transfer from the drive to the master (e.g. PLC). – Output means data transfer from the master (e.g. PLC) to the drive. **Other**; source selection (10 ms update). 0: **None**; inactive. Data I/O is disabled. 1: **CW 16bit**; control word (16-bit) (2 ms update). Taken from 06.09 Used main control word./Send to 06.01 Main control word. 2: **Ref1 16bit**; reference 1 REF1 (16-bit) (2 ms update). Taken from 03.09 EFB reference 1./Send to 03.09 EFB reference 1. 3: **Ref2 16bit**; reference 2 REF2 (16-bit) (2 ms update). Taken from 03.10 EFB reference 2./Send to 03.10 EFB reference 2. 4: **SW 16bit**; status word (16-bit) (2 ms update). Taken from 06.15 Main status word./NA. 5: **Act1 16bit**; actual value 1 ACT1 (16-bit) (2 ms update). Depending on 58.28 EFB act1 type./NA. 6: **Act2 16bit**; actual value 2 ACT2 (16-bit) (2 ms update). Depending on 58.29 EFB act2 type./NA. 11: **CW 32bit**; control word (32-bit) (2 ms update). Taken from 06.09 Used main control word./Send to 06.01 Main control word. 12: **Ref1 32bit**; reference 1 REF1 (32-bit) (2 ms update). Taken from 03.09 EFB reference 1./Send to 03.09 EFB reference 1.						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	13: **Ref2 32bit**; reference 2 REF2 (32-bit) (2 ms update). Taken from 03.10 EFB reference 2./Send to 03.10 EFB reference 2. 14: **SW 32bit**; status word (32-bit) (2 ms update). Taken from 06.15 Main status word./NA. 15: **Act1 32bit**; actual value 1 ACT1 (32-bit) (2 ms update). Depending on 58.28 EFB act1 type./NA. 16: **Act2 32bit**; actual value 2 ACT2 (32-bit) (2 ms update). Depending on 58.29 EFB act2 type./NA. 21: **CW2 16bit**; control word 2 (16-bit) (2 ms update). 24: **SW2 16bit**; status word 2 (16-bit) (2 ms update). 31: **RO/DIO control word**; see 10.99 RO/DIO control word. Taken from 10.99 RO/DIO control word./Send to 10.99 RO/DIO control word. 32: **AO1 data storage**; see 13.91 AO1 data storage. Taken from 13.91 AO1 data storage./Send to 13.91 AO1 data storage. 33: **AO2 data storage**; see 13.92 AO2 data storage. Taken from 13.92 AO2 data storage./Send to 13.92 AO2 data storage. 40: **Feedback data storage**; see 40.91 Feedback data storage. Taken from 40.91 Feedback data storage./Send to 40.91 Feedback data storage. 41: **Setpoint data storage**; see 40.92 Setpoint data storage. Taken from 40.92 Setpoint data storage./Send to 40.92 Setpoint data storage.						
	0 … 41	None	-	1 = 1	n	y	Parameter

60 DDCS Communication

DDCS communication configuration.

The DDCS protocol is used in the communication between:

- Drives in a master-follower link configuration.
- Drives and a DDCS controller such as an AC 800M.

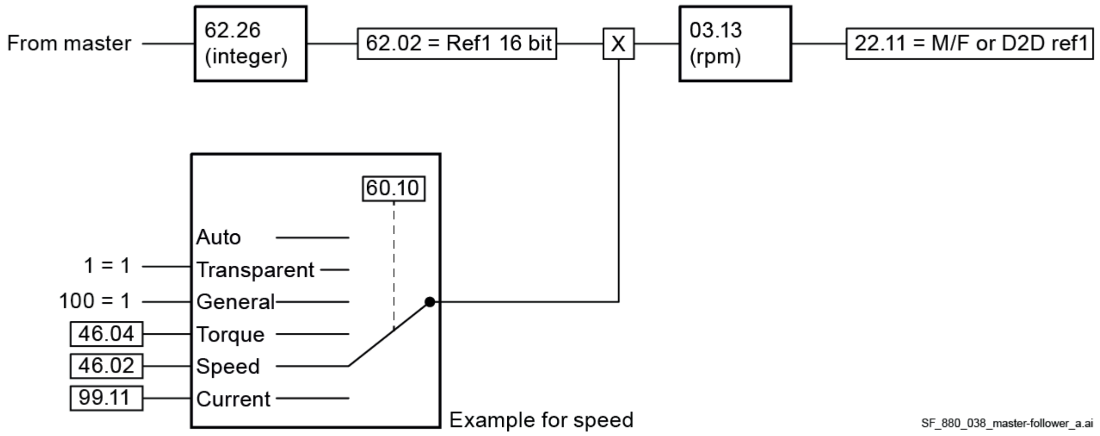
All of the above utilize a fiber optic link, which requires FDCO modules. Master-follower link and DDCS controller communication can also be implemented through shielded twisted-pair cable via connector XD2D (drive-to-drive link) of the drive.

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
60.01	**M/F communication port**						
	Master-follower link, communication port. Selects the connection used by the master-follower link. 0: **Not in use**; not in use, disable communication. 1: **Slot 1A**; activates channel A on the FDCO-0x which is in slot 1. 2: **Slot 2A**; activates channel A on the FDCO-0x which is in slot 2. 3: **Slot 3A**; activates channel A on the FDCO-0x which is in slot 3. 4: **Slot 1B**; activates channel B on the FDCO-0x which is in slot 1. 5: **Slot 2B**; activates channel B on the FDCO-0x which is in slot 2. 6: **Slot 3B**; activates channel B on the FDCO-0x which is in slot 3. 7: **XD2D**; activates connector XD2D.						
	0 … 7	Not in use	-	1 = 1	n	n	Parameter
60.02	**M/F node address**						
	Master-follower link, node address. Defines the node address of the drive for the master-follower link. Two drives with the same node address are not allowed.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	Notes: – The allowable address for the master is 1. – The allowable addresses for followers are 2 … 60.						
	1 … 254	1	-	1 = 1	n	n	Parameter
60.03	**M/F mode**						
	Master-follower link, mode. Defines the role of the drive on the master-follower link. 0: **Not in use**; not in use, disable master-follower link. 1: **FDCO-XD2D Master**; the drive is the master on the master-follower link either via FDCO-0x or via connector XD2D. 2: **FDCO-XD2D Follower**; the drive is a follower on the master-follower link either via FDCO-0x or via connector XD2D. 3: **ApplPrg Master**; reserved. 4: **ApplPrg Follower**; reserved. 5: **FDCO-XD2D forcing**; the role of the drive on the master-follower link is defined by 60.15 Force master and 60.16 Force follower. 6: **ApplPrg forcing**; reserved.						
	0 … 5	Not in use	-	1 = 1	n	n	Parameter
60.05	**M/F HW connection**						
	Master-follower link, hardware connection. Selects the topology of the master-follower link. 0: **Ring**; the drives are connected in a ring topology. Forwarding of messages is enabled. Not to be set when using connector XD2D. 1: **Star**; the drives are connected in a star topology, e.g. through a branching unit. Forwarding of messages is disabled. To be set when using connector XD2D. **Note:** Set to Star, if the master-follower link is made using connector XD2D.						
	0 … 1	Ring	-	1 = 1	n	n	Parameter
60.08	**M/F comm loss timeout**						
	Master-follower link, communication loss timeout. Defines the time delay for the master-follower link before the action defined in 60.09 M/F comm loss function is executed.						
	0 … 65535	100	ms	1 = 1 ms	n	y	Parameter
60.09	**M/F comm loss function**						
	Master-follower link, communication loss action. Selects how the drive reacts to a master-follower link loss. 0: **No action**; none, disable communication loss function. 1: **Warning**; the event generates warning A7CB Master-follower link communication. This occurs only when the drive is controlled from the master-follower link. **WARNING** Make sure that it is safe to continue operation in case of a communication break. 2: **Fault**; the event generates fault 7582 Master-follower link communication and the motor stops due to 31.13 Fault stop mode communication. This occurs only when the drive is controlled from the master-follower link. 3: **Fault always**; the event generates fault 7582 Master-follower link communication and the motor stops due to 31.13 Fault stop mode communication. This occurs even though no control is expected from the master-follower link.						
	0 … 3	Fault	-	1 = 1	n	y	Parameter
60.10	**M/F ref1 type**						
	Master-follower link, reference 1 type.						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

Selects the type and scaling of reference 1 received from the master-follower link, if any parameter 62.01 …. 62.03 is set to Ref1 16bit. The received and scaled value is then sent to 03.13 M/F or D2D ref1.
Example: In the follower set 60.10 M/F ref1 type = Speed to receive a speed reference from the master:



0: **Auto**; automatic type and scaling according to which reference chain 03.13 M/F or D2D ref1 is connected to. If 03.13 M/F or D2D ref1 is not connected to any chain, setting Transparent is applied.

Parameter	**Auto type and scaling**
22.11 Speed reference 1 source	Speed
22.12 Speed reference 2 source	
23.32 Direct speed reference	
26.11 Torque reference 1 source	Torque
26.12 Torque reference 2 source	
27.22 Current reference source	Current

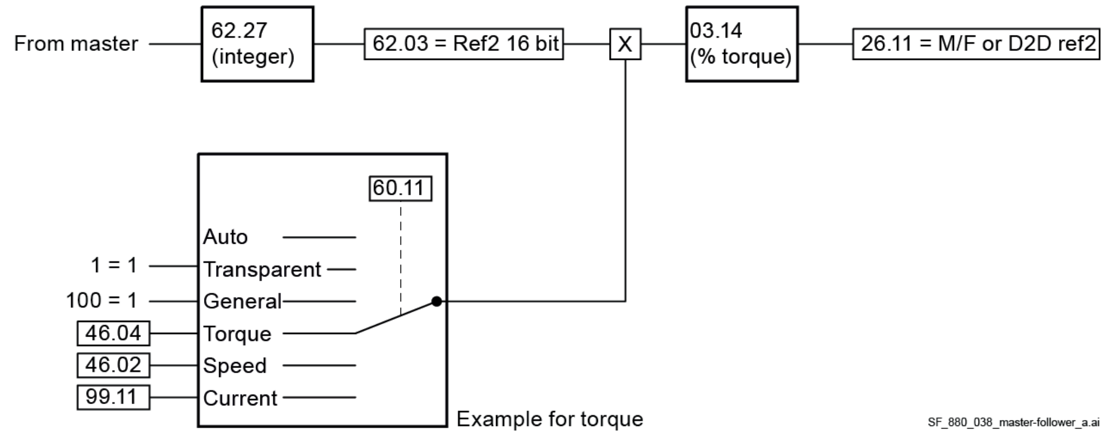
1: **Transparent**; no scaling is applied.
2: **General**; generic reference with a scaling of 100 = 1 (e.g. integer and two decimals).
3: **Torque**; the scaling is defined by 46.04 M1 torque scaling actual.
4: **Speed**; the scaling is defined by 46.02 M1 speed scaling actual.
5: **Current**; the scaling is in percent of 99.11 M1 nominal current: 100 = 1 %.

Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
0 … 5	Speed	-	1 = 1	n	y	Parameter

60.11 **M/F ref2 type**

Master-follower link, reference 2 type.
Selects the type and scaling of reference 2 received from the master-follower link, if any parameter 62.01 …. 62.03 is set to Ref2 16bit. The received and scaled value is then sent to 03.14 M/F or D2D ref2. See 60.10 M/F ref1 type.
Example: In the follower set 60.11 M/F ref2 type = Torque to receive a torque reference from the master:

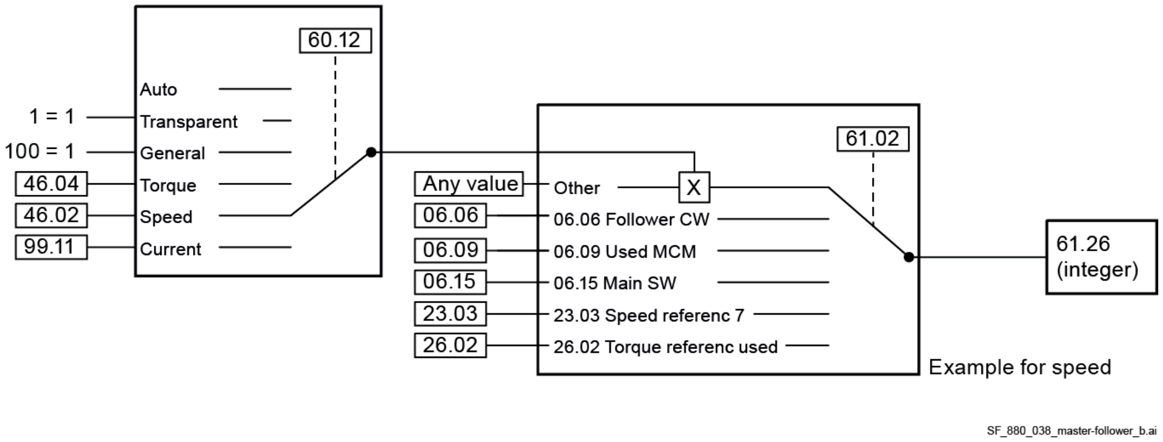
Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type



Index	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	0 … 5	Torque	-	1 = 1	n	y	Parameter

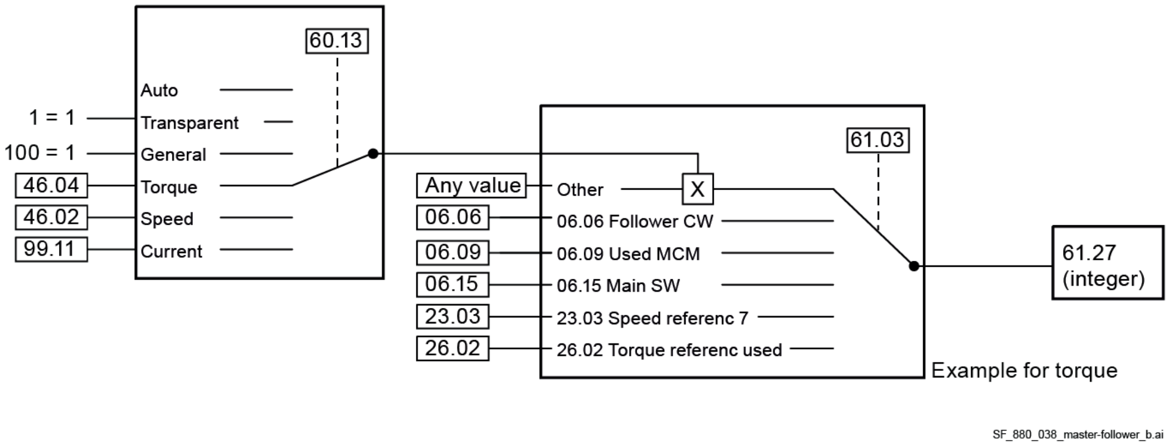
60.12 **M/F act1 type**

Master-follower link, actual value 1 type.
Selects the transmit type and scaling if 61.02 M/F data 2 selection = Other.
Example: In the follower set 60.12 M/F act1 type = Speed to send a speed feedback to the master:



0: **Auto**; type/source and scaling follow the type of reference 1 selected by 60.10 M/F ref1 type. For individual settings see below.
1: **Transparent**; no scaling is applied. The 16-bit scaling is 1 = 1 unit. Only valid for 61.02 M/F data 2 selection = Other.
2: **General**; generic actual value with a scaling of 100 = 1 (e.g. integer and two decimals). Only valid for 61.02 M/F data 2 selection = Other.
3: **Torque**; the scaling is defined by 46.04 M1 torque scaling actual. Only valid for 61.02 M/F data 2 selection = Other.
4: **Speed**; the scaling is defined by 46.02 M1 speed scaling actual. Only valid for 61.02 M/F data 2 selection = Other.
5: **Current**; the scaling is in percent of 99.11 M1 nominal current. Only valid for 61.02 M/F data 2 selection = Other.

Index	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
60.12	0 … 5	Speed	-	1 = 1	n	y	Parameter

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">60.13</td><td colspan="7">M/F act2 type</td></tr>
<tr><td colspan="7">Master-follower link, actual value 2 type.
Selects the transmit type and scaling if 61.03 M/F data 3 selection = Other.
See 60.12 M/F act1 type.
Example: In the follower set 60.13 M/F act2 type = Torque to send a torque feedback to the master:

</td></tr>
<tr><td>0 … 5</td><td>Torque</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">60.14</td><td colspan="7">M/F follower selection</td></tr>
<tr><td colspan="7">Master-follower link, follower supervision selection (master only).
Defines the supervised followers. Reaction see 60.17 Follower fault action. Values are visible in parameters 62.28 … 62.36.
Note: Wrong setting of 60.14 M/F follower selection causes either warning A7CB Master-follower link communication or fault 7582 Master-follower link communication depending on 60.09 M/F comm loss function.
0: Broadcast; supervision is disabled.
2: Follower node 2; data is read from follower node 2, supervision is enabled.
4: Follower node 3; data is read from follower node 3, supervision is enabled.
6: Follower node 2+3; data is read from followers’ node 2 and 3, supervision is enabled.
8: Follower node 4; data is read from follower node 4, supervision is enabled.
10: Follower node 2+4; data is read from followers’ node 2 and 4, supervision is enabled.
12: Follower node 3+4; data is read from followers’ node 3 and 4, supervision is enabled.
14: Follower node 2+3+4; data is read from followers’ node 2, 3 and 4, supervision is enabled.</td></tr>
<tr><td>0 … 14</td><td>Broadcast</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">60.15</td><td colspan="7">Force master</td></tr>
<tr><td colspan="7">Master-follower link, force master.
When 60.03 M/F mode is set to FDCO-XD2D forcing or ApplPrg forcing, 60.15 Force master selects a source that forces the drive to be the master on the master-follower link.
0 = Drive is not the master on the master-follower link.
1 = Drive is the master on the master-follower link.
Other [bit]; source selection.
0: False; 0, not the master.
1: True; 1, the master.</td></tr>
<tr><td>0 … 1</td><td>False</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">60.16</td><td colspan="7">Force follower</td></tr>
<tr><td colspan="7">Master-follower link, force follower.
When 60.03 M/F mode is set to FDCO-XD2D forcing or ApplPrg forcing, 60.16 Force follower selects a source that forces the drive to be a follower on the master-follower link.
0 = Drive is not a follower on the master-follower link.
1 = Drive is a follower on the master-follower link.
Other [bit]; source selection.
0: False; 0, not a follower.
1: True; 1, a follower.</td></tr>
<tr><td>0 … 1</td><td>False</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">60.17</td><td colspan="7">Follower fault action</td></tr>
<tr><td colspan="7">Master-follower link, follower faulty action (master only).
Selects how the master reacts to a faulty follower on the master-follower link.
0: No action; no action taken. Unaffected drives on the master-follower link will continue running.
1: Warning; the event generates warning AFE7 Follower in the master. Unaffected drives on the master-follower link will continue running.
2: Fault; the event generates fault FF7E Follower in the master and the motor(s) stop(s) according to 31.13 Fault stop mode communication.
Note: Each follower to be supervised must be configured to feed 06.15 Main status word back to the master. Thus:
– In all followers one of the three data words in parameters 61.01 … 61.03 must be set to 06.15 Main SW.
– In the master the corresponding target parameter 62.04 … 62.14 must be set to 06.12x Follower SW node x.</td></tr>
<tr><td>0 … 2</td><td>Fault</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">60.18</td><td colspan="7">Follower enable</td></tr>
<tr><td colspan="7">Master-follower link, follower enable action (master only).
Interlocks the starting of the master depending on the status of all followers on the master-follower link.
0: MSW bit 0; the master can only start if all followers are Ready to be switched on, see 06.15.b00 Main status word.
1: MSW bit 1; the master can only start if all followers are Ready to operate, see 06.15.b01 Main status word.
2: MSW bits 0+1; the master can only start if all followers are Ready to be switched on and Ready to operate, see 06.15.b00 Main status word and 06.15.b01 Main status word.
3: Always; the starting of the master is not interlocked by the status of any follower.
4: MSW bit 12; the master can only start if the user-definable 06.11.b12 Main status word in each follower is set. See 06.31 MSW bit 12 sel.
5: MSW bits 0+12; the master can only start if in all followers 06.11.b00 Main status word and 06.11.b12 Main status word are set.
6: MSW bits 1+12; the master can only start if in all followers 06.11.b01 Main status word and 06.11.b12 Main status word are set.
Note: Each follower to be supervised must be configured to feed 06.15 Main status word back to the master. Thus:
– In all followers one of the three data words in parameters 61.01 … 61.03 must be set to 06.15 Main SW.
– In the master the corresponding target parameter 62.04 … 62.14 must be set to 06.12x Follower SW node x.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td>0 … 6</td><td>Always</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">60.19</td><td colspan="7">M/F comm supervision sel 1</td></tr>
<tr><td colspan="7">reserved</td></tr>
<tr><td>0000h … FFFFh</td><td>0000h</td><td>-</td><td>1 = 1</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">60.20</td><td colspan="7">M/F comm supervision sel 2</td></tr>
<tr><td colspan="7">reserved</td></tr>
<tr><td>0000h … FFFFh</td><td>0000h</td><td>-</td><td>1 = 1</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">60.23</td><td colspan="7">M/F status supervision sel 1</td></tr>
<tr><td colspan="7">reserved</td></tr>
<tr><td>0000h … FFFFh</td><td>0000h</td><td>-</td><td>1 = 1</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">60.24</td><td colspan="7">M/F status supervision sel 2</td></tr>
<tr><td colspan="7">reserved</td></tr>
<tr><td>0000h … FFFFh</td><td>0000h</td><td>-</td><td>1 = 1</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">60.27</td><td colspan="7">M/F status supervision mode sel 1</td></tr>
<tr><td colspan="7">reserved</td></tr>
<tr><td>0000h … FFFFh</td><td>0000h</td><td>-</td><td>1 = 1</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">60.28</td><td colspan="7">M/F status supervision mode sel 2</td></tr>
<tr><td colspan="7">reserved</td></tr>
<tr><td>0000h … FFFFh</td><td>0000h</td><td>-</td><td>1 = 1</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">60.31</td><td colspan="7">M/F wake up delay</td></tr>
<tr><td colspan="7">Master-follower link, wake-up delay.
Defines a wake-up delay during which no master-follower link communication faults or warnings can be generated. This allows all drives on the master-follower link to power up without causing nuisance events.
The master cannot start until the delay is elapsed or all monitored followers are Ready to be switched on, see 06.15.b00 Main status word.</td></tr>
<tr><td>0.0 … 180.0</td><td>10.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">60.41</td><td colspan="7">Extension adapter comm port</td></tr>
<tr><td colspan="7">FEA-03 extension adapter communication port.
Selects the connection used by the FEA-03 extension adapter.
0: Not in use; not in use, disable communication.
1: Slot 1A; activates channel A on the FDCO-0x which is in slot 1.
2: Slot 2A; activates channel A on the FDCO-0x which is in slot 2.
3: Slot 3A; activates channel A on the FDCO-0x which is in slot 3.
4: Slot 1B; activates channel B on the FDCO-0x which is in slot 1.
5: Slot 2B; activates channel B on the FDCO-0x which is in slot 2.
6: Slot 3B; activates channel B on the FDCO-0x which is in slot 3.</td></tr>
<tr><td>0 … 6</td><td>Not in use</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3">60.50</td><td colspan="7">DDCS controller drive type</td></tr>
<tr><td colspan="7">DDCS controller link, communication type of drive.
In ModuleBus communication, defines whether the drive is of “engineered” or “standard” type.
0: ABB engineered drive; the drive is an “engineered drive” (data sets 10 … 25 are used).
1: ABB standard drive; the drive is a “standard drive” (data sets 1 … 4 are used).</td></tr>
<tr><td>0 … 1</td><td>ABB engineered drive</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>60.51</td><td colspan="7">DDCS controller comm port</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">DDCS controller link, communication port.
Selects the connection used by a DDCS controller (such as an AC 800M).
0: Not in use; not in use, communication is disabled.
1: Slot 1A; activates channel A on the FDCO-0x which is in slot 1.
2: Slot 2A; activates channel A on the FDCO-0x which is in slot 2.
3: Slot 3A; activates channel A on the FDCO-0x which is in slot 3.
4: Slot 1B; activates channel B on the FDCO-0x which is in slot 1.
5: Slot 2B; activates channel B on the FDCO-0x which is in slot 2.
6: Slot 3B; activates channel B on the FDCO-0x which is in slot 3.
7: XD2D; activates connector XD2D.</td></tr>
<tr><td>0 … 7</td><td>Not in use</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3">60.52</td><td colspan="7">DDCS controller node address</td></tr>
<tr><td colspan="7">DDCS controller link, node address.
Defines the node address of the drive for the DDCS controller. Two drives with the same node address are not allowed.
DriveBus connection:
– AC 800M with CI858, drives must be addressed from 1 … 24.
– AC 80, drives must be addressed from 1 … 12.
Optical ModuleBus:
– AC 800M, drives must be addressed the following way:
1. Multiply the hundreds of the position value by 16.
2. Add the tens and ones of the position value to the result.
Examples:
<table>
<tr><td>Position value</td><td>60.52 DDCS controller node address</td></tr>
<tr><td>101</td><td>16 • 1 + 01 = 17</td></tr>
<tr><td>712</td><td>16 • 7 + 12 = 124</td></tr>
</table>
– AC 80 with TB810 or TB811, drives must be addressed the following way:
1. Multiply the hundreds of the position value by 16.
2. Add the tens and ones of the position value to the result.
Examples:
<table>
<tr><td>Position value</td><td>60.52 DDCS controller node address</td></tr>
<tr><td>101</td><td>16 • 1 + 01 = 17</td></tr>
<tr><td>712</td><td>16 • 7 + 12 = 124</td></tr>
</table></td></tr>
<tr><td>1 … 254</td><td>1</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3">60.55</td><td colspan="7">DDCS controller HW connection</td></tr>
<tr><td colspan="7">DDCS controller link, hardware connection.
Selects the topology of the DDCS controller link.
0: Ring; The drives are connected in a ring topology. Forwarding of messages is enabled.
1: Star; The drives are connected in a star topology, e.g. through a branching unit. Forwarding of messages is disabled.</td></tr>
<tr><td>0 … 1</td><td>Star</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="2">60.56</td><td colspan="7">DDCS controller baud rate</td></tr>
<tr><td colspan="7">DDCS controller link, link speed.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Selects the communication speed of the DDCS controller link channel selected by 60.51 DDCS controller comm port.
1: 1 Mbps; 1 Mbit/s.
2: 2 Mbps; 2 Mbit/s.
4: 4 Mbps; 4 Mbit/s.
8: 8 Mbps; 8 Mbit/s.</td></tr>
<tr><td>1 … 8</td><td>4 Mbps</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">60.58</td><td colspan="7">DDCS controller comm loss time</td></tr>
<tr><td colspan="7">DDCS controller link, loss timeout.
Defines the time delay for the DDCS controller link loss, before the action defined in 60.59 DDCS controller comm loss function is executed.
Notes:
– 60.58 DDCS controller comm loss time should be set to at least 3 times the transmit interval of the DDCS controller.
– There is a 60-second boot-up delay immediately after power-up of the drive. During the delay, the communication loss function is disabled, but communication itself can be active.
– The AC 800M immediately detects a communication break. Re-establishing the communication is done at 9-second idle intervals.
– The sending interval of a data set is not the same as the execution interval of the application task. When using ModuleBus, the sending interval is defined by the DDCS controller parameter Scan Cycle Time (by default, 100 ms).</td></tr>
<tr><td>0 … 65535</td><td>100</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">60.59</td><td colspan="7">DDCS controller comm loss function</td></tr>
<tr><td colspan="7">DDCS controller link, loss action.
Selects how the drive reacts to a DDCS controller link loss.
0: No action; none, disable communication loss function.
1: Fault; the event generates fault 7581 DDCS controller comm loss and the motor stops due to 31.13 Fault stop mode communication. This occurs only when the drive is controlled from the DDCS controller link.
2: Last speed; the evet generates warning A7CA DDCS controller comm loss and freezes the speed to the level the drive was operating at. This occurs only when the drive is controlled from the DDCS controller link. The last speed is determined based on the speed feedback using an 850 ms low-pass filter.
WARNING
Make sure that it is safe to continue operation in case of a communication break.
3: Speed reference safe; the event generates warning A7CA DDCS controller comm loss and sets the speed to the value defined in 22.46 Speed reference safe. This occurs only when the drive is controlled from the DDCS controller link.
WARNING
Make sure that it is safe to continue operation in case of a communication break.
4: Fault always; the event generates fault 7581 DDCS controller comm loss and the motor stops due to 31.13 Fault stop mode communication. This occurs even though no control is expected from the DDCS controller link.
5: Warning; the event generates warning A7CA DDCS controller comm loss. This occurs only when the drive is controlled from the DDCS controller link.
WARNING
Make sure that it is safe to continue operation in case of a communication break.</td></tr>
<tr><td>0 … 5</td><td>No action</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>60.60</td><td colspan="7">DDCS controller ref1 type</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">DDCS controller link, reference 1 type.
Selects the type and scaling of 03.11 DDCS controller ref1 send by the DDCS controller to a DDCS communication option module (FDCO-0x).
0: Auto; automatic type and scaling according to which reference chain the incoming reference is connected to. If the reference is not connected to any chain, setting Transparent is applied.
<table>
<tr><th>Parameter</th><th>Auto type and scaling</th></tr>
<tr><td>22.11 Speed reference 1 source</td><td rowspan="3">Speed</td></tr>
<tr><td>22.12 Speed reference 2 source</td></tr>
<tr><td>23.32 Direct speed reference</td></tr>
<tr><td>26.11 Torque reference 1 source</td><td rowspan="2">Torque</td></tr>
<tr><td>26.12 Torque reference 2 source</td></tr>
<tr><td>27.22 Current reference source</td><td>Current</td></tr>
<tr><td>28.18 EMF reference source</td><td rowspan="3">General</td></tr>
<tr><td>28.20 EMF voltage correction source</td></tr>
<tr><td>28.29 Flux correction source</td></tr>
</table>
1: Transparent; no scaling is applied.
2: General; generic reference with a scaling of 100 = 1 (e.g. integer and two decimals).
3: Torque; the scaling is defined by 46.04 M1 torque scaling actual.
4: Speed; the scaling is defined by 46.02 M1 speed scaling actual.
5: Current; the scaling is in percent of 99.11 M1 nominal current: 100 = 1 %.</td></tr>
<tr><td>0 … 5</td><td>Auto</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">60.61</td><td colspan="7">DDCS controller ref2 type</td></tr>
<tr><td colspan="7">DDCS controller link, reference 2 type.
Selects the type and scaling of 03.12 DDCS controller ref2 send by the DDCS controller to a DDCS communication option module (FDCO-0x). See 60.60 DDCS controller ref1 type.</td></tr>
<tr><td>0 … 5</td><td>Auto</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">60.62</td><td colspan="7">DDCS controller act1 type</td></tr>
<tr><td colspan="7">DDCS controller link, actual value 1 type.
Selects the type/source and scaling of actual value 1 sent by a DDCS communication option module (FDCO-0x) to the DDCS controller.
0: Auto; type/source and scaling follow the type of reference 1 selected by 60.60 DDCS controller ref1 type. For individual settings see below.
1: Transparent; no scaling is applied. The 16-bit scaling is 1 = 1 unit.
2: General; generic actual value with a scaling of 100 = 1 (e.g. integer and two decimals).
3: Torque; 01.17 Motor torque filtered is sent as actual value 1. The scaling is defined by 46.04 M1 torque scaling actual.
4: Speed; 01.01 Used motor speed filtered is sent as actual value 1. The scaling is defined by 46.02 M1 speed scaling actual.
5: Current; 27.05 Motor current is sent as actual value 1. The scaling is in percent of 99.11 M1 nominal current.</td></tr>
<tr><td>0 … 5</td><td>Auto</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">60.63</td><td colspan="7">DDCS controller act2 type</td></tr>
<tr><td colspan="7">DDCS controller link, actual value 2 type.
Selects the type/source and scaling of actual value 2 sent by a DDCS communication option module (FDCO-0x) to the DDCS controller. See 60.62 DDCS controller act1 type.</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	0 … 5	Auto	-	1 = 1	n	y	Parameter
60.64	**Mailbox data set selection**						
	DDCS controller link, mailbox data set selection. Selects the pair of data sets used by the mailbox service in the DDCS controller link. See chapter DDCS controller interface. 0: **Data set 32/33**; data sets 32 and 33 are dedicated for the mailbox service. 1: **Data set 24/25**; Data sets 24 and 25 are dedicated for the mailbox service.						
	0 … 1	Data set 32/33	-	1 = 1	n	y	Parameter

61 D2D and DDCS transmit data

Defines the data sent from the drive to the DDCS/D2D link.

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
61.01	**M/F data 1 selection**						
	Master-follower link, data 1 from the drive to the master-follower link. Select data sent as word 1 from the drive to the master-follower link. The value is visible in 61.25 M/F data 1 value. **Other**; source selection. 0: **None**; inactive. 1542: **06.06 Follower CW**; 06.06 Follower control word. Usually sent from the master to the followers. 1545: **06.09 Used MCW**; 06.09 Used main control word. 1551: **06.15 Main SW**; 06.15 Main status word. Usually sent from the followers to the master. 5891: **23.03 Speed reference 7**; 23.03 Speed reference 7. Usually sent from the master to the followers. 6658: **26.02 Torque reference used**; 26.02 Torque reference used. Usually sent from the master to the followers.						
	0 … 6658	06.06 Follower CW	-	1 = 1	n	y	Parameter
61.02	**M/F data 2 selection**						
	Master-follower link, data 2 from the drive to the master-follower link. Select data sent as word 2 from the drive to the master-follower link. The value is visible in 61.26 M/F data 2 value. See 61.01 M/F data 1 selection.						
	0 … 6658	23.03 Speed reference 7	-	1 = 1	n	y	Parameter
61.03	**M/F data 3 selection**						
	Master-follower link, data 3 from the drive to the master-follower link. Select data sent as word 3 from the drive to the master-follower link. The value is visible in 61.27 M/F data 3 value. See 61.01 M/F data 1 selection.						
	0 … 6658	26.02 Torque reference used	-	1 = 1	n	y	Parameter
61.25	**M/F data 1 value**						
	Master-follower link, data 1 value from the drive to the master-follower link. Shows the value sent as word 1 to the master-follower link as integer. If no data has been preselected by 61.01 M/F data 1 selection, the value to be sent can be written directly into 61.25 M/F data 1 value.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	0 … 65535	0	-	1 = 1	y	n	Signal
61.26	**M/F data 2 value**						
	Master-follower link, data 2 value from the drive to the master-follower link. Shows the value sent as word 2 to the master-follower link as integer. If no data has been preselected by 61.02 M/F data 2 selection, the value to be sent can be written directly into 61.26 M/F data 2 value.						
	0 … 65535	0	-	1 = 1	y	n	Signal
61.27	**M/F data 3 value**						
	Master-follower link, data 3 value from the drive to the master-follower link. Shows the value sent as word 3 to the master-follower link as integer. If no data has been preselected by 61.03 M/F data 3 selection, the value to be sent can be written directly into 61.27 M/F data 3 value.						
	0 … 65535	0	-	1 = 1	y	n	Signal
.	Parameters 61.45 … 61.50 select data sent from the drive, in data sets 2 and 4, to the DDCS controller. These data sets are used in communication with 60.50 DDCS controller drive type = ABB standard drive. Signals 61.95 … 61.100 display the data to be sent to the DDCS controller in integer format. If no data has been preselected, the value to be sent can be written directly into these signals. **Example:** 61.45 Data set 2 data 1 selection preselects the data for data set 2 word 1. 61.95 Data set 2 data 1 value displays the selected data in integer format. If no data is preselected, the value to be sent can be written directly into 61.95 Data set 2 data 1 value.						
61.45	**Data set 2 data 1 selection**						
	DDCS controller link, data set 2 data 1 from the drive to the DDCS controller link. Select data sent as data set 2 data 1 from the drive to the DDCS controller link. The value is visible in 61.95 Data set 2 data 1 value. **Other**; source selection. 0: **None**; inactive. Disable DDCS controller link data in. 4: **SW 16bit**; status word (16-bit). Taken from 06.15 Main status word. 5: **Act1 16bit**; actual value 1 ACT1 (16-bit). Depending on 60.62 DDCS controller act1 type. 6: **Act2 16bit**; actual value 2 ACT2 (16-bit). Depending on 60.63 DDCS controller act2 type.						
	0 … 6	None	-	1 = 1	n	y	Parameter
61.46	**Data set 2 data 2 selection**						
	DDCS controller link, data set 2 data 2 from the drive to the DDCS controller link. Select data sent as data set 2 data 2 from the drive to the DDCS controller link. The value is visible in 61.96 Data set 2 data 2 value. See 61.45 Data set 2 data 1 selection.						
	0 … 6	None	-	1 = 1	n	y	Parameter
61.47 to 61.50	**Data set 2 data 3 selection … Data set 4 data 3 selection**						
	See 61.45 Data set 2 data 1 selection.						
	0 … 6	None	-	1 = 1	n	y	Parameter
.	Parameters 61.51 … 61.74 select data sent from the drive, in data sets 11, 13, 15, 17, 19, 21, 23 and 25, to the DDCS controller. These data sets are used in communication with 60.50 DDCS controller drive type = ABB engineered drive. The update intervals of the data sets are as follows: – Data sets 10 and 11: 2 ms. – Data sets 12 and 13: 4 ms. – Data sets 14 … 17: 10 ms.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	– Data sets 18 … 25, 32 and 33: 100 ms. Signals 61.101 … 61.124 display the data to be sent to the DDCS controller in integer format. If no data has been preselected, the value to be sent can be written directly into these signals. **Example:** 61.51 Data set 11 data 1 selection preselects the data for data set 11 word 1. 61.101 Data set 11 data 1 value displays the selected data in integer format. If no data is preselected, the value to be sent can be written directly into 61.101 Data set 11 data 1 value.						
61.51	**Data set 11 data 1 selection**						
	DDCS controller link, data set 11 data 1 from the drive to the DDCS controller link. Select data sent as data set 11 data 1 from the drive to the DDCS controller link. The value is visible in 61.101 Data set 11 data 1 value. **Other**; source selection. 0: **None**; inactive. Disable DDCS controller link data in. 4: **SW 16bit**; status word (16-bit). Taken from 06.15 Main status word. 5: **Act1 16bit**; actual value 1 ACT1 (16-bit). Depending on 60.62 DDCS controller act1 type. 6: **Act2 16bit**; actual value 2 ACT2 (16-bit). Depending on 60.63 DDCS controller act2 type.						
	0 … 6	None	-	1 = 1	n	y	Parameter
61.52	**Data set 11 data 2 selection**						
	DDCS controller link, data set 11 data 2 from the drive to the DDCS controller link. Select data sent as data set 11 data 2 from the drive to the DDCS controller link. The value is visible in 61.102 Data set 11 data 2 value. See 61.51 Data set 11 data 1 selection.						
	0 … 6	None	-	1 = 1	n	y	Parameter
61.53 to 61.74	**Data set 11 data 3 selection … Data set 25 data 3 selection**						
	See 61.51 Data set 11 data 1 selection.						
	0 … 6	None	-	1 = 1	n	y	Parameter
61.95	**Data set 2 data 1 value**						
	DDCS controller link, data set 2 data 1 from the drive to the DDCS controller link. Shows the value sent as data set 2 data 1 to the DDCS controller link as integer. If no data has been preselected by 61.45 Data set 2 data 1 selection, the value to be sent can be written directly into 61.95 Data set 2 data 1 value.						
	0 … 65535	0	-	1 = 1	y	n	Signal
61.96	**Data set 2 data 2 value**						
	DDCS controller link, data set 2 data 2 from the drive to the DDCS controller link. Shows the value sent as data set 2 data 2 to the DDCS controller link as integer. If no data has been preselected by 61.46 Data set 2 data 2 selection, the value to be sent can be written directly into 61.96 Data set 2 data 2 value.						
	0 … 65535	0	-	1 = 1	y	n	Signal
61.97 to 61.100	**Data set 2 data 3 value … Data set 4 data 3 value**						
	See 61.95 Data set 2 data 1 value.						
	0 … 65535	0	-	1 = 1	y	n	Signal
61.101	**Data set 11 data 1 value**						
	DDCS controller link, data set 11 data 1 from the drive to the DDCS controller link. Shows the value sent as data set 11 data 1 to the DDCS controller link as integer.						

Index	Name						
	Text						
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	If no data has been preselected by 61.51 Data set 11 data 1 selection, the value to be sent can be written directly into 61.101 Data set 11 data 1 value.						
	0 … 65535	0	-	1 = 1	y	n	Signal
61.102	**Data set 11 data 2 value**						
	DDCS controller link, data set 11 data 2 from the drive to the DDCS controller link. Shows the value sent as data set 11 data 2 to the DDCS controller link as integer. If no data has been preselected by 61.52 Data set 11 data 2 selection, the value to be sent can be written directly into 61.102 Data set 11 data 2 value.						
	0 … 65535	0	-	1 = 1	y	n	Signal
61.103 to 61.124	**Data set 11 data 3 value … Data set 25 data 3 value**						
	See 61.101 Data set 11 data 1 value.						
	0 … 65535	0	-	1 = 1	y	n	Signal

62 D2D and DDCS receive data

Defines the data sent from the DDCS/D2D link to the drive.

Index	Name						
	Text						
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
62.01	**M/F data 1 selection**						
	Master-follower link, data 1 from the master via master-follower link to the followers (followers only). Select data sent as word 1 from the master via master-follower link to the followers. The value is visible in 62.25 M/F data 1 value. **Other**; source selection. 0: **None**; inactive. 1: **CW 16bit**; control word (16-bit). Send to 06.07 Follower control word received. 2: **Ref1 16bit**; reference REF1 (16-bit). Send to 03.13 M/F or D2D ref1. Type and scaling are set by 60.10 M/F ref1 type. 3: **Ref2 16bit**; reference REF2 (16-bit). Send to 03.14 M/F or D2D ref2. Type and scaling are set by 60.11 M/F ref2 type.						
	0 … 3	CW 16bit	-	1 = 1	n	y	Parameter
62.02	**M/F data 2 selection**						
	Master-follower link, data 2 from the master via master-follower link to the followers (followers only). Select data sent as word 2 from the master via master-follower link to the followers. The value is visible in 62.26 M/F data 2 value. See 62.01 M/F data 1 selection.						
	0 … 3	Ref1 16bit	-	1 = 1	n	y	Parameter
62.03	**M/F data 3 selection**						
	Master-follower link, data 3 from the master via master-follower link to the followers (followers only). Select data sent as word 3 from the master via master-follower link to the followers. The value is visible in 62.27 M/F data 3 value. See 62.01 M/F data 1 selection.						
	0 … 3	Ref2 16bit	-	1 = 1	n	y	Parameter
62.04	**Follower node 2 data 1 sel**						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	Master-follower link, data 1 from follower node 2 via master-follower link to the master (master only). Select data sent as word 1 from follower node 2 via master-follower link to the master. The value is visible in 62.28 Follower node 2 data 1 value. **Other**; source selection. 0: **None**; inactive. 26: **06.122 Follower SW node 2**; follower status word node 2 (16-bit). 06.15 Main status word received from follower node 2 and sent to 06.122 Follower status word node 2. See 60.18 Follower enable.						
	0 … 26	06.122 Follower SW node 2	-	1 = 1	n	y	Parameter
62.05	**Follower node 2 data 2 sel**						
	Master-follower link, data 2 from follower node 2 via master-follower link to the master (master only). Select data sent as word 2 from follower node 2 via master-follower link to the master. The value is visible in 62.29 Follower node 2 data 2 value. See 62.04 Follower node 2 data 1 sel.						
	0 … 26	None	-	1 = 1	n	y	Parameter
62.06	**Follower node 2 data 3 sel**						
	Master-follower link, data 3 from follower node 2 via master-follower link to the master (master only). Select data sent as word 3 from follower node 2 via master-follower link to the master. The value is visible in 62.30 Follower node 2 data 3 value. See 62.04 Follower node 2 data 1 sel.						
	0 … 26	None	-	1 = 1	n	y	Parameter
62.07	**Follower node 3 data 1 sel**						
	Master-follower link, data 1 from follower node 3 via master-follower link to the master (master only). Select data sent as word 1 from follower node 3 via master-follower link to the master. The value is visible in 62.31 Follower node 3 data 1 value. **Other**; source selection. 0: **None**; inactive. 26: **06.123 Follower SW node 3**; follower status word node 3 (16-bit). 06.15 Main status word received from follower node 3 and sent to 06.123 Follower status word node 3. See 60.18 Follower enable.						
	0 … 26	06.123 Follower SW node 3	-	1 = 1	n	y	Parameter
62.08	**Follower node 3 data 2 sel**						
	Master-follower link, data 2 from follower node 3 via master-follower link to the master (master only). Select data sent as word 2 from follower node 3 via master-follower link to the master. The value is visible in 62.32 Follower node 3 data 2 value. See 62.07 Follower node 3 data 1 sel.						
	0 … 26	None	-	1 = 1	n	y	Parameter
62.09	**Follower node 3 data 3 sel**						
	Master-follower link, data 3 from follower node 3 via master-follower link to the master (master only). Select data sent as word 3 from follower node 3 via master-follower link to the master. The value is visible in 62.33 Follower node 3 data 3 value. See 62.07 Follower node 3 data 1 sel.						
	0 … 26	None	-	1 = 1	n	y	Parameter
62.10	**Follower node 4 data 1 sel**						

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th></th><th colspan="7">Text</th></tr>
<tr><th></th><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">Master-follower link, data 1 from follower node 4 via master-follower link to the master (master only).
Select data sent as word 1 from follower node 4 via master-follower link to the master. The value is visible in 62.34 Follower node 4 data 1 value.
Other; source selection.
0: **None**; inactive.
26: **06.124 Follower SW node 4**; follower status word node 4 (16-bit). 06.15 Main status word received from follower node 4 and sent to 06.124 Follower status word node 4. See 60.18 Follower enable.</td></tr>
<tr><td></td><td>0 … 26</td><td>06.124 Follower SW node 4</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**62.11**</td><td colspan="7">**Follower node 4 data 2 sel**</td></tr>
<tr><td></td><td colspan="7">Master-follower link, data 2 from follower node 4 via master-follower link to the master (master only).
Select data sent as word 2 from follower node 4 via master-follower link to the master. The value is visible in 62.35 Follower node 4 data 2 value. See 62.10 Follower node 4 data 1 sel.</td></tr>
<tr><td></td><td>0 … 26</td><td>None</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**62.12**</td><td colspan="7">**Follower node 4 data 3 sel**</td></tr>
<tr><td></td><td colspan="7">Master-follower link, data 3 from follower node 4 via master-follower link to the master (master only).
Select data sent as word 3 from follower node 4 via master-follower link to the master. The value is visible in 62.36 Follower node 4 data 3 value. See 62.10 Follower node 4 data 1 sel.</td></tr>
<tr><td></td><td>0 … 26</td><td>None</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**62.25**</td><td colspan="7">**M/F data 1 value**</td></tr>
<tr><td></td><td colspan="7">Master-follower link, data 1 value from the master via master-follower link to the followers (followers only).
Shows the value sent as word 1 from the master via master-follower link to the followers as integer by 62.01 M/F data 1 selection. Can also be used as source by other parameters.</td></tr>
<tr><td></td><td>0 … 65535</td><td>0</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>**62.26**</td><td colspan="7">**M/F data 2 value**</td></tr>
<tr><td></td><td colspan="7">Master-follower link, data 2 value from the master via master-follower link to the followers (followers only).
Shows the value sent as word 2 from the master via master-follower link to the followers as integer by 62.02 M/F data 2 selection. Can also be used as source by other parameters.</td></tr>
<tr><td></td><td>0 … 65535</td><td>0</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>**62.27**</td><td colspan="7">**M/F data 3 value**</td></tr>
<tr><td></td><td colspan="7">Master-follower link, data 3 value from the master via master-follower link to the followers (followers only).
Shows the value sent as word 3 from the master via master-follower link to the followers as integer by 62.03 M/F data 3 selection. Can also be used as source by other parameters.</td></tr>
<tr><td></td><td>0 … 65535</td><td>0</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>**62.28**</td><td colspan="7">**Follower node 2 data 1 value**</td></tr>
<tr><td></td><td colspan="7">Master-follower link, data 1 value from follower node 2 via master-follower link to the master (master only).
Shows the value sent as word 1 from follower node 2 via master-follower link to the master as integer by 62.04 Follower node 2 data 1 sel. Can also be used as source by other parameters.</td></tr>
<tr><td></td><td>0 … 65535</td><td>0</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>**62.29**</td><td colspan="7">**Follower node 2 data 2 value**</td></tr>
</table>

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	Master-follower link, data 2 value from follower node 2 via master-follower link to the master (master only). Shows the value sent as word 2 from follower node 2 via master-follower link to the master as integer by 62.05 Follower node 2 data 2 sel. Can also be used as source by other parameters.						
	0 … 65535	0	-	1 = 1	y	n	Signal
62.30	**Follower node 2 data 3 value**						
	Master-follower link, data 3 value from follower node 2 via master-follower link to the master (master only). Shows the value sent as word 3 from follower node 2 via master-follower link to the master as integer by 62.06 Follower node 2 data 3 sel. Can also be used as source by other parameters.						
	0 … 65535	0	-	1 = 1	y	n	Signal
62.31	**Follower node 3 data 1 value**						
	Master-follower link, data 1 value from follower node 3 via master-follower link to the master (master only). Shows the value sent as word 1 from follower node 3 via master-follower link to the master as integer by 62.07 Follower node 3 data 1 sel. Can also be used as source by other parameters.						
	0 … 65535	0	-	1 = 1	y	n	Signal
62.32	**Follower node 3 data 2 value**						
	Master-follower link, data 2 value from follower node 3 via master-follower link to the master (master only). Shows the value sent as word 2 from follower node 3 via master-follower link to the master as integer by 62.08 Follower node 3 data 2 sel. Can also be used as source by other parameters.						
	0 … 65535	0	-	1 = 1	y	n	Signal
62.33	**Follower node 3 data 3 value**						
	Master-follower link, data 3 value from follower node 3 via master-follower link to the master (master only). Shows the value sent as word 3 from follower node 3 via master-follower link to the master as integer by 62.09 Follower node 3 data 3 sel. Can also be used as source by other parameters.						
	0 … 65535	0	-	1 = 1	y	n	Signal
62.34	**Follower node 4 data 1 value**						
	Master-follower link, data 1 value from follower node 4 via master-follower link to the master (master only). Shows the value sent as word 1 from follower node 4 via master-follower link to the master as integer by 62.10 Follower node 4 data 1 sel. Can also be used as source by other parameters.						
	0 … 65535	0	-	1 = 1	y	n	Signal
62.35	**Follower node 4 data 2 value**						
	Master-follower link, data 2 value from follower node 4 via master-follower link to the master (master only). Shows the value sent as word 2 from follower node 4 via master-follower link to the master as integer by 62.11 Follower node 4 data 2 sel. Can also be used as source by other parameters.						
	0 … 65535	0	-	1 = 1	y	n	Signal
62.36	**Follower node 4 data 3 value**						
	Master-follower link, data 3 value from follower node 4 via master-follower link to the master (master only). Shows the value sent as word 3 from follower node 4 via master-follower link to the master as integer by 62.12 Follower node 4 data 3 sel. Can also be used as source by other parameters.						
	0 … 65535	0	-	1 = 1	y	n	Signal

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
62.37	**M/F communication status 1**						
	reserved						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
62.38	**M/F communication status 2**						
	reserved						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
62.41	**M/F follower ready status 1**						
	reserved						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
62.41	**M/F follower ready status 2**						
	reserved						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
.	Parameters 62.45 … 62.50 select targets for the data received from the DDCS controller in data sets 1 and 3. These data sets are used in communication with 60.50 DDCS controller drive type = ABB standard drive. Signals 62.95 … 62.100 display the data received from the DDCS controller in integer format and can also be used as sources by other parameters. **Example:** 62.45 Data set 1 data 1 selection selects a target for data set 1 data 1. Then 62.95 Data set 1 data 1 value displays the received data in integer format and can also be used as a source by other parameters.						
62.45	**Data set 1 data 1 selection**						
	DDCS controller link, data set 1 data 1 from the DDCS controller via DDCS controller link to the drive. Select data sent as data set 1 data 1 from the DDCS controller via DDCS controller link to the drive. The value is visible in 62.95 Data set 1 data 1 value. **Other**; source selection. 0: **None**; inactive. Disable DDCS controller link data out. 1: **CW 16bit**; control word (16-bit). Send to 06.110 DDCS control word. 2: **Ref1 16bit**; reference REF1 (16-bit). Send to 03.11 DDCS controller ref1. 3: **Ref2 16bit**; reference REF2 (16-bit). Send to 03.12 DDCS controller ref2.						
	0 … 3	None	-	1 = 1	n	y	Parameter
62.46	**Data set 1 data 2 selection**						
	DDCS controller link, data set 1 data 2 from the DDCS controller via DDCS controller link to the drive. Select data sent as data set 1 data 2 from the DDCS controller via DDCS controller link to the drive. The value is visible in 62.96 Data set 1 data 2 value. See 62.45 Data set 1 data 1 selection.						
	0 … 3	None	-	1 = 1	n	y	Parameter
62.47 to 62.50	**Data set 1 data 3 selection … Data set 3 data 3 selection**						
	See 62.45 Data set 1 data 1 selection.						
	0 … 3	None	-	1 = 1	n	y	Parameter
.	Parameters 62.51 … 62.74 select targets for the data received from the DDCS controller in data sets 10, 12, 14, 16, 18, 20, 22 and 24. These data sets are used in communication with 60.50 DDCS controller drive type = ABB engineered drive. The update intervals of the data sets are as follows: – Data sets 10 and 11: 2 ms. – Data sets 12 and 13: 4 ms.						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	– Data sets 14 … 17: 10 ms. – Data sets 18 … 25, 32 and 33: 100 ms. Signals 62.101 … 62.124 display the data received from the DDCS controller in integer format and can also be used as sources by other parameters. **Example:** 62.51 Data set 10 data 1 selection selects a target for data set 10 data 1. Then 62.101 Data set 10 data 1 value displays the received data in integer format and can also be used as a source by other parameters.						
62.51	**Data set 10 data 1 selection**						
	DDCS controller link, data set 10 data 1 from the DDCS controller via DDCS controller link to the drive. Select data sent as data set 10 data 1 from the DDCS controller via DDCS controller link to the drive. The value is visible in 62.101 Data set 10 data 1 value. **Other**; source selection. 0: **None**; inactive. Disable DDCS controller link data out. 1: **CW 16bit**; control word (16-bit). Send to 06.110 DDCS control word. 2: **Ref1 16bit**; reference REF1 (16-bit). Send to 03.11 DDCS controller ref1. 3: **Ref2 16bit**; reference REF2 (16-bit). Send to 03.12 DDCS controller ref2.						
	0 … 3	None	-	1 = 1	n	y	Parameter
62.52	**Data set 10 data 2 selection**						
	DDCS controller link, data set 10 data 2 from the DDCS controller via DDCS controller link to the drive. Select data sent as data set 10 data 2 from the DDCS controller via DDCS controller link to the drive. The value is visible in 62.102 Data set 10 data 2 value. See 62.51 Data set 10 data 1 selection.						
	0 … 3	None	-	1 = 1	n	y	Parameter
62.53 to 62.74	**Data set 10 data 3 selection … Data set 24 data 3 selection**						
	See 62.51 Data set 10 data 1 selection.						
	0 … 3	None	-	1 = 1	n	y	Parameter
62.95	**Data set 1 data 1 value**						
	DDCS controller link, data set 1 data 1 from the DDCS controller via DDCS controller link to the drive. Shows the value sent as data set 1 data 1 from the DDCS controller via DDCS controller link to the drive as integer by 62.45 Data set 1 data 1 selection. Can also be used as source by other parameters.						
	0 … 65535	0	-	1 = 1	y	n	Signal
62.96	**Data set 1 data 2 value**						
	DDCS controller link, data set 1 data 2 from the DDCS controller via DDCS controller link to the drive. Shows the value sent as data set 1 data 2 from the DDCS controller via DDCS controller link to the drive as integer by 62.46 Data set 1 data 2 selection. Can also be used as source by other parameters.						
	0 … 65535	0	-	1 = 1	y	n	Signal
62.97 to 62.100	**Data set 1 data 3 value … Data set 3 data 3 value**						
	See 62.95 Data set 1 data 1 value.						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	0 … 65535	0	-	1 = 1	y	n	Signal
62.101	**Data set 10 data 1 value**						
	DDCS controller link, data set 10 data 1 from the DDCS controller via DDCS controller link to the drive. Shows the value sent as data set 10 data 1 from the DDCS controller via DDCS controller link to the drive as integer by 62.51 Data set 10 data 1 selection. Can also be used as source by other parameters.						
	0 … 65535	0	-	1 = 1	y	n	Signal
62.102	**Data set 10 data 2 value**						
	DDCS controller link, data set 10 data 2 from the DDCS controller via DDCS controller link to the drive. Shows the value sent as data set 10 data 2 from the DDCS controller via DDCS controller link to the drive as integer by 62.52 Data set 10 data 2 selection. Can also be used as source by other parameters.						
	0 … 65535	0	-	1 = 1	y	n	Signal
62.102 to 62.124	**Data set 10 data 3 value … Data set 24 data 3 value**						
	See 62.101 Data set 10 data 1 value.						
	0 … 65535	0	-	1 = 1	y	n	Signal

70 DCSLink Communication

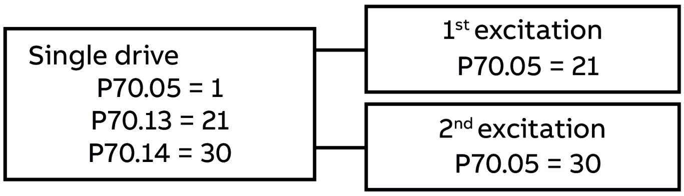
Defines the communication parameters for the DCSLink board SDCS-DSL-H1x.
For communication between the armature converter and the field exciters or 12-pulse communication only the basic communication parameters 70.05 … 70.14 must be set.

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**

Parameter settings for:

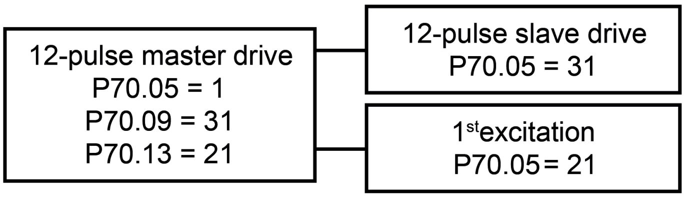
Single drive with excitation	70.05 DCSLink node ID = 1. 70.13 M1 field exciter node ID = 21. 70.14 M2 field exciter node ID = 30.	See example 1.
12-pulse drive	70.05 DCSLink node ID= 1. 70.09 12-pulse slave node ID = 31. 70.13 M1 field exciter node ID = 21.	See example 2.

Example 1
Single drive with one or two field exciters and communication supervision:



SB_880_029_master-slave_b.ai

Example 2
12-pulse configuration and communication supervision:



SB_880_029_master-slave_a.ai

70.01 **DCSLink status 1**

DCSLink status 1 of field exciter nodes 1 … 16.
This word displays the status of the DCSLink for field exciter nodes 1 … 16.
Bit assignment:

Bit	**Name**	**Value**	**Remarks**
0	Node01	1	DCSLink node01 active and OK.
		0	DCSLink node01 not active or faulty.
1	Node02	1	DCSLink node02 active and OK.
		0	DCSLink node02 not active or faulty.
2	Node03	1	DCSLink node03 active and OK.
		0	DCSLink node03 not active or faulty.

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

Bit	Name	Value	Remarks
3	Node04	1	DCSLink node04 active and OK.
		0	DCSLink node04 not active or faulty.
4	Node05	1	DCSLink node05 active and OK.
		0	DCSLink node05 not active or faulty.
5	Node06	1	DCSLink node06 active and OK.
		0	DCSLink node06 not active or faulty.
6	Node07	1	DCSLink node07 active and OK.
		0	DCSLink node07 not active or faulty.
7	Node08	0	DCSLink node08 active and OK.
		1	DCSLink node08 not active or faulty.
8	Node09	0	DCSLink node09 active and OK.
		1	DCSLink node09 not active or faulty.
9	Node10	0	DCSLink node10 active and OK.
		1	DCSLink node10 not active or faulty.
10	Node11	0	DCSLink node11 active and OK.
		1	DCSLink node11 not active or faulty.
11	Node12	0	DCSLink node12 active and OK.
		1	DCSLink node12 not active or faulty.
12	Node13	0	DCSLink node13 active and OK.
		1	DCSLink node13 not active or faulty.
12	Node14	0	DCSLink node14 active and OK.
		1	DCSLink node14 not active or faulty.
14	Node15	0	DCSLink node15 active and OK.
		1	DCSLink node15 not active or faulty.
15	Node16	0	DCSLink node16 active and OK.
		1	DCSLink node16 not active or faulty.

Index	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	0000h … FFFFh	-	-	1 = 1	y	n	Signal

70.02 **DCSLink status 2**

DCSLink status 2 of field exciter nodes 17 … 32.
This word displays the status of the DCSLink for field exciter nodes 17 … 32.
Bit assignment:

Bit	Name	Value	Remarks
0	Node17	1	DCSLink node17 active and OK.
		0	DCSLink node17 not active or faulty.
1	Node18	1	DCSLink node18 active and OK.
		0	DCSLink node18 not active or faulty.
2	Node19	1	DCSLink node19 active and OK.
		0	DCSLink node19 not active or faulty.
3	Node20	1	DCSLink node20 active and OK.

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

		0	DCSLink node20 not active or faulty.
4	Node21	1	DCSLink node21 active and OK.
		0	DCSLink node21 not active or faulty.
5	Node22	1	DCSLink node22 active and OK.
		0	DCSLink node22 not active or faulty.
6	Node23	1	DCSLink node23 active and OK.
		0	DCSLink node23 not active or faulty.
7	Node24	0	DCSLink node24 active and OK.
		1	DCSLink node24 not active or faulty.
8	Node25	0	DCSLink node25 active and OK.
		1	DCSLink node25 not active or faulty.
9	Node26	0	DCSLink node26 active and OK.
		1	DCSLink node26 not active or faulty.
10	Node27	0	DCSLink node27 active and OK.
		1	DCSLink node27 not active or faulty.
11	Node28	0	DCSLink node28 active and OK.
		1	DCSLink node28 not active or faulty.
12	Node29	0	DCSLink node29 active and OK.
		1	DCSLink node29 not active or faulty.
12	Node30	0	DCSLink node30 active and OK.
		1	DCSLink node30 not active or faulty.
14	Node31	0	DCSLink node31 active and OK.
		1	DCSLink node31 not active or faulty.
15	Node32	0	DCSLink node32 active and OK.
		1	DCSLink node32 not active or faulty.

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
70.05	**DCSLink node ID**						
	DCSLink node ID. Defines the DCSLink node ID of the drive. Two drives with the same node ID are not allowed. Maximum allowed drive count is 50. See also examples 1 … 2 above. The DCSLink node ID is inactive, if 70.05 DCSLink node ID is set to 0. A chosen (70.05 DCSLink node ID > 0), but not connected or faulty SDCS-DSL-H1x board generates fault 7082 I/O extension communication or warning A7AB I/O extension configuration depending on the setting of 70.07 DCSLink comm loss function.						
	0 … 63	0	-	1 = 1	n	n	Parameter
70.06	**Baud rate**						
	Baud rate. Defines the transfer rate of the DCSLink. The transfer rate decreases with the total length of the DCSLink cable: 0: **20 kbit/s**; 20 kbit/s, total cable length max. 500 m. 1: **50 kbit/s**; 50 kbit/s, total cable length max. 500 m.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	2: **125 kbit/s**; 125 kbit/s, total cable length max. 500 m. 3: **250 kbit/s**; 250 kbit/s, total cable length max. 250 m. 4: **500 kbit/s**; 500 kbit/s, total cable length max. 100 m. 5: **800 kbit/s**; 800 kbit/s, total cable length max. 50 m. 7: **1 Mbit/s**; 1 Mbit/s, total cable length approximately 25 m. **Note:** Maximum total cable length should not exceed 100 m. Maximum amount of connected drives is 50 (e.g. 25 drives including one external field exciter each).						
	0 … 7	500 kbit/s	-	1 = 1	n	y	Parameter
70.07	**DCSLink comm loss function**						
	DCSLink communication and DCSLink board (SDCS-DSL-H1x) loss action. Selects how the drive reacts to a DCSLink communication and DCSLink board (SDCS-DSL-H1x) loss. 0: **No action**; none, disable communication loss function and board loss function. 1: **Fault**; the event generates fault F544 P2P and M/F communication, or 7082 I/O extension communication and the motor stops due to 31.13 Fault stop mode communication. This occurs only when the drive is controlled via the DCSLink. 2: **Warning**; the event generates warning A112 P2P and M/F communication or A7AB I/O extension configuration. This occurs even though no control is expected via the DCSLink. **WARNING** Make sure that it is safe to continue operation in case of a communication break or a board loss.						
	0 … 2	No action	-	1 = 1	n	y	Parameter
70.08	**12-pulse timeout**						
	12-pulse communication loss timeout. Defines the time delay before a 12-pulse communication break is declared and fault F535 12-pulse communication is generated. Time count starts when the communication link fails to update the message. 70.08 12-pulse timeout is only active in the 12-pulse master drive. The communication fault is inactive, if 70.08 12-pulse timeout is set to 0 ms. **Note:** 70.08 12-pulse timeout is void, when 99.06 Operation mode = Armature converter, Large field exciter or xxx Slave.						
	0 … 32500	100	ms	1 = 1 ms	n	y	Parameter
70.09	**12-pulse slave node ID**						
	12-pulse slave node ID (12-pulse master only). Defines the DCSLink node ID of the 12-pulse slave drive in the 12-pulse master drive. See also example 2 above. The 12-pulse node ID is inactive, if 70.09 12-pulse slave node ID is set to 0. **Note:** 70.09 12-pulse slave node ID is void, when 99.06 Operation mode = Armature converter, Large field exciter or xxx Slave.						
	0 … 63	31	-	1 = 1	n	n	Parameter
70.12	**Field exciter timeout**						
	Field exciter communication loss timeout. Defines the time delay before a field exciter communication break is declared and either fault F516 M1 field exciter communication or F519 M2 field exciter communication is generated, depending on the field exciter with the communication break. Time count starts when the communication link fails to update the message. 70.12 Field exciter timeout is only active in the armature drive. The communication fault is inactive, if 70.12 Field exciter timeout is set to 0 ms.						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	Note: 70.12 Field exciter timeout is void, when 99.07 M1 used field exciter type = NotUsed, OnBoard or External field exciter via Aix and 42.49 M2 used field exciter type = NotUsed, OnBoard or External field exciter via AIx.						
	0 … 32500	100	ms	1 = 1 ms	n	y	Parameter
70.13	**M1 field exciter node ID**						
	Motor 1 field exciter node ID (armature converter only). Defines the DCSLink node ID of motor 1 field exciter in the armature drive. See also examples 1 and 2 above. Motor 1 field exciter node ID is inactive, if 70.13 M1 field exciter node ID is set to 0. **Note:** 70.13 M1 field exciter node ID is void, when 99.07 M1 used field exciter type = NotUsed, OnBoard or External field exciter via AIx.						
	0 … 32	21	-	1 = 1	n	n	Parameter
70.14	**M2 field exciter node ID**						
	Motor 2 field exciter node ID. Defines the DCSLink node ID of motor 2 field exciter in the armature drive. See also example 1 above. Motor 1 field exciter node ID is inactive, if 70.14 M2 field exciter node ID is set to 0. **Note:** 70.14 M2 field exciter node ID is void, when 42.49 M2 used field exciter type = NotUsed, OnBoard or External field exciter via AIx.						
	0 … 32	30	-	1 = 1	n	n	Parameter

74 … 89 Application specific groups

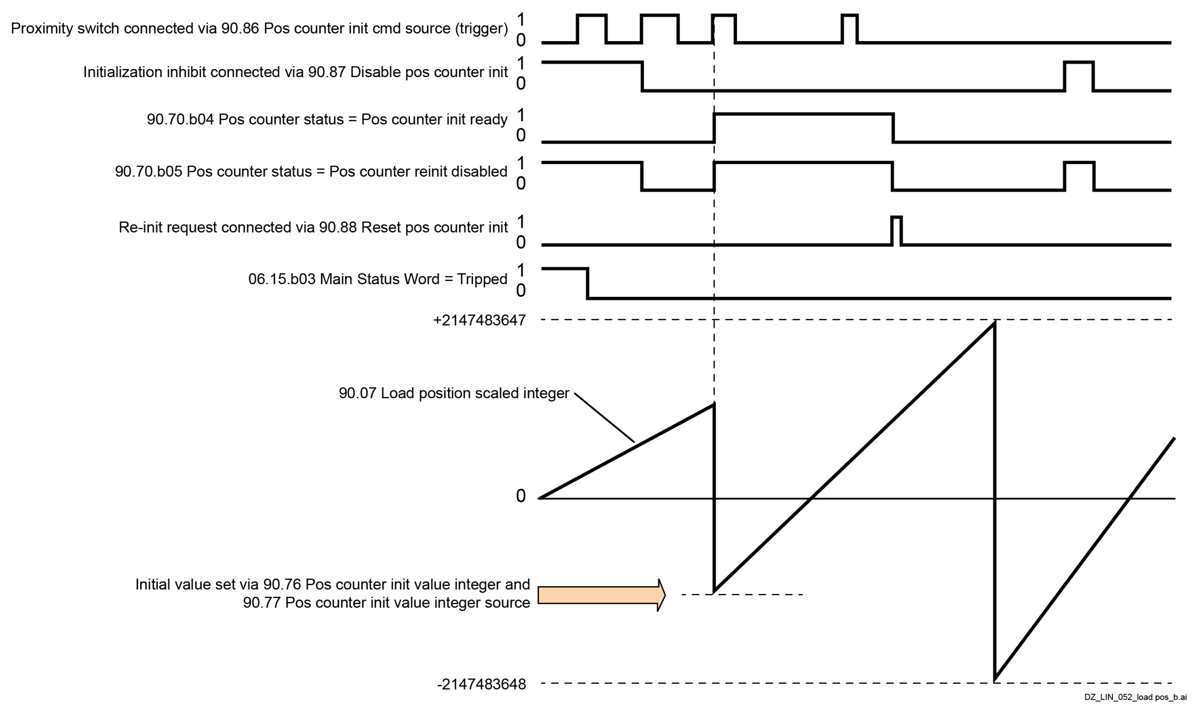
Groups used for application programming.

90 Feedback selection

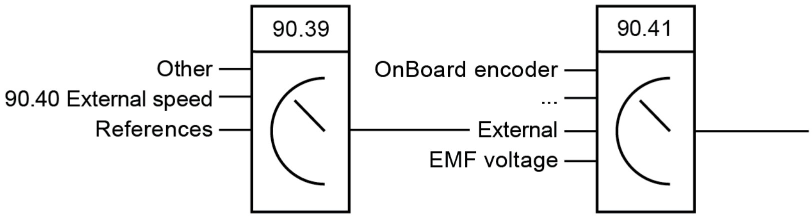
Motor and load feedback configuration.

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
90.01	**Motor speed for control**						
	Measured (tacho/encoder), EMF or external motor speed used for control. Displays measured, EMF or external motor speed depending on the used feedback. See 90.41 M1 feedback selection. For measured or EMF motor speed a filter time constant is defined by 46.11 Filter time motor speed. The unit is selected by 96.03 Unit for speed control. In case a measured or external feedback is selected, it is also scaled by the motor gear function. See 90.43 Motor gear numerator and 90.44 Motor gear denominator.						
	-30000.00 … 30000.00	-	rpm, % or V	See 46.02	y	n	Signal
90.02	**Motor position**						
	Motor position. Displays the motor position, within one revolution, received from the source selected by 90.41 M1 Motor feedback selection. This parameter is only valid for encoder speed feedback. An encoder feedback is scaled by the motor gear function. See 90.43 Motor gear numerator and 90.44 Motor gear denominator.						
	0.00000000 … 1.00000000	-	rev	32767 = 1 rev	y	n	Signal
90.03	**Load speed**						

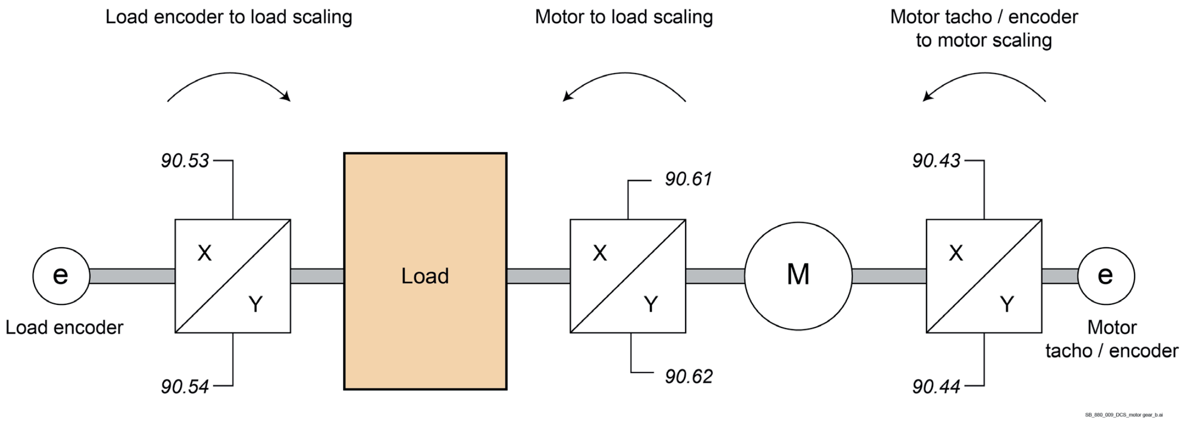
Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	Measured (tacho/encoder), EMF or external load speed. Displays measured, EMF or external load speed depending on the used feedback. See 90.51 Load feedback selection. A filter time constant is defined by 90.52 Load speed filter time. In case an encoder feedback from the load is selected, it is also scaled by the load gear function. See 90.53 Load gear numerator and 90.54 Load gear denominator. In case a feedback from the motor is used, it is inversely scaled by 90.61 Gear numerator and 90.62 Gear denominator (90.62 divided by 90.61).						
	-30000.00 … 30000.00	-	rpm	See 46.02	y	n	Signal
90.04	**Load position**						
	Load position. Displays the (rotational) load position received from the source selected by 90.51 Load feedback selection. This parameter is only valid for encoder speed feedback. In case an encoder feedback from the load is selected, it is also scaled by the load gear function. See 90.53 Load gear numerator and 90.54 Load gear denominator. In case a feedback from the motor is used, it is inversely scaled by 90.61 Gear numerator and 90.62 Gear denominator (90.62 divided by 90.61). Offset and resolution are defined by 90.56 Load position offset and 90.57 Load position resolution.						
	-2147483648 … 2147483647	-	-	1 = 1	y	n	Signal
90.05	**Load position scaled**						
	Scaled (translatory) load position as decimal number. Displays the output of the position counter function as decimal number. The position is relative to the initial position set by 90.80 Pos counter init value and 90.81 Pos counter init value. The number of decimal places is defined by 90.82 Pos counter decimals. **Note:** This is a floating-point parameter and the accuracy is compromised near the ends of the range. Consider using 90.07 Load position scaled integer instead.						
	-2147483.648 … 2147483.647	-	-	1 = 1	y	n	Signal
90.06	**Motor position scaled**						
	Scaled motor position. Displays the calculated (rotational) motor position. The axis mode (linear or rollover) and resolution are defined by 90.48 Motor position axis mode and 90.49 Motor position resolution. **Note:** The position value can be sent on a fast time level to the fieldbus controller by selecting Position in either 50.07 FBA A actual 1 type, 50.08 FBA A actual 2 type, 50.37 FBA B actual 1 type or 50.38 FBA B actual 2 type.						
	-2147483.648 … 2147483.647	-	-	1 = 1	y	n	Signal
90.07	**Load position scaled integer**						
	Scaled (translatory) load position as integer. Displays the output of the position counter function as an integer. The position is relative to the initial position set by 90.76 Pos counter init value int and 90.77 Pos counter init value int source.						

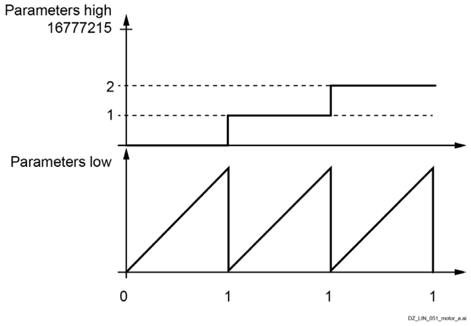
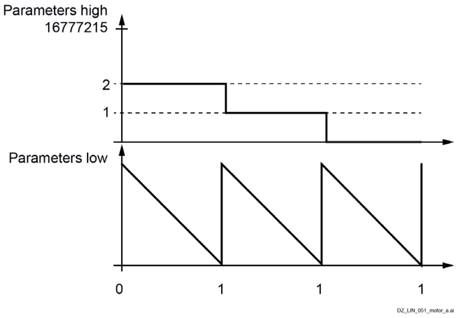
Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
							
	-2147483648 … 2147483647	-	-	1 = 1	y	n	Signal
90.10	**Encoder 1 speed**						
	Encoder 1 speed. Displays the speed feedback measured by encoder 1 in rpm.						
	-30000.00 … 30000.00	-	rpm	See 46.02	y	n	Signal
90.11	**Encoder 1 position**						
	Encoder 1 position within one revolution. Displays encoder 1 position, within one revolution. See 90.48 Motor position axis mode.						
	0.00000000 … 1.00000000	-	rev	32767 = 1 rev	y	n	Signal
90.12	**Encoder 1 multiturn revolutions**						
	Encoder 1 revolutions. Displays the revolutions of a multi-turn encoder 1 within its range. See 92.14 Revolution data width and 90.48 Motor position axis mode.						
	0 … 16777215	-	-	1 = 1	n	n	Signal
90.13	**Encoder 1 revolution extension**						
	Encoder 1 revolution count extension. Displays the revolution count extension for encoder 1. See 90.48 Motor position axis mode. With a single-turn encoder the counter is incremented, when the encoder position wraps around in positive direction and decremented in negative direction. See 90.11 Encoder 1 position. With a multi-turn encoder, the counter is incremented, when the revolutions count exceeds the value range in positive direction and decremented in negative direction. See 90.12 Encoder 1 multiturn revolutions.						

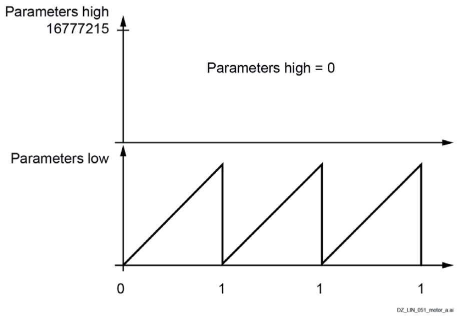
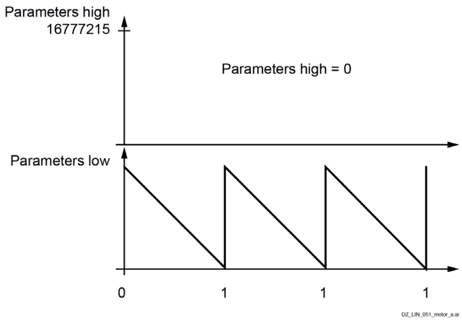
Index	Name						
	Text						
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	-2147483648 … 2147483647	-	-	1 = 1	n	n	Signal
90.14	**Encoder 1 position raw**						
	Raw encoder 1 position within one revolution. Displays the raw measurement data of encoder 1 position within one revolution. The encoder interface provides a 24-bit unsigned integer.						
	0 … 16777215	-	-	1 = 1	y	n	Signal
90.15	**Encoder 1 revolutions raw**						
	Raw encoder 1 revolution count. Displays the revolutions of a multi-turn encoder 1 within its value range as a raw measurement. See 92.14 Revolution data width.						
	0 … 16777215	-	-	1 = 1	y	n	Signal
90.20	**Encoder 2 speed**						
	Encoder 2 speed. Displays the speed feedback measured by encoder 2 in rpm.						
	-30000.00 … 30000.00	-	rpm	See 46.02	y	n	Signal
90.21	**Encoder 2 position**						
	Encoder 2 position within one revolution. Displays encoder 1 position, within one revolution. See 90.48 Motor position axis mode.						
	0.00000000 … 1.00000000	-	rev	32767 = 1 rev	y	n	Signal
90.22	**Encoder 2 multiturn revolutions**						
	Encoder 2 revolutions. Displays the revolutions of a multi-turn encoder 2 within its range. See 93.14 Revolution data width and 90.48 Motor position axis mode.						
	0 … 16777215	-	-	1 = 1	n	n	Signal
90.23	**Encoder 2 revolution extension**						
	Encoder 2 revolution count extension. Displays the revolution count extension for encoder 2. See 90.48 Motor position axis mode. With a single-turn encoder the counter is incremented, when the encoder position wraps around in positive direction and decremented in negative direction. See 90.21 Encoder 2 position. With a multi-turn encoder, the counter is incremented, when the revolutions count exceeds the value range in positive direction and decremented in negative direction. See 90.22 Encoder 2 multiturn revolutions.						
	-2147483648 … 2147483647	-	-	1 = 1	n	n	Signal
90.24	**Encoder 2 position raw**						
	Raw encoder 2 position within one revolution. Displays the raw measurement data of encoder 2 position within one revolution. The encoder interface provides a 24-bit unsigned integer.						
	0 … 16777215	-	-	1 = 1	y	n	Signal
90.25	**Encoder 2 revolutions raw**						
	Raw encoder 2 revolution count. Displays the revolutions of a multi-turn encoder 2 within its value range as a raw measurement. See 93.14 Revolution data width.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td>0 … 16777215</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">90.26</td><td colspan="7">Motor revolution extension</td></tr>
<tr><td colspan="7">Motor revolution count extension.
Displays the revolution count extension for the motor.
The counter is incremented, when the position selected by 90.41 Motor feedback selection wraps around in positive direction and decremented in negative direction.</td></tr>
<tr><td>-2147483648 … 2147483647</td><td>-</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">90.27</td><td colspan="7">Load revolution extension</td></tr>
<tr><td colspan="7">Load revolution count extension.
Displays the revolution count extension for the load.
The counter is incremented, when the position selected by 90.51 Load feedback selection wraps around in positive direction and decremented in negative direction.</td></tr>
<tr><td>-2147483648 … 2147483647</td><td>-</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="2">90.39</td><td colspan="7">External speed feedback source</td></tr>
<tr><td colspan="7">Selects the external speed feedback source.
90.39 External speed source is valid if 90.41 M1 feedback selection = External. The external speed feedback can be connected in several ways:
– Any source via option Other.
– Via 90.40 External speed. This parameter can be written to by e.g. Adaptive Program, application program or overriding control.
– Via an analog input.
– Via serial communication using the fast communication cycle of REF1/REF2 instead of the slower communication cycle of direct parameter access. See also 50.21 FBA A timelevel sel and corresponding parameters.

SF_880_030_DCS_ext-speed-source_b.ai
Other; source selection.
0: 90.40 External speed; 90.40 External speed.
4: AI1 scaled; 12.12 AI1 scaled value.
5: AI2 scaled; 12.22 AI2 scaled value.
6: AI3 scaled; 12.32 AI3 scaled value.
7: FBA A reference 1; 03.05 FBA A reference 1.
8: FBA A reference 2; 03.06 FBA A reference 2.
9: FBA B reference 1; 03.07 FBA B reference 1.
10: FBA B reference 2; 03.08 FBA B reference 2.
11: EFB reference 1; 03.09 EFB reference 1.
12: EFB reference 2; 03.10 EFB reference 2.
13: DDCS controller ref1; 03.11 DDCS controller ref1.</td></tr>
</table>

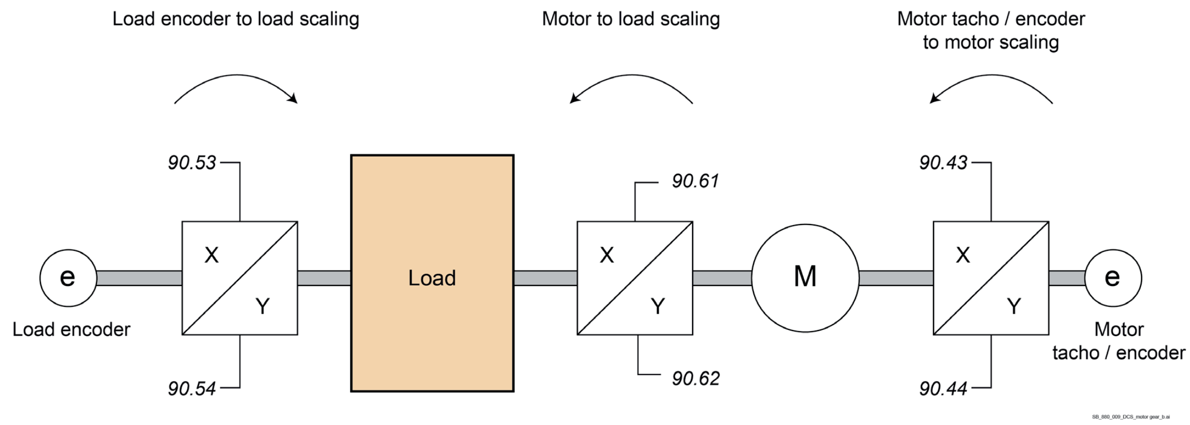
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">14: DDCS controller ref2; 03.12 DDCS controller ref2.
15: M/F or D2D ref1; 03.13 M/F or D2D ref1.
16: M/F or D2D ref2; 03.14 M/F or D2D ref2.</td></tr>
<tr><td>0 … 16</td><td>90.40 External speed</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">90.40</td><td colspan="7">External speed</td></tr>
<tr><td colspan="7">External speed feedback.
This parameter can be written to by e.g. Adaptive Program, application program or overriding control and is valid if 90.39 External speed source = 90.41 M1 feedback selection = External.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>0.00</td><td>rpm</td><td>See 46.02</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">90.41</td><td colspan="7">M1 feedback selection</td></tr>
<tr><td colspan="7">Motor 1 speed feedback selection.
Selects the motor speed feedback for motor control.
Other; source selection.
1: OnBoard encoder; the speed feedback is measured by means of a pulse encoder connected to the SDCS-CON-H01. See group 94.
2: Encoder 1; the speed feedback is measured by encoder 1. See group 92.
3: Encoder 2; the speed feedback is measured by encoder 2. See group 93.
4: Tacho; the speed feedback is measured by means of an analog tacho connected to the SDCS-CON-H01. See group 94.
5: EMF; the speed feedback is calculated from the EMF (base speed area) and field current (field weakening area). Thus, it is possible to go into the field weakening range, but with a low performance compared to encoder or analog tacho feedback.
Commissioning hint: The flux linearization must be tuned manually.
6: External; the speed feedback is connected using 90.39 External speed source.
7: EMF voltage; the speed feedback is calculated from the EMF only. Thus, no field weakening is possible.</td></tr>
<tr><td>1 … 7</td><td>EMF</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">90.42</td><td colspan="7">Motor speed filter time</td></tr>
<tr><td colspan="7">Motor speed feedback filter time constant.
Filter time constant for 90.01 Motor speed for control.
Note: There are three different filters for speed feedback and speed error:
– 90.42 Motor speed filter time is filtering the speed feedback and should be used for filter time constants smaller than 30 ms.
– 24.18 Speed error filter time 1 and 24.19 Speed error filter time 2 are filtering the speed error and should be used for filter time constants greater than 30 ms. Set 24.18 Speed error filter time 1 = 24.19 Speed error filter time 2.</td></tr>
<tr><td>0 … 32500</td><td>5</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">90.43</td><td colspan="7">Motor gear numerator</td></tr>
<tr><td colspan="7">Motor gear numerator.
90.43 Motor gear numerator and 90.44 Motor gear denominator define a gear function between motor speed feedback and motor control. The gear function is used to correct a difference between motor and measured (tacho/encoder) speed, for example if the tacho/encoder is not mounted directly on the motor shaft.
$$\frac{Motor\ speed}{Measured\ (tacho/encoder)\ speed} = \frac{90.43\ Motor\ gear\ numerator}{90.44\ Motor\ gear\ denominator}$$</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
							
	-2147483648 … 2147483647	1	-	1 = 1	n	n	Parameter
90.44	**Motor gear denominator**						
	Motor gear denominator. See 90.43 Motor gear numerator.						
	-2147483648 … 2147483647	1	-	1 = 1	n	n	Parameter
90.48	**Motor position axis mode**						
	Axis type for the motor position. Selects the axis type for the motor position measurement. 0: **Linear**; linear. 1: **Rollover**; the value of the low word is between 0 and 1 revolutions and rolls over at 360 degrees.						

Setting	**Low word**	**High words**
	90.11 Encoder 1 position	90.12 Encoder 1 multiturn revolutions 90.13 Encoder 1 revolution extension
	90.21 Encoder 2 position	90.22 Encoder 2 multiturn revolutions 90.23 Encoder 2 revolution extension
	94.16 OnBoard encoder position	94.18 OnBoard encoder revolution extension
Linear	0.00000000 == 0° and 1.00000000 == 360°	1 == 1 revolution
	Forward direction: 	Reverse direction: 

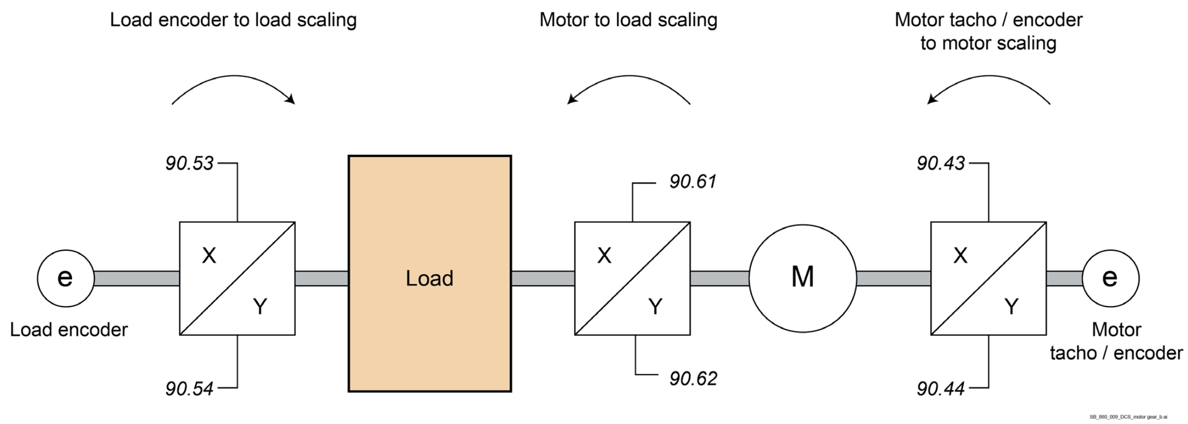
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/
FbEq16</th><th>Volatile</th><th>Change
running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">
<table>
<tr><td rowspan="2">Rollover</td><td>0.00000000 == 0° and
1.00000000 == 360°</td><td>Always zero</td></tr>
<tr><td>Forward direction:

 </td><td>Reverse direction:

 </td></tr>
</table>
</td></tr>
<tr><td></td><td>0 … 1</td><td>Rollover</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**90.49**</td><td colspan="7">**Motor position resolution**</td></tr>
<tr><td colspan="7">Motor position resolution.
Defines how many bits are used for the motor position count within one revolution. For example, with the setting of 16, the position value is multiplied by 2^{16} = 65536 to be displayed in 90.06 Motor position scaled and thus, also for the fieldbuses.</td></tr>
<tr><td>0 … 31</td><td>16</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**90.51**</td><td colspan="7">**Load feedback selection**</td></tr>
<tr><td colspan="7">Load speed feedback selection.
Selects the load speed feedback and position feedbacks for the control. The values are scaled by 90.53 Load gear numerator and 90.54 Load gear denominator.
0: **None**; no load feedback.
1: **OnBoard encoder**; load feedbacks are updated based on the speed and position values read from a pulse encoder connected to the SDCS-CON-H01. See group 94.
2: **Encoder 1**; load feedbacks are updated based on the speed and position values read from encoder 1. See group 92.
3: **Encoder 2**; load feedbacks are updated based on the speed and position values read from encoder 2. See group 93.
8: **Motor feedback**; the source selected by 90.41 Motor feedback selection can also be used for load feedback. Any difference between the motor and load speed/position can be compensated using the inverted ratio between 90.61 Gear numerator and 90.62 Gear denominator (90.62 divided by 90.61).</td></tr>
<tr><td>0 … 8</td><td>None</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**90.52**</td><td colspan="7">**Load speed filter time**</td></tr>
<tr><td colspan="7">Load speed feedback filter time constant.
Filter time constant for 90.03 Load speed.</td></tr>
<tr><td>0 … 32500</td><td>5</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**90.53**</td><td colspan="7">**Load gear numerator**</td></tr>
<tr><td colspan="7">Load (e.g. driven equipment) gear numerator.
90.53 Load gear numerator and 90.54 Load gear denominator define a gear function between load speed and encoder feedback selected by 90.51 Load feedback selection. The gear function is used to correct a difference between load and encoder speed, for example if the encoder is not mounted directly on the rotated machinery.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">$$\frac{Load\ speed}{Encoder\ speed} = \frac{90.53\ Load\ gear\ numerator}{90.54\ Load\ gear\ denominator}$$



</td></tr>
<tr><td>-2147483648 …
2147483647</td><td>1</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3">90.54</td><td colspan="7">Load gear denominator</td></tr>
<tr><td colspan="7">Load (e.g. driven equipment) gear denominator.
See 90.53 Load gear numerator.</td></tr>
<tr><td>-2147483648 …
2147483647</td><td>1</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3">90.56</td><td colspan="7">Load position offset</td></tr>
<tr><td colspan="7">Load side position offset.
Defines a load side position offset.</td></tr>
<tr><td>-2147483648 …
2147483647</td><td>0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">90.57</td><td colspan="7">Load position resolution</td></tr>
<tr><td colspan="7">Load position resolution.
Defines how many bits are used for the load position count within one revolution. For example, with the setting of 16, the position value is multiplied by 2^{16} = 65536 to be displayed in 90.04 Load position.</td></tr>
<tr><td>0 … 31</td><td>16</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">90.61</td><td colspan="7">Gear numerator</td></tr>
<tr><td colspan="7">Gear numerator (motor side).
90.61 Gear numerator and 90.62 Gear denominator define a gear function between motor and load speed.

$$\frac{Motor\ speed}{Load\ speed} = \frac{90.61\ Gear\ numerator}{90.62\ Gear\ denominator}$$</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">
</td></tr>
<tr><td>-2147483648 …
2147483647</td><td>1</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3">90.62</td><td colspan="7">Gear denominator</td></tr>
<tr><td colspan="7">Gear denominator (load side).
See 90.61 Gear numerator.</td></tr>
<tr><td>-2147483648 …
2147483647</td><td>1</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3">90.63</td><td colspan="7">Feed constant numerator</td></tr>
<tr><td colspan="7">Feed constant numerator.
90.63 Feed constant numerator and 90.64 Feed constant denominator define the feed constant for the position calculation.

$$\frac{90.63\ \textit{Feed constant numerator}}{90.62\ \textit{Feed constant denominator}}$$

The feed constant converts rotational motion into translatory motion. E.g., the feed constant is the distance the load moves during one turn of the motor shaft.
The translatory load position is shown in 90.07 Load position scaled integer.
Note: The load position is only updated after new position input data is received.</td></tr>
<tr><td>-2147483648 …
2147483647</td><td>1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">90.64</td><td colspan="7">Feed constant denominator</td></tr>
<tr><td colspan="7">Feed constant denominator.
See 90.63 Feed constant numerator.</td></tr>
<tr><td>-2147483648 …
2147483647</td><td>1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">90.70</td><td colspan="7">Pos counter status</td></tr>
<tr><td colspan="7">Position counter status word.
Displays the status of the position counter.
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>OnBoard encoder feedback</td><td>1</td><td>OnBoard encoder is selected as load feedback source.</td></tr>
<tr><td>1</td><td>Encoder 1 feedback</td><td>1</td><td>Encoder 1 is selected as load feedback source.</td></tr>
</table></td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">
<table>
<tr><td>2</td><td>Encoder 2 feedback</td><td>1</td><td>Encoder 2 is selected as load feedback source.</td></tr>
<tr><td>3</td><td>Motor feedback</td><td>1</td><td>Motor feedback is selected as load feedback source.</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Pos counter init ready</td><td>1</td><td>Position counter is successfully initialized.</td></tr>
<tr><td>0</td><td>Position counter is not initialized, or encoder feedback was lost. Fresh counter initialization is recommended. Note: Always zero if 90.85 Pos counter sync mode = Cyclic.</td></tr>
<tr><td>5</td><td>Pos counter re-init disabled</td><td>1</td><td>Position counter initialization is prevented. See 90.87 Disable pos counter init.</td></tr>
<tr><td>6</td><td>Position data inaccurate</td><td>1</td><td>Encoder feedback intermittent or lost. If the drive is stopped, the position counting will continue based on encoder data after the connection is restored.</td></tr>
<tr><td>7 … 15</td><td>reserved</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td></td><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">90.73</td><td colspan="7">Pos counter error and boot action</td></tr>
<tr><td colspan="7">Position counter, error handling.
Selects how the position counter reacts to loss of load feedback.
0: Request re-initialization; 90.70.b04 Pos counter status is cleared. Reinitialization of the position counter is recommended.
1: Continue from previous value; the position counting resumes from the previous value over a loss of load feedback or drive reboot. 90.70.b04 Pos counter status is not cleared, but 90.70.b06 Pos counter status is set to indicate that an error has occurred.
WARNING
If load feedback is lost when the drive is stopped or not powered, the counter is not updated even if the load moves.</td></tr>
<tr><td>0 … 1</td><td>Request reinitialization</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">90.76</td><td colspan="7">Pos counter init value integer</td></tr>
<tr><td colspan="7">Position counter, initial position as integer.
Defines an initial position or distance for the position counter as integer. For this, set 90.77 Pos counter init value int source = Pos counter init value integer.
Result see 90.07 Load position scaled integer.</td></tr>
<tr><td>-2147483648 … 2147483647</td><td>0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">90.77</td><td colspan="7">Pos counter init value integer source</td></tr>
<tr><td colspan="7">Position counter, source of the initial position as integer.
Selects the source of the initial position as integer. When the device selected by 90.86 Pos counter init cmd source (trigger) activates, the selection in 90.77 Pos counter init value int source becomes the position of the load.
Other; source selection.
0: Zero; 0.
1: Pos counter init value integer; see 90.76 Pos counter init value int.</td></tr>
<tr><td>0 … 1</td><td>Pos counter init value integer</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

Index	Name						
	Text						
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
90.80	**Pos counter init value**						
	Position counter, initial position value as decimal number. Defines an initial position or distance for the position counter as decimal number. For this, set 90.81 Pos counter init value source = Pos counter init value. The number of decimal places is defined by 90.82 Pos counter decimals. Result see 90.05 Load position scaled.						
	-2147483.648 … 2147483.647	0.000	-	1 = 1	n	y	Parameter
90.81	**Pos counter init value source**						
	Position counter, source of the initial position value. Selects the source of the initial position value. When the device selected by 90.86 Pos counter init cmd source (trigger) activates, the selection in 90.81 Pos counter init value source becomes the position of the load. **Other**; source selection. 0: **Zero**; 0. 1: **Pos counter init value**; see selection in 90.80 Pos counter init value.						
	0 … 1	Pos counter init value	-	1 = 1	n	y	Parameter
90.82	**Pos counter decimals**						
	Position counter, number of decimal places. Scales the values of 90.05 Load position scaled and 90.80 Pos counter init value when written to or read by an external source (e.g. fieldbus). The setting corresponds to the number of decimal places. **Examples with a setting of 3:** – An integer value written into 90.80 Pos counter init value by an external source is divided by 1000. The value written is 12345 and the value shown is 12.345. – The value of 90.05 Load position scaled is multiplied by 1000 when read by an external source. The value shown is 12.345 and the value written is 12345.						
	0 … 9	3	-	1 = 1	n	y	Parameter
90.85	**Pos counter sync mode**						
	Position counter, synchronization mode. Position counter synchronization mode for encoder feedback. 0: **Single**; the next synchronization of the encoder feedback must be prepared by resetting 90.70.b04 Pos counter status using 90.88 Reset pos counter init ready. 1: **Cyclic**; the synchronization of the encoder feedback happens at every occurrence of the synchronization event.						
	0 … 1	Single	-	1 = 1	n	y	Parameter
90.86	**Pos counter init cmd source (trigger)**						
	Position counter, source of the initialization command. Selects a digital source e.g. a limit switch that initializes the position counter. When the digital source triggers, the selection in 90.77 Pos counter init value int source becomes the position of the load. 0 = No trigger. 0 → 1 = Trigger. **Note**: The position counter initialization can be prevented by 90.87 Disable pos counter init. **Other [bit]**; source selection. 0: **No trigger command**; 0, normal operation. 1: **Trigger command**; 1. 3: **DI1**; 10.02.b00 DI delayed status.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status. 50: **Z OnBoard**; taken from the zero channel of the OnBoard encoder. 51: **Z OnBoard forward**; taken from zero channel the OnBoard encoder and the motor is rotating forward. See 06.21.b01 Speed control status word. 52: **Z OnBoard reverse**; taken from zero channel the OnBoard encoder and the motor is rotating reverse. See 06.21.b02 Speed control status word.						
	0 … 52	No trigger	-	1 = 1	n	y	Parameter
90.87	**Disable pos counter init**						
	Position counter, source of the initialization inhibit command. Selects a source that prevents the initialization of the position counter. Thus, it blocks the synchronization command. 0 = Release. 1 = Disable. **Other [bit]**; source selection. 0: **Enable**; 0, normal operation. 1: **Disable**; 1. 3: **DI1**; 10.02.b00 DI delayed status. 4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status.						
	0 … 19	Release	-	1 = 1	n	y	Parameter
90.88	**Reset pos counter init ready**						
	Position counter, source of the initialization command reset. Selects a source that enables a new initialization of the position counter. It resets 90.70.b04 Pos counter status. 0 = No reset. 0 → 1 = Reset. **Other [bit]**; source selection. 0: **No Reset**; 0. 1: **Reset**; 1. 0: **Not selected**; inactive. No reset is forced. 3: **DI1**; 10.02.b00 DI delayed status. 4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status.						

Index	Name						
	Text						
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status.						
	0 … 19	No Reset	-	1 = 1	n	y	Parameter

91 Encoder module settings

Configuration of the encoder interface modules.

Index	Name						
	Text						
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	Attention: Any changed parameters must be validated by means of 91.10 Encoder parameter refresh = Refresh.						
91.01	**FEN DI status**						
	Module 1 and 2, status of digital inputs. Displays the electrical status of digital inputs DI1 and DI2. Bits 0 and 1 reflect the status of DI1 and DI2 of module 1. Bits 4 and 5 reflect the status of DI1 and DI2 of module 2. **Example**: 0000000000010010b = DI1 of module 2 and DI2 of module 1 are on. Bit assignment:						

Bit	Name	Value	Remarks
0	DI1/Module 1	1	On. See parameters 91.11 and 91.12.
1	DI2/Module 1	1	On. See parameters 91.11 and 91.12.
2	reserved		
3	reserved		
4	DI1/Module 2	1	On. See parameters 91.13 and 91.14.
5	DI2/Module 2	1	On. See parameters 91.13 and 91.14.
6 … 15	reserved		

	0000h … FFFFh	-	-	1 = 1	y	n	Signal
91.02	**Module 1 status**						
	Module 1, status. Displays the type of the module found in the location specified by 91.12 Module 1 location. 0: **No option**; no module detected in the specified slot. 1: **No communication**; a module has been detected but cannot be communicated with. 2: **Unknown**; the module type is unknown. 16: **FEN-01**; a FEN-01 has been detected and is active. 17: **FEN-11**; a FEN-11 has been detected and is active. Not supported at the time of publication. 18: **FEN-21**; a FEN-21 has been detected and is active. 21: **FEN-31**; a FEN-31 has been detected and is active. 25: **FSE-31**; a FSE-31 has been detected and is active. Not supported at the time of publication.						
	0 … 25	-	-	1 = 1	y	n	Signal
91.03	**Module 2 status**						
	Module 2, status. Displays the type of the module found in the location specified by 91.14 Module 2 location. See 91.02 Module 1 status.						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	0 … 25	-	-	1 = 1	y	n	Signal
91.04	**Module 1 temperature**						
	Module 1, measured temperature. Displays the temperature measured through the sensor input of module 1. The unit is selected by 96.02 Unit selection. **Note**: With a PTC sensor, the unit is Ω.						
	0 … 1000	-	°C, °F or Ohm	1 = 1°C, °F or Ohm	y	n	Signal
91.06	**Module 2 temperature**						
	Module 2, measured temperature. Displays the temperature measured through the sensor input of module 2. The unit is selected by 96.02 Unit selection. **Note**: With a PTC sensor, the unit is Ω.						
	0 … 1000	-	°C, °F or Ohm	1 = 1°C, °F or Ohm	y	n	Signal
91.10	**Encoder parameter refresh**						
	Module 1 and 2, parameter refresh. Validates any changed module parameters. This is needed for any parameter changes in groups 90 … 93 to take effect. The value reverts to Done automatically, when the refresh is done. 0: **Done**; 0, refreshing done. 1: **Refresh**; 1, refreshing.						
	0 … 1	Done	-	1 = 1	y	y	Parameter
91.11	**Module 1 type**						
	Module 1, type. Activates (and specifies the type of) module 1. 0: **None**; inactive. 1: **FEN-01**; FEN-01, 2 inputs (TTL encoder), 1 output. 2: **FEN-11**; FEN-11, 2 inputs (absolute encoder, TTL encoder), 1 output. Not supported at the time of publication. 3: **FEN-21**; FEN-21, 2 inputs (resolver, TTL encoder), 1 output. 4: **FEN-31**; FEN-31, 1 input (HTL encoder), 1 output. 5: **FSE-31**; FSE-31. Not supported at the time of publication.						
	0 … 5	None	-	1 = 1	n	n	Parameter
91.12	**Module 1 location**						
	Module 1, location. Activates and specifies the slot (1 … 3) on the drive’s control board into which module 1 is installed. Alternatively, specifies the node ID of the slot on a FEA-03 extension module. 1: **Slot 1**; module 1 is in slot 1. 2: **Slot 2**; module 1 is in slot 2. 3: **Slot 3**; module 1 is in slot 3. **04 … 254**: Node ID of a slot on the FEA-03 extension module. **Note:** The node ID of a slot on the FEA-03 extension module can be typed in. This is only possible with Drive composer.						
	1 … 254	Slot 2	-	1 = 1	n	n	Parameter
91.13	**Module 2 type**						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	Module 2, type. Activates (and specifies the type of) module 2. See 91.11 Module 1 type.						
	0 … 5	None	-	1 = 1	n	n	Parameter
91.14	**Module 2 location**						
	Module 2, location. Activates and specifies the slot (1 … 3) on the drive’s control board into which module 2 is installed. Alternatively, specifies the node ID of the slot on a FEA-03 extension module. See 91.12 Module 1 location.						
	1 … 254	Slot 3	-	1 = 1	n	n	Parameter
91.21	**Module 1 temp sensor type**						
	Module 1, temperature sensor type. Specifies the type of temperature sensor connected to module 1. **Note:** Module 1 must also be activated by parameters 91.11 … 91.12. 0: **None**; disable module 1 temperature monitoring function. 1: **PTC**; PTC sensor connected to module 1. See 35.11 Temperature 1 source and 35.21 Temperature 2 source. 2: **KTY84**; KTY84 sensor connected to module 1. See 35.11 Temperature 1 source and 35.21 Temperature 2 source.						
	0 … 2	None	-	1 = 1	n	y	Parameter
91.22	**Module 1 temp filter time**						
	Module 1, filter time constant for temperature measurement. Defines the filter time constant for the temperature measurement through module 1.						
	0 … 10000	1500	ms	1 = 1 ms	n	y	Parameter
91.24	**Module 2 temp sensor type**						
	Module 2, temperature sensor type. Specifies the type of temperature sensor connected to module 2. **Note:** Module 2 must also be activated by parameters 91.13 … 91.14. 0: **None**; disable module 2 temperature monitoring function. 1: **PTC**; PTC sensor connected to module 2. See 35.11 Temperature 1 source and 35.21 Temperature 2 source. 2: **KTY84**; KTY84 sensor connected to module 2. See 35.11 Temperature 1 source and 35.21 Temperature 2 source.						
	0 … 2	None	-	1 = 1	n	y	Parameter
91.25	**Module 2 temp filter time**						
	Module 2, filter time constant for temperature measurement. Defines the filter time constant for the temperature measurement through module 2.						
	0 … 10000	1500	ms	1 = 1 ms	n	y	Parameter
91.31	**Module 1 TTL output source**						
	Module 1, source for TTL output. Selects the encoder input on module 1 whose signal is echoed by or emulated to the TTL output. **Note:** This can be used as a splitter. 0: **Not selected**; module 1 TTL output not in use. 1: **Module input 1**; module 1 input 1 is echoed by or emulated to the TTL output. 2: **Module input 2**; module 1 input 2 is echoed by or emulated to the TTL output.						
	0 … 2	Not selected	-	1 = 1	n	y	Parameter
91.32	**Module 1 emulation pulses/rev**						
	Module 1, pulses per revolution for the TTL output.						

Index	Name						
	Text						
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	Defines the number of TTL pulses per revolution for the encoder emulation output of module 1.						
	0 … 65535	0	-	1 = 1	n	y	Parameter
91.33	**Module 1 emulated Z-pulse offset**						
	Module 1, position of the emulated zero pulses. Defines when zero pulses are emulated in relation to the zero-position received from the encoder. **Examples:** – With a value of 0.50000, a zero pulse is emulated whenever the encoder position passes 0.5 revolutions. – With a value of 0.00000, a zero pulse is emulated whenever the encoder position passes zero position.						
	0.00000 … 1.00000	0.00000	rev	32767 = 1 rev	n	y	Parameter
91.41	**Module 2 TTL output source**						
	Module 2, source for TTL output. Selects the encoder input on module 2 whose signal is echoed by or emulated to the TTL output. **Note:** This can be used as a splitter. 0: **Not selected**; module 2 TTL output not in use. 1: **Module input 1**; module 2 input 1 is echoed by or emulated to the TTL output. 2: **Module input 2**; module 2 input 2 is echoed by or emulated to the TTL output.						
	0 … 2	Not selected	-	1 = 1	n	y	Parameter
91.42	**Module 2 emulation pulses/rev**						
	Module 2, pulses per revolution for the TTL output. Defines the number of TTL pulses per revolution for the encoder emulation output of module 2.						
	0 … 65535	0	-	1 = 1	n	y	Parameter
91.43	**Module 2 emulated Z-pulse offset**						
	Module 2, position of the emulated zero pulses. Defines when zero pulses are emulated in relation to the zero-position received from the encoder. **Examples:** – With a value of 0.50000, a zero pulse is emulated whenever the encoder position passes 0.5 revolutions. – With a value of 0.00000, a zero pulse is emulated whenever the encoder position passes zero position.						
	0.00000 … 1.00000	0.00000	rev	32767 = 1 rev	n	y	Parameter

92 Encoder 1 configuration

Settings for encoder 1.

Notes:

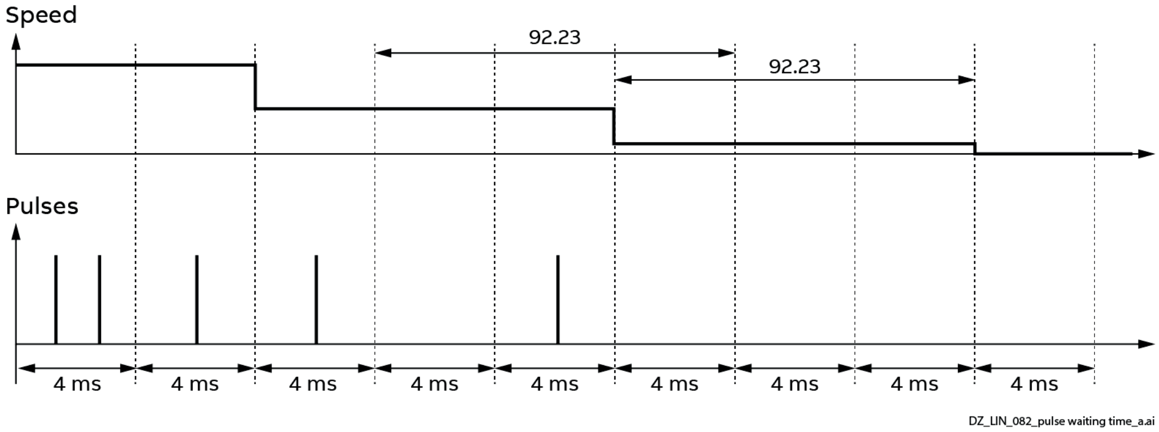
- The contents of the parameter group varies according to the selected encoder type.
- It is recommended that encoder connection 1 (this group) is used whenever possible since the data received through this interface are more actual than the data received through connection 2 (group 93).

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">92.01</td><td colspan="7">Encoder 1 type</td></tr>
<tr><td colspan="7">Encoder 1, type.
Activates (and specifies the type of) encoder/resolver 1.
0: None; inactive.
1: TTL; TTL, module type (input): FEN-01 (X31), FEN-11 (X41) or FEN-21 (X51).
2: TTL+; TTL+, module type (input): FEN-01 (X32).
3: Absolute encoder; absolute encoder, module type (input): FEN-11 (X42).
4: Resolver; resolver, module type (input): FEN-21 (X52).
5: HTL; HTL, module type (input): FEN-31 (X82).
6: HTL 1; HTL, module type (input): FSE-31 (X31). Not supported at the time of publication.
7: HTL 2; HTL, module type (input): FSE-31 (X32). Not supported at the time of publication.
Attention: FEN-11 and FSE-31 are not supported at the time of publication.</td></tr>
<tr><td>0 … 7</td><td>None configured</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3">92.02</td><td colspan="7">Encoder 1 source</td></tr>
<tr><td colspan="7">Encoder 1, source.
Selects the module (either module 1 or module 2) that the encoder is connected to. The physical locations and types of encoder interface modules are defined in group 91 Encoder module settings.
0: Module 1; module 1 is activated by parameters 91.11 … 91.12.
1: Module 2; module 2 is activated by parameters 91.13 … 91.14.</td></tr>
<tr><td>0 … 1</td><td>Module 1</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3">92.10</td><td colspan="7">Pulses/revolution</td></tr>
<tr><td colspan="7">Encoder 1, pulses per revolution (ppr).
(Visible when 92.01 Encoder 1 type = TTL, TTL+ or HTL)
Defines encoder 1 pulses per revolution, see encoder nameplate.</td></tr>
<tr><td>0 … 65535</td><td>2048</td><td>ppr</td><td>1 = 1 ppr</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">92.10</td><td colspan="7">Sine/cosine number</td></tr>
<tr><td colspan="7">Encoder 1, Number of sine/cosine wave cycles within one revolution.
(Visible when 92.01 Encoder 1 type = Absolute encoder)
Defines encoder 1 number of sine/cosine wave cycles within one revolution.
Note: No need to set 92.10 Sine/cosine number when an EnDat or SSI encoder is used in continuous mode. See 92.30 Serial link mode.</td></tr>
<tr><td>0 … 65535</td><td>0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">92.10</td><td colspan="7">Excitation signal frequency</td></tr>
<tr><td colspan="7">Encoder 1, excitation signal frequency.
(Visible when 92.01 Encoder 1 type = Resolver)
Defines the frequency of the excitation signal.
Note: With an EnDat or HIPERFACE encoder and a FEN-21 with FPGA version VIE12200 or later, 92.10 Excitation signal frequency is automatically set using 91.10 Encoder parameter refresh = Refresh.</td></tr>
<tr><td>1 … 20</td><td>1</td><td>kHz</td><td>1 = 1 kHz</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">92.11</td><td colspan="7">Pulse encoder type</td></tr>
<tr><td colspan="7">Encoder 1, type.
(Visible when 92.01 Encoder 1 type = TTL, TTL+ or HTL)
Selects the type of encoder 1.
0: Quadrature; quadrature encoder with two channels, A and B.
1: Single track; single-track encoder with one channel, A.
Note: With setting Single track, the measured speed value is always positive regardless of direction of rotation.</td></tr>
<tr><td>0 … 1</td><td>Quadrature</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">92.11</td><td colspan="7">Absolute position source</td></tr>
<tr><td colspan="7">Encoder 1, source for absolute position.
(Visible when 92.01 Encoder 1 type = Absolute encoder)
Selects the source of the absolute position information.
0: None; not selected.
1: Commutation signals; commutation signals.
2: EnDat; serial interface: EnDat encoder.
3: Hiperface; serial interface: HIPERFACE encoder.
4: SSI; resolver, serial interface: SSI encoder.
5: Tamagawa; serial interface: Tamagawa 17/33-bit encoder.</td></tr>
<tr><td>0 … 5</td><td>None</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">92.11</td><td colspan="7">Excitation signal amplitude</td></tr>
<tr><td colspan="7">Encoder 1, excitation signal amplitude.
(Visible when 92.01 Encoder 1 type = Resolver)
Defines the rms amplitude of the excitation signal.</td></tr>
<tr><td>4.0 … 12.0</td><td>4.0</td><td>V</td><td>10 = 1 V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">92.12</td><td colspan="7">Speed calculation mode</td></tr>
<tr><td colspan="7">Encoder 1, encoder speed calculation mode.
(Visible when 92.01 Encoder 1 type = TTL, TTL+ or HTL)
Selects the speed calculation mode.
*With a single-track encoder, 92.11 Pulse encoder type = Single track, the speed is always positive.
0: A&B all; channels A and B rising and falling edges are used for the speed calculation.
*Channel B defines the direction of rotation, see comment above.
Note: With a single-track encoder, 92.11 Pulse encoder type = Single track, this setting act like setting A all.
1: A all; channel A rising and falling edges are used for speed calculation.
*Channel B defines the direction of rotation, see comment above.
2: A rising; channel A rising edges are used for speed calculation.
*Channel B defines the direction of rotation, see comment above.
3: A falling; channel A falling edges are used for speed calculation.
*Channel B defines the direction of rotation, see comment above.
4: Auto rising; one of the above modes is selected automatically depending on the pulse frequency:
<table>
<tr><th>Pulse frequency of the channel(s)</th><th>Used mode</th></tr>
<tr><td>< 2442 Hz</td><td>A&B all</td></tr>
<tr><td>2442 … 4884 Hz</td><td>A all</td></tr>
<tr><td>> 4884 Hz</td><td>A rising</td></tr>
</table></td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">5: **Auto falling**; one of the above modes is selected automatically depending on the pulse frequency:
<table>
<tr><th>Pulse frequency of the channel(s)</th><th>Used mode</th></tr>
<tr><td>< 2442 Hz</td><td>A&B all</td></tr>
<tr><td>2442 … 4884 Hz</td><td>A all</td></tr>
<tr><td>> 4884 Hz</td><td>A falling</td></tr>
</table></td></tr>
<tr><td>0 … 5</td><td>Auto rising</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">92.12</td><td colspan="7">**Zero pulse enable**</td></tr>
<tr><td colspan="7">Encoder 1, enable zero pulse.
(Visible when 92.01 Encoder 1 type = Absolute encoder)
Enables/Disables the encoder zero pulse for the absolute encoder input (X42) of the FEN-11.
Note: No zero pulse exists with serial interfaces, when 92.11 Absolute position source = EnDat, HIPERFACE, SSI or Tamagawa.
0: **Disable**; disable the encoder zero pulse.
1: **Enable**; enable the encoder zero pulse.</td></tr>
<tr><td>0 … 1</td><td>Disable</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">92.12</td><td colspan="7">**Resolver polepairs**</td></tr>
<tr><td colspan="7">Encoder 1, number of resolver pole pairs.
(Visible when 92.01 Encoder 1 type = Resolver)
Defines the number of pole pairs of the resolver.</td></tr>
<tr><td>1 … 32</td><td>1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">92.13</td><td colspan="7">**Position estimation enable**</td></tr>
<tr><td colspan="7">Encoder 1, enable position estimation.
(Visible when 92.01 Encoder 1 type = TTL, TTL+ or HTL)
Enables/Disables the position estimation to increase the position data resolution.
0: **Disable**; disable the position estimation. Measured position is used. The resolution is 4 times the amount of pulses per revolution for quadrature encoders and 2 times the amount of pulses per revolution for single-track encoders.
1: **Enable**; enable the position estimation. Estimated position is used. Uses the position interpolation which is extrapolated at the time of the data request.</td></tr>
<tr><td>0 … 1</td><td>Enable</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">92.13</td><td colspan="7">**Position data width**</td></tr>
<tr><td colspan="7">Encoder 1, number of bits used in the position indication within one revolution.
(Visible when 92.01 Encoder 1 type = Absolute encoder)
Defines the number of bits used to indicate the position within one revolution.
Example: A setting of 15 bits corresponds to 32768 positions per revolution.
The value is used when 92.11 Absolute position source = EnDat, Hiperface or SSI. When 92.11 Absolute position source = Tamagawa, 92.13 Position data width is internally set to 17.
Note: With an EnDat or HIPERFACE encoder and a FEN-11 with FPGA version VIE12200 or later, 92.13 Position data width is automatically set using 91.10 Encoder parameter refresh = Refresh.</td></tr>
<tr><td>0 … 32</td><td>0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">92.14</td><td colspan="7">**Speed estimation enable**</td></tr>
<tr><td colspan="7">Encoder 1, enable speed estimation.
(Visible when 92.01 Encoder 1 type = TTL, TTL+ or HTL)
Selects whether calculated or estimated speed is used. Estimation increases the speed ripple in steady state operation but improves the dynamics.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">Note: 92.14 Speed estimation enable is not effective using FEN-xx with FPGA version VIEx 2000 or later.
0: Disable; last calculated speed is used. The calculation interval is 62.5 µs … 4 ms.
1: Enable; estimated speed is used, estimated at the time of data request.</td></tr>
<tr><td></td><td>0 … 1</td><td>Disable</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">92.14</td><td colspan="7">Revolution data width</td></tr>
<tr><td colspan="7">Encoder 1, Number of bits used in the revolution count.
(Visible when 92.01 Encoder 1 type = Absolute encoder)
Defines the number of bits used in the revolution counting with a multiturn encoder.
Example: A setting of 12 bits would support counting to 4096 revolutions.
The value is used when 92.11 Absolute position source = EnDat, Hiperface or SSI. When 92.11 Absolute position source = Tamagawa, setting 92.14 Revolution data width to a non-zero value activates the multiturn data requesting.
Note: With an EnDat or HIPERFACE encoder and a FEN-11 FPGA version VIE12200 or later, 92.14 Revolution data width is automatically set using 91.10 Encoder parameter refresh = Refresh.</td></tr>
<tr><td>0 … 32</td><td>0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">92.15</td><td colspan="7">Transient filter</td></tr>
<tr><td colspan="7">Encoder 1, transient filter.
(Visible when 92.01 Encoder 1 type = TTL, TTL+ or HTL)
Activates the transient filtering for encoder 1. Thus, unintentional changes in direction of rotation are ignored. Should be activated when the connected mechanics are vibrating heavily.
0: 4880 Hz; change in direction of rotation allowed below 4880 Hz.
1: 2440 Hz; change in direction of rotation allowed below 2440 Hz.
2: 1220 Hz; change in direction of rotation allowed below 1220 Hz.
3: Disable; change in direction of rotation allowed at any pulse frequency.</td></tr>
<tr><td>0 … 3</td><td>4880 Hz</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">92.17</td><td colspan="7">Accepted pulse freq of encoder 1</td></tr>
<tr><td colspan="7">Encoder 1, maximum pulse frequency.
(Visible when 92.01 Encoder 1 type = HTL 1 or HTL 2)
Defines the maximum pulse frequency of encoder 1.</td></tr>
<tr><td>0 … 300</td><td>0</td><td>kHz</td><td>1 = 1 kHz</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">92.21</td><td colspan="7">Encoder cable fault mode</td></tr>
<tr><td colspan="7">Encoder 1, mode for a cable fault.
(Visible when 92.01 Encoder 1 type = TTL, TTL+ or HTL)
Selects which encoder track channels are monitored for wiring faults. In case of problems, the event generates warning A7E1 Speed feedback device or fault 7381 Speed feedback device, depending on the setting of 31.35 Motor feedback fault.
0: A, B; tracks A and B.
1: A, B, Z; tracks A, B and Z.
2: A+, A-, B+, B-; tracks A+, A-, B+ and B-.
3: A+, A-, B+, B-, Z+, Z-; tracks A+, A-, B+, B-, Z+ and Z-.</td></tr>
<tr><td>0 … 3</td><td>A, B</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">92.23</td><td colspan="7">Maximum pulse waiting time</td></tr>
<tr><td colspan="7">Encoder 1, maximum pulse waiting time.
(Visible when 92.01 Encoder 1 type = TTL or HTL)
When an encoder is used as speed feedback device the actual speed is measured by counting pulses per measurement interval. The base (minimum) measurement interval is 4 ms.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">92.23 Maximum pulse waiting time determines the pulse waiting time for the speed feedback calculation of encoder 1. If no pulse edges are detected within the measurement interval, the measured speed feedback is set to zero. Increasing the time can improve measuring performance especially at low, near zero speeds.
Only the speed measurement is affected. The position is updated whenever a new pulse edge is detected. When the measured speed from the interface is zero, the drive updates its speed data based on position changes.

Note: 92.23 Maximum pulse waiting time is only supported using FEN-xx with FPGA version VIEx 2000 or later. On older FEN-xx, the pulse waiting time is fixed at 4 ms.</td></tr>
<tr><td>1 … 200</td><td>4</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**92.24**</td><td colspan="7">**Pulse edge filtering**</td></tr>
<tr><td colspan="7">Encoder 1, pulse edge filtering.
(Visible when 92.01 Encoder 1 type = HTL)
Enables pulse edge filtering. Pulse edge filtering can improve the reliability of measurements especially from encoders with a single ended connection.
Notes:
– 92.24 Pulse edge filtering is only supported using FEN-31 with FPGA version VIE3 2200 or later.
– Pulse edge filtering decreases the maximum pulse frequency. With 2 µs filtering time, the maximum pulse frequency is 200 kHz.
0: **No filtering**; disable filtering.
1: **1 µs**; filtering time is 1 µs.
2: **2 µs**; filtering time is 2 µs.</td></tr>
<tr><td>0 … 2</td><td>No filtering</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**92.25**</td><td colspan="7">**Pulse overfrequency function**</td></tr>
<tr><td colspan="7">Encoder 1, overfrequency function.
(Visible when 92.01 Encoder 1 type = HTL)
Selects how the drive reacts when the FEN-31 detects a pulse overfrequency condition.
Note: 92.25 Pulse overfrequency function is only supported using FEN-31 with FPGA version VIEx 2200 or later.
0: **Warning**; the event generates warning A7E1 Speed feedback device. The FEN-31 module will continue to update speed and position data.
1: **Fault**; the event generates fault 7381 Speed feedback device.</td></tr>
<tr><td>0 … 1</td><td>Fault</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**92.30**</td><td colspan="7">**Serial link mode**</td></tr>
<tr><td colspan="7">Encoder 1, serial link mode.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">(Visible when 92.01 Encoder 1 type = Absolute encoder)
Selects the serial link mode with an EnDat or SSI encoder.
0: Initial position; single position transfer mode (initial position).
1: Continuous position; continuous position data transfer mode.
2: Continuous speed and position; Continuous speed and position data transfer mode. Intended for EnDat 2.2 encoders without sin/cos signals.
Note: This setting requires a FEN-11 revision H or later.</td></tr>
<tr><td>0 … 2</td><td>Initial position</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">92.31</td><td colspan="7">EnDat max calculation time</td></tr>
<tr><td colspan="7">Encoder 1, maximum calculation time.
(Visible when 92.01 Encoder 1 type = Absolute encoder)
Selects the maximum encoder calculation time for an EnDat encoder.
Note: 92.31 EnDat max calculation time needs to be set only when an EnDat encoder is used in continuous mode, e.g. without incremental sin/cos signals (supported only as encoder 1). See also 92.30 Serial link mode.
0: 10 µs; 10 µs.
1: 100 µs; 100 µs.
2: 1 ms; 1 ms.
3: 50 ms; 50 ms.</td></tr>
<tr><td>0 … 3</td><td>50 ms</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">92.32</td><td colspan="7">SSI cycle time</td></tr>
<tr><td colspan="7">Encoder 1. SSI cycle time.
(Visible when 92.01 Encoder 1 type = Absolute encoder)
Selects the transmission cycle for an SSI encoder.
Note: 92.32 SSI cycle time needs to be set only when a SSI encoder is used in continuous mode, e.g. without incremental sin/cos signals (supported only as encoder 1). See also 92.30 Serial link mode.
0: 50 µs; 50 µs.
1: 100 µs; 100 µs.
2: 200 µs; 200 µs.
3: 500 µs; 500 µs.
4: 1 ms; 1 ms.
5: 2 ms; 2 ms.</td></tr>
<tr><td>0 … 5</td><td>100 µs</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">92.33</td><td colspan="7">SSI clock cycles</td></tr>
<tr><td colspan="7">Encoder 1, SSI message length.
(Visible when 92.01 Encoder 1 type = Absolute encoder)
Defines the length of an SSI message. The length is the number of clock cycles. The number of cycles can be calculated by adding 1 to the number of bits in an SSI message frame.</td></tr>
<tr><td>2 … 127</td><td>2</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">92.34</td><td colspan="7">SSI position msb</td></tr>
<tr><td colspan="7">Encoder 1, position data MSB (Most Significant Bit) location (bit number).
(Visible when 92.01 Encoder 1 type = Absolute encoder)
With an SSI encoder, defines the location of the MSB of the position data within an SSI message.</td></tr>
<tr><td>1 … 126</td><td>1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">92.35</td><td colspan="7">SSI revolution msb</td></tr>
<tr><td colspan="7">Encoder 1, revolution count MSB (Most Significant Bit) location (bit number).</td></tr>
</table>

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	(Visible when 92.01 Encoder 1 type = Absolute encoder) With an SSI encoder, defines the location of the MSB of the revolution count within an SSI message.						
	1 … 126	1	-	1 = 1	n	y	Parameter
92.36	**SSI data format**						
	Encoder 1, SSI data format. (Visible when 92.01 Encoder 1 type = Absolute encoder) With an SSI encoder, selects the data format. 0: **Binary**; binary code. 1: **Gray**; gray code.						
	0 … 1	Binary	-	1 = 1	n	y	Parameter
92.37	**SSI baud rate**						
	Encoder 1, SSI baud rate. (Visible when 92.01 Encoder 1 type = Absolute encoder) With an SSI encoder, selects the baud rate. 0: **10 kbit/s**; 10 kbit/s. 1: **50 kbit/s**; 50 kbit/s. 2: **100 kbit/s**; 100 kbit/s. 3: **200 kbit/s**; 200 kbit/s. 4: **500 kbit/s**; 500 kbit/s. 5: **1000 kbit/s**; 1000 kbit/s.						
	0 … 5	100 kBit/s	-	1 = 1	n	y	Parameter
92.40	**SSI zero phase**						
	Encoder 1, SSI zero phase. (Visible when 92.01 Encoder 1 type = Absolute encoder) Selects the phase angle within one sine/cosine signal period that corresponds to the value of zero on the SSI serial link data. 92.40 SSI zero phase is used to adjust the synchronization of the SSI position data and the position based on sine/cosine incremental signals. Incorrect synchronization may cause an error of ±1 incremental period. **Note:** 92.40 SSI zero phase needs to be set only when an SSI encoder is used in initial position mode (see 92.30 Serial link mode). 0: **315 ... 45 deg**; 315° … 45°. 1: **45 ... 135 deg**; 45° … 135°. 2: **135 ... 225 deg**; 135° … 225°. 3: **225 ... 315 deg**; 225° … 315°.						
	0 … 3	315-45 deg	-	1 = 1	n	y	Parameter
92.45	**Hiperface parity**						
	Encoder 1, HIPERFACE parity. (Visible when 92.01 Encoder 1 type = Absolute encoder) With a HIPERFACE encoder, selects the use of parity and stop bits. **Note:** Typically, 92.45 Hiperface parity does not need to be set. 0: **Odd**; odd parity indication bit, one stop bit. 1: **Even**; even parity indication bit, one stop bit.						
	0 … 1	Odd	-	1 = 1	n	y	Parameter
92.46	**Hiperface baud rate**						
	Encoder 1, HIPERFACE baud rate. (Visible when 92.01 Encoder 1 type = Absolute encoder) With a HIPERFACE encoder, selects the transfer rate of the link. **Note:** Typically, 92.46 Hiperface baud rate does not need to be set.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	0: **4800 bits/s**; 4800 bits/s. 1: **9600 bits/s**; 9600 bits/s. 2: **19200 bits/s**; 19200 bits/s. 3: **38400 bits/s**; 38400 bits/s.						
	0 … 3	4800 bits/s	-	1 = 1	n	y	Parameter
92.47	**Hiperface node address**						
	Encoder 1, HIPERFACE encoder node address. (Visible when 92.01 Encoder 1 type = Absolute encoder) With a HIPERFACE encoder, selects the node address. **Note:** Typically, 92.47 Hiperface node address does not need to be set.						
	0 … 255	64	-	1 = 1	n	y	Parameter

93 Encoder 2 configuration

Settings for encoder 2.

Description see group 92 Encoder 1 configuration.

Notes:

- The contents of the parameter group varies according to the selected encoder type.
- It is recommended that encoder connection 1 (group 92) is used whenever possible since the data received through that interface is fresher than the data received through connection 2 (this group).

94 OnBoard speed feedback configuration

Settings for analog tacho and OnBoard encoder.

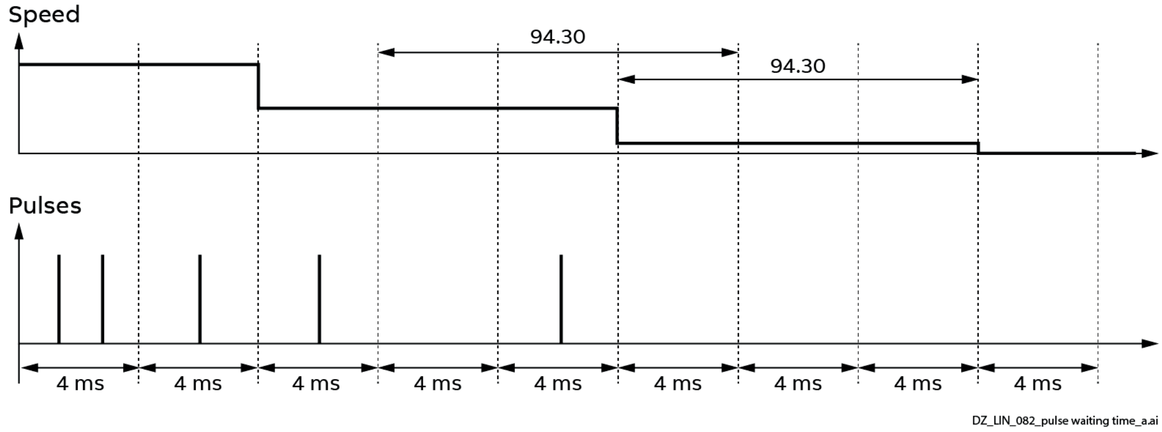
Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
94.01	**EMF speed**						
	EMF speed. Displays the speed feedback calculated from the EMF in rpm, % or V. The unit is selected by 96.03 Unit for speed control.						
	-30000.00 … 30000.00	-	rpm, % or V	See 46.02	y	n	Signal
94.02	**Tacho voltage**						
	Value of XTAC (tacho terminals). Displays the value of the tacho connected to XTAC in V.						
	-3250.0 … 3250.0	-	V	10 = 1 V	y	n	Signal
94.03	**Tacho speed**						
	Tacho speed. Displays the speed feedback measured by the tacho in rpm.						
	-30000.00 … 30000.00	-	rpm	See 46.02	y	n	Signal
94.04	**OnBoard encoder speed**						
	OnBoard encoder speed. Displays the speed feedback measured by the OnBoard encoder in rpm.						
	-30000.00 … 30000.00	-	rpm	See 46.02	y	n	Signal
94.07	**M1 tacho type**						
	Motor 1 type of connected tacho.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	Depending on the type of the connected tacho, a hardware filter of 40 ms is activated. 0: **DC tacho**; disable filter. 1: **AC tacho**; enable filter.						
	0 … 1	DC tacho	-	1 = 1	n	y	Parameter
94.08	**M1 tacho voltage at 1000 rpm**						
	Motor 1 tacho voltage at 1000 rpm. A tacho generates this voltage at a speed of 1000 rpm, see tacho nameplate. It is used to calculate 94.10 M1 tacho tuning gain. Measure and set the value using 99.20 Tuning requested = Speed feedback assistant. – 94.08 M1 tacho voltage at 1000 rpm ≥ 1.0 V, the value is set by hand. – 94.08 M1 tacho voltage at 1000 rpm = 0.0 V, the value is to be measured by means of the speed feedback assistant. – 94.08 M1 tacho voltage at 1000 rpm ≤ -1.0 V, the value was successfully measured and set by means of the speed feedback assistant.						
	-270.0 … 270.0	0.0	V	10 = 1 V	n	y	Parameter
94.09	**M1 tacho max displayable speed**						
	Motor 1 maximum displayable speed. Internally used maximum tacho speed for motor 1. This value is depending on the tacho output voltage, see 94.08 M1 tacho voltage at 1000 rpm, and the maximum speed of the drive system. For maximum speed, see 46.02 M1 speed scaling actual, 30.11 M1 minimum speed, 30.12 M1 maximum speed, 31.30 M1 overspeed trip margin and 99.14 M1 nominal (base) speed. The value is only valid if written to by: – Via 99.20 Tuning requested = Speed feedback assistant. – Via 94.08 M1 tacho voltage at 1000 rpm. – Via parameter download.						
	0.00 … 30000.00	0.00	rpm	See 46.02	n	y	Parameter
94.10	**M1 tacho tuning gain**						
	Motor 1 tacho tuning gain. Internally used tacho gain tuning for motor 1. The value is only valid if written to by: – Via 99.20 Tuning requested = Speed feedback assistant. – Via 94.08 M1 tacho voltage at 1000 rpm. – Via parameter download.						
	0 … 5	5	-	1 = 1	n	y	Parameter
94.11	**M1 tacho fine-tuning adjust**						
	Motor 1 tacho fine-tuning adjust. Internally used fine-tuning adjust of the tacho for motor 1. The value equals the speed feedback measured by means of a handheld tacho. Set the value of 94.11 M1 tacho fine-tuning adjust to the measured speed feedback of a handheld tacho. The value is only valid if written to by: – Via 99.20 Tuning requested = Tacho fine-tuning. During the tacho fine-tuning 90.41 M1 feedback selection is automatically forced to EMF. – Via parameter download. **Attention:** The value of 94.11 M1 tacho fine-tuning adjust must be the measured speed feedback of a handheld tacho and not to the delta between speed reference and measured speed in the drive.						
	-30000.00 … 30000.00	0.00	rpm	See 46.02	n	y	Parameter
94.12	**M1 tacho fine-tuning factor**						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	Motor 1 tacho fine-tuning factor. Internally used tacho fine-tuning factor for motor 1.						
	0.30 … 3.00	1.00	-	100 = 1	n	y	Parameter
94.13	**M1 tacho offset**						
	Motor 1 tacho offset. Adds an offset to 94.03 Tacho speed.						
	-10.00 … 10.00	0.00	rpm	See 46.02	n	y	Parameter
94.16	**OnBoard encoder position**						
	OnBoard encoder, position within one revolution. Displays the OnBoard encoder position, within one revolution. See 90.48 Motor position axis mode.						
	0.00000000 … 1.00000000	-	rev	32767 = 1 rev	y	n	Signal
94.18	**OnBoard encoder revolution extension**						
	OnBoard encoder, revolution count extension. Displays the revolution count extension for the OnBoard encode. See 90.48 Motor position axis mode. The counter is incremented, when the encoder position wraps around in positive direction and decremented in negative direction. See 90.11 Encoder 1 position.						
	-2147483648 … 2147483647	-	-	1 = 1	y	n	Signal
94.23	**OnBoard encoder pulses/revolution**						
	OnBoard encoder, pulses per revolution (ppr). Defines the OnBoard encoder pulses per revolution, see encoder nameplate. **Note**: Formula to calculate the frequency at the encoder with maximum speed: $f_{max}\ [kHz] = \frac{n_{max}\ [rpm]\ \times ppr}{60\ s\ * 1000}$ with: ppr = pulses per revolution, see 94.26 OnBoard encoder transient filter.						
	0 … 65535	2048	ppr	1 = 1 ppr	n	y	Parameter
94.24	**OnBoard encoder type**						
	OnBoard encoder, type. Selects the type of the OnBoard encoder. 0: **Quadrature**; quadrature encoder with two channels, A and B. 1: **Single track**; single-track encoder with one channel, A. **Note**: With setting Single track, the measured speed value is always positive regardless of direction of rotation.						
	0 … 1	Quadrature	-	1 = 1	n	y	Parameter
94.25	**OnBoard encoder speed calculation mode**						
	OnBoard encoder, speed calculation mode. Selects the speed calculation mode. 0: **A&B all**; channels A and B rising and falling edges are used for the speed calculation and direction. Set 94.24 OnBoard encoder type = Quadrature. The speed evaluation factor = 4. 1: **A all, B direction**; channel A rising and falling edges are used for speed calculation. Channel B defines the direction of rotation. Set 94.24 OnBoard encoder type = Quadrature. The speed evaluation factor = 2.						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	2: **A rising, B direction**; channel A rising edges are used for speed calculation. Channel B defines the direction of rotation. Set 94.24 OnBoard encoder type = Quadrature. The speed evaluation factor = 1. 3: **A falling, B direction**; channel A falling edges are used for speed calculation. Channel B defines the direction of rotation. Set 94.24 OnBoard encoder type = Quadrature. The speed evaluation factor = 1. 4: **A all**; channel A rising and falling edges are used for speed calculation. EMF speed feedback defines the direction of rotation. Can be used, if channel B is defective. Set 94.24 OnBoard encoder type = Single-track. The speed evaluation factor = 2. 5: **B all**; channel B rising and falling edges are used for speed calculation. EMF speed feedback defines the direction of rotation. Can be used, if channel A is defective. Set 94.24 OnBoard encoder type = Single-track. The speed evaluation factor = 2.						
	0 … 5	A&B all	-	1 = 1	n	y	Parameter
94.26	**OnBoard encoder transient filter**						
	OnBoard encoder, transient filter. Activates the transient filtering for the OnBoard encoder. Thus, unintentional changes in direction of rotation are ignored. Should be activated when the connected mechanics are vibrating heavily. 0: **0.0 µs**; filter not active. Maximum frequency at the encoder is 300.0 kHz. 1: **1.6 µs**; fastest filter time. Maximum frequency at the encoder is 300.0 kHz. 2: **3.2 µs**; fast filter time. Maximum frequency at the encoder is 150.0 kHz. 3: **6.4 µs**; medium filter time. Maximum frequency at the encoder is 75.0 kHz. 4: **12.8 µs**; slow filter time. Maximum frequency at the encoder is 37.5 kHz. **Note**: Formula to calculate the frequency at the encoder with maximum speed: $f_{max}\ [kHz] = \frac{n_{max}\ [rpm]\ \times ppr}{60\ s\ * 1000}$ with: ppr = pulses per revolution, see 94.23 OnBoard encoder pulses/revolution.						
	0 … 4	1.6 µs	-	1 = 1	n	y	Parameter
94.30	**OnBoard encoder maximum pulse waiting time**						
	OnBoard encoder, maximum pulse waiting time. When an encoder is used as speed feedback device the actual speed is measured by counting pulses per measurement interval. The base (minimum) measurement interval is 4 ms. 94.30 OnBoard encoder maximum pulse waiting time determines the pulse waiting time for the speed feedback calculation of the OnBoard encoder. If no pulse edges are detected within the measurement interval, the measured speed feedback is set to zero. Increasing the time can improve measuring performance especially at low, near zero speeds.						

Index	Name					
	Text					
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type



Notes:

- Formula to calculate the maximum speed using an encoder:

$$n_{max}\ [rpm] = \frac{300\ [kHz] * 60\ [s]}{ppr} * 1000$$

with: ppr = pulses per revolution, see 94.23 OnBoard encoder pulses/revolution.
300 kHz are the maximum allowed input frequency.

- Formula to calculate the minimum speed resolution using an encoder:

$$n_{min}\ [rpm] = \frac{60\ [s]}{k\ \times\ ppr\ \times t_{cycle}\ [ms]} * 1000$$

with: k = speed evaluation factor, see 94.25 OnBoard encoder speed calculation mode.

ppr = pulses per revolution, see 94.23 OnBoard encoder pulses/revolution.
t_{cycle} = cycle time of the speed feedback measurement, 4 ms. See 94.30 OnBoard encoder maximum pulse waiting time.

- Only the speed measurement is affected. The position is updated whenever a new pulse edge is detected. When the measured speed from the interface is zero, the drive updates its speed data based on position changes.

	0 … 200	4	ms	1 = 1 ms	n	y	Parameter

95 HW configuration

Various hardware-related settings.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">95.14</td><td colspan="7">Set: Power unit</td></tr>
<tr><td colspan="7">Set the type of power unit.
95.14 Set: Power unit is only shown and available when there is a mismatch between 95.14 Set: Power unit read from SDCS-CON-H01 and 95.14 Set: Power unit read from the plugged-in memory unit. See also 07.02 Power unit set.
Either adapt the SDCS-CON-H01 using 95.14 Set: Power unit and 95.25 Set: Type code or use a memory unit with an appropriate firmware.
0: DCS converter; the unit is a DCS880.
20: DCT controller; the unit is a DCT880.
40: TSU supply unit; the unit is a TSU880.
100: Unsupported power unit type; mismatch between 95.14 Set: Power unit read from SDCS-CON-H01 and 95.14 Set: Power unit read from the plugged-in memory unit. This event generates fault 50FE Type code and shows 95.14 Set: Power unit.</td></tr>
<tr><td>0 … 100</td><td>Unsupported power unit type</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3">95.15</td><td colspan="7">Set: Special HW settings</td></tr>
<tr><td colspan="7">Hardware configuration.
Contains hardware-related settings. 95.15 Set: Special HW settings is write protected. To enable use 95.24 Service mode = Set: Type code.
Service mode = Set: Type code must be set back to Normal mode by the user.
0: 3ph B6C; the connected power part is a B6 configuration connected to three phase mains.
1: M3C; the connected power part is a M3 configuration.
2: 2xM3C; the connected power part is a double M3 configuration.
3; M6C; the connected power part is a M6 configuration.
4: 1ph B2C; the connected power part is a B2 configuration or a B6 configuration connected to single phase mains. This setting is e.g. needed for the demo unit.</td></tr>
<tr><td>0 … 4</td><td>3ph B6C</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="2">95.16</td><td colspan="7">Control unit configuration</td></tr>
<tr><td colspan="7">Control/Electronic unit configuration.
Contains the structure of the unit. Either electronic unit and power unit are in the same housing as in units of sizes H1 … H6 or control unit and power units are separate like in units of sizes H7, H8 or hardparallel dives.
A wrong setting of 95.16 Control unit configuration generates warning A113 Power unit, communication and A7AB I/O extension configuration.
0: Internal; electronic unit and power unit are usually in the same housing. E.g. for units of sizes H1 … H6. Fiber optic control inactive.
1: 1 external PU; control unit and one power unit are separate. For units of sizes H7 and H8. Channel1 of the SDCS-DSL-H1x is active. Fiber optic control active.
2: 2 external PUs; control unit and two power units are separate. For two units of size H8 in hardparallel configuration. Channel1 and channel2 of the SDCS-DSL-H1x are active. Fiber optic control active.
3: 3 external PUs; control unit and three power units are separate. For three units of size H8 in hardparallel configuration. Channel1 … channel3 of the SDCS-DSL-H14 are active. Fiber optic control active.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">4: 4 external PUs; control unit and four power units are separate. For four units of size H8 in hardparallel configuration. Channel1 … channel4 of the SDCS-DSL-H14 are active. Fiber optic control active.
9: Automatic; automatic setting according to 95.25 Set: Type code. For units of sizes H1 … H8.</td></tr>
<tr><td>0 … 9</td><td>Automatic</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3">95.24</td><td colspan="7">Service mode</td></tr>
<tr><td colspan="7">Drive service mode.
The service mode contains Type code settings, thyristor test and firing pulse test procedures. Service mode is automatically reset to Normal mode after the thyristor test is finished/failed. In case errors occur during the selected procedure, warning AF90 Autotuning is generated. The reason of the error can be seen in the AUX code.
Service mode = Set: Type code or Firing pulses Vxx must be set back to Normal mode by the user.
Notes:
– The reference chain is blocked while 95.24 Service mode ≠ Normal mode.
– After checking individual firing pulses, the power needs to be cycled, otherwise the drive will not start.
0: Normal mode; normal operating mode depending on 99.06 Operation mode.
1: Set: Type code; enables setting of following parameters:
– 95.15 Set: Special HW settings.
– 95.25 Set: Type code.
– 95.27 Set: Drive DC current scaling.
– 95.28 Set: Drive AC voltage scaling.
Note:
– For drives size H5 ... H8 make sure, that 99.11 M1 nominal current is set to 50 A or higher.
5: Thyristor test; starts a complete thyristor test. All thyristors are tested. 05.22 Diagnostic shows the results.
11: Firing pulses V11; only firing pulses for thyristor V11 are released.
12: Firing pulses V12; only firing pulses for thyristor V12 are released.
13: Firing pulses V13; only firing pulses for thyristor V13 are released.
14: Firing pulses V14; only firing pulses for thyristor V14 are released.
15: Firing pulses V15; only firing pulses for thyristor V15 are released.
16: Firing pulses V16; only firing pulses for thyristor V16 are released.
21: Firing pulses V21; only firing pulses for thyristor V21 are released.
22: Firing pulses V22; only firing pulses for thyristor V22 are released.
23: Firing pulses V23; only firing pulses for thyristor V23 are released.
24: Firing pulses V24; only firing pulses for thyristor V24 are released.
25: Firing pulses V25; only firing pulses for thyristor V25 are released.
26: Firing pulses V26; only firing pulses for thyristor V26 are released.
31: Ch1 HP thyristor test; starts a complete Thyristor test. All thyristors of the power unit connected to channel1 of the SDCS-DLS-H1x are tested. 05.22 Diagnostic shows the results.
32: Ch2 HP thyristor test; starts a complete Thyristor test. All thyristors of the power unit connected to channel2 of the SDCS-DLS-H1x are tested. 05.22 Diagnostic shows the results.
33: Ch3 HP thyristor test; starts a complete Thyristor test. All thyristors of the power unit connected to channel3 of the SDCS-DLS-H1x are tested. 05.22 Diagnostic shows the results.
34: Ch4 HP thyristor test; starts a complete Thyristor test. All thyristors of the power unit connected to channel4 of the SDCS-DLS-H1x are tested. 05.22 Diagnostic shows the results.</td></tr>
<tr><td>0 … 34</td><td>Normal mode</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Parameter</td></tr>
<tr><td>95.25</td><td colspan="7">Set: Type code</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

Set the type code of the drive.
Contains the drive's current-, voltage-, temperature measurement and its quadrant type. 95.25 Set: Type code is preset in the factory and is write protected. To enable use 95.24 Service mode = Set Type code. The change of the type code is immediately taken over.
95.24 Service mode = Set Type code must be set back to Normal mode by the user.
0: **None**; the type code is set by the user, see 95.26 Set: Drive block bridge 2, 95.27 Set: Drive DC current scaling, 95.28 Set: Drive AC voltage scaling and 95.29 Set: Drive max bridge temperature e.g. for rebuild kits.
1: **S01-0020-04**; type code, see table.
…
152: **S02-5200-05**; type code, see table.

The drive's basic type code: **DCS880-aab-cccc-ddef**			
Product family:	DCS880		
Product type:	aa	= S0	Standard converter module
		= R0	Rebuild kit
		= E0	Panel solution
		= A0	Enclosed converter
Bridge type:	b	= 1	Single bridge (2-Q)
		= 2	2 anti-parallel bridges (4-Q)
Module type:	cccc	=	Rated DC current (IP00)
Rated AC voltage:	dd	= 04	100 V_{AC} … 415 V_{AC}
		= 05	100 V_{AC} … 500 V_{AC} (IEC)/525 V_{AC} (UL)
		= 06	270 V_{AC} … 600 V_{AC}
		= 07	315 V_{AC} … 690 V_{AC}
		= 08	360 V_{AC} … 800 V_{AC}
		= 10	450 V_{AC} … 990 V_{AC}
		= 12	540 V_{AC} … 1190 V_{AC}
Power connection:	e	= X	Standard H1 … H7
		= L	Left side H8
		= R	Right side H8
Revision code:	f	= 0	1st generation
		= A	H7: fusing adaption due to UL certification

Attention: When using H1 … H5 modules the current and voltage range of the type code setting is limited to max 1190 A_{DC} and max 600 V_{AC}.

	0 … 520	None	-	1 = 1	n	n	Parameter

95.26 **Set: Drive block bridge 2**

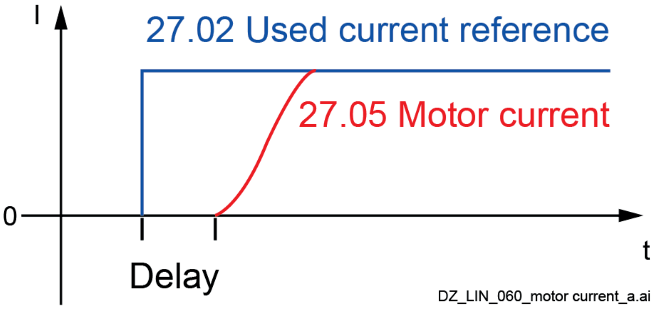
Set the quadrant type of the drive (1 or 2 bridges).
Bridge 2 can be blocked.
0: **Auto**; operation mode is taken from 95.25 Set: Type code. If 95.25 Set: Type code = None set 95.26 Set: Drive block bridge 2 = Block bridge 2 or Release bridge 2.
1: **Block bridge 2**; block bridge 2 (≡ 2-Q operation), e.g. for 2-Q rebuild kits.
2: **Release bridge 2**; release bridge 2 (≡ 4-Q operation), e.g. 4-Q for rebuild kits.
This value overrides the type code and is immediately visible in 07.61 Drive block bridge 2 set.

	0 … 2	Auto	-	1 = 1	n	n	Parameter

95.27 **Set: Drive DC current scaling**

Set the nominal DC current of the drive.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Adjustment of DC current measuring channels (SDCS-PIN-H01 or SDCS-PIN-H51). 95.27 Set: Drive DC current scaling is write protected. To enable use 95.24 Service mode = Set Type code. 95.24 Service mode = Set Type code must be set back to Normal mode by the user.
<table>
<tr><td>0 A</td><td>Take value from 95.25 Set: Type code.
– This setting must be selected for converter modules with a standard hardware configuration including SDCS-PIN-H01 and a type code.
– This setting must be selected for converter modules with a standard hardware configuration including SDCS-PIN-H51 and a type code. No cutting of the burden resistors is required.
More details see DCS880 Hardware manual (3ADW000462).</td></tr>
<tr><td>1 … 32500 A</td><td>Take the value from 95.27 Set: Drive DC current scaling as current measurement scaling (the value of parameter 95.27 equals to 1.5 V over the burden resistor) as DC current scaling. Typically used for rebuild projects (DCS880-R), if no type code is available.
– Not applicable for DCS880 sizes H1 ... H5 with a SDCS PIN-H01.
– This setting is used for converter hardware configuration if no type code is available. If the scaling in 95.27 Set: Drive DC current scaling is used, the burden resistor on the SDCS-PIN-H51 must be cut and scaled.
This setting is not recommended for converter modules with a standard hardware configuration including SDCS-PIN-H51.
More details see DCS880-R Selection, Installation and Start-Up Manual for Rebuild kits (3ADW000599).</td></tr>
</table>
This value overrides the type code and is immediately visible in 07.62 Drive DC current scaling set.
Attention: When using H1 … H5 modules the current and voltage range of the type code setting is limited to max 1190 A_{DC} and max 600 V_{AC}.</td></tr>
<tr><td>0 … 32500</td><td>0</td><td>A</td><td>1 = 1 A</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3">95.28</td><td colspan="7">Set: Drive AC voltage scaling</td></tr>
<tr><td colspan="7">Set the nominal AC voltage of the drive.
Adjustment of AC voltage measuring channels (SDCS-PIN-H01 or SDCS-PIN-H51). 95.28 Set: Drive AC voltage scaling is write protected. To enable use 95.24 Service mode = Set Type code. 95.24 Service mode = Set Type code must be set back to Normal mode by the user.
<table>
<tr><td>0.0 V</td><td>Take value from 95.25 Set: Type code.</td></tr>
<tr><td>0.1 … 3250.0 V</td><td>Take value from 95.28 Set: Drive AC voltage scaling.</td></tr>
</table>
This value overrides the type code and is immediately visible in 07.64 Drive AC voltage scaling set.
Attention: When using H1 … H5 modules the current and voltage range of the type code setting is limited to max 1190 A_{DC} and max 600 V_{AC}.</td></tr>
<tr><td>0.0 … 3250.0</td><td>0.0</td><td>V</td><td>10 = 1 V</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="2">95.29</td><td colspan="7">Set: Drive max bridge temperature</td></tr>
<tr><td colspan="7">Set the maximum bridge temperature of the drive.
Adjustment of the drive bridge temperature tripping level.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7"><table><tr><td>0°C/32°F</td><td>Take value from 95.25 Set: Type code.</td></tr><tr><td>1°C … 149°C/33°F … 300°F</td><td>Take value from 95.29 Set: Drive max bridge temperature.</td></tr><tr><td>150°C/301°F</td><td>The temperature supervision is inactive, e.g. for rebuild kits.</td></tr></table>
This value overrides the type code and is immediately visible in 07.65 Drive max bridge temperature set.
Maximum setting for converters size H7 and H8 is 55°C/131°F, because the cooling air input temperature is measured. For more details, see DCS880 Hardware manual (3ADW000462).
The unit is selected by 96.02 Unit selection.</td></tr>
<tr><td></td><td>-80.0 … 1000.0</td><td>0.0</td><td>°C or °F</td><td>1 = 1°C or °F</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td>95.32</td><td colspan="7">DC current measurement adjust</td></tr>
<tr><td></td><td colspan="7">Set the DC current measurement adjust of the drive.
95.32 DC current measurement adjust in percent of 07.62 Drive DC current scaling set is used to cover drives with different current measuring circuits for bridge 1 and bridge 2. It rescales the measured armature current if bridge 2 is active, not implemented yet.</td></tr>
<tr><td></td><td>12.5 … 800.0</td><td>100.0</td><td>%</td><td>10 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>95.33</td><td colspan="7">DC current measurement offset</td></tr>
<tr><td></td><td colspan="7">Set the DC current measurement offset of the drive.
The offset value in percent of 99.11 M1 nominal current is added to the armature current measurement. 95.33 DC current measurement offset adjusts 01.10 Motor current in A to the real armature current.
Commissioning hints:
– In case the response of the current controller is delayed when starting at zero current, increase 95.33 DC current measurement offset slowly to 1.0 %:

– In case a 2-Q converter is used and the motor turns with a zero-speed reference increase 95.33 DC current measurement offset until the motor is not turning anymore.</td></tr>
<tr><td></td><td>-10.0 … 10.0</td><td>0.0</td><td>%</td><td>10 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>95.34</td><td colspan="7">DC voltage measurement adjust</td></tr>
<tr><td></td><td colspan="7">Set the DC voltage measurement adjust of the drive.
95.34 DC voltage measurement adjust in percent of 07.64 Drive AC voltage scaling set is used to cover drives with different voltage measuring circuits for armature and mains voltage. It rescales the armature voltage measurement.</td></tr>
<tr><td></td><td>12.5 … 800.0</td><td>100.0</td><td>%</td><td>10 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>95.35</td><td colspan="7">DC voltage measurement offset</td></tr>
<tr><td></td><td colspan="7">Set the DC voltage measurement offset of the drive.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">The offset value in percent of 99.12 M1 nominal voltage added to the armature voltage measurement. 95.35 DC voltage measurement offset adjusts 01.21 Armature voltage in V to the real armature voltage (e.g. measured by a meter). See 95.37 DC voltage measurement mode.</td></tr>
<tr><td>-10.0 … 10.1</td><td>0</td><td>%</td><td>10 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">95.37</td><td colspan="7">DC voltage measurement mode</td></tr>
<tr><td colspan="7">DC voltage measurement mode of the drive.
Selects the DC voltage measurement mode.
0: Auto; automatic voltage measurement offset. The automatic offset is executed until an On command is given. See 06.09.b00 Used main control word.
The internal DC voltage measurement is taken.
Attention: The armature voltage measurement circuit between drive and motor must be closed before the On command is given. If this is not the case set 95.37 DC voltage measurement mode = DC-contactor.
1: Manual; manual voltage measurement offset. The value of 95.35 DC voltage measurement offset is taken.
The internal DC voltage measurement is taken.
2: DC-contactor; manual voltage measurement offset. The value of 95.35 DC voltage measurement offset is taken. Until an On command is given the voltage measurement is forced to zero. See also 20.33 Mains contactor control mode.
The internal DC voltage measurement is taken.
3: AI3 scaled; manual voltage measurement offset. The value of 95.35 DC voltage measurement offset is taken.
The external DC voltage measurement is taken. Thus, the DC voltage measurement is located at the motor terminals via SDCS-UCM-01/DC-DC transducer and AI3. The raw value at the analog input can be seen in 12.31 AI3 actual value. The scaling in percent of 99.12 M1 nominal voltage is done via analog input parameters 12.37 … 12.40. See also DCS880 External voltage measurement (3ADW000601).</td></tr>
<tr><td>0 … 3</td><td>Manual</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">95.39</td><td colspan="7">PLL input deviation</td></tr>
<tr><td colspan="7">PLL input deviation.
Actual measured mains voltage cycle (period) time. Is used as input of the PLL controller.

For 50 Hz mains the value should be: $\frac{1}{50\ Hz} = 20\ ms\ \equiv 0°$.

For 60 Hz mains the value should be: $\frac{1}{60\ Hz} = 16.67\ ms\ \equiv 0°$.</td></tr>
<tr><td>-180.00 … 180.00</td><td>-</td><td>°</td><td>100 = 1°</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">95.40</td><td colspan="7">PLL output, internal mains frequency</td></tr>
<tr><td colspan="7">PLL output.
Calculated and internally controlled mains frequency. Output of PLL controller.</td></tr>
<tr><td>0.00 … 100.00</td><td>-</td><td>Hz</td><td>100 = 1 Hz</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">95.43</td><td colspan="7">PLL offset synchronization transformer</td></tr>
<tr><td colspan="7">PLL offset due to a synchronization transformer.
Compensation of a synchronization transformer’s phase shift compared to the mains transformer. The maximum phase shift compensation is ±60.00°.</td></tr>
<tr><td>-60.00 … 60.00</td><td>0.00</td><td>°</td><td>100 = 1°</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>95.44</td><td colspan="7">PLL deviation level</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">PLL deviation level to block the current controller.
Maximum allowed deviation of the PLL controller. Exceeding the level generates alarm A131 PLL deviation and sets 06.25.b13 Current controller status word 2. Thus, the current controller is blocked, the firing angle is forced to the value of 30.45 Maximum firing angle and single firing pulses to suppress the DC current are given.

For 50 Hz mains is valid: $\frac{1}{50\,Hz} = 20\,ms \equiv 0^\circ$.

For 60 Hz mains is valid: $\frac{1}{60\,Hz} = 16.67\,ms \equiv 0^\circ$.</td></tr>
<tr><td>5.00 … 20.00</td><td>10.00</td><td>°</td><td>100 = 1°</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">95.45</td><td colspan="7">PLL proportional gain</td></tr>
<tr><td colspan="7">PLL p-part.
Gain of firing unit’s phase lock loop. See 95.46 PLL filter time.</td></tr>
<tr><td>0.01 … 2.00</td><td>0.50</td><td>-</td><td>100 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">95.46</td><td colspan="7">PLL filter time</td></tr>
<tr><td colspan="7">PLL filter time constant.
Filter of firing unit’s phase lock loop.
Commissioning hint:

<table>
<tr><td>95.45 PLL proportional gain</td><td>95.46 PLL filter time</td></tr>
<tr><td>1.0</td><td>≤ 5 msec</td></tr>
<tr><td>0.5</td><td>≤ 10 msec</td></tr>
<tr><td>0.2</td><td>≤ 20 msec</td></tr>
<tr><td>0.1</td><td>≤ 50 msec</td></tr>
<tr><td>0.05</td><td>≤ 100 msec</td></tr>
<tr><td>0.02</td><td>≤ 200 msec</td></tr>
<tr><td>0.01</td><td>≤ 500 msec</td></tr>
</table></td></tr>
<tr><td>0.0 … 500.0</td><td>0.0</td><td>ms</td><td>10 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">95.47</td><td colspan="7">PLL Uk compensation</td></tr>
<tr><td colspan="7">PLL mains transformer u_k compensation.
The measured firing angle of the firing unit's PLL can be corrected to compensate the error caused by the commutation notches of the thyristors. The compensation depends on the u_k (short circuit voltage) of the mains.
95.47 PLL Uk compensation defines the mains short circuit voltage, in percent of 99.01 Mains voltage, which is caused by the unit’s nominal current for the PLL correction:

$PLL\ u_k\ compenzation = u_k \times \frac{S_c}{S_t} \times 100\ \%$

With: u_k = related mains short circuit voltage.
S_c = apparent power of the drive.
S_t = apparent power of the transformer.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Commissioning hint: 95.47 PLL Uk compensation is used to compensate for the phase shift of the mains due to the thyristors switching, in case the mains are measured on the secondary side of the dedicated transformer.
This situation leads to unstable output currents during high loads. Increase 95.47 PLL Uk compensation slowly (1 by 1) until the output current becomes stable.</td></tr>
<tr><td>0.0 … 15.0</td><td>0.0</td><td>%</td><td>10 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">95.50</td><td colspan="7">PLL sync mode</td></tr>
<tr><td colspan="7">PLL synchronization mode.
reserved</td></tr>
<tr><td>0 … 1</td><td>1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

96 System

Language selection; access levels; macro selection; parameter save and restore; control board reboot; user parameter sets; unit selection; data logger triggering; user lock.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">96.01</td><td colspan="7">Language</td></tr>
<tr><td colspan="7">Select language.
Selects the language of the parameter interface and other displayed information when viewed on the control panel.
Notes:
– Not all languages listed below are necessarily supported.
– 96.01 Language does not affect the languages visible in the PC tool.
0: Not selected; none.
1029: Czech; Czech.
1030: Dansk; Danish.
1031: Deutsch; German. Supported.
1033: English; English. Supported.
1035: Suomi; Finnish.
1036: Français; French. Supported.
1040: Italiano; Italian. Supported.
1043: Nederlands; Dutch.
1045: Polski; Polish. Supported.
1049: Russki; Russian. Supported.
1053: Svenska; Swedish.
1055: Türkçe; Turkish.
2052: Chinese (Simplified, PRC); Simplified Chinese. Supported.
2070: Portugues; Portuguese.
3082: Español; Spanish. Supported.</td></tr>
<tr><td>0 … 3082</td><td>English</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">96.02</td><td colspan="7">Unit selection</td></tr>
<tr><td colspan="7">Unit selection word.
Selects the unit of parameters indicating power, temperature and torque.
Bit assignment:
<table><tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr></table></td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">
<table>
<tr><td rowspan="2">0</td><td rowspan="2">Power unit</td><td>1</td><td>hp</td></tr>
<tr><td>0</td><td>kW</td></tr>
<tr><td>1</td><td>reserved</td><td></td><td></td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Temperature unit</td><td>1</td><td>°F</td></tr>
<tr><td>0</td><td>°C</td></tr>
<tr><td>3</td><td>reserved</td><td></td><td></td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Torque unit</td><td>1</td><td>Lb ft</td></tr>
<tr><td>0</td><td>Nm</td></tr>
<tr><td>5 … 15</td><td>reserved</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td></td><td>0000h … FFFFh</td><td>0000h</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>96.03</td><td colspan="7">Unit for speed control</td></tr>
<tr><td></td><td colspan="7">Unit for the speed control.
Sets the speed control unit.
0: rpm; in rpm.
1: %; in percent of 99.14 M1 nominal (base) speed. Set 99.14 M1 nominal (base) speed = 100 %.
2: V; in volt. Set 99.14 M1 nominal (base) speed to the value of 99.12 M1 nominal voltage.
Following signals/parameters are affected:
– 01.72 24.01 Used speed reference fast
– 22.01 Speed reference unlimited
– 22.07 Speed reference
– 22.08 Auxiliary speed reference
– 22.31 Constant speed 6
– 22.32 Constant speed 7
– 22.81 Speed reference 1
– 22.82 Speed reference 2
– 23.01 Speed reference ramp input
– 23.02 Speed reference ramp output
– 23.03 Speed reference 7
– 23.27 Ramp out balancing reference
– 24.01 Used speed reference
– 24.04 Speed error inverted
– 24.11 Speed correction
– 24.46 Speed error step
– 30.11 M1 minimum speed
– 30.12 M1 maximum speed
– 46.01 M1 speed scaling
– 46.02 M1 speed scaling actual
– 90.01 Motor speed for control
– 94.01 EMF speed
– 99.14 M1 nominal (base) speed
Note: After changing, restart the drive and the PC tool to make the change visible.</td></tr>
<tr><td></td><td>0 … 2</td><td>rpm</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>96.04</td><td colspan="7">Access levels active</td></tr>
<tr><td></td><td colspan="7">Active access levels.
Shows, which access levels, have been activated by 96.07 Pass code and 96.102 User lock functionality.</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	Bit assignment:						

Bit	Name	Value	Remarks
0	End user	1	End user active.
1	Service	0	Service active.
2	Advanced programmer	0	Advanced programmer active.
3	reserved		
4	reserved		
5	reserved		
6	reserved		
7	reserved		
8	reserved		
9	reserved		
10	reserved		
11	OEM access level 1		OEM access level 1 active.
12	OEM access level 2		OEM access level 2 active.
13	OEM access level 3		OEM access level 3 active.
14	Parameter lock	0	Parameter lock is active.
15	reserved		

Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	n	n	Signal

96.07 **Pass code**

Pass code.
Enter a pass code to activate the parameter lock or to configure the user lock. See 96.102 User lock functionality.
Parameter lock:
Entering “358” toggles the parameter lock, which prevents the changing of all other parameters through control panel or PC tool.
User lock (opening generates warning A6B0 User lock open):
Entering the user pass code, by default “10,000,000”, unhides parameters 96.100 … 96.102. Now it is possible to define a new user pass code and to select the actions to be prevented.
Entering an invalid pass code will close an open user lock, by hiding parameters 96.100 … 96.102. After entering the code, check that the parameters are in fact hidden.
Example: For better cyber security, set a user pass code preventing change of parameter values or loading of firmware and other files.
To activate the user lock for the first time, enter the default user pass code “10,000,000” into 96.07 Pass code. This unhide parameters 96.100 … 96.102. Then enter a new user pass code into 96.100 Change user pass code and confirm the code in 96.101 Confirm user pass code. In 96.102 User lock functionality define the actions to be prevented.
To close the user lock, enter an invalid user pass code into 96.07 Pass code then activate 96.27 Control board boot or cycle the power. With the lock closed, parameters 96.100 … 96.102 are hidden.
To reopen the lock, enter Your user pass code into 96.07 Pass code. This will again unhide parameters 96.100 … 96.102.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">**WARNING**
Do not forget Your user pass code. The factory has no means to reset the control board! A **new** control board must be purchased.</td></tr>
<tr><td>0 … 99999999</td><td>0</td><td>-</td><td>1 = 1</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**96.08**</td><td colspan="7">**Local control**</td></tr>
<tr><td colspan="7">Local control access.
Enables/Disables local control. Start and stop buttons on the control panel and the local controls of the PC tool.
WARNING
Before disabling local control, ensure that the control panel or PC tool is not needed to stop the drive.
0: **Enable**; enable local control.
1: **Disable**; disable local control.</td></tr>
<tr><td>0 … 1</td><td>Enable</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**96.11**</td><td colspan="7">**Macro active**</td></tr>
<tr><td colspan="7">Shows the active macro.
Shows which macro is currently selected. To change the macro, use 96.14 Macro select.
0: **None**; no macro selected.
1: **Default**; default parameter set. See 96.15 Parameter restore = Default.
10: **Factory**; factory parameter set. See 96.14 Macro select.
11: **ABB standard**; macro ABB standard. See 96.14 Macro select.
12: **ABB standard US**; macro ABB standard with US style DC-contactor. See 96.14 Macro select.
13: **Standard 3wire**; macro 3 wire standard. See 96.14 Macro select.
14: **Standard 3wire US**; macro 3 wire with US style DC-contactor. See 96.14 Macro select.
15: **Local I/O or fieldbus**; macro control via fieldbus/control via local I/O. See 96.14 Macro select.
16: **Motor potentiometer**; macro motor potentiometer. See 96.14 Macro select.
17: **Speed or torque**; macro speed control/torque control. See 96.14 Macro select.
20: **Demo unit**; macro for the demo unit. See 96.14 Macro select, **not implemented yet**.</td></tr>
<tr><td>0 … 20</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="2">**96.14**</td><td colspan="7">**Macro select**</td></tr>
<tr><td colspan="7">Selects a macro (pre-defined parameter set).
Selects a macro. The value reverts automatically to Done, when the macro selection is done. The selected macro is shown in 96.11 Macro active.
Notes:
– Only macro depending parameters will be set. The rest of the parameters will not be changed.
– It is possible to change all preset parameters of a loaded macro.
– Selecting the actual macro again restores all macro depending parameters to the macro’s default values.
0: **Done**; normal operation or application macro selection done.
10: **Factory**; factory parameter set. Same as 96.15 Parameter restore = Default.
11: **ABB standard**; macro ABB standard.
12: **ABB standard US**; macro ABB standard with US style DC-contactor.
13: **Standard 3wire**; macro 3 wire standard.
14: **Standard 3wire US**; macro 3 wire with US style DC-contactor.
15: **Local I/O or fieldbus**; macro control via fieldbus/control via local I/O.
16: **Motor potentiometer**; macro motor potentiometer.
17: **Speed or torque**; macro speed control/torque control.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">20: Demo unit; macro for the demo unit, not implemented yet.</td></tr>
<tr><td></td><td>0 … 20</td><td>Done</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td>96.15</td><td colspan="7">Parameter restore</td></tr>
<tr><td></td><td colspan="7">Reset parameter values.
Restores the default settings of the firmware. Depending on the choice only certain parameters or all parameter are restored. The value reverts automatically to Done, when the restore is done.
Note: Restoring may cause a communication break, so reconnecting the drive may be required.
0: Done; normal operation or restore done.
8: Restore; all parameters are restored to default, except:
– Motor 1 and Motor 2 parameters.
– Control panel/PC communication settings.
– I/O extension module settings.
– Fieldbus adapter settings.
– Encoder configuration data.
– Macro depending parameters.
– 99.10 Nominal mains voltage.
– Defaults implemented by 95.20 HW options word 1 and 95.21 HW options word 2.
– User lock parameters 96.100 … 96.102.
62: Clear; all parameters are restored to default, except:
– Control panel/PC communication settings.
– Fieldbus adapter settings.
– Encoder configuration data.
– Macro depending parameters.
– 99.10 Nominal mains voltage.
– Defaults implemented by 95.20 HW options word 1 and 95.21 HW options word 2.
– User lock parameters 96.100 … 96.102.
70: Default; all parameters are restored to default.</td></tr>
<tr><td></td><td>0 … 70</td><td>Done</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Parameter</td></tr>
<tr><td>96.16</td><td colspan="7">Parameter save manually</td></tr>
<tr><td></td><td colspan="7">Save/Load parameters.
Saves valid parameter values to the flash memory. 96.16 Parameter save manually should be used to save e.g. values sent from a fieldbus.
The value reverts automatically to Done, when the parameter save is done.
Notes:
– Use the parameter save function only when needed.
– A new parameter value is saved automatically when changed from the control panel or PC tool but not when altered through a fieldbus adapter connection.
0: Done; normal operation or save completed.
1: Save; command to save parameters or saving parameters in progress.</td></tr>
<tr><td></td><td>0 … 1</td><td>Done</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Parameter</td></tr>
<tr><td>96.19</td><td colspan="7">User set status</td></tr>
<tr><td></td><td colspan="7">User parameter set status display.
Shows the status of the user parameter sets.
0: None; No user parameter sets have been saved.
1: Loading; currently loading a user parameter set.
2: Saving; currently saving a user parameter set.
3: Faulted; invalid or empty user set.
4: User set 1; user set 1 is loaded.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">5: User set 2; user set 2 is loaded.
6: User set 3; user set 3 is loaded.
7: User set 4; user set 4 is loaded.</td></tr>
<tr><td>0 … 7</td><td>-</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">96.22</td><td colspan="7">User set save/load</td></tr>
<tr><td colspan="7">User parameter set handling.
Enables the saving and restoring of up to four user parameter sets. The value reverts automatically to Done, when the loading or saving is done.
Notes:
– Hardware configuration settings such as I/O extension module, fieldbus and encoder configuration parameters (groups 14 … 16, 47, 51 … 56, 58 and 92 … 93) are not included in the user parameter sets.
– Forced input/output values such as 10.03 DI force selection and 10.04 DI force data are not included in the user parameter sets.
– The user parameter set that was in use before powering down the drive is in use after the next power-up. Except User set I/O mode is used. See parameters 96.23 and 96.24.
– Parameter changes made after loading a user parameter set are not automatically stored in it. They must be saved again using 96.22 User set save/load.
– The loaded user parameter set is shown in 96.19 User set status and 06.18.b06 … b09 Drive status word 3.
– The PC tool ‘Backup/restore’ function saves the active parameter set and all 4 user sets.
– The PC tool ‘Save parameters to file’ function only saves the active parameter set. Thus, user set 1 … user set 4 must be saved separately.
0: Done; normal operation, loading or saving is done.
1: User set I/O mode; load user parameter set using 96.23 User set I/O mode in1 and 96.24 User set I/O mode in2.
2: Load set 1; load user set 1.
3: Load set 2; load user set 2.
4: Load set 3; load user set 3.
5: Load set 4; load user set 4.
18: Save to set 1; save parameters to user set 1.
19: Save to set 2; save parameters to user set 2.
20: Save to set 3; save parameters to user set 3.
21: Save to set 4; save parameters to user set 4.</td></tr>
<tr><td>0 … 21</td><td>Done</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="2">96.23</td><td colspan="7">User set I/O mode in1</td></tr>
<tr><td colspan="7">Load user sets using digital I/O.
With 96.22 User set save/load = User set I/O mode it is possible to select user parameter sets via 96.23 User set I/O mode in1 and 96.24 User set I/O mode in2 according to the following table.
<table>
<tr><th>Source defined by 96.23 User set I/O mode in1</th><th>Source defined by 96.24 User set I/O mode in2</th><th>Selected user parameter set</th></tr>
<tr><td>0</td><td>0</td><td>User set 1</td></tr>
<tr><td>1</td><td>0</td><td>User set 2</td></tr>
<tr><td>0</td><td>1</td><td>User set 3</td></tr>
<tr><td>1</td><td>1</td><td>User set 4</td></tr>
</table></td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	0 = Always off. 1 = Always on. **Other [bit]**; source selection. 0: **Not selected**; 0, normal operation. 1: **Selected**; 1. 3: **DI1**; 10.02.b00 DI delayed status. 4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status						
	0 … 19	Not selected	-	1 = 1	n	n	Parameter
96.24	**User set I/O mode in2**						
	Load user sets using digital I/O. See 96.23 User set I/O mode in1.						
	0 … 19	Not selected	-	1 = 1	n	n	Parameter
96.27	**Control board boot**						
	Reboot the control board. Reboots the control board. No cycling the power of the complete drive required. The value reverts automatically to Done, when the reboot is done. 0: **Done**; 0, normal operation or reboot done. 1: **Reboot**; 1, reboot the control board.						
	0 … 1	Done	-	1 = 1	y	n	Parameter
96.28	**FSO reboot**						
	Reboot the FSO-xx safety functions module. Reboots the optional FSO-xx safety functions module. **Note**: The value does not revert to done automatically. 0: **Done**; 0, normal operation or reboot done. 1: **Reboot**; 1, reboot the FSO-xx safety functions module.						
	0 … 1	Done	-	1 = 1	n	n	Parameter
96.31	**Time sync source status**						
	Time source status word. Displays the time source status word. See 96.35 Time sync primary source. Bit assignment:						

Bit	Name	Value	Remarks
0	Time tick received	1	1st priority tick received: Tick has been received from 1st priority source.
1	Aux time tick received	1	2nd priority tick received: Tick has been received from 2nd priority.
2	Tick interval is too long	1	Yes: Tick interval too long, accuracy compromised.
3	DDCS controller	1	Tick received: Tick has been received from an external DDCS-PLC.

Index	Name						
	Text						
	Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type

4	M/F	1	Tick received: Tick has been received through the master-follower link.
5	reserved		
6	D2D	1	Tick received: Tick has been received through the drive-to-drive link.
7	FBA A	1	Tick received: Tick has been received through fieldbus adapter A.
8	FBA B	1	Tick received: Tick has been received through fieldbus adapter B.
9	EFB	1	Tick received: Tick has been received through the embedded fieldbus.
10	reserved		
11	Panel link	1	Tick received: Tick has been received from the control panel, or the PC tool connected to the control panel.
12	Ethernet tool link	1	Tick received: Tick has been received from the PC tool through a FENA module.
13	Parameter setting	1	Tick received: Tick has been set by parameters 96.37 … 96.39.
14	RTC	1	RTC time in use: Time and date have been read from the real-time clock.
15	Drive On-Time	1	Drive on-time in use: Time and date are displaying drive on-time.

	0000h … FFFFh	-	-	1 = 1	y	n	Signal
96.32	**Drive time**						
	Actual drive time. Shows the 24 h drive time in format hh:mm:ss. The drive time is set by parameters 96.35 … 96.39.						
	00:00:00 … 23:59:59	-	-	1 = 1	y	n	Signal
96.35	**Time sync primary source**						
	1st priority time synchronization source. Defines the 1st priority external source for the drive time and date synchronization. 0: **Internal**; no external source selected. 1: **DDCS controller**; external DDCS-PLC. 2: **FBA A or FBA B**; fieldbus adapter A or fieldbus adapter B. 3: **FBA A**; fieldbus adapter A. 4: **FBA B**; fieldbus adapter B. 5: **D2D or M/F**; master drive of a master-follower link or drive-to-drive link. 6: **EFB**; embedded fieldbus. 7: reserved; 8: **Panel link**; control panel, or the PC tool connected to the control panel. 9: **Ethernet tool link**; PC tool through a FENA module. 10: reserved;						
	0 … 9	DDCS controller	-	1 = 1	n	y	Parameter

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">96.36</td><td colspan="7">M/F and D2D clock synchronization</td></tr>
<tr><td colspan="7">Activate the clock synchronization.
Activates the clock synchronization for master-follower link and drive-to-drive communication.
0: Inactive; clock synchronization not active.
1: Active; clock synchronization active.</td></tr>
<tr><td>0 … 1</td><td>Inactive</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">96.37</td><td colspan="7">Full days since 1st Jan 1980</td></tr>
<tr><td colspan="7">Days since beginning of 1980.
Number of full days passed since beginning of the year 1980. Together with 96.38 Time in minutes within 24 h and 96.39 Time in ms within one minute makes it possible to set the date and time in the drive via the parameter interface from a fieldbus or application program. This may be necessary if the fieldbus protocol does not support time synchronization.</td></tr>
<tr><td>1 … 59999</td><td>12055</td><td>days</td><td>1 = 1 day</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">96.38</td><td colspan="7">Time in minutes within 24 h</td></tr>
<tr><td colspan="7">Minutes since midnight.
Number of full minutes passed since midnight. For example, the value 860 corresponds to 14:20.
See 96.37 Full days since 1st Jan 1980.</td></tr>
<tr><td>0 … 1439</td><td>0</td><td>min</td><td>1 = 1 min</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">96.39</td><td colspan="7">Time in ms within one minute</td></tr>
<tr><td colspan="7">Number of milliseconds since the last minute.
Number of milliseconds passed since the last minute.
See 96.37 Full days since 1st Jan 1980.</td></tr>
<tr><td>0 … 59999</td><td>0</td><td>ms</td><td>1 = 1 ms</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">96.51</td><td colspan="7">Clear fault and event logger</td></tr>
<tr><td colspan="7">Clears the fault and event logger in the Drive composer by setting to a value greater than 0.
96.51 Clear fault and event logger is automatically reset to 0 after the cleaning has been finished.</td></tr>
<tr><td>0 … 65535</td><td>0</td><td>-</td><td>1 = 1</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">96.61</td><td colspan="7">User data logger status word</td></tr>
<tr><td colspan="7">User data logger status word.
Provides status information about the user data logger. See also chapter User data logger.
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">Running</td><td>1</td><td>Running.</td></tr>
<tr><td>0</td><td>The post-trigger time is passed.</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Triggered</td><td>1</td><td>Triggered.</td></tr>
<tr><td>0</td><td>Restarted.</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Data available</td><td>1</td><td>Contains data that can be read.</td></tr>
<tr><td>0</td><td>Contains no data.</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Configured</td><td>1</td><td>Configured.</td></tr>
<tr><td></td><td>Not configured.</td></tr>
<tr><td>4 … 15</td><td>reserved</td><td></td><td></td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>96.63</td><td colspan="7">User data logger trigger</td></tr>
<tr><td></td><td colspan="7">Trigger source for the user data logger.
Triggers or selects a source that triggers the user data logger.
0: No trigger command; 0, normal operation.
1: Trigger; 1.</td></tr>
<tr><td></td><td>0 … 1</td><td>No trigger command</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>96.64</td><td colspan="7">User data logger start</td></tr>
<tr><td></td><td colspan="7">Start source for the user data logger.
Starts or selects a source that starts the user data logger.
0: No start command; 0, normal operation.
1: Start; 1.</td></tr>
<tr><td></td><td>0 … 1</td><td>No start command</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>96.65</td><td colspan="7">Factory data logger time level</td></tr>
<tr><td></td><td colspan="7">Factory data logger sample time.
Selects the sampling interval for the factory data logger. The values that are recorded in the factory data logger are:
– 06.09 Used main control word.
– 06.15 Main Status Word.
– 06.25 Current controller status word 2.
– 99.01 Mains voltage.
– 24.01 Used speed reference.
– 90.01 Motor speed for control.
– 27.02 Used current reference.
– 27.05 Motor current.
– 27.18 Firing angle.
– 28.15 M1 field current.
This selection of parameters cannot be changed by the user.
500: 500 µs; 500 microseconds.
2000: 2 ms; 2 milliseconds.
10000: 10 ms; 10 milliseconds.</td></tr>
<tr><td></td><td>500 … 10000</td><td>500 µs</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>96.70</td><td colspan="7">Disable adaptive program</td></tr>
<tr><td></td><td colspan="7">Enable/Disable an adaptive program.
Enables/Disables an adaptive program, if present.
0: Enable adaptive program; 0, normal operation.
1: Disable adaptive program; 1.</td></tr>
<tr><td></td><td>0 … 1</td><td>Enable adaptive program</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td>96.71</td><td colspan="7">Disable application program</td></tr>
<tr><td></td><td colspan="7">Enable/Disable an application program.
Enables/Disables an application program, if present.
0: Enable application program; 0, normal operation.
1: Disable application program; 1.</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	0 … 1	Enable application program	-	1 = 1	n	n	Parameter
96.100	**Change user pass code**						
	New user pass code. Only visible when the user lock is open. To change the current user pass code, enter a new one here and confirm using 96.101 Confirm user pass code. Warning A6B1 User pass code not confirmed is active until the new pass code is confirmed. To cancel changing the pass code, close the user lock without confirming. To close the user lock, enter an invalid user pass code into 96.07 Pass code then activate 96.27 Control board boot or cycle the power. See 96.07 Pass code.						
	10000000 … 99999999	10000000	-	1 = 1	y	y	Parameter
96.101	**Confirm user pass code**						
	Confirms the new user pass code. Only visible when the user lock is open. Confirms the new user pass code entered in 96.100 Change user pass code. See 96.07 Pass code.						
	10000000 … 99999999	10000000	-	1 = 1	y	y	Parameter
96.102	**User lock functionality**						
	Selects the actions to be prevented by the user lock. Only visible when the user lock is open. Selects the actions or functionalities to be prevented by the user lock. **Note:** Changes made, take effect after the user lock is closed. See 96.07 Pass code. Bit assignment:						

Bit	Name	Value	Remarks
0	Disable ABB access levels	1	Disable ABB access levels like service, advanced programmer, etc. See 96.04 Access levels active.
1	Freeze parameter lock state	1	Prevent changing the parameter lock state. See 96.07 Pass code = 358.
2	Disable file download	1	Prevent loading of files to drive. This applies to: – Firmware upgrades. – Safety functions module FSO-xx configuration. – Parameter restore. See 96.15 Parameter restore. – Loading of adaptive or application programs. – Changing the home view of the control panel. – Editing drive texts. – Editing the favorite parameters list on the control panel. – Configuration settings made via the control panel such as time/date formats and enabling/disabling the clock display.
3	reserved		
4	reserved		
5	reserved		

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**

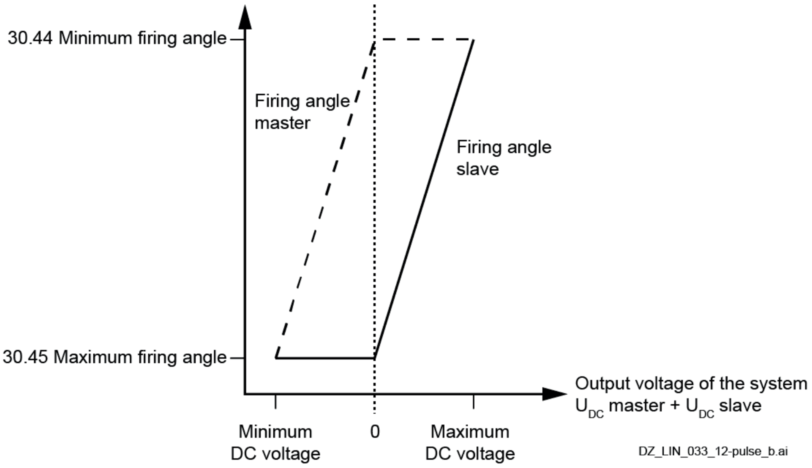
6	reserved		
7	reserved		
8	reserved		
9	reserved		
10	reserved		
11	Disable OEM access level 1	1	Disable OEM access level 1.
12	Disable OEM access level 2	1	Disable OEM access level 2.
13	Disable OEM access level 3	1	Disable OEM access level 3.
14 … 15	reserved		

Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	n	y	Parameter

99 Motor data

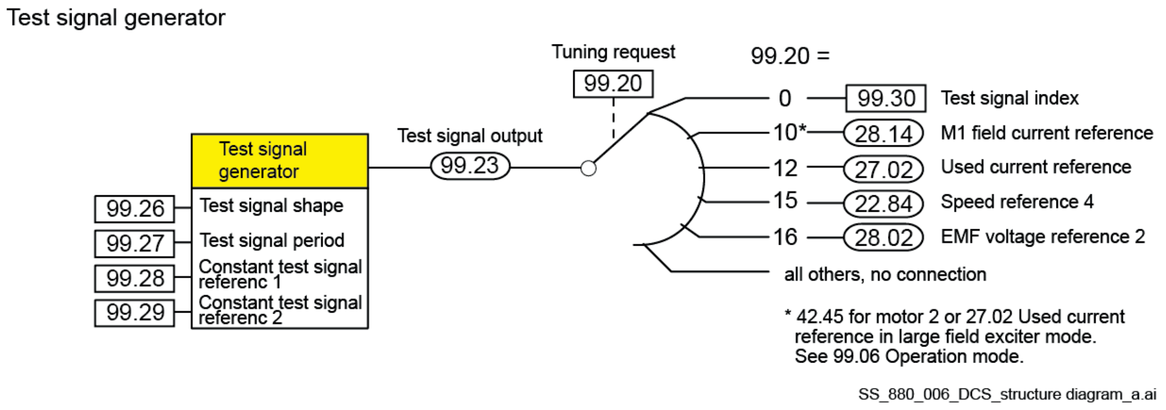
Motor configuration settings.

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
99.01	**Mains voltage**						
	Mains voltage. Measured mains voltage in percent of 99.10 Nominal mains voltage.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
99.02	**M1 nominal torque**						
	Motor 1, calculated nominal torque. Motor 1 nominal torque is calculated the following way: $99.02\ M1\ nominal\ torque = \frac{60}{2\pi} \times \frac{[99.12\ M1\ nominal\ voltage - 99.11\ M1\ nominal\ current \times 27.32\ M1\ armature\ resistance] \times 99.11\ M1\ nominal\ current}{99.14\ M1\ nominal\ (base)\ speed}$ The unit is selected by 96.02 Unit selection.						
	0 … 200000000	-	Nm or Lb ft	1 = 1 Nm or Lb ft	y	n	Signal
99.03	**M1 nominal power**						
	Motor 1, calculated nominal power (electrical). Motor 1 nominal power (electrical) is calculated the following way: $99.03\ M1\ nominal\ power = \frac{99.12\ M1\ nominal\ voltage \times 99.11\ M1\ nominal\ current}{1000}$ The unit is selected by 96.02 Unit selection.						
	0.00 … 32500.00	-	kW or hp	1 = 1 kW or hp	y	n	Signal
99.06	**Operation mode**						
	Operation mode of the drive.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Specifies the operating mode of the drive.
0: **Armature converter**; the drive is used as a 6-pulse single armature converter.
1: **Large field exciter**; the drive is used as a large field exciter.
Attention: The digital input for the external overvoltage protection is assigned by means of 20.47 Overvoltage protection trigger source.
2: **12-pulse parallel master**; the drive is used as 12-pulse parallel master. Connected to a 3-winding transformer having 30° phase shift between secondary windings.
3: **12-pulse parallel slave**; the drive is used as 12-pulse parallel slave. Connected to a 3-winding transformer having 30° phase shift between secondary windings.
4: **12-pulse serial master**; the drive is used as 12-pulse serial master. Connected to a 3-winding transformer having 30° phase shift between secondary windings.
5: **12-pulse serial slave**; the drive is used as 12-pulse serial slave. Connected to a 3-winding transformer having 30° phase shift between secondary windings.
6: **6-pulse serial master**; the drive is used as 6-pulse serial master. Connected to a 3-winding transformer having no (0°) phase shift between secondary windings.
7: **6-pulse serial slave**; the drive is used as 6-pulse serial slave. Connected to a 3-winding transformer having no (0°) phase shift between secondary windings.
8: **Serial sequential master 30°**; the drive is used as a serial sequential master. Connected to a 3-winding transformer having a 30° phase shift between secondary windings.
9: **Serial sequential slave 30°**; the drive is used as a serial sequential slave. Connected to a 3-winding transformer having a 30° phase shift between secondary windings.
10: **Serial sequential master 0°**; the drive is used as a serial sequential master. Connected to a 3-winding transformer having no (0°) phase shift between secondary windings.
11: **Serial sequential slave 0°**; the drive is used as a serial sequential slave. Connected to a 3-winding transformer having no (0°) phase shift secondary windings.
12: **Firing angle follower degree**; reserved.
13: **Firing angle follower scaled**; reserved.
Note: Sequential control of the firing angles. Only one of the two drives changes the firing angle. The other drive keeps the firing angle fixed at minimum- or maximum firing angle limit.
 </td></tr>
<tr><td>0 … 13</td><td>Armature converter</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="2">**99.07**</td><td colspan="7">**M1 used field exciter type**</td></tr>
<tr><td colspan="7">Motor 1 field exciter type.
99.07 M1 used field exciter type ≠ None, activates motor 1 field exciter. Now it reacts to an On command and generates field current.</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	Note: To activate both field exciters (motor 1 and motor 2) set also 42.49 M2 used field exciter type ≠ None. 0: **None**; no or third-party field exciter connected. 1: **OnBoard**; integrated 1-Q field exciter (for sizes H1 … H4 only). 2: **DCF803-0016**; external 1-Q 16 A field exciter used for field currents from 0.3 A ... 16 A. 3: **FEX-425-Int**; internal 1-Q 25 A field exciter (for size H5 and H6 only) used for field currents from 0.3 A ... 25 A. 4: **DCF803-0035**; external 1-Q 35 A field exciter used for field currents from 0.3 A ... 35 A. 5: **DCF803 terminal 5 A**; external 1-Q 16 A field exciter (DCF803-0016), internal 1-Q 25 A field exciter (FEX-425-Int) or external 1-Q 35 A field exciter (DCF803-0035) used for field currents from 0.3 A ... 5 A. **Note:** Use 5 A terminals. 6: **DCF803-0050**; external 1-Q 50 A field exciter. 7: **DCF804-0050**; external 4-Q 50 A field exciter. 8: **DCF803-0060**; external 1-Q 60 A field exciter. 9: **DCF804-0060**; external 4-Q 60 A field exciter. 10: **DCS880-S01**; external 2-Q standard DCS880 module. 11: **DCS880-S02**; external 4-Q standard DCS880 module. 16: **External field exciter via AI1**; third party field exciter, acknowledge via AI1. 17: **External field exciter via AI2**; third party field exciter, acknowledge via AI2. 18: **External field exciter via AI3**; third party field exciter, acknowledge via AI3. 19: **Multiple field exciters**; reserved. 20: **Series wound motor**; reserved.						
	0 … 19	OnBoard	-	1 = 1	n	n	Parameter
99.10	**Nominal mains voltage**						
	Nominal mains voltage. Nominal mains voltage (AC) of the supply. The default and maximum values are preset automatically according to 95.25 Set: Type coder and 95.28 Set: Drive AC voltage scaling. The absolute maximum is 1200.0 V_{AC}.						
	0.0 … 95.25/95.28	0.0	V	10 = 1 V	n	y	Parameter
99.11	**M1 nominal current**						
	Motor 1 nominal current. Motor 1 nominal armature current (DC) from the motor rating plate. **Notes:** – For 12-pulse parallel mode, see DCS880 12-pulse manual (3ADW000533). – In case the converter is used as a large field exciter set the value to the nominal field current from the motor rating plate. See 99.06 Operation mode. – The allowable range for the motor nominal current is 10 % … 230 % of the nominal drive current. See 07.62 Drive DC current scaling set.						
	0 … 32500	0	A	1 = 1 A	n	y	Parameter
99.12	**M1 nominal voltage**						
	Motor 1 nominal voltage. Motor 1 nominal armature voltage (DC) from the motor rating plate. **Notes:** – For 12-pulse serial mode or serial sequential mode, see DCS880 12-pulse manual (3ADW000533). – In case the converter is used as a large field exciter set the value to the nominal field voltage from the motor rating plate. See 99.06 Operation mode.						
	0.0 … 3250.0	350.0	V	10 = 1 V	n	y	Parameter

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">**99.13**</td><td colspan="7">**M1 nominal field current**</td></tr>
<tr><td colspan="7">Motor 1 nominal field current.
Motor 1 nominal field current from the motor rating plate.
Note: In case the converter is used as a large field exciter use 99.11 M1 nominal current to set the nominal field current.</td></tr>
<tr><td>0.3 … 3250.0</td><td>0.3</td><td>A</td><td>10 = 1 A</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**99.14**</td><td colspan="7">**M1 nominal (base) speed**</td></tr>
<tr><td colspan="7">Motor 1 nominal (base) speed.
Motor 1 nominal (base) speed from the motor rating plate, usually the field weak point. The unit is selected by 96.03 Unit for speed control.</td></tr>
<tr><td>0.00 … 30000.00</td><td>1500.00</td><td>rpm, % or V</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**99.17**</td><td colspan="7">**Last tuning performed**</td></tr>
<tr><td colspan="7">Last performed tuning.
Shows the type of tuning that was performed last. See 99.20 Tuning request.</td></tr>
<tr><td>0 … 16</td><td>-</td><td></td><td></td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="2">**99.20**</td><td colspan="7">**Tuning request**</td></tr>
<tr><td colspan="7">Drive tuning request.
The tuning request contains all auto- and manual tuning procedures.
Tuning request is automatically reset to Normal mode after an autotuning procedure is finished or failed. In case errors occur during the selected tuning, warning AF90 Autotuning is generated. The reason of the warning can be seen in the AUX codes.
When choosing manual tuning 99.20 Tuning request must be set back to Normal mode by the user.
Notes:
– The reference chain is blocked while 99.20 Tuning request ≠ Normal mode.
– Depending on 06.18.b04/b05 Drive status word 3 the field current of motor 1 or motor 2 is tuned.
– A standard DCS880 converter used as a large field exciter cannot be tuned by means of the armature converter it is connected to. Tune the field current controller by setting 99.20 Tuning request = Field current autotuning in the large field exciter itself.
0: **Normal mode**; normal operating mode depending on 99.06 Operation mode.
1: **Field current autotuning**; autotuning the field current controller.
Attention: The field autotuning is realized through increasing the field voltage (≡ decreasing the firing angel) and not via field current reference. Please note that the limits in group 30 will not be taken in consideration during the autotuning. The maximum field current during tuning can be reduced by adapting 99.13 M1 nominal field current if required.
2: **Armature current autotuning**; autotuning the armature current controller.
3: **Speed feedback assistant**; test the speed feedback. See 90.41 M1 feedback selection, 94.08 M1 tacho voltage at 1000 rpm, 94.23 OnBoard encoder pulses/revolution, 94.24 OnBoard pulse encoder type and 94.25 OnBoard encoder speed calculation mode.
Attention: In case ODVA is used, internal fieldbus adapter parameters need to be validated after a speed feedback autotuning. When using 99.20 Tuning request = Speed feedback assistant, validate the internal fieldbus adapter parameters by setting either 51.27 FBA A par refresh = Refresh or 54.27 FBA B par refresh = Refresh.
4: **Speed controller autotuning**; autotuning the speed controller.
5: **EMF controller autotuning**; autotuning the EMF controller.
6: **Flux linearization autotuning**; autotuning the flux linearization.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">10: Field current manual tuning; manual tuning of the field current controller.
11: Field reversal assistant; assistant to test the field reversal.
12: Armature current manual tuning; manual tuning of the Armature current controller.
13: Find discontinuous current limit; find the discontinuous current limit.
14: Tacho fine-tuning; tacho fine-tuning. See 94.11 M1 tacho fine-tuning adjust and 94.12 M1 tacho fine-tuning factor.
15: Speed controller manual tuning; manual tuning the speed controller.
16: EMF controller manual tuning; manual tuning the EMF controller.</td></tr>
<tr><td>0 … 16</td><td>Normal mode</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3">99.23</td><td colspan="7">Test signal output</td></tr>
<tr><td colspan="7">Test signal generator, output.
Output signal of the test signal generator.
Note: The range, the unit and the scaling for the fieldbus communication depends on the chosen sink. See 99.20 Tuning request and 99.30 Test signal index.

</td></tr>
<tr><td>99.20/99.30</td><td>0.000</td><td>99.20/ 99.30</td><td>99.20/ 99.30</td><td>y</td><td>y</td><td>Signal</td></tr>
<tr><td rowspan="3">99.26</td><td colspan="7">Test signal shape</td></tr>
<tr><td colspan="7">Test signal generator, shape.
Signal forms for the test signal generator and the manual tuning functions. See 99.20 Tuning request.
Note: After a power-up, the value is set back to Zero and thus disables the test signal generator.
0: Zero; not in use.
1: Square wave; a square wave is used.
2: Triangle; a triangle wave is used.
3: Sine wave; a sine wave is used.
4: Constant test signal 1; a constant value set with 99.28 Constant test signal reference 1 is used.
5: Constant test signal 2; a constant value set with 99.29 Constant test signal reference 2 is used.</td></tr>
<tr><td>0 … 5</td><td>Zero</td><td>-</td><td>1 = 1</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">99.27</td><td colspan="7">Test signal period</td></tr>
<tr><td colspan="7">Test signal generator, time period.
The time period for the test signal generator and the manual tuning functions. See 99.20 Tuning request.
Note: After a power-up, the value is set back to 0.00.</td></tr>
</table>

Index	**Name** **Text** **Range**	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	0.00 … 655.36	0.00	s	10 = 1 s	y	y	Parameter
99.28	**Constant test signal reference 1**						
	Test signal generator, test signal reference 1. Constant test reference 1 for the test signal generator and the manual tuning functions. See 99.20 Tuning request. **Notes:** – The range, the unit and the scaling for the fieldbus communication depends on the chosen sink. See 99.20 Tuning request and 99.30 Test signal index. – After a power-up, the value is set back to 0. **Examples:** – 100.00 % voltage ≡ 10,000. – 100.00 % current ≡ 10,000. – 100.00 % power ≡ 10,000. – 100.00 % torque ≡ see 46.04 M1 torque scaling actual ≡ 10,000. – 100.00 % speed ≡ 46.02 M1 speed scaling actual ≡ 20,000.						
	99.20/99.30	0	99.20/ 99.30	99.20/ 99.30	y	y	Parameter
99.29	**Constant test signal reference 2**						
	Test signal generator, test signal reference 2. Constant test reference 2 for the test signal generator and the manual tuning functions. See 99.28 Constant test signal reference 1.						
	99.20/99.30	0	99.20/ 99.30	99.20/ 99.30	y	y	Parameter
99.30	**Test signal index**						
	Test signal generator, test signal index. Index pointer to the sink (signal/parameter) for the test signal generator. E.g. a setting of 2207 equals 22.07 Speed reference. **Notes:** – 99.30 Test signal index must not be used for the manual tuning functions of 99.20 Tuning request. – After a power-up, the value is set back to 0.						
	0 … 9999	9999	-	1 = 1	y	y	Parameter

200 Safety

Safety related status and control words.

Index	**Name** **Text** **Range**	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
200.01 to 200.10	This group contains parameters related to an optional safety functions module (FSPS-21/FSO-21). See: – FSPS-21 PROFIsafe safety functions module (AXD50000158638). – FSO-21 safety functions module (3AXD50000015614).						
200.05	**FSO control word 1**						
	FSO control word. Displays the FSO control word of the drive. This signal shows the control signals as received from the safety PLC. It is also used for the FSPS-21 module. **Attention:** Do not write on this signal.						

Index	Name Text Range	Default	Unit	Scale/ FbEq16	Volatile	Change running	Type
	Bit assignment:						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal

Bit assignment:

Bit	Name	Value	Remarks
0	STO Request	1	STO inactive. Normal operation.
		0	STO active. The FSPS-21 module uses terminal XSTO on the SDCS-CON-H01 to activate the STO. See also 31.98.b10 STO actual status. See also drawing Profile conversion using a FSPS-21 fieldbus adapter.
1	Not used by DCS880		
2	SS1 Request	1	SS1 inactive. Normal operation.
		0	SS1 active. Activates command Off3 (emergency stop), see 06.09.b02 Used main control word. The drive always uses the emergency ramp stop. Details see 21.03 Emergency stop mode. The deceleration time is set in 23.23 Emergency stop time and relates to 46.02 M1 speed scaling actual. The SS1 safety time set in the safety PLC needs to be set slightly higher than 23.23 Emergency stop time. If 01.73 24.02 Used speed feedback fast is < than 21.06 Used zero speed level follows: After 21.07 Used zero speed delay is elapsed STO is activated. If the drive does not ramp down within the SS1 safety time for any reason, STO is activated by the FSPS-21 module using terminal XSTO on the SDCS-CON-H01. See also drawing Profile conversion using a FSPS-21 fieldbus adapter.
3 … 15	Not used by DCS880		

Fault tracing

What this chapter contains

This chapter lists all warning/fault messages including possible causes and corrective actions. By means of this chapter, the causes of all warnings/faults can be identified and corrected. If not, an ABB service representative should be contacted.

Warnings/faults are listed below in separate tables. Each table is sorted by warning and fault code.

Safety

WARNING

Only qualified electricians are allowed to service the drive. Read the Safety instructions on the first pages of the DCS880 Hardware manual (3ADW000462) before working on the drive.

Indications

Warnings and faults

Warnings/faults indicate an abnormal drive status. The codes and names of active warnings/faults are displayed on the control panel of the drive as well as in the PC tool. Via fieldbus only the codes of the warnings/faults are available.

Warnings do not need to be reset. They stop showing when the cause of the warning ceases. Warnings do not latch, and the drive will continue to operate the motor.

Faults do latch inside the drive. They cause the drive to trip and the motor stops. After the cause of a fault has been removed, the fault can be reset from a selectable source. See 20.13 Fault reset selection. This can be the control panel, the PC tool, a digital input of the drive or the fieldbus. After the fault is reset, the drive can be restarted.

Note: Some faults require a reboot of the control board, either by cycling the power or via 96.27 Control board boot. This is mentioned in the fault listing wherever appropriate.

The warning/fault indications can be directed to a relay output or a digital input/output by selecting Warning, Tripped or Tripped (-1) in the source selection parameter. See groups:

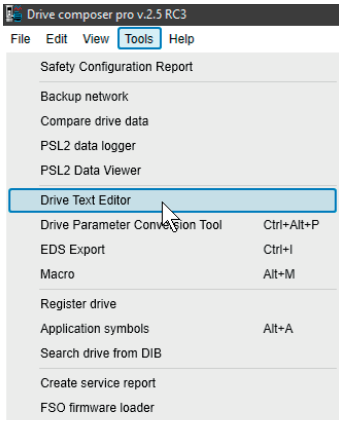
- 10 Standard DI, RO.
- 11 Standard DIO, FI, FO.
- 14 … 16 I/O extension module 1 … 3.

Events

In addition to warnings and faults, there are notices that are only recorded in the event logs of the drive. The codes of these notices are included in the Warning messages table.

Editable messages

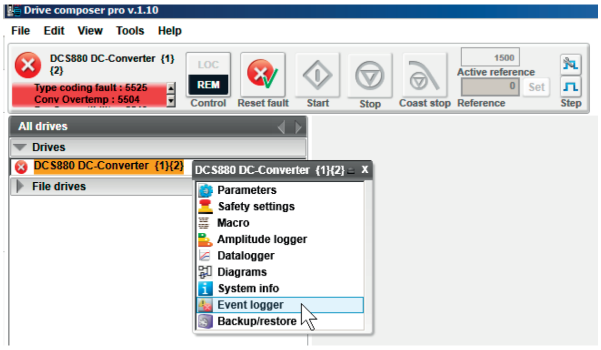
For some warnings/faults, the message text can be edited, and instructions and contact information added. To edit these messages, choose **Menu - Settings - Edit texts** on the control panel or use the Drive Text Editor in the Drive composer pro.



Warning/fault history and analysis

Event logs

The drive has several event logs, to access, choose **Menu - Event log** on the control panel. The event logs can also be accessed and reset using the PC tool.



Type coding fault : 5525
Conv Overtemp : 5504

The event logs contain faults, warnings and notices, as well as cleared entries. Each event log contains 32 most recent events. All indications in the event logs are stored including a time stamp and other information.

AUX codes

Some events generate AUX codes helping to pinpoint the problem.

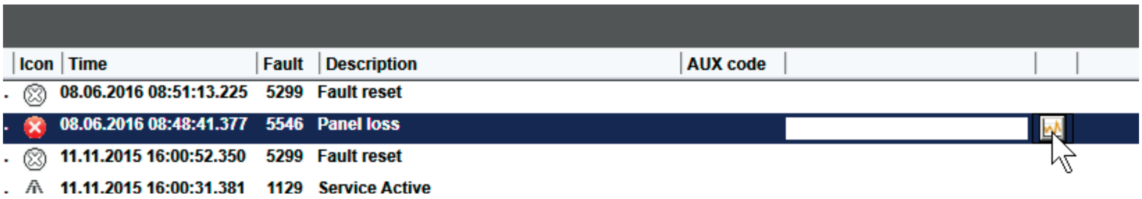
The AUX codes are displayed on the control panel together with a corresponding message. It is also stored in the event logs details. In the PC tool, AUX codes can be found in the event listing.

Drive	Icon	Time	Fault	Description	AUX code
DCS880 DC-Converter...	⊗	08.06.2016 08:51:41.484	5549	Par Compatibility	00009907
DCS880 DC-Converter...	⊗	08.06.2016 08:51:41.468	5504	Conv Overtemp	
DCS880 DC-Converter...	⊗	08.06.2016 08:51:41.400	5525	Type coding fault	00000001

Factory data logger

The drive has a factory data logger that samples preselected drive values. The default sampling time is 500 µs. See 96.65 Factory data logger time level for additional sampling times.

Approximately 7000 samples are recorded immediately before and after a fault. They are saved to the memory unit of the drive. The fault data of the last five faults are only accessible in the event log of the Drive composer pro PC tool.



Icon	Time	Fault	Description	AUX code
⊗	08.06.2016 08:51:13.225	5299	Fault reset	
⊗	08.06.2016 08:48:41.377	5546	Panel loss	
⊗	11.11.2015 16:00:52.350	5299	Fault reset	
⚠	11.11.2015 16:00:31.381	1129	Service Active	

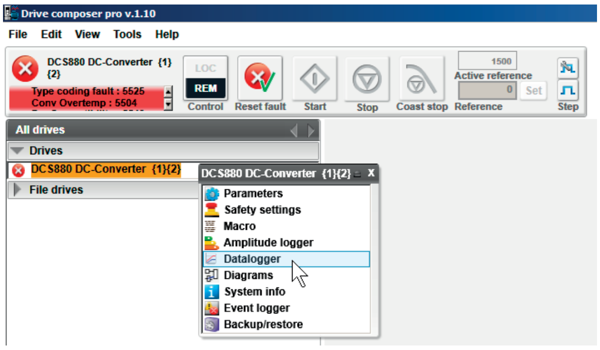
The values that are recorded in the factory data logger are:

- 06.09 Used main control word.
- 06.15 Main Status Word.
- 06.25 Current controller status word 2.
- 99.01 Mains voltage.
- 24.01 Used speed reference.
- 90.01 Motor speed for control.
- 27.02 Used current reference.
- 27.05 Motor current.
- 27.18 Firing angle.
- 28.15 M1 field current.

This selection of parameters cannot be changed by the user.

User data logger

The settings and values of the custom user data logger are saved in the drive. It can be configured using the Drive composer pro PC tool.



Type coding fault : 5525
Conv Overtemp : 5504

This functionality enables the free selection of up to eight drive parameters to be sampled at selectable intervals. The triggering conditions and the length of the monitoring period can also be defined by the user within the limit of approximately 8000 samples.

In addition to the PC tool, the status of the logger is shown in 96.61 User data logger status word. The triggering sources can be selected by 96.63 User data logger trigger and 96.64 User data logger start.

The configuration, status and collected data is saved on the memory unit for later analysis.

Parameters that contain warning/fault information

The drive stores a list of active faults and the one causing the trip in signals 04.01 … 04.05. Active warnings are shown in signals 04.06 … 04.10. The group 04 also displays a list of faults and warnings that have previously occurred.

Event word (parameters 04.40 … 04.72)

04.40 Event word 1 can be configured by the user to indicate the status of 16 selectable events, e.g. faults, warnings or notices. It is possible to specify an AUX code for each event.

QR Code generation for mobile service application

A QR Code or a series of QR Codes can be generated by the drive for display on the control panel. The QR Code contains drive identification data, information on the latest events, status information and counter parameters. The code can be read with a mobile device containing the ABB service application, which then sends the data to ABB for analysis. For more information on the application, contact your local ABB service representative.

The QR Code can be generated by choosing **Menu - Assistants - QRCode** on the control panel.

Converter protection

Auto-reclosing (ride through a mains undervoltage)

WARNING

If auto-reclosing is enabled the motor automatically picks up speed again. Design the machine or equipment so, that human safety is ensured after auto-reclosing otherwise an accident could occur.

Auto-reclosing allows continuing drive operation immediately after a short mains undervoltage without any additional functions in the overriding control system.

To keep the overriding control system and the drive control electronics running through short mains undervoltage, an UPS is needed for the 115/230 V_{AC} auxiliary voltages. Without the UPS all DI like e.g. E-stop, start inhibition, acknowledge signals etc. would have false states and trip the drive although the system itself could stay alive. Also, the control circuits of the mains contactor must be supplied during the mains undervoltage.

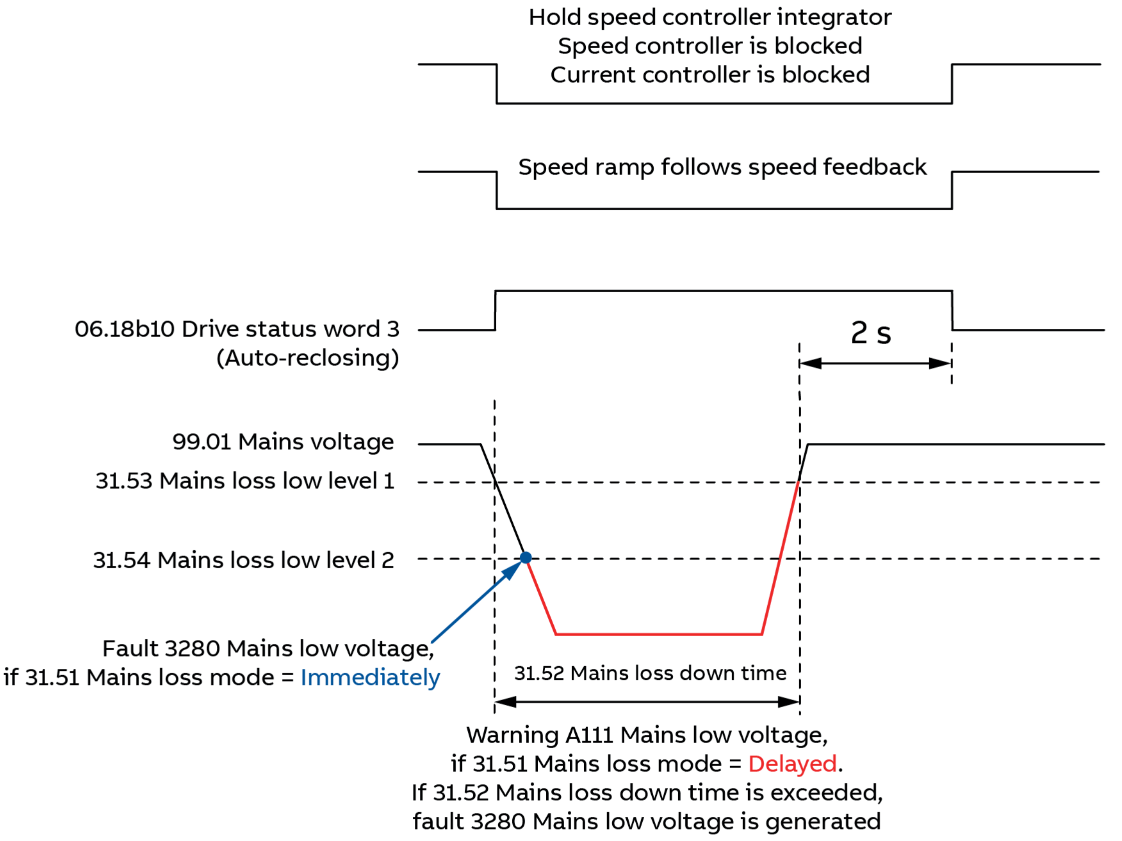
Mains loss mode

31.51 Mains loss mode = Immediately:

- The event generates warning A111 Mains low voltage, if 31.53 Mains loss low level 1 is undershoot. The warning is removed when the mains voltage recovers before 31.52 Mains loss down time elapses.
- The event generates fault 3280 Mains low voltage, if 31.53 Mains loss low level 1 is undershoot for longer than 31.52 Mains loss down time.
- The event immediately generates fault 3280 Mains low voltage, if 31.54 Mains loss low level 2 is undershoot.

31.51 Mains loss mode = Delayed:

- The event generates warning A111 Mains low voltage, if 31.53 Mains loss low level 1 and/or 31.54 Mains loss low level 2 is undershoot. The warning is removed when the mains voltage recovers before 31.52 Mains loss down time elapses.
- The event generates fault 3280 Mains low voltage, if 31.53 Mains loss low level 1 and/or 31.54 Mains loss low level 2 is undershoot for longer than 31.52 Mains loss down time.
- Thus, undershooting 31.54 Mains loss low level 2 generates no immediate fault.



DZ_LIN_012_autom-einschalt_c.ai

Note: If no UPS is available, set 31.51 Mains loss mode = Immediately. Thus, the drive will trip with fault 3280 Mains low voltage avoiding secondary phenomena due to missing power for AI’s and DI’s.

Short mains undervoltage

The supervision of mains undervoltage has two levels:

31.53 Mains loss low level 1 for warning, protection and trip level and 31.54 Mains loss low level 2 as trip level.

If the mains voltage undershoots 31.53 Mains loss low level 1 following actions take place:

- The firing angle is set to 30.45 Maximum firing angle.
- Single firing pulses are applied to extinguish the DC current as fast as possible.
- The controllers are frozen.
- The speed ramp output is updated from the speed feedback.
- Warning A111 Mains low voltage is generated. The warning is removed when the mains voltage recovers before 31.52 Mains loss down time elapses. The drive will start again after 2 seconds, if On and Start commands are maintained.
- Fault 3280 Mains low voltage is generated, if 31.53 Mains loss low level 1 is undershoot for longer than 31.52 Mains loss down time.

If the mains voltage undershoots 31.54 Mains loss low level 2 following actions take place:

- If 31.51 Mains loss mode = Immediately:
  - Fault 3280 Mains low voltage is generated immediately.
- If 31.51 Mains loss mode = Delayed:
  - The field acknowledge signals are ignored.
  - The firing angle is set to 30.45 Maximum firing angle.
  - Single firing pulses are applied to extinguish the DC current as fast as possible.
  - The controllers are frozen.
  - The speed ramp output is from the speed feedback.

  - Warning A111 Mains low voltage is generated. The warning is removed when the mains voltage recovers before 31.52 Mains loss down time elapses. The drive will start again after 2 seconds, if On and Start commands are maintained.
  - Fault 3280 Mains low voltage is generated, if 31.53 Mains loss low level 2 is undershoot for longer than 31.52 Mains loss down time.
  - Thus, undershooting 31.54 Mains loss low level 2 generates **no** immediate fault.

Notes:

- In case an On command is given and the measured mains voltage is too low for longer than 500 ms A111 Mains low voltage is generated. If the problem persists for longer than 10 s 3280 Mains low voltage is generated.
- 31.54 Mains loss low level 2 is not monitored, unless the mains voltage drops below 31.53 Mains loss low level 1 first. Thus, for a proper function of the mains undervoltage monitoring 31.53 Mains loss low level 1 must be higher than 31.54 Mains loss low level 2.

Converter overtemperature

The maximum temperature of the bridge can be read from 07.65 Drive max bridge temperature set and is automatically set by 95.25 Set: Type code or manually set by 95.29 Set: Drive max bridge temperature.
Note: When setting the air entry temperature for H7 and H8 modules manually use 95.29 Set: Drive max bridge temperature = 50°C as absolute maximum.
Exceeding the level in 07.65 Drive max bridge temperature set generates fault 4310 Bridge temperature measured. The threshold for warning A4B0 Bridge temperature measured is 5°C below the tripping level. The measured temperatures can be read from 05.11 Ch1 bridge temperature, 05.12 Ch2 bridge temperature, 05.13 Ch3 bridge temperature and 05.14 Ch4 bridge temperature.

Fan, field and mains contactor acknowledge

When an On command is given, the firmware closes the fan contactors and waits for the acknowledge. After it is received, the field contactor is closed, and the field converter is started. Now the firmware waits for the field acknowledge. Finally, the mains contactor is closed and its acknowledge is waited for. If the acknowledges are not received during 10 seconds after the On command is given, the corresponding faults are generated. These are:

- 5080 Drive fan acknowledge, see 20.38 Drive fan acknowledge source.
- 71B1 Motor fan acknowledge, see 20.39 Motor fan acknowledge source.
- F521 Field acknowledge, see 06.26 M1 field exciter status word.
- F524 Mains contactor acknowledge, see 20.34 Mains contactor acknowledge source.

Note: F521 Field acknowledge missing is the sum fault for all field related faults like:

- F515 M1 field exciter overcurrent, see 31.59 M1 field overcurrent level.
- F516 M1 field exciter communication, see 70.12 Field exciter timeout.
- F529 M1 field exciter not OK, fault during self-diagnosis.
- F537 M1 field exciter ready lost, AC voltage is missing or not in synchronism.
- F541 M1 field exciter low current, see 31.58 M1 field current low level.

Safe torque off

The drive monitors the status of the Safe Torque Off (STO) input, and 31.22 STO indication run/stop selects which indications are given when the signals are lost. The parameter does not affect the operation of the Safe Torque Off function itself. For more information on Safe Torque Off, see Supplement for functional safety.

Communication loss

The reaction to a communication loss and the time out can be set by means of the parameters listed in the below table. Additionally, all fault- and warning messages are shown as well.

Device	Loss control	Time out	Related fault	Related warning
Control panel Drive composer	49.05 Communication loss action	49.04 Communication loss time	7081 Control panel/PC tool link communication	A7EE Control panel/PC tool link communication

FBA A	50.02 FBA A comm loss func	50.03 FBA A comm loss timeout	7510 FBA A communication	A7C1 FBA A communication
FBA B	50.32 FBA B comm loss func	50.33 FBA B comm loss timeout	7520 FBA B communication	A7C2 FBA B communication
EFB	58.14 Communication loss action	58.16 Communication loss time	6681 EFB communication	A7CE EFB communication
Master-follower link	60.09 M/F comm loss function	60.08 M/F comm loss timeout	7582 Master-follower link communication	A7CB Master-follower link communication
DDCS controller	60.59 DDCS controller comm loss function	60.58 DDCS controller comm loss time	7581 DDCS controller comm loss	A7CA DDCS controller comm loss
DCSLink SDCS-DSL-H1x	70.07 DCSLink comm loss function	-	F544 P2P and M/F communication	A112 P2P and M/F communication
DCSLink 12-pulse	-	70.08 12-pulse timeout	F535 12-pulse communication	-
DCSLink Field exciter	-	70.12 Field exciter timeout	F516 M1 field exciter communication F519 M2 field exciter communication	-

External events

Five different events from the process can be connected to selectable inputs to generate faults and warnings. See parameters 31.01 … 31.10. When the signal is low, an external event (fault and/or warning) is generated. See A981 External warning 1 … A985 External warning 5 and 9081 External fault 1 … 9085 External fault 5.

Note: In case inverted fault inputs are needed, it is possible to invert the DI's.

Auxiliary undervoltage

Too low auxiliary voltage, e.g. short dip, while Ready run = 1 generates fault F501 Auxiliary undervoltage.

Auxiliary supply voltage	Trip level
230/115 V_{AC}	< 96 V_{AC}

Armature overcurrent

The nominal value of the armature current is set with 99.11 M1 nominal current. The overcurrent level is set by means of 31.44 Armature overcurrent level. Additionally, the actual current is monitored against the overcurrent level of the drive. This overcurrent level can be read from 07.63 Drive DC overcurrent level. Exceeding one of the two levels generates fault 2310 Armature overcurrent.

Mains overvoltage

Too high voltage on the mains/AC side. If the actual mains voltage is > 1.3 • 99.10 Nominal mains voltage for longer than 10 s while Ready run = 1 fault F513 Mains overvoltage is generated.

Mains synchronism

As soon as the mains contactor is closed, and the firing unit is synchronized with the incoming voltage, supervising of the synchronization is activated. If the synchronization fails, fault F514 Mains synchronization lost will be generated.

The synchronization of the firing unit takes typically 300 ms before the current controller is ready.

Bridge reversal

With a 6-pulse converter, the bridge reversal is initiated by changing the polarity 27.01 Current reference. Upon zero current detection, see 06.24.b13 Current controller status word 1, the bridge reversal is started. Depending on the moment, the new bridge may be "fired" either during the same or during the next current cycle.

The switchover can be delayed by 27.38 Reversal delay. The delay starts after zero current has been detected, see 06.24.b13 Current controller status word 1. Thus 27.38 Reversal delay is the length of the forced current gap during a bridge changeover. After the reversal delay is elapsed the system changes to the selected bridge without any further consideration.

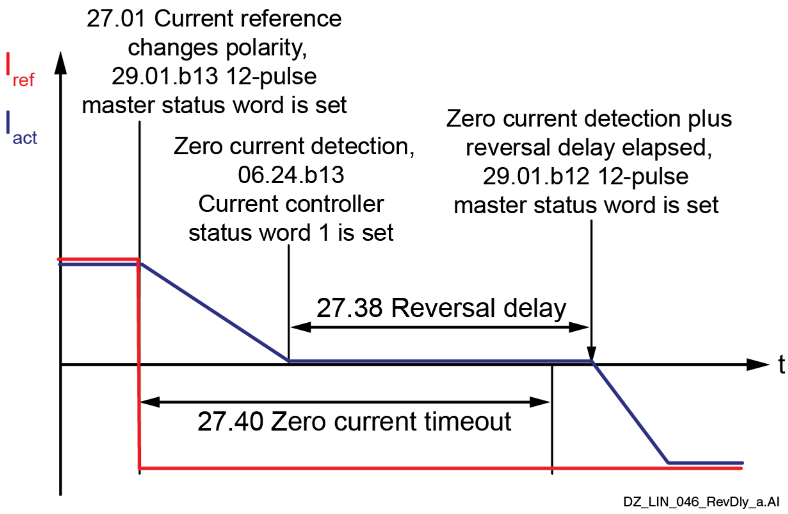
This feature may prove useful when operating with large inductances. Also, the time needed to change the current direction can be longer when changing from motoring mode to regenerative mode at high motor voltages, because the motor voltage must be reduced before switching to regenerative mode. See also 27.42 Reversal volt margin.

After a command to change the current direction, see 27.01 Current reference, the opposite current must be reached before 27.40 Zero current timeout has been elapsed otherwise the drive trips with fault F557 Reversal time.

The setting of 27.38 Reversal delay and 27.40 Zero current timeout depends on the discontinuous current limit:

27.31 M1 discontinuous current limit	27.38 Reversal delay	Delta	27.40 Zero current timeout
≤ 50.00 %	5.0 ms	15 ms	20 ms
≤ 35.00 %	10.0 ms	25 ms	35 ms
≤ 20.00 %	15.0 ms	35 ms	50 ms
≤ 10.00 %	20.0 ms	50 ms	70 ms

Example: The drive trips with fault F557 Reversal time:



Motor protection

Overspeed protection

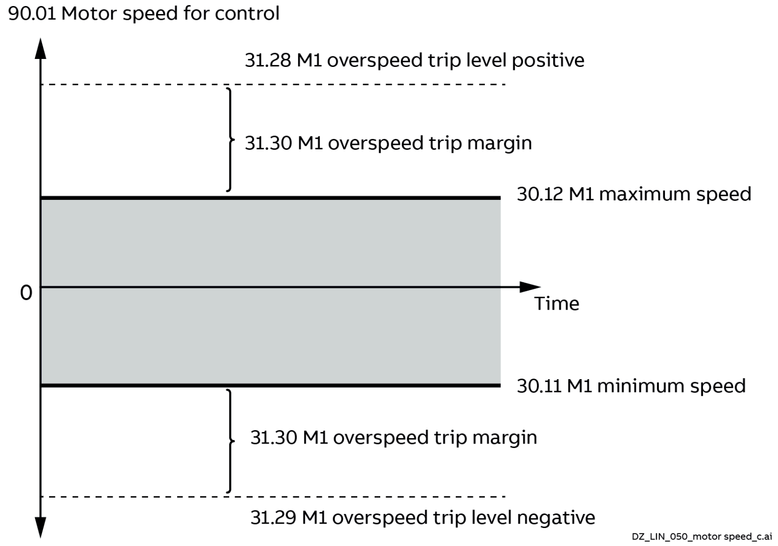
The motor is protected against overspeed e.g. in a case when the drive is in torque control mode and the load drops unexpected.

The overspeed trip levels, see 31.28 M1 overspeed trip level positive and 31.29 M1 overspeed trip level negative, are set by means of 31.30 M1 overspeed trip margin. Exceeding either level causes fault 7310 Overspeed.

It is recommended to set 31.30 M1 overspeed trip margin at least to 20 % of the maximum motor speed.

Examples:
- If the maximum speed is 1100 rpm and overspeed trip margin is 300 rpm, the drive trips at 1400 rpm. See 31.28 M1 overspeed trip level positive.
- If the minimum speed is -1420 rpm and overspeed trip margin is 300 rpm, the drive trips at -1720 rpm. See 31.29 M1 overspeed trip level negative.

Note: The overspeed fault for motor 1 is inactive, if 31.30 M1 overspeed trip margin = 0.



Motor thermal protection

The firmware is equipped with two identical temperature feedback channels including supervision functions, see group 35 Motor thermal protection.

Measured motor temperature

The following table shows what sensor types can be connected to standard I/O, I/O extension and/or encoder interface modules.

Hardware	**Temperature sensor type**			
	PT100, PT1000	**PTC**	**KTY84**	**Klixon**
SDCS-CON-H01	X	X	X	X
FAIO-01	X	X	X	-
FIO-11	X	X	X	-
FEN-01	-	X	-	-
FEN-11/-21/-31	-	X	X	-

The DCS880 can measure the motor temperature and set warnings and faults if the motor temperature reaches critical values. Following temperature measurement sensors can be used:
- PT100.
- PT1000.
- PTC.
- KTY84.
- Klixon.

PT100, PT1000, PTC and KTY84 get connected to a constant current source and the voltage drop over them is then measured via analogue inputs. Additionally, it is possible to connect one PTC to a digital input. The feedback is used to calculate the actual temperature (PT100, PT1000, KTY84) or the resistance (PTC) and is displayed as a signal.
Klixons work like a switch and detect critical temperature levels. They are connected to digital inputs of the drive and generate a waring/fault message.
Both, temperature 1 feedback channel and temperature 2 feedback channel can be used at the same time.

	Temperature 1 feedback channel	**Temperature 2 feedback channel**
Measured temperature	35.02 Measured temperature 1. The unit depends on the selected measurement mode. For PT100 the unit is °C or °F and for PTC the unit is Ohm.	35.04 Measured temperature 2. The unit depends on the selected measurement mode. For PT100 the unit is °C or °F and for PTC the unit is Ohm.
Source	35.11 Temperature 1 source.	35.21 Temperature 2 source.
Fault level	35.12 Temperature 1 fault level. Generates fault 4981 Motor temperature 1 measured/estimated.	35.22 Temperature 2 fault level. Generates fault 4982 Motor temperature 2 measured/estimated.
Warning level	35.13 Temperature 1 warning level. Generates warning A491 Motor temperature 1 measured/estimated.	35.23 Temperature 2 warning level. Generates warning A492 Motor temperature 2 measured/estimated.

Temperature monitoring using PT100 or PT1000 sensors

1 … 3 PT100 or PT1000 can be connected in series to an analog input and an analog output. The analog output feeds a constant excitation current of 9.1 mA (PT100) or 1 mA (PT1000) through the sensors. The sensors resistance increases as the motor temperature rises, as does the voltage over the sensors. The temperature measurement function reads the voltage through the analog input and converts it into °C or °F.

Temperature monitoring using PTC sensors

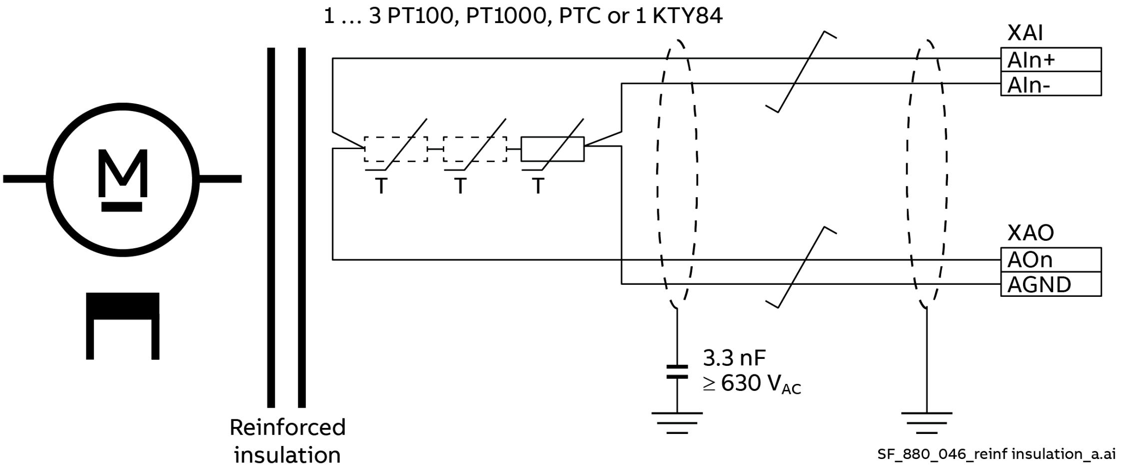
1 … 3 PTC can also be connected in series to an analog input and an analog output. The analog output feeds a constant excitation current of 1.6 mA through the sensors. The sensors resistance increases as the motor temperature rises, as does the voltage over the sensors. The temperature measurement function calculates the resistance of the sensors and generates an event if overtemperature is detected.
Additionally, 1 PTC can be connected to digital input DI6. The resistance of the PTC increases when its temperature rises. The increasing resistance of the sensor decreases the voltage at the input and eventually its state switches from 1 to 0 indicating overtemperature.

Temperature monitoring using KTY84 sensors

1 KTY84 can be connected to an analog input and an analog output. The analog output feeds a constant excitation current of 2.0 mA through the sensor. The sensor resistance increases as the motor temperature rises, as does the voltage over the sensor. The temperature measurement function reads the voltage through the analog input and converts it into °C or °F.

Using analog inputs and analog outputs

It is possible to connect a maximum of 3 PT100, 3 PT1000, 3 PTC or 1 KTY84 to temperature 1 feedback channel and 3 PT100, 3 PT1000, 3 PTC or 1 KTY84 to temperature 2 feedback channel. They are connected between an analog input and an analog output.
Do not connect both ends of the cable shields directly to ground. If a capacitor cannot be used at one end, leave that end of the shield unconnected.



SF_880_046_reinf insulation_a.ai

WARNING
IEC 60664 requires double or reinforced insulation between live parts and the surface of accessible parts of electrical equipment which are either non-conductive or conductive but not connected to the protective earth.
To fulfill this requirement, the connection of a thermistor (and other similar components) to the digital inputs of the drive can be implemented in three alternate ways:

1. There is double or reinforced insulation between the thermistor and live parts of the motor.
2. Circuits connected to all digital and analog inputs of the drive are protected against contact and insulated with basic insulation (the same voltage level as the drive main circuit) from other low voltage circuits.
3. An external thermistor relay is used. The insulation of the relay must be rated for the same voltage level as the main circuit of the drive.

There are 2 ways to connect the PT100, PT1000, PTC and KTY84 to the drive:

1. Via standard I/O on the SDCS-CON-H01.
2. Via I/O extension modules FAIO-01 or FIO-11.

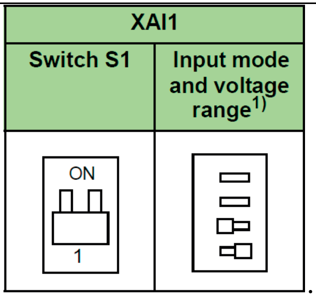
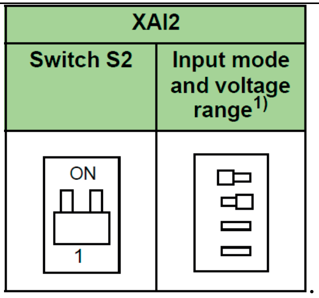
Standard I/O on the SDCS-CON-H01

	AI1 and AO1	**AI2 and AO1**	**AI3 and AO1**
Jumpers:	AI1 using J1:  Voltage (U), default	AI2 using J2:  Voltage (U), default	AI3 is always in voltage mode.
	12.15 AI1 unit selection = V.	12.25 AI2 unit selection = V.	
	AO1 using J5:  Current (I)		
Source:	35.14 Temperature 1 AI source = AI1 actual value.	35.14 Temperature 1 AI source = AI2 actual value.	35.14 Temperature 1 AI source = AI3 actual value.
1 … 3 PT100:	13.12 AO1 source = Force PT100 excitation.		
	35.11 Temperature 1 source = 1 … 3 • PT100 analog I/O.		
1 … 3 PT1000:	13.12 AO1 source = Force PT1000 excitation.		
	35.11 Temperature 1 source = 1 … 3 • PT1000 analog I/O.		
1 … 3 PTC:	13.12 AO1 source = Force PTC excitation.		

	35.11 Temperature 1 source = PTC analog I/O.
1 KTY84:	13.12 AO1 source = Force KTY84 excitation.
	35.11 Temperature 1 source = KTY84 analog I/O.

1 PTC:	**DI6 and +24VD**
	35.11 Temperature 1 source = PTC DI6. The threshold is not adjustable.

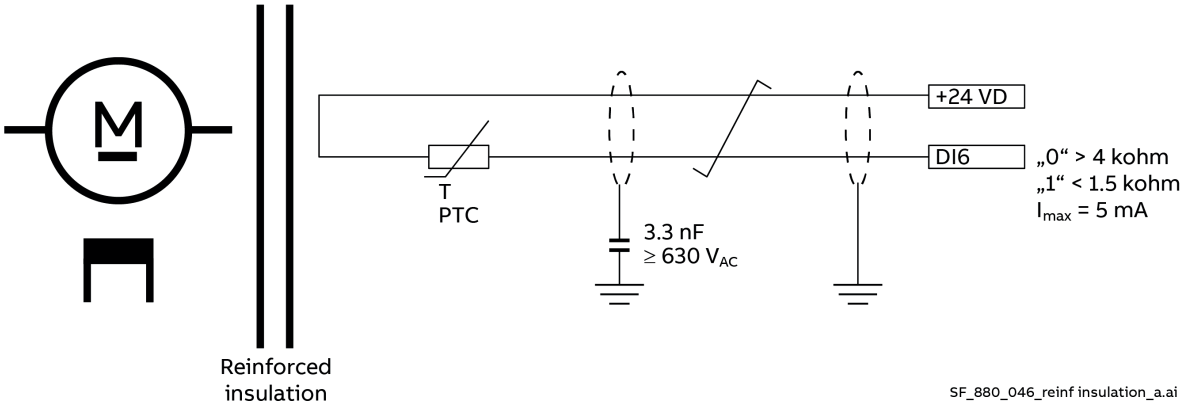
I/O extension modules FAIO-01 or FIO-11

	AI1 and AO1	**AI2 and AO2**
Switches:	 XAI1 Switch S1 | Input mode and voltage range1)	 XAI2 Switch S2 | Input mode and voltage range1)
	14.29 AI1 HW switch position = V.	14.44 AI2 HW switch position = V.
	14.30 AI1 unit selection = V.	14.45 AI2 unit selection = V.
	AO1 is always in current mode.	AO2 is always in current mode.
Source:	35.14 Temperature 1 AI source = Other. Set to 14.26 AI1 actual value.	35.14 Temperature 1 AI source = Other. Set to 14.41 AI2 actual value.
1 … 3 PT100:	14.77 AO1 source = Force PT100 excitation.	14.87 AO2 source = Force PT100 excitation.
	35.11 Temperature 1 source = 1 … 3 • PT100 analog I/O.	35.11 Temperature 1 source = 1 … 3 • PT100 analog I/O.
1 … 3 PT1000:	14.77 AO1 source = Force PT1000 excitation.	14.87 AO2 source = Force PT1000 excitation.
	35.11 Temperature 1 source = 1 … 3 • PT100 analog I/O.	35.11 Temperature 1 source = 1 … 3 • PT100 analog I/O.
1 … 3 PTC:	14.77 AO1 source = Force PTC excitation.	14.87 AO2 source = Force PTC excitation.
	35.11 Temperature 1 source = PTC analog I/O.	35.11 Temperature 1 source = PTC analog I/O.
1 KTY84:	14.77 AO1 source = Force KTY84 excitation.	14.87 AO2 source = Force KTY84 excitation.
	35.11 Temperature 1 source = KTY84 analog I/O.	35.11 Temperature 1 source = KTY84 analog I/O.

Using DI6 (XDI:6) on the SDCS-CON-H01

It is possible to connect 1 PTC to digital input DI6 to the temperature feedback channels. The sensor resistance must not exceed the threshold resistance of the digital input at the motor normal operating temperature.

Do not connect both ends of the cable shield directly to ground. If a capacitor cannot be used at one end, leave that end of the shield unconnected.



Klixon

The temperature measurement can be done using klixons. For this the drive provides two possibilities which can be used simultaneously.

The klixon is a thermal switch, opening its contact at a defined temperature. This can be used for supervision of the temperature by connecting the switch to a digital input of the drive. The digital input for the klixon(s) is selected with 35.15 Supervision 1 klixon source and 35.25 Supervision 2 klixon source. An open klixon generates fault 4981 Motor temperature 1 measured/estimated or fault 4982 Motor temperature 2 measured/estimated.

Note: It is possible to connect several klixons in series.

Motor thermal model

The drive includes two thermal models in one in temperature 1 feedback channel and one in temperature 2 feedback channel. The models can be used at the same time. Two models are needed in case one converter is shared by two motors (e.g. shared motion). During normal operation only one thermal model is needed.

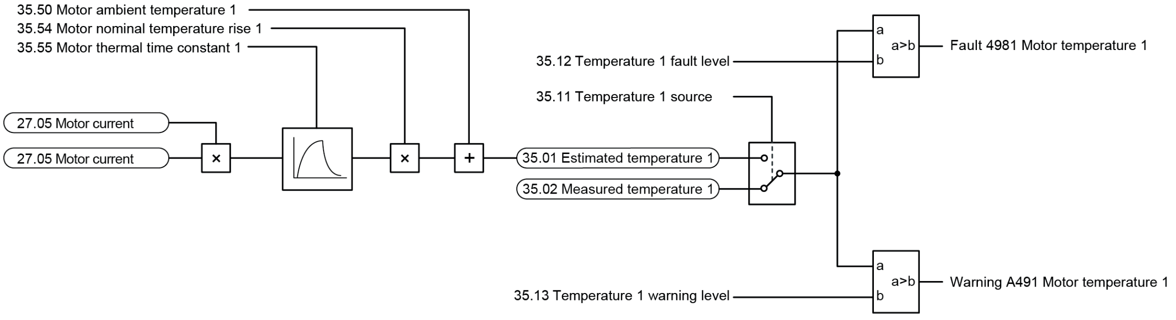
It is recommended to use the thermal model of the motor if a direct temperature measurement is not available and the current limits of the drive are set higher than the motor nominal current.

The thermal model is based on the actual motor current related to motor nominal current and the ambient temperature. Thus, the thermal model does not directly calculate the temperature of the motor, but it calculates the temperature rise of the motor.

Example: 80 % of nominal motor current is calculated to a 64 % temperature rise.

The drive calculates the temperature of the motor based on the following assumptions:

- When power is applied to the drive for the first time, the motor is assumed to be at ambient temperature defined by 35.50 Motor ambient temperature 1 or 35.58 Motor ambient temperature 2. After this, when auxiliary power is applied to the drive, the motor is assumed to be at the temperature estimated before.
- The motor temperature is calculated using the user-adjustable motor thermal time constant, see 35.55 Motor thermal time constant 1 and 35.63 Motor thermal time constant 2, and the motor load (current^2). The temperature rise of the motor behaves like the time constant which is proportional to the motor current^2.



SF_880_041_temperature_a.ai

Stall protection

The stall protection generates event motor stall when the motor is in apparent danger of overheating. The rotor is either mechanically stalled or the load is continuously too high. It is possible to adjust the supervision (time, speed and torque).

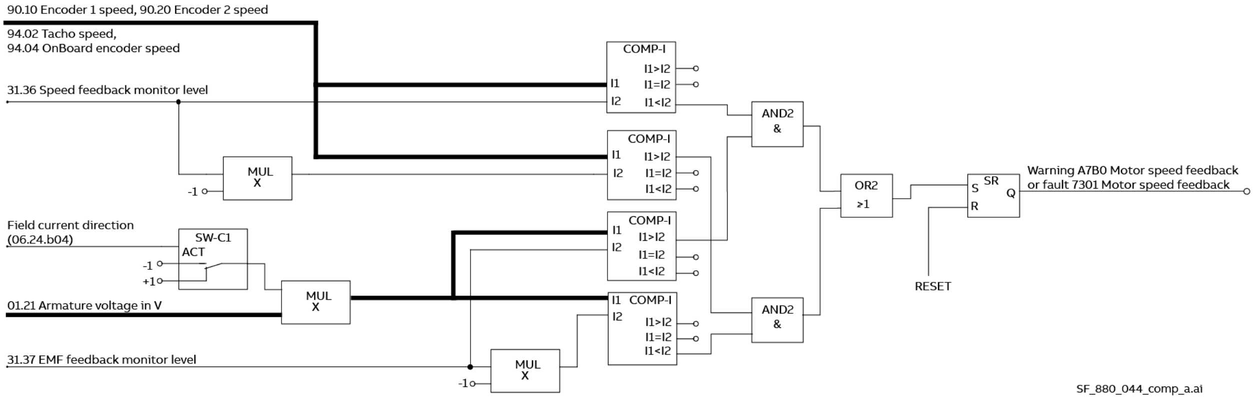
The drive reacts according to 31.24 Stall function and generates either warning A780 Motor stall or fault 7121 Motor stall, when the following is true:

- The actual torque, in percent of 99.02 M1 nominal torque, exceeds 31.25 Stall torque level.
- The actual speed is below 31.26 Stall speed level.
- The time defined in 31.27 Stall time is exceeded.

Speed feedback monitor

The speed feedback monitor supervises an attached analog tacho or encoder for proper function by means of measured speed and measured armature voltage. Above a certain armature voltage, see 01.21 Armature voltage in V, the measured speed feedback, see 90.01 Motor speed for control, must be above a certain level. The sign of the speed measurement must be correct as well.

31.36 Speed feedback monitor level and 31.37 EMF feedback monitor level set the levels and activate the monitor.

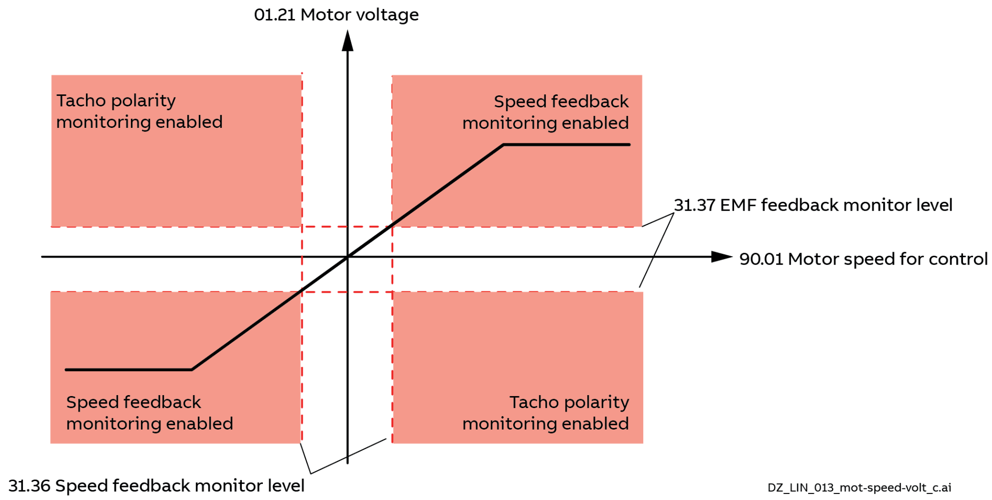


SF_880_044_comp_a.ai

The drive reacts according to 31.35 Motor feedback fault and generates either warning A7B0 Motor speed feedback or fault 7301 Motor speed feedback, when the following is true:

- The measured speed feedback, see 90.01 Motor speed for control, does not exceed 31.36 Speed feedback monitor level.
- The measured armature voltage, see 01.21 Armature voltage in V, exceeds 31.37 EMF feedback monitor level.

Example: 31.36 Speed feedback monitor level = 15 rpm and 31.37 EMF feedback monitor level = 50 V_{DC}. The drive trips when the armature voltage, see 01.21 Armature voltage in V, is > 50 V_{DC}, while the speed feedback, see 90.01 Motor speed for control, is ≤ 15 rpm.



31.35 Motor feedback fault selects the reaction to a speed feedback problem:

- The drive is immediately tripped with fault 7301 Motor speed feedback.
- The speed feedback is switched to EMF and the drive is stopped according to the emergency stop ramp, then fault 7301 Motor speed feedback is set.
- The speed feedback is switched to EMF and warning A7B0 Motor speed feedback is set.
- This selection is only valid if 2 pulse encoders are connected. Depending on the setting of 90.41 M1 feedback selection the speed feedback is switched from one encoder to the other encoder in case of a problem. Additionally, warning A7B0 Motor speed feedback is set.

In case the field is weakened the drive immediately trips with fault 7301 Motor speed feedback, except two encoders are in use.

Armature overvoltage

The nominal value of the armature voltage is set with 99.12 M1 nominal voltage.

The overvoltage level is set by means of 31.50 Armature overvoltage level. Exceeding this level generates fault F503 Armature overvoltage.

Field overcurrent

The nominal value of the field current is set with 99.13 M1 nominal field current.

The overcurrent level is set by means of 31.59 M1 field overcurrent level. Exceeding this level causes F515 M1 field exciter overcurrent.

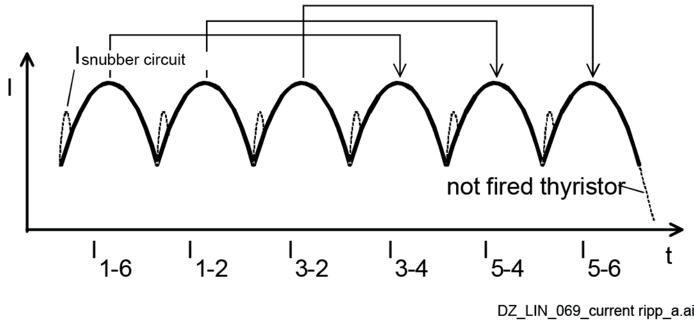
Armature current ripple

The current control is equipped with a current ripple monitor. This function can detect:

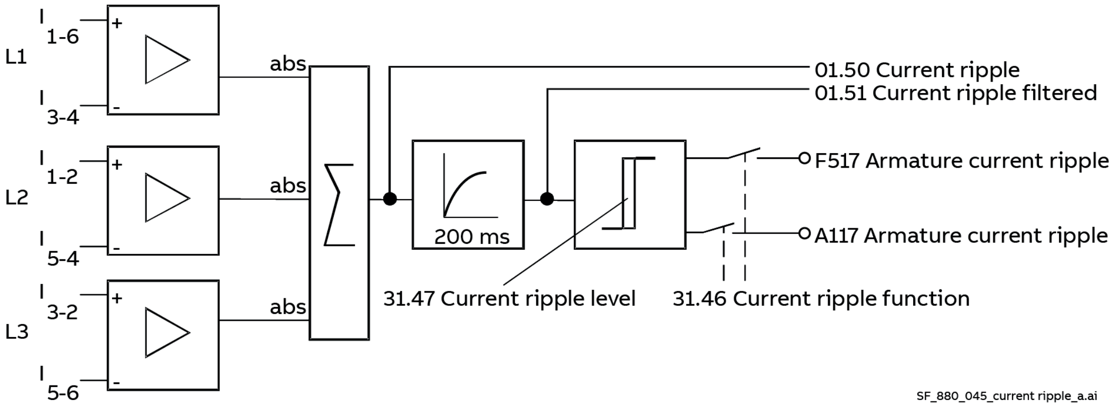
- A broken branch fuse or thyristor.
- A too high proportional gain (K_P) of the current controller (wrong tuning).
- A broken current transformer (T51, T52).
- Poor mains voltage condition.

The current ripple monitor level is set by means of 31.47 Current ripple level. Exceeding this level generates either fault F517 Armature current ripple or warning A117 Armature current ripple on the setting of 31.46 Current ripple function.

The current ripple monitor method is based on comparing positive and negative currents of each phase. The calculation is done per thyristor pair:



01.50 Current ripple is calculated as abs(I_{1-6}-I_{3-4}) + abs(I_{1-2}-I_{5-4}) + abs(I_{3-2}-I_{5-6}). By low-pass filtering with 200 ms 01.51 Current ripple filtered is generated and compared against 31.47 Current ripple level.



Note: The load influences the error signal 01.51 Current ripple filtered. For armature drive currents near the discontinuous level will create values of about 300 % of 01.40 Drive current if a thyristor is not fired. High inductive loads will create values of about 90% of 01.40 Drive current if a thyristor is not fired.
Commissioning hints:

- It is not possible to pre-calculate clear levels.
- The current control reacts to unstable current feedback.
- The load is continuously driving the current if a thyristor is not fired.

Current rise

The protection against fast current rise during generating is configured by means of 31.45 Maximum current rise. Exceeding this level causes fault F539 Fast current rise.
Note: This trip opens the mains contactor and the DC-breaker, if present.

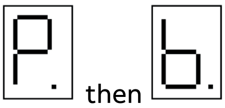
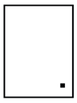
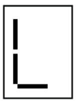
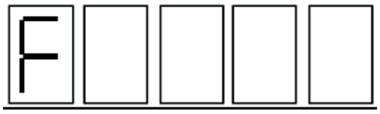
Field undercurrent

The nominal value of the field current is set with 99.13 M1 nominal field current.
The minimum field current level is set by means of 31.58 M1 field current low level. Undershooting this level for longer than defined in 31.57 Minimum field current trip delay causes fault F541 M1 field exciter low current.

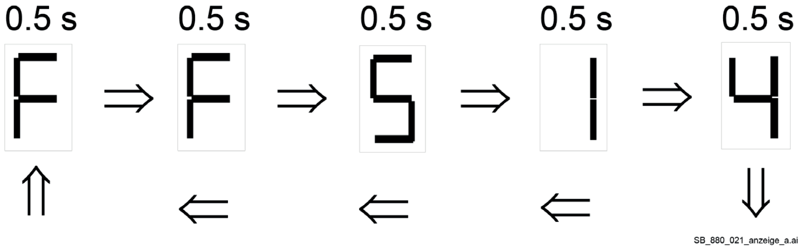
Messages

Display of status messages, fault and warning signals

A seven-segment display (V301) is located on the control board SDCS-CON-H01 and it shows the state of the drive:

	Power up, firmware is not yet running.
	Dot is slowly flashing (1 s), firmware is running. No warnings, no faults.
	Indication while loading firmware into the SDCS-CON-H01.
	Warning.
	Fault.

The seven-segment display shows the event in code. The letters and numbers of multi-character codes are displayed one after the other for 0.5 seconds at a time. Plain text messages are available on the control panel and in the fault logger of Drive composer.



F514 Mains synchronization lost.

Status messages

Status messages will only be indicated on the seven-segment display of the SDCS-CON-H01.

7-segment display	Text on control panel, and Drive composer	Definition
P. then b.	Not available.	Power up, firmware is yet not running.
.	Not available.	Dot is slowly flashing (1 s), firmware is running. No warnings, no faults.
L	Not available.	Indication while loading firmware into the SDCS-CON-H01.

Warnings and AUX codes

A warning is an event, that a condition occurred, which may lead to a dangerous situation. It is displayed and written into the event logger. However, the cause for the warning can inhibit the drive from continuing with normal operation. If the cause of the warning disappears the warning will be automatically reset. The fault logger shows the appearing warning like this:

22.11.2018 14:18:13.294 **A132** Parameter setting conflict

The disappearing warning is shown like this:

22.11.2018 14:18:11.116 **A132** Parameter setting conflict

Warning levels

The warning handling provides 5 warning levels.

Warning level 1
- The drive keeps on running and the warning is indicated.
- After the drive is stopped, the mains contactor cannot be switched on again (no re-start possible).

Warning level 2
- The drive keeps on running and the warning is indicated.
- The fan contactor stays on as long as the warning is pending.
- After the warning disappears 20.40 Drive/Motor fan delay time starts.

Warning level 3
- Auto-reclosing logic is active (auto re-start). See 06.18.b10 Drive status word 3.
- Ready run is disabled, but the drive is automatically restarted when the warning condition vanishes. See 06.15.b01 Main Status Word.
- The firing angle is forced to the value of 30.45 Maximum firing angle.
- Single firing pulses to suppress the DC current are given.

Warning level 4
- The drive keeps on running and the warning is indicated.

Warning level 5
- Used for STO related warnings.
  See Supplement for functional safety converters DCS880 (3ADW000452).

Warning messages

The list contains the warning/notice code in hex, its name, the cause and hints what to do.

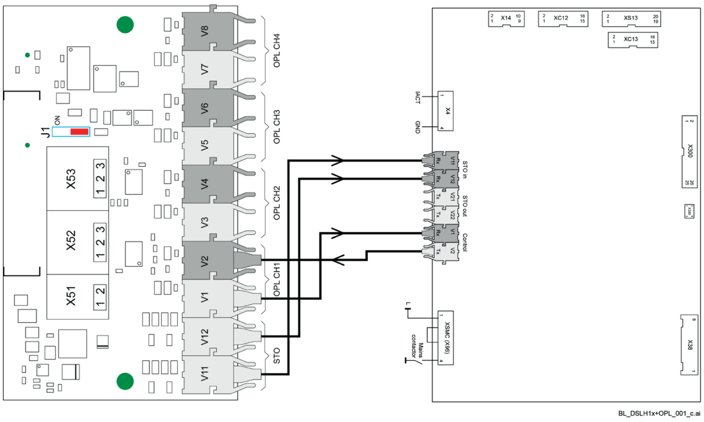
Note: The list also contains notices that only appear in the Event log.

Code	Warning/Notice	Cause and what to do	Warning level
1310 … 132F	User defined.	User defined warning by application program.	1
A103	DC-breaker acknowledge.	Selected motor, DC-breaker acknowledge at the DI is missing. The firing angle is forced to the value of 30.45 Maximum firing angle and single firing pulses to suppress the DC current are given, thus the drive cannot be started or re-started while the DC-breaker acknowledge is missing. Check: – The setting of 20.35 DC-breaker acknowledge source, if necessary invert the signal.	3
A104	Reversal volt function.		3

Code	Warning/Notice	Cause and what to do	Warning level
	Programmable, see 31.60 Reversal volt function. See 06.25.b03 Current controller status word 2 and fault F504.	Reversal volt function active. The armature voltage is too high compared to the mains voltage, before braking (switching from motoring to generating). Check: – If the setting of 31.61 Reversal volt delay is suitable for the system. – For too low mains voltage. See 99.01 Mains voltage. – Too high motor voltage. Lower 99.12 M1 nominal voltage and 99.14 M1 nominal (base) speed accordingly. – If the motor is accelerating during reversal e.g. hanging load. – The settings of the field current controller, EMF controller, flux linearization in group 28 EMF and field current control. E.g. field weakening is not activated. – For too high field current (e.g. problems with field weakening). – For overspeed. – For proper speed scaling. See 46.02 M1 speed scaling actual. – For proper armature voltage feedback.	
A105	Dynamic braking acknowledge.	Selected motor, dynamic braking is still pending. The firing angle is forced to the value of 30.45 Maximum firing angle and single firing pulses to suppress the DC current are given until zero speed is reached, thus the drive cannot be started or re-started while dynamic braking is active, except if 21.01 Start mode = Flying start dynamic braking. Check: – The setting of 20.43 Dynamic braking acknowledge source. – The setting of 21.01 Start mode.	3

A111	Mains low voltage.
	Programmable, see 31.51. Mains loss mode.
	See also fault 3280.
		Mains/AC side low (under-) voltage.
		The firing angle is forced to the value of 30.45 Maximum firing angle and single firing pulses to suppress the DC current are given.
		Check:
		– The setting of 31.51. Mains loss mode, 31.52 Mains loss down time, 31.53 Mains loss low level 1 and 31.54 Mains loss low level 2.
		– That the mains voltage scaling is correct. See 99.10 Nominal mains voltage.
		– That the proper voltage coding resistors on the SDCS-PIN-H51 are used.
		– The condition of the mains (voltage, cabling, fuses, switchgear).
		– That all 3 phases are present directly at the drive.
		    – H1 … H5: measure the fuses F100 … F102 on the SDCS-PIN-H01.
		    – H6 … H8: check and measure the connections XU1/XU2, XV1/XV2 and XW1/XW2 on the SDCS-PIN-H51.
			3

Code	Warning/Notice	Cause and what to do	Warning level
		– That the mains voltage is within the set tolerance. E.g. too deep mains voltage drops during load current. – For mains supply imbalance. – For loose mains cable connections. – That the mains contactor closes and opens and the timing. – For H1 … H4, that the field circuit has no short circuit or ground fault. – In case an On command is given, and the measured mains voltage is too low for longer than 500 ms warning A111 Mains low voltage is set. If the problem persists for longer than 10 s fault 3280 Mains low voltage is generated.	
A112	P2P and M/F communication. Programmable, see 70.07 DCSLink comm loss function. See also fault F544.	DCSLink communication and DCSLink board (SDCS-DSL-H1x) communication loss. Check: – DCSLink node ID settings. See 70.05 DCSLink node ID. – The setting of 31.13 Fault stop mode communication and 70.07 DCSLink comm loss function. – The setting of 70.17 Mailbox 1 node ID, 70.23 Mailbox 2 node ID, 70.29 Mailbox 3 node ID and 70.35 Mailbox 4 node ID. – The setting of 70.18 Mailbox 1 cycle time/timeout, 70.24 Mailbox 2 cycle time/timeout, 70.30 Mailbox 3 cycle time/timeout and 70.36 Mailbox 4 cycle time/timeout. – The DCSLink cable connections. – The DCSLink terminations.	4

A113	Power unit, communication.
	See also fault 5681.
		Communication errors between the control unit and a power unit.
		Check:
		– The connections between the control unit and the power unit:
		
		BL_DSLH1x+OPL_001_c.ai
		– The auxiliary power of the SDCS-OPL-H01.
		– The auxiliary code (format XXXYYYZZ).
		XXX specifies the transmitter FIFO error code.
		  – 000: No transmitter FIFO error.
		  – 001: Internal error [invalid call parameter].
		  – 002: Internal error [configuration not supported].
		  – 003: Transmission buffer full.
		YYY identifies the power unit.
			1

Code	Warning/Notice	Cause and what to do	Warning level
		– 000: Broadcast. – 001: Power unit connected to channel1 on SDCS-DSL-H1x. – 002: Power unit connected to channel2 on SDCS-DSL-H1x. – 003: Power unit connected to channel3 on SDCS-DSL-H1x. – 004: Power unit connected to channel4 on SDCS-DSL-H1x. ZZ specifies the error source. – 01: Transmitter side [link error] from power unit to control unit. – 02: Transmitter side [no communication] from power unit to control unit. – 03: Receiver side [link error] from control unit to power unit. – 04: Receiver side [no communication] from control unit to power unit. – 05: Transmitter FIFO error, see XXX. – 06: SDCS-OPL-H01 not found.	
A114	Armature current deviation.	27.02 Used current reference differs from 27.05 Motor current for longer than 5 s by more than 20 % of nominal motor current. If the current controller cannot match the given current reference, the warning signal is created. Normally the reason is a too small incoming voltage compared to the motor EMF. For non-motoric applications, it is possible to block the warning using 06.11.b07 Auxiliary control word 2. Check: – For blown DC fuses. – The ratio between mains voltage and armature voltage (either the mains voltage is too low, or the motor's armature voltage is too high). – If the setting of 30.44 Minimum firing angle is too high.	4
A116	Brake long falling	Selected motor, the acknowledge signal for the mechanical brake closed (applied) stage at the DI is missing. Check: – The mechanical brake itself. – The mechanical brake cable connections. – The mechanical brake settings in group 44 Mechanical brake control. – That the acknowledgement signal, if used, matches the actual status of the brake. – The used digital inputs and outputs (groups 10 and 11).	4
A117	Armature current ripple. See also fault F517.	One or several thyristors may carry no current. Check: – The values of 01.50 Current ripple and 01.51 Current ripple filtered1. – The setting of 31.46 Current ripple function and 31.47 Current ripple level.	4

Code	Warning/Notice	Cause and what to do	Warning level
		– For too high gain of current controller. See 27.29 M1 current proportional gain. – For too fast rise of the current reference. – The positive/negative current feedback with an oscilloscope (6 pulses within one cycle visible?). – The thyristor gate-cathode resistance. – The thyristor gate connection. – The current transformers (T51, T52). – The condition of the mains (voltage, cabling, fuses, switchgear).	
A118	Application.	Application file new or different. Check the AUX code. Actions see below.	1
	0001	Found a new application on the memory unit. Activate the application on the memory unit by means of 96.16 Parameter save manually = Enable application.	
	0002	Application in drive memory and on memory unit are different. Activate the application on the memory unit by means of 96.16 Parameter save manually = Enable application.	
A120	Overvoltage protection active.	The overvoltage protection DCF506 of a large field exciter is active and the field exciter is blocked. **Notes:** – Only valid if 99.06 Operation mode = Large field exciter. – The DO of the DCF506 must be connected to a DI of the large field exciter. See 20.47 Overvoltage protection trigger source. – This alarm typically pops up for a short time, when the field current changes its direction. The firing angle is forced to the value of 30.45 Maximum firing angle and single firing pulses to suppress the field current are given. Check: – The setting of 20.47 Overvoltage protection trigger source if necessary invert the signal. – The field converter cables and connections.	3
A124	Speed scaling.	The settings of: – 30.11 M1 minimum speed. – 30.12 M1 maximum speed. – 31.30 M1 overspeed trip margin. – 46.01 M1 speed scaling. – 99.14 M1 nominal (base) speed. Must be set in a range of 0.1 ... 1.6 • 46.02 M1 speed scaling actual (1.6 = 32000/20000). – The parameters causing the warning can be identified in the AUX code (format YYZZ). YY specifies the parameter group. ZZ specifies the parameter number. The firing angle is forced to the value of 30.45 Maximum firing angle and single firing pulses to suppress the DC current are given.	3
A130	Mains phase loss.		3

Code	Warning/Notice	Cause and what to do	Warning level

	Programmable, see 31.21 Mains phase loss.
	See also fault 3130.
		One or several mains voltage phase(s) are missing, or the mains voltage phases are imbalanced.
		The firing angle is forced to the value of 30.45 Maximum firing angle and single firing pulses to suppress the DC current are given.
		Check:
		– The condition of the mains (voltage, cabling, fuses, switchgear).
		– That all 3 phases are present directly at the drive.
		    – H1 … H5: measure the fuses F100 … F102 on the SDCS-PIN-H01.
		    – H6 … H8: check and measure the connections XU1/XU2, XV1/XV2 and XW1/XW2 on the SDCS-PIN-H51.
		– For mains supply imbalance.
		– For loose mains cable connections.
		– That the mains contactor closes and opens.
		– The AUX code:
		    – 0: All phase voltages U (L1), V (L2) and W (L3) are missing.
		    – 1: Mains voltage phases are imbalanced. Phase-to-phase voltage U_{UV} is the smallest voltage.
		    – 2: Mains voltage phases are imbalanced. Phase-to-phase voltage U_{VW} is the smallest voltage.
		    – 3: Phase V (L2) is missing.
		    – 4: Mains voltage phases are imbalanced. Phase-to-phase voltage U_{WU} is the smallest voltage.
		    – 5: Phase U (L1) is missing.
		    – 6: Phase W (L3) is missing.	

A131	PLL deviation	PLL deviation level is exceeded and the current controller is blocked. See also 06.25.b13 Current controller status word 2. The firing angle is forced to the value of 30.45 Maximum firing angle and single firing pulses to suppress the DC current are given. Check: – For an instable mains voltage. – For a too fast armature current rise. – 95.39 PLL input deviation. – 95.40 PLL output, internal mains frequency. – 95.43 PLL offset synchronization transformer. – 95.44 PLL deviation level. – 95.45 PLL proportional gain. – 95.46 PLL filter time. – 95.47 PLL Uk compensation.	3
A132	Parameter setting conflict.	Parameter settings conflicting with other parameters. The parameters causing the warning can be identified in the AUX code (format YYZZ YYZZ). YY specifies the parameter group. In case of 00, see the actions below. ZZ specifies the parameter number or the actions below. Additionally check:	4

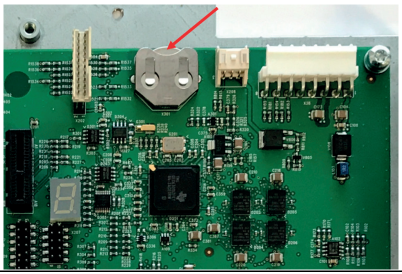
Code	Warning/Notice	Cause and what to do	Warning level
		– 95.25 Set: Type code for proper value.	
	0070	No field reversal possible due to 28.54 Field current force direction = External reverse.	
	0071	Flux linearization parameters not consistent. See 28.31 Field current at 40 % flux, 28.32 Field current at 70 % flux and 28.33 Field current at 90 % flux.	
	0077	Encoder 1 parameters not consistent. Check: – 46.02 M1 speed scaling actual or 42.14 M2 speed scaling actual. – 92.10 Pulses/revolution. – 92.11 Pulse encoder type. At scaling speed, the pulse frequency must be greater than 600 Hz according to following formula: $f \geq 600\ [Hz] = \frac{ppr \bullet evaluation \bullet speed\ scaling}{60\ [s]}$ $f \geq 600\ [Hz] = \frac{(92.10) \bullet (92.11) \bullet (46.02\ or\ 42.14)}{60\ [s]}$ E.g. the speed scaling must be greater than 9 rpm for a quadrature pulse encoder (with two channels, A and B) and 1024 pulses.	
	0078	Encoder 2 parameters not consistent. Check: – 46.02 M1 speed scaling actual or 42.14 M2 speed scaling actual. – 93.10 Pulses/revolution. – 93.11 Pulse encoder type. At scaling speed, the pulse frequency must be greater than 600 Hz according to following formula: $f \geq 600\ [Hz] = \frac{ppr \bullet evaluation \bullet speed\ scaling}{60\ [s]}$ $f \geq 600\ [Hz] = \frac{(92.10) \bullet (92.11) \bullet (46.02\ or\ 42.14)}{60\ [s]}$ E.g. the speed scaling must be greater than 9 rpm for a quadrature pulse encoder (with two channels, A and B) and 1024.	
A137	Start condition conflict.	Re-start of the drive is not possible. Check: – The AUX code (format XXXX 00YY). XXXX specifies the parameter group and number e.g.: – 0619: 06.19 Drive inhibit status word 2. – 0620: 06.20 Run inhibit status word. – 9524: 95.24 Service mode ≠ Normal mode. YY specifies the bit showing the reason, if applicable.	1
A2B3	Residual current detected.		1

<table>
<tr><th>Code</th><th>Warning/Notice</th><th colspan="2">Cause and what to do</th><th>Warning level</th></tr>
<tr><td></td><td>Programmable, see 31.18 Residual current detection type.
See also fault 2330.</td><td colspan="2">The drive has detected an unbalance typically due to a residual current in the motor or the motor cables.
Sum of I_{L1}, I_{L2}, $I_{L3} \neq$ zero.
Check:
– The settings of 31.17 Residual current detection source, 31.18 Residual current detection type, 31.19 Residual current detection level and 31.20 Residual current detection delay.
– The sum current transformer, if necessary change transformer or connected drive hardware.
– The insulation resistances of motor and motor cables. Disconnect the mains, verify safe isolation from supply in armature and field circuits and make insulation tests for the complete installation.</td><td></td></tr>
<tr><td rowspan="5">A490</td><td>Incorrect temperature sensor setup.</td><td colspan="2">Problem with motor temperature measurement.
Check the AUX code (format 0XYYZZZZ).
X identifies the affected temperature monitoring function.
0 = parameter 35.11. 1 = parameter 35.21.
YY indicates the selected temperature source, e.g. the setting of the selection parameter in hexadecimal.
ZZZZ indicates the problem. Actions see below.</td><td rowspan="5">1</td></tr>
<tr><td>0001</td><td colspan="2">Sensor type mismatch.
Check parameters 35.11/35.21 against 91.21/91.24.</td></tr>
<tr><td>0002</td><td>Temperature under limit.</td><td rowspan="3">Check parameters 35.11 … 35.14/ 35.21 … 35.24 and 91.21/91.24 if the sensor is connected to an encoder interface.
Check the sensor and its wiring.</td></tr>
<tr><td>0003</td><td>Short circuit.</td></tr>
<tr><td>0004</td><td>Open circuit.</td></tr>
<tr><td rowspan="2">A491</td><td>Motor temperature 1 measured/estimated.</td><td colspan="2" rowspan="2">Measured/Estimated motor temperature 1 has exceeded the warning level.
Wait until the motor/motor model is cooled down. The fan contactor stays on as long as the warning is pending.
Check:
– The value of 35.02 Measured temperature 1.
– The real motor temperature. Let motor cool down and restart.
– The value of 35.13 Temperature 1 warning level.
– The cooling of the motor or other temperature measured equipment.
– The ambient conditions (e.g. ambient temperature).
– The airflow and fan operation.
– The motor fan supply voltage.
– The motor fan direction of rotation.
– The motor fan components.
– The motor cooling air inlet (e.g. filters).
– The motor cooling air outlet.
– The motor load and drive ratings.
– Inadmissible load cycle.
– The wiring of the temperature sensor.
– The resistance of the temperature sensor by measuring it.</td><td rowspan="2">2</td></tr>
<tr><td>(Editable message text)
See also fault 4981.</td></tr>
</table>

Code	Warning/Notice	Cause and what to do		Warning level
		Hint: – The measured/estimated motor temperature is blocked, if 35.11 Temperature 1 source = Disable.		
A492	Motor temperature 2 measured/estimated. (Editable message text) See also fault 4982.	Measured/Estimated motor temperature 2 has exceeded the warning level. Wait until the motor/motor model is cooled down. The fan contactor stays on as long as the warning is pending. Check: – The value of 35.03 Measured temperature 2. – The real motor temperature. Let motor cool down and restart. – The value of 35.23 Temperature 2 warning level. – The cooling of the motor or other temperature measured equipment. – The ambient conditions (e.g. ambient temperature). – The airflow and fan operation. – The motor fan supply voltage. – The motor fan direction of rotation. – The motor fan components. – The motor cooling air inlet (e.g. filters). – The motor cooling air outlet. – The motor load and drive ratings. – Inadmissible load cycle. – The wiring of the temperature sensor. – The resistance of the temperature sensor by measuring it. Hint: – The measured/estimated motor temperature is blocked, if 35.21 Temperature 2 source = Disable.		2
A497	Motor temperature slot 1 measured. (Editable message text) See also fault 4991.	The thermistor protection module (FEN-xx or FPTC-xx) installed in slot 1 indicates overtemperature.	Depending on the used module, a PTC and/or KTY temperature sensor can be attached. Check: – The cooling of the motor or other temperature measured equipment. – The motor load and drive ratings. – The wiring of the temperature sensor. – The resistance of the temperature sensor by measuring it.	2
A498	Motor temperature slot 2 measured. (Editable message text) See also fault 4992	The thermistor protection module (FEN-xx or FPTC-xx) installed in slot 2 indicates overtemperature.		2
A499	Motor temperature slot 3 measured. (Editable message text) See also fault 4993.	The thermistor protection module (FEN-xx or FPTC-xx) installed in slot 3 indicates overtemperature.		2
A4A0	Control board temperature measured.	Excessive control board temperature. Check the AUX code (format XXXXZZZZ). ZZZZ indicates the problem. Actions see below.		2
	None	Temperature above warning limit of xx °C or xx °F.		

Code	Warning/Notice	Cause and what to do	Warning level
		Check: – The value of 05.10 Control board temperature. – The ambient conditions. – The airflow and fan operation. – The heatsink fins for dust pick-up.	
	0001	Thermistor broken. Contact an ABB service representative for control board replacement.	
A4B0	Bridge temperature measured.	Excessive bridge temperature. Wait until the bridge is cooled down. The fan contactor stays on as long as the warning is pending. Shutdown temperature, see 07.65 Drive max bridge temperature set. The bridge overtemperature warning will already appear at approximately 5°C below the shutdown temperature. Check: – The values of 05.11 Ch1 bridge temperature … 05.14 Ch4 bridge temperature. – The setting of 20.38 Drive fan acknowledge source. – The setting of 20.40 Drive/Motor fan delay time. – The ambient conditions (e.g. ambient temperature). – The airflow and fan operation. – The drive fan supply voltage. – The drive fan direction of rotation. – The drive fan components. – The heatsink fins for dust pick-up. – The drive cooling air inlet (e.g. filters). – The drive cooling air outlet. – For open drive doors. – The motor power against the drive power. – Inadmissible load cycle. – When 95.25 Set: Type code = None, that 95.29 Set: Drive max bridge temperature is set properly. – The AUX code (format XXXYYYZZ). YYY identifies the power unit channel. In case of a hardparallel configuration.	2
	See also fault 4310.		
A534	12-pulse current difference.	The current of difference of a 12-pulse parallel configuration exceeded the current difference level. Check: – The settings of 29.07 12-pulse parallel current difference level and 29.08 12-pulse parallel current difference delay. – The settings of the current controller in group 27 Armature current control.	4
	Programmable, see 29.09 12-pulse parallel current difference type. See also fault F534.		
A560	Power unit, unbalanced current.	The unbalanced current between hardparallel connected power units is excessive. Check: – That the mains and motor cable routing is according to the specification for hardparallel configurations. – The branch fuses. – The thyristors.	4
	Programmable, see 29.63 Power unit unbalanced current function. See also fault F560.		

Code	Warning/Notice	Cause and what to do	Warning level
		– The AUX code (format XXXYYYZZ). YYY identifies the power unit channel. ZZ identifies the affected thyristor. **Example:** 00000314 means thyristor14 in the power unit connected to channel3.	
A561	Power unit, thyristor loss function. Programmable, see 29.68 Power unit thyristor loss function. See also fault F561.	Displays the thyristors/branch fuses of a power unit which are lost, in other words not conducting any current. Check: – The branch fuses. – The thyristors. – The AUX code (format XXXYYYZZ). YYY identifies the power unit channel. ZZ identifies the affected thyristor. **Example:** 00000314 means thyristor14 in the power unit connected to channel3.	4
A581	Drive fan acknowledge. Programmable, see 31.41 Drive fan fault function. See also fault 5080.	Drive cooling fan feedback at the DI is missing. Check: – The settings of 20.38 Drive fan acknowledge source and 20.40 Drive/Motor fan delay time. – The drive fan operation and connection. – The drive fan contactor. – The drive fan circuit. – The drive fan klixon. – The drive fan components. – The drive fan supply voltage. – The drive fan direction of rotation. – The drive door open. – The drive cooling air inlet (e.g. filter). – The drive cooling air outlet. – H7 and H8 pressure switch (setting should be 2 mbar). – The used digital inputs and outputs (groups 10 and 11).	2
A596	12-pulse slave blocked.	The 12-pulse slave is preventing the 12-pulse master from starting. Check: – Warnings in the 12-pulse slave. **Note**: The warning level depends on the 12-pulse slave warning level.	1 or 3
A5A0	Safe torque off. Programmable, see 31.22 STO indication run/stop. See also event B5A0 and fault 5091.	Safe torque off active, no drive problem. See Safety supplement for functional safety converter DCS880 (3ADW000452). Check: – 31.22 STO indication run/stop. – The safe torque off circuit.	5
A5A3	Safe off mains contactor XSMC:STO. Programmable, see 31.90 XSMC:STO Indication. See also event B5A3 and fault 5093.	Safe torque off monitor DC current not zero (zero current time out). The DCS880 has the possibility to open the mains contactor using a hardware supervision of the DC current in case of a safe torque off request. This is called fault shutdown path. In case safe torque off is requested and current zero is detected in less than 300 ms the XSMC:STO relay is kept closed.	5

Code	Warning/Notice	Cause and what to do	Warning level
		In case safe torque off is requested and current zero is not detected in less than 300 ms the XSMC:STO relay is opened and the fault shutdown path becomes active. See Safety supplement for functional safety converter DCS880 (3ADW000452). Check: – For defective parts (e.g. thyristors) in the unit. – The SDCS-CON-H01. – For high inductive loads.	
A5F4	Control board battery.	The battery on the SDCS-CON-H01 is low. Exchange the battery: 	4
A682	Flash erase speed exceeded.	The flash memory in the memory unit has been erased too frequently. This compromises the lifetime of the memory. Avoid forcing unnecessary parameter saves by 96.16 Parameter save manually or cyclic parameter writes. E.g. user logger triggering via parameters. Check the AUX code (format XYYYYZZZ). X specifies the source of warning. – 1: Generic flash memory erase supervision. ZZZ specifies the flash memory subsector number that generated the warning.	1
A6B0	User lock open.	The user lock is open and parameters 96.100 … 96.102 are visible. Close the user lock by entering an invalid pass code in 96.07 Pass code.	4
A6B1	User pass code not confirmed.	A new user pass code has been entered, but not confirmed yet. A new user pass code has been entered in 96.100 Change user pass code. Confirm the new pass code by entering the same code in 96.101 Confirm user pass code. To cancel, close the user lock without confirming the new code. To close the user lock, enter an invalid user pass code into 96.07 Pass code then activate 96.27 Control board boot or cycle the power.	4
A6D1	FBA A parameter conflict. See also fault 65A1.	Fieldbus adapter A (FBA A): The drive does not have a functionality requested by a PLC or a requested functionality has not been activated. The settings of parameter groups 50 Fieldbus adapter (FBA) and 51 FBA A settings are not set according to the fieldbus adapter or the device has not been selected. Check: – The PLC programming.	4

Code	Warning/Notice	Cause and what to do	Warning level
		– The settings of parameter groups 50 Fieldbus adapter (FBA) and 51 FBA A settings. – The configuration of the fieldbus adapter.	
A6D2	FBA B parameter conflict. See also fault 65A2.	Fieldbus adapter B (FBA B): The drive does not have a functionality requested by a PLC or a requested functionality has not been activated. The settings of parameter groups 50 Fieldbus adapter (FBA) and 54 FBA B settings are not set according to the fieldbus adapter or the device has not been selected. Check: – The PLC programming. – The settings of parameter groups 50 Fieldbus adapter (FBA) and 54 FBA B settings. – The configuration of the fieldbus adapter.	4
A6DA	Reference source parametrization.	A reference source is simultaneously connected to multiple parameters with different units. See also 65B1. Check: – The reference source selection parameters. – The AUX code (format YYZZ). YY specifies the parameter group. ZZ specifies the parameter number.	4
A6E5	AI parametrization.	The current/voltage hardware setting of an analog input does not correspond to the parameter settings. Check the AUX code. The code identifies the analog input whose settings are in conflict. Adjust either the jumper (J1, J2) setting on the control board or parameters 12.15, 12.25.	4
A6E6	ULC configuration.	User load curve configuration error. Check the AUX code (format XXXXZZZZ). ZZZZ indicates the problem. Actions see below.	4
	0000	Speed points inconsistent. Check that each speed point, see parameters 37.11 … 37.15, has a higher value than the previous point.	
	0002	Underload point above overload point. Check that each overload point, see parameters 37.31 … 37.35, has a higher value than the corresponding underload point, see parameters 37.21 … 37.25.	
	0003	Overload point below underload point.	
A780	Motor stall. Programmable, see 31.24 Stall function. See also fault 7121.	Selected motor, the motor is operating in the stall region because of excessive load or insufficient motor power. The motor torque exceeded 31.25 Stall torque level for a time longer than 31.28 Stall time while the speed feedback was below 31.26 Stall speed level. Check: – The motor load/mechanics (e.g. brake). – The drive ratings. – For correct field current. – The settings of 31.24 Stall function, 31.25 Stall torque level, 31.26 Stall speed level and 31.28 Stall time. – The settings for current and torque limits in group 30 Control limits.	1
A781	Motor fan acknowledge.	Motor/External cooling fan feedback at the DI is missing. Check:	2

Code	Warning/Notice	Cause and what to do	Warning level
	Programmable, see 20.39 Motor fan acknowledge source. See also fault 71B1.	– The setting of 20.39 Motor fan acknowledge source. – The fan operation and connection. Replace the motor/external fan if faulty. – The fan contactor. – The fan supply voltage.	
A782	Measurement circuit FEN temperature.	Problem with the temperature measurement when a FEN-xx is used. Check that 35.11 Temperature 1 source and 35.21 Temperature 2 source setting corresponds to the actual installation connected to the encoder interface.	1
		Problem with the temperature measurement when a FEN-01 is used. A non-supported KTY sensor is connected to the encoder interface FEN-01. Use either a PTC sensor or another encoder interface module.	
A797	Speed feedback configuration. Programmable, see 31.35 Motor feedback fault. See also fault 73A0.	The speed feedback configuration via encoder interface modules has changed. Check the AUX code (format XXYYZZZZ). XX specifies the encoder interface module. – 01: For module 1 see parameters 91.11 and 91.12. – 02: For module 2 see parameters 91.13 and 91.14. YY specifies the encoder. – 01: Group 92 Encoder 1 configuration. – 02: Group 93 Encoder 2 configuration. ZZZZ indicates the problem. Actions see below.	4
	0001	Adapter not found in specified slot. Check module location. See parameters 91.12 and 91.14.	
	0002	Detected type of interface module does not match parameter setting. Check the module type parameters 91.11 and 91.13 against status parameters 91.02 and 91.03.	
	0003	Logic version too old. Contact your local ABB representative.	
	0004	Firmware version too old. Contact your local ABB representative.	
	0006	Encoder type incompatible with interface module type. Check module type parameters 91.11 and 91.13 against encoder type parameters 92.01 and 93.01.	
	0007	Adapter not configured. Check module location parameters 91.12 and 91.14.	
	0008	Speed feedback configuration has changed. Use 91.10 Encoder parameter refresh to validate any changes in the settings.	
	0009	No encoders configured in the encoder module. Configure the encoder in group 92 Encoder 1 configuration or 93 Encoder 2 configuration.	
	000A	Non-existing emulation input. Check input selection parameters 91.31 and 91.41.	
	000B	Echo not supported by the selected input. E.g. resolver or absolute encoder.	

Code	Warning/Notice	Cause and what to do	Warning level
		Check: – The input selection parameters 91.31 and 91.41. – The interface module type against the encoder type.	
	000C	Emulation in continuous mode not supported. Check: – The input selection parameters 91.31 and 91.41. – The serial link mode parameters 92.30 and 93.30.	
A798	Encoder interface communication. Programmable, see 31.35 Motor feedback fault and 31.38 Load feedback fault.	Measured motor/load feedback via an encoder interface module is lost. Check: – That the encoder interface module is properly seated in its slot. – That the encoder interface module or slot connectors are not damaged. To pinpoint the problem, try installing the module into another slot. – The AUX code (format XXXXYYYY). YYYY indicates the problem. Actions see below.	4
	0001	Failed answer to encoder configuration message. Contact your local ABB representative.	
	0002	Failed answer to adapter watchdog disable message.	
	0003	Failed answer to adapter watchdog enable message.	
	0004	Failed answer to adapter configuration message.	
	0005	Too many failed answers inline to speed and position messages.	
	0006	DDCS driver failed.	
A7A1	Mechanical brake closing failed. Programmable, see 44.17 M1 brake fault function. See also fault 71A2.	Selected motor, the acknowledge signal for the mechanical brake closed (applied) stage at the DI is missing. Check: – The mechanical brake itself. – The mechanical brake cable connections. – The mechanical brake settings in group 44 Mechanical brake control. – That the acknowledgement signal, if used, matches the actual status of the brake. – The used digital inputs and outputs (groups 10 and 11).	4
A7A2	Mechanical brake opening failed. Programmable, see 44.17 M1 brake fault function. See also fault 71A3.	Selected motor, the acknowledge signal for the mechanical brake opened (lifted) stage at the DI is missing. Check: – The mechanical brake itself. – The mechanical brake cable connections. – The mechanical brake settings in group 44 Mechanical brake control. – That the acknowledgement signal, if used, matches actual status of brake. – The used digital inputs and outputs (groups 10 and 11).	4

Code	Warning/Notice	Cause and what to do	Warning level
A7A5	Mechanical brake opening not allowed. Programmable, see 44.17 M1 brake fault function. See also fault 71A5.	Selected motor, open (lift) conditions of the mechanical brake are not fulfilled. The brake has been prevented from opening (lifting) by 44.11 M1 keep brake closed, 44.12 M1 Brake close request or torque actual does not reach 44.26 M1 Torque proving reference, during torque proving. Check: – The mechanical brake settings in group 44 Mechanical brake control. Especially 44.11 M1 keep brake closed and 44.12 M1 Brake close request. – That the acknowledgement signal, if used, matches the actual status of the brake. – The used digital inputs and outputs (groups 10 and 11).	4
A7AA	Extension AI parameterization.	The hardware current/voltage and parameter settings do not match for an analog input on an I/O extension module. Check the AUX code (format XX0000YY). XX specifies the number of the I/O extension module. – 01: Group 14 I/O extension module 1. – 02: Group 15 I/O extension module 2. – 03: Group 16 I/O extension module 3. YY specifies the analog input on the module. **Example:** In case of I/O extension module 1 and analog input AI1 the AUX code is 01000001. The hardware current/voltage setting on the module is shown by 14.29 AI1 HW switch position. The corresponding parameter setting is in 14.30 AI1 unit selection. Adjust either the hardware setting on the module or the parameter to solve the mismatch.	4
A7AB	I/O extension configuration. Programmable, see 70.07 DCSLink comm loss function. See also fault 7082.	The I/O extension module/DCSLink board (SDCS-DSL-H1x) types and locations specified by parameters do not match the detected configuration or do not communicate with the drive. Check: – The type and location settings of the modules/board. See parameters 14.01, 14.02, 15.01, 15.02, 16.01, 16.02, 70.01, 70.02, 70.05, 70.07 and 95.16. – That the module/board is properly seated in its slot. – That the module/board and the slot connector is not damaged. – Try installing the module into another slot. – Check the AUX code (format XXYYYYYY). XX specifies the number of the I/O extension module. – 01: Group 14 I/O extension module 1. – 02: Group 15 I/O extension module 2. – 03: Group 16 I/O extension module 3. – 04: Group 70 DCSLink Communication or group 95 HW configuration. YYYYYY indicates the problem. Actions see below.	4
	000001	Communication with module/board failed.	
	000002	Module/Board not found.	
	000003	Configuration of module/board failed.	

Code	Warning/Notice	Cause and what to do	Warning level
	000004		
A7B0	Motor speed feedback. Programmable, see 31.35 Motor feedback fault. See also fault 7301.	Selected motor, no motor speed feedback is received. Check the AUX code (format XXYYZZZZ). XX specifies the location of the speed feedback device. Either an encoder interface module or the control board. – 01: Encoder interface module 1, see parameters 91.11 and 91.12. – 02: Encoder interface module 2, see parameters 91.13 and 91.14. – 03: Control board, see group 94 OnBoard speed feedback configuration. YY specifies the speed feedback device. – 01: Encoder 1, see group 92 Encoder 1 configuration. – 02: Encoder 2, see group 93 Encoder 2 configuration. – 03: OnBoard encoder, see group 94 OnBoard speed feedback configuration. – 04: Tacho, see group 94 OnBoard speed feedback configuration. ZZZZ indicates the problem. Actions see below.	4
	0001	Motor gear definition invalid or outside limits. Check motor gear settings. See 90.43 Motor gear numerator and 90.44 Motor gear denominator. This warning is always active independent of 31.35 Motor feedback fault.	
	0002	Speed feedback device not configured. Check the settings of the speed feedback device: – Encoder 1, see group 92 Encoder 1 configuration. – Encoder 2, see group 93 Encoder 2 configuration. – The OnBoard encoder, see group 94 OnBoard speed feedback configuration. – The tacho, see group 94 OnBoard speed feedback configuration. Use 91.10 Encoder parameter refresh to validate any changes in the settings for an encoder.	
	0003	Speed feedback device stopped working. Check the status of the speed feedback device.	
	0004	Speed feedback device drift detected. Check for slippage between speed feedback device and motor.	
	0007	The comparison of the measured speed feedback from pulse encoder or analog tacho to measured EMF has failed. Check: – The setting of 90.41 M1 feedback selection, 31.14 Fault stop mode fault level 3, 31.35 Motor feedback fault, 31.36 Speed feedback monitor level and 31.37 EMF feedback monitor level. – At the encoder: The encoder itself, alignment, cabling, coupling, power supply (feedback might be too low), mechanical disturbances, jumper J4 on the SDCS-CON-H01. – At the tacho: The tacho itself, tacho polarity and voltage, alignment, cabling, coupling, mechanical disturbances.	

Code	Warning/Notice	Cause and what to do	Warning level
		– EMF: The armature cable connection form the drive to the motor and the polarity.	
A7B1	Load speed feedback. Programmable, see 31.38 Load feedback fault. See also fault 73A1.	Selected motor, no load speed feedback is received. **Attention:** The warning can only be reset by setting 96.27 Control board boot = Reboot or by cycling the auxiliary power. Check the AUX code (format XXYYZZZZ). XX specifies the location of the speed feedback device. Either an encoder interface module or the control board. – 01: Encoder interface module 1, see parameters 91.11 and 91.12. – 02: Encoder interface module 2, see parameters 91.13 and 91.14. – 03: Control board, see group 94 OnBoard speed feedback configuration. YY specifies the speed feedback device. – 01: Encoder 1, see group 92 Encoder 1 configuration. – 02: Encoder 2, see group 93 Encoder 2 configuration. – 03: OnBoard encoder, see group 94 OnBoard speed feedback configuration. – 04: Tacho, see group 94 OnBoard speed feedback configuration. ZZZZ indicates the problem. Actions see below.	1
	0001	Load gear definition invalid or outside limits. Check load gear settings. See 90.53 Load gear numerator and 90.54 Load gear denominator. This warning is always active independent of 31.38 Load feedback fault.	
	0002	Feed constant definition invalid or outside limits. Check feed constant settings. See 90.63 Feed constant numerator and 90.64 Feed constant denominator. This warning is always active independent of 31.38 Load feedback fault.	
	0003	Motor/Load gear definition invalid or outside limits. Check motor/load gear settings. See 90.61 Gear numerator and 90.62 Gear denominator. This warning is always active independent of 31.38 Load feedback fault.	
	0004	Speed feedback device not configured. Check the settings of the speed feedback device: – Encoder 1, see group 92 Encoder 1 configuration. – Encoder 2, see group 93 Encoder 2 configuration. – The OnBoard encoder, see group 94 OnBoard speed feedback configuration. – The tacho, see group 94 OnBoard speed feedback configuration. Use 91.10 Encoder parameter refresh to validate any changes in the settings for an encoder.	
	0005	Speed feedback device stopped working. Check the status of the speed feedback device.	

Code	**Warning/Notice**	**Cause and what to do**	**Warning level**
	0007	The comparison of the measured speed feedback from pulse encoder or analog tacho to measured EMF has failed. Check: – The setting of 90.41 M1 feedback selection, 31.14 Fault stop mode fault level 3, 31.35 Motor feedback fault, 31.36 Speed feedback monitor level and 31.37 EMF feedback monitor level. – At the encoder: The encoder itself, alignment, cabling, coupling, power supply (feedback might be too low), mechanical disturbances, jumper J4 on the SDCS-CON-H01. – At the tacho: The tacho itself, tacho polarity and voltage, alignment, cabling, coupling, mechanical disturbances. – EMF: The armature cable connection form the drive to the motor and the polarity.	
A7C1	FBA A communication. Programmable, see 50.02 FBA A comm loss func. See also fault 7510.	Fieldbus adapter A (FBA A): Cyclical communication between PLC and fieldbus adapter module A or between drive and fieldbus adapter module A is lost. Fault 7510 FBA A communication is only activated after the first data set from the overriding control is received by the drive. Before the first data set is received, only warning A7C1 FBA A communication is active. The reason is to suppress unnecessary faults (the startup of the overriding control is usually slower than the one of the drive). Check: – The status of the fieldbus communication. See user documentation of the fieldbus interface. – The settings of groups 50 Fieldbus adapter (FBA), 51 FBA A settings, 52 FBA A data in and 53 FBA A data out. – The cable connections. – The fieldbus cable termination. – The fieldbus adapter. – That the master can communicate.	4
A7C2	FBA B communication. Programmable, see 50.32 FBA B comm loss func. See also fault 7520.	Fieldbus adapter B (FBA B): Cyclical communication between PLC and fieldbus adapter module B or between drive and fieldbus adapter module B is lost. Fault 7520 FBA B communication is only activated after the first data set from the overriding control is received by the drive. Before the first data set is received, only warning A7C2 FBA B communication is active. The reason is to suppress unnecessary faults (the startup of the overriding control is usually slower than the one of the drive). Check: – The status of the fieldbus communication. See user documentation of the fieldbus interface. – The settings of group 50 Fieldbus adapter (FBA), 54 FBA B settings, 55 FBA B data in and 56 FBA B data out. – The cable connections. – The fieldbus cable termination. – The fieldbus adapter. – That the master can communicate.	4

Code	Warning/Notice	Cause and what to do	Warning level
A7CA	DDCS controller communication. Programmable, see 60.59 DDCS controller comm loss function. See also fault 7581.	Cyclical communication between DDCS controller and drive is lost or there is no communication at all. The drive is waiting for the very first data set. Check: – The status/settings of the DDCS controller. See user documentation of the DDCS controller. – The adapters between DDCS controller and drive. – The setting of 20.01 Command location. – The settings of group 60 DDCS communication, 61 D2D and DDCS transmit data and 62 D2D and DDCS receive data. – The fiber optic cable connections.	4
A7CB	Master-follower link communication. Programmable, see 60.09 M/F comm loss function. See also fault 7582.	Cyclical communication between master and a follower (DDCS/D2D) is lost or there is no communication at all. The drive is waiting for the very first data set. Check: – The AUX code. It indicates which node address on the master-follower link is affected. See 60.02 M/F node address in each drive. – The setting of 60.14 M/F follower selection. – The setting of 20.01 Command location. – The settings of group 60 DDCS communication. – The cable connections.	4
A7CE	EFB communication. Programmable, see 58.14 Communication loss action. See also fault 6681.	Cyclical communication to the embedded fieldbus (EFB) is lost. Fault 6681 EFB communication is only activated after the first data set from the overriding control is received by the drive. Before the first data set is received, only warning A7CE EFB communication is active. The reason is to suppress unnecessary faults (the startup of the overriding control is usually slower than the one of the drive). Check: – The status of the fieldbus master (online, offline, error etc.). – The settings of group 58 FBA Embedded fieldbus. – The cable connections to connector XD2D on the control board. – The fieldbus cable termination.	4
A7DC	FSx undefined warning.	See FSPS-21 PROFIsafe safety functions module (AXD50000158638).	-
A7E1	Speed feedback device. Programmable, see 31.35 Motor feedback fault. See also fault 7381.	Speed feedback device error. Check the AUX code (format XXYYZZZZ). XX specifies the location of the speed feedback device. Either an encoder interface module or the control board. – 01: Encoder interface module 1, see parameters 91.11 and 91.12. – 02: Encoder interface module 2, see parameters 91.13 and 91.14. – 03: Control board, see group 94 OnBoard speed feedback configuration. YY specifies the speed feedback device.	1

<table>
<tr><th>Code</th><th>Warning/Notice</th><th colspan="2">Cause and what to do</th><th>Warning level</th></tr>
<tr><td rowspan="18"></td><td></td><td colspan="2">– 01: Encoder 1, see group 92 Encoder 1 configuration.
– 02: Encoder 2, see group 93 Encoder 2 configuration.
– 03: OnBoard encoder, see group 94 OnBoard speed feedback configuration.
– 04: Tacho, see group 94 OnBoard speed feedback configuration.
– 05: EMF, see group 94 OnBoard speed feedback configuration.
ZZZZ indicates the problem. Actions see below.</td><td rowspan="18"></td></tr>
<tr><td>0001</td><td colspan="2">Cable fault.
If the encoder was working previously, check the encoder, encoder cable and encoder interface module for damage.
Check:
– The conductor order at both ends of the encoder cable.
– The groundings of the encoder cable.
– 92.21 Encoder cable fault mode.
– 94.29 OnBoard encoder cable fault mode.</td></tr>
<tr><td>0002</td><td colspan="2">No encoder signal.
Check the condition of the encoder.</td></tr>
<tr><td>0003</td><td>Overspeed.</td><td rowspan="7">Contact your local ABB representative.</td></tr>
<tr><td>0004</td><td>Overfrequency.</td></tr>
<tr><td>0005</td><td>Resolver ID run failed.</td></tr>
<tr><td>0006</td><td>Resolver overcurrent.</td></tr>
<tr><td>0008</td><td>Absolute encoder communication error.</td></tr>
<tr><td>0009</td><td>Absolute encoder initialization error.</td></tr>
<tr><td>000A</td><td>Absolute SSI encoder configuration error.</td></tr>
<tr><td>000B</td><td>Encoder reported an internal error.</td><td rowspan="5">See the documentation of the encoder.</td></tr>
<tr><td>000C</td><td>Encoder reported a battery error.</td></tr>
<tr><td>000D</td><td>Encoder reported overspeed or decreased resolution due to overspeed.</td></tr>
<tr><td>000E</td><td>Encoder reported a position counter error.</td></tr>
<tr><td>000F</td><td>Encoder reported an internal error.</td></tr>
<tr><td>0010</td><td colspan="2">Speed feedback device.
Speed feedback was change from speed feedback device to EMF.
This warning is always active independent of 31.35 Motor feedback fault.</td></tr>
<tr><td>0011</td><td colspan="2">Encoder speed feedback.
Speed feedback was change from one encoder to the other encoder (only valid if 2 encoders are connected).
This warning is always active independent of 31.35 Motor feedback fault.</td></tr>
</table>

Code	**Warning/Notice**	**Cause and what to do**	**Warning level**
	0012	Selected motor, wrong direction of speed feedback. The speed feedback direction of tacho and encoders is checked against the speed feedback direction of the EMF. See 90.41 M1 feedback selection. Check: – The real direction of motor rotation. – The settings of 31.36 Speed feedback monitor level and 31.37 EMF feedback monitor level. – The connection of the tacho cable. To correct, swap the two wires. – The connection of the encoder cable. To correct, swap e.g. channels A and A-. – The connection of armature and field cables.	
	0013	Selected motor, tacho range. Check: – That the tacho voltage at overspeed fits to the tacho input. It should not be higher than 270 V.	
	0014	Re-do the tacho fine-tuning. 31.30 M1 overspeed trip margin or 42.25 M2 overspeed trip margin have been changed. Use 99.20 Tuning request = Tacho fine-tuning. This warning is always active independent of 31.35 Motor feedback fault.	
A7EE	Control panel/PC tool link communication. Programmable, see 49.05 Communication loss action. See also fault 7081.	This alarm occurs even though no control is expected from the control panel/PC tool. The control panel/PC tool connected via USB or the PC tool connected via FENA-11/21 has stopped communicating. Check: – The setting of 49.04 Communication loss time. If needed extend the time out to 2000 ms. Do not forget to verify the setting by means of 49.06 Refresh settings Refresh. – The setting of 49.05 Communication loss action. If changed, do not forget to verify the setting by means of 49.06 Refresh settings Refresh. – The control panel/PC tool connection/cable. – The control panel connector. – The mounting platform if being used (e.g. DPMP-01). – Disconnect and reconnect the control panel/PC tool.	4
A880	Motor bearings. Programmable, see 33.14 On-time 1 warn message, 33.24 On-time 2 warn message, 33.55 Value counter 1 warn message and 33.65 Value counter 2 warn message	Warning generated by an on-time timer or a value counter. See group 33 Generic timer & counter. Check the AUX code for the source of the warning. – 0: 33.13 On-time 1 source. – 1: 33.23 On-time 2 source. – 4: 33.53 Value counter 1 source. – 5: 33.63 Value counter 2 source.	4 (default) 1 … 5 user selectable
A881	Output relay.	Warning generated by an edge counter. See group 33 Generic timer & counter.	4 (default) 1 … 5 user selectable
A882	Motor starts.		
A883	Power ups.		

Code	Warning/Notice	Cause and what to do	Warning level
A884	Mains contactor.	Programmable warnings, see 33.35 Edge counter 1 warn message and 33.45 Edge counter 2 warn message. Check the AUX code for the source of the warning. – 2: 33.33 Edge counter 1 source. – 3: 33.43 Edge counter 2 source.	
A885	DC-breaker.		
A886	On-time 1. (Editable message text) Programmable, see 33.14 On-time 1 warn message.	Warning generated by on-time timer 1. See group 33 Generic timer & counter. Check the source of the warning. See 33.13 On-time 1 source.	4 (default) 1 … 5 user selectable
A887	On-time 2. (Editable message text) Programmable, see 33.24 On-time 2 warn message.	Warning generated by on-time timer 2. See group 33 Generic timer & counter. Check the source of the warning. See 33.23 On-time 2 source.	4 (default) 1 … 5 user selectable
A888	Edge counter 1. (Editable message text) Programmable, see 33.35 Edge counter 1 warn message.	Warning generated by edge counter 1. See group 33 Generic timer & counter. Check the source of the warning. See 33.33 Edge counter 1 source.	4 (default) 1 … 5 user selectable
A889	Edge counter 2. (Editable message text) Programmable, see 33.45 Edge counter 2 warn message.	Warning generated by edge counter 2. See group 33 Generic timer & counter. Check the source of the warning. See 33.43 Edge counter 2 source.	4 (default) 1 … 5 user selectable
A88A	Value counter 1. (Editable message text) Programmable, see 33.55 Value counter 1 warn message.	Warning generated by value counter 1. See group 33 Generic timer & counter. Check the source of the warning. See 33.53 Value counter 1 source.	4 (default) 1 … 5 user selectable
A88B	Value counter 2. (Editable message text) Programmable, see 33.65 Value counter 2 warn message.	Warning generated by value counter 2. See group 33 Generic timer & counter. Check the source of the warning. See 33.63 Value counter 2 source.	4 (default) 1 … 5 user selectable
A88C	Clean device.	Warning generated by an on-time timer. See group 33 Generic timer & counter. Programmable warnings, see 33.14 On-time 1 warn message and 33.24 On-time 2 warn message. Check the AUX code for the source of the warning. – 0: 33.13 On-time 1 source. – 1: 33.23 On-time 2 source. – 10: 05.04 Fan on-time counter.	4 (default) 1 … 5 user selectable
A88D	Any fan.		
A88E	Cabinet fan.		
A88F	Cooling fan.		
A890	Additional cooling fan.		
A8A0	AI supervision.		4

Code	Warning/Notice	Cause and what to do	Warning level
	Programmable, see 12.03 AI supervision function. See also fault 80A0.	An analog signal is outside the limits specified for the analog input. Check: – The AUX code (format XYY). X specifies the location of the input. – 0: Control board. – 1: I/O extension module 1. – 2: I/O extension module 2 – 3: I/O extension module 3. – 4: …. YY specifies the input and limit. – 01: AI1 under minimum. – 02: AI1 over maximum. – 03: AI2 under minimum. – 04: AI2 over maximum. – 05: AI3 under minimum. – 06: AI3 over maximum. – The signal level at the analog input. – The wiring connected to the input. – Polarity of the connection. – The minimum and maximum limits of the input in groups 12 Standard AI, 14 I/O extension module 1, 15 I/O extension module 2 and 16 I/O extension module 3.	
A8B0	Signal supervision 1. (Editable message text) Programmable, see 32.06 Supervision 1 action. See also fault 80B0.	Warning generated by signal supervision 1. See group 32 Supervision. Check the source of the warning. See 32.07 Supervision 1 signal.	4 (default) 1 … 5 user selectable
A8B1	Signal supervision 2. (Editable message text) Programmable, see 32.16 Supervision 2 action. See also fault 80B1.	Warning generated by signal supervision 2. See group 32 Supervision. Check the source of the warning. See 32.17 Supervision 2 signal.	4 (default) 1 … 5 user selectable
A8B2	Signal supervision 3. (Editable message text) Programmable, see 32.26 Supervision 3 action. See also fault 80B2.	Warning generated by signal supervision 3. See group 32 Supervision. Check the source of the warning. See 32.27 Supervision 3 signal.	4 (default) 1 … 5 user selectable
A8BE	ULC overload. Programmable, see 37.03 ULC overload actions. See also fault 8002.	Selected signal has exceeded the user overload curve. See group 37 User load curve. Check: – For any operating conditions increasing the monitored signal. E.g., the load of the motor if the torque or current is being monitored. – The definition of the load curve.	4 (default) 1 … 5 user selectable

Code	Warning/Notice	Cause and what to do	Warning level
A8BF	ULC underload. Programmable, see 37.04 ULC underload actions. See also fault 8001.	Selected signal has fallen below the user underload curve. See group 37 User load curve. Check: – For any operating conditions decreasing the monitored signal. E.g., the loss of load if the torque or current is being monitored. – The definition of the load curve.	4 (default) 1 … 5 user selectable
A8C0	Fan service counter.	A cooling fan has reached the end of its estimated lifetime. See 05.41 Main fan service counter. Check the AUX code for the fan to be replaced. – 0: Main cooling fan. – 1: Auxiliary cooling fan. – 2: Auxiliary cooling fan 2. – 3: Cabinet cooling fan. Refer to the DCS880 Service manual (3ADW000488) of the drive for fan replacement instructions.	4
A981	External warning 1. (Editable message text) Programmable, see 31.01 External event 1 source and 31.02 External event 1 type. See also fault 9081.	There is no problem with the drive itself! Warning generated by external device 1. See group 31 Fault functions and fault levels. Check: – External device 1. – 31.01 External event 1 source.	4 (default) 1 … 5 user selectable.
A982	External warning 2. (Editable message text) Programmable, see 31.03 External event 2 source and 31.04 External event 2 type. See also fault 9082.	There is no problem with the drive itself! Warning generated by external device 2. See group 31 Fault functions and fault levels. Check: – External device 2. – 31.03 External event 2 source.	4 (default) 1 … 5 user selectable
A983	External warning 3. (Editable message text) Programmable, see 31.05 External event 3 source and 31.06 External event 3 type. See also fault 9083.	There is no problem with the drive itself! Warning generated by external device 3. See group 31 Fault functions and fault levels. Check: – External device 3. – 31.05 External event 3 source.	4 (default) 1 … 5 user selectable
A984	External warning 4. (Editable message text) Programmable, see 31.07 External event 4 source and 31.08 External event 4 type. See also fault 9084.	There is no problem with the drive itself! Warning generated by external device 4. See group 31 Fault functions and fault levels. Check: – External device 4. – 31.07 External event 4 source.	4 (default) 1 … 5 user selectable
A985	External warning 5. (Editable message text)	There is no problem with the drive itself! Warning generated by external device 5. See group 31 Fault functions and fault levels.	4 (default) 1 … 5 user selectable

Code	Warning/Notice	Cause and what to do	Warning level
	Programmable, see 31.09 External event 5 source and 31.10 External event 5 type. See also fault 9085.	Check: – External device 5. – 31.09 External event 5 source.	
AF8C	Process PID sleep mode.	reserved	4
AF90	Autotuning.	The autotuning or assistant did not complete successfully. To clear the warning, either finish an autotuning/assistant successfully or keep Reset (e.g. via DI) depressed for over 3 seconds. Check the AUX code (format XXXXYYYY). XXXX specifies the autotuning or assistant. – 0001: Field current autotuning. – 0002: Armature current autotuning. – 0003: Speed feedback assistant. – 0004: Speed controller autotuning. – 0005: EMF controller autotuning. – 0006: Flux linearization autotuning. – 0007: Thyristor test. For drives size H5 ... H8 make sure, that 99.11 M1 nominal current is set to 50 A or higher. – 0008: Tacho fine tuning. YYYY indicates the problem. Actions see below.	4
	00010001	– The drive was stopped before the autotuning finished. – The On command was prematurely removed. – Autotuning aborted by a fault. Repeat autotuning until successful.	
	00010002	Motor is turning. No speed zero indication.	
	00010003	Armature current not zero.	
	00010004	Field current autotuning wrongly started in armature drive, please use the field exciter.	
	00010005	No field exciter selected. See 99.07 M1 used field exciter type.	
	00010006	Autotuning timeout, On command was not set in time.	
	00010007 … 0001000A	– Measured field current does not reach the field current reference. – No detection of field resistance. – Field circuit open (e.g. not connected) respectively interrupted.	
	0001000B	Unable to detect a field inductance.	
	0001000C	Firmware fault. Contact your local ABB representative.	
	00020002	– The drive was stopped before the autotuning finished. – The Run command was prematurely removed. – Autotuning aborted by a fault. Repeat autotuning until successful.	
	00020003	Autotuning timeout, Run command was not set in time or is missing.	
	00020004	– Invalid nominal armature current setting. – Armature current 99.11 M1 nominal current is set to zero.	

Code	Warning/Notice	Cause and what to do	Warning level
	00020005	Motor is turning. No speed zero indication.	
	00020006	Armature circuit and/or armature voltage measurement circuit wrongly connected (e.g. at C1/D1 or at the SDCS-PIN-H51).	
	00020007	No load connected to armature circuit.	
	00020008	Armature voltage measurement circuit open (e.g. not connected at C1/D1 or at the SDCS-PIN-H51) or interrupted. This can be checked by measuring the motor resistance at C1/D1 and the SDCS-PIN-H51. Check also current and torque limits.	
	00020009	Firmware fault. Contact your local ABB representative.	
	00030001	– The drive was stopped before the autotuning finished. – The Run command was prematurely removed. – Autotuning aborted by a fault. Repeat autotuning until successful.	
	00030002	Tuning of speed controller, speed feedback assistant or tacho fine-tuning not possible due to speed limitation. See 30.11 M1 minimum speed and 30.12 M1 maximum speed.	
	00030003	Tuning of speed controller, speed feedback assistant or tacho fine-tuning not possible due to voltage limitation. During the tuning of the speed controller, the speed feedback assistant or the tacho fine-tuning base speed, 99.14 M1 nominal (base) speed, might be reached. Thus, full armature voltage, 99.12 M1 nominal voltage, is necessary. In case the mains voltage is too low to provide for the needed armature voltage the autotuning procedure is canceled. Check and adapt if needed: – 99.10 Nominal mains voltage. – 99.12 M1 nominal voltage. – 99.14 M1 nominal (base) speed.	
	00030004	Autotuning timeout, Run command was not set in time or is missing.	
	00030005	Motor could not accelerate to base speed. Decrease 23.12 Acceleration time 1 to get more torque and current.	
	00030006	Tacho adjustment faulty or not OK or the tacho voltage is too high during autotuning	
	00040001	– The drive was stopped before the autotuning finished. – The Run command was prematurely removed. – Autotuning aborted by a fault. Repeat autotuning until successful.	
	00040002	Autotuning timeout, Run command was not set in time or is missing.	
	00040003	Tuning of speed controller, speed feedback assistant or tacho fine-tuning not possible due to speed limitation. See 30.11 M1 minimum speed and 30.12 M1 maximum speed.	
	00040004 … 00040006	Motor is turning. No speed zero indication.	
	00040007	Motor could not decelerate with full autotuning torque.	

Code	Warning/Notice	Cause and what to do	Warning level
		Decrease 23.13 Deceleration time 1 to get more torque and current.	
	00040008	Armature current not zero.	
	00040009	Tuning of speed controller, speed feedback assistant or tacho fine-tuning not possible due to voltage limitation. During the tuning of the speed controller, the speed feedback assistant or the tacho fine-tuning base speed, 99.14 M1 nominal (base) speed, might be reached. Thus, full armature voltage, 99.12 M1 nominal voltage, is necessary. In case the mains voltage is too low to provide for the needed armature voltage the autotuning procedure is canceled. Check and adapt if needed: – 99.10 Nominal mains voltage. – 99.12 M1 nominal voltage. – 99.14 M1 nominal (base) speed.	
	0004000A	Required torque reference could not be reached before the drive reached base speed.	
	0004000B	Drive is not in speed control mode. See 19.01 Actual operation mode.	
	0004000C	Motor could not accelerate to base speed. Decrease 23.12 Acceleration time 1 to get more torque and current.	
	0004000D	No writing of control parameters of speed controller possible.	
	0004000E	Firmware fault. Contact your local ABB representative.	
		– The drive was stopped before the autotuning finished. – The Run command was prematurely removed. – Autotuning aborted by a fault.	
	00060001	– The drive was stopped before the autotuning finished. – The Run command was prematurely removed. – Autotuning aborted by a fault. Repeat autotuning until successful.	
	00060002	Autotuning timeout, Run command was not set in time or is missing.	
	00060003	Field weakening not allowed. See 90.41 M1 feedback selection and 28.17 M1 EMF/Field control mode.	
	00060004	Motor is turning. No speed zero indication.	
	00060005	Drive is not in speed control mode. See 19.01 Actual operation mode.	
	00060006	Requested speed was not reached after 300 seconds.	

Code	Warning/Notice	Cause and what to do	Warning level
	00060007	Wrong order of measurement results in the flux linearization parameters. See 28.31 Field current at 40 % flux, 28.32 Field current at 70 % flux and 28.33 Field current at 90 % flux.	
	00060008	Firmware fault. Contact your local ABB representative.	
	00070002	– The drive was stopped before the autotuning finished. – The Run command was prematurely removed. – Autotuning aborted by a fault. Repeat autotuning until successful.	
	00070003	Autotuning timeout, Run command was not set in time or is missing.	
	00070004	Field current not zero.	
	00070005	Armature current not zero.	
	00070006	Motor is turning. No speed zero indication.	
	00070007	Thyristor blocking test failed.	
	00070008	Motor connected to ground (near terminal C).	
	00070009	Motor connected to ground (near terminal D).	
	00070010	Armature winding is not connected (terminals C and D are open).	
	00070011	V11 short circuit.	
	00070012	V12 short circuit.	
	00070013	V13 short circuit.	
	00070014	V14 short circuit.	
	00070015	V15 short circuit.	
	00070016	V16 short circuit.	
	00070C11	V11 not conducting.	
	00070C12	V12 not conducting.	
	00070C13	V13 not conducting.	
	00070C14	V14 not conducting.	
	00070C15	V15 not conducting.	
	00070C16	V16 not conducting.	
	00070C21	V21 not conducting.	
	00070C22	V22 not conducting.	
	00070C23	V23 not conducting.	
	00070C24	V24 not conducting.	
	00070C25	V25 not conducting.	
	00070C26	V26 not conducting.	
	00071124	V11 or V24 short circuit	
	00071225	V12 or V25 short circuit.	
	00071326	V13 or V26 short circuit.	
	00071421	V14 or V21 short circuit.	
	00071522	V15 or V22 short circuit.	
	00071623	V16 or V23 short circuit.	
	00072000	Armature winding is short-circuited (short circuit between terminals C and D).	
	0007FFFF	Thyristor test finishes successful, stack okay.	
	00080001	– The drive was stopped before the autotuning finished. – The Run command was prematurely removed.	

Code	Warning/Notice	Cause and what to do	Warning level
		– Autotuning aborted by a fault. Repeat autotuning until successful.	
	00080002	Autotuning timeout, Run command was not set in time or is missing.	
	00080003	Drive in on state when autotuning was requested. Remove the On command.	
	00080004	A fault happened during the autotuning. For details see event logger.	
AFE1	Off2 (emergency off).	The drive has received an Off2 command (emergency off/fast current off). There is no problem with the drive itself! Check: – The AUX code (format 00XXYYYY). XX specifies the source of the Off2 command. – 04: 20.04 Off2 source 1 (emergency off). – 08: 20.08 Off2 source 2 (emergency off). – 09: 06.09.b01 Used main control word. YYYY specifies the digital input or bit. – 0000: Other [bit]; source selection. – 0100: Off2 command; 0, emergency off/fast current off. – 0101: Off2 inactive; 1, normal operation. – 0103: DI1; 10.02.b00 DI delayed status. – 0104: DI2; 10.02.b01 DI delayed status. – 0105: DI3; 10.02.b02 DI delayed status. – 0106: DI4; 10.02.b03 DI delayed status. – 0107: DI5; 10.02.b04 DI delayed status. – 0108: DI6; 10.02.b05 DI delayed status. – 0111: DIO1; 11.02.b00 DIO delayed status. – 0112: DIO2; 11.02.b01 DIO delayed status. – 0119: DIL; 10.02.b15 DI delayed status. – 1001: 06.09.b01 Used main control word. – That it is safe to continue operation. – That it is safe to reset the source of the Off2 command. E.g. a push button. Then restart the drive. – If necessary, invert the signal, since the signal should be low active. – If On/Run command is still high.	1
		Follower drive in a master-follower link configuration. The drive has received an Off2 command from the master. Informative warning. After stopping on an Off2 command, the master sends a short, 10 ms Off2 command to the follower(s). Thus, the Off2 event is stored in the event log of the follower.	
AFE2	Off3 (emergency stop).	The drive has received an Off3 command (emergency stop). There is no problem with the drive itself! Check: – The AUX code (format 00XXYYYY). XX specifies the source of the Off3 command. – 01: 200.05.b02 FSO control word 1. – 05: 20.05 Off3 source (emergency stop).	1

Code	Warning/Notice	Cause and what to do	Warning level
		– 09: 06.09.b02 Used main control word. YYYY specifies the digital input or bit. – 0000: Other [bit]; source selection. – 0100: Off3 command; 0, emergency stop. – 0101: Off3 inactive; 1, normal operation. – 0103: DI1; 10.02.b00 DI delayed status. – 0104: DI2; 10.02.b01 DI delayed status. – 0105: DI3; 10.02.b02 DI delayed status. – 0106: DI4; 10.02.b03 DI delayed status. – 0107: DI5; 10.02.b04 DI delayed status. – 0108: DI6; 10.02.b05 DI delayed status. – 0111: DIO1; 11.02.b00 DIO delayed status. – 0112: DIO2; 11.02.b01 DIO delayed status. – 0119: DIL; 10.02.b15 DI delayed status. – 1002: 06.09.b02 Used main control word. – 1003: 200.05.b02 FSO control word 1. – That it is safe to continue operation. – That it is safe to reset the source of the Off3 command. E.g. a push button. Then restart the drive. – If necessary, invert the signal, since the signal should be low active. – If On/Run command is still high. Follower drive in a master-follower link configuration. The drive has received an Off3 command from the master. Informative warning. After stopping on an Off3 command, the master sends a short, 10 ms Off3 command to the follower(s). Thus, the Off3 event is stored in the event log of the follower.	
AFE7	Follower. Programmable, see 60.17 Follower fault action. See also fault FFE7.	A follower has tripped. Check the AUX code to find out the node address of the faulted follower. See 60.02 M/F node address. Correct the fault in the follower.	1
B5A0	Safe torque off. Programmable, see 31.22 STO indication run/stop. See also warning A5A0 and fault 5091.	Safe torque off active, no drive problem. See Safety supplement for functional safety converter DCS880 (3ADW000452). Check: – 31.22 STO indication run/stop. – The safe torque off circuit.	4
B5A3	Safe off mains contactor XSMC:STO. Programmable, see 31.90 XSMC:STO Indication. See also warning A5A3 and fault 5093.	Safe torque off monitor DC current not zero (zero current time out). The DCS880 has the possibility to open the mains contactor using a hardware supervision of the DC current in case of a safe torque off request. This is called fault shutdown path. In case safe torque off is requested and current zero is detected in less than 300 ms the XSMC:STO relay is kept closed. In case safe torque off is requested and current zero is not detected in less than 300 ms the XSMC:STO relay is opened and the fault shutdown path becomes active. See Safety supplement for functional safety converter DCS880 (3ADW000452).	4

Code	Warning/Notice	Cause and what to do	Warning level
		Check: – For broken parts (e.g. thyristors) in the unit. – The SDCS-CON-H01. – For high inductive loads.	
B5A4	Firmware internal diagnostics.	The control board rebooted unexpectedly. Notice.	4

Faults and AUX codes

To avoid dangerous situations, damage of the motor, the drive or any other material some physical values must not exceed certain limits. Therefore, limit values can be specified for these values by parameter setting which cause a fault when the value exceeds the limits (e.g. max. armature voltage, max. converter temperature). Faults can also be caused by situations which inhibit the drive from normal operation (e.g. blown fuse).

A fault is a condition which requires an immediate stop of the drive in order to avoid danger or damage. The drive is stopped automatically and cannot be restarted before removing its cause.

In case a fault occurs, it stays active until the cause is eliminated and a Reset is given. All fault signals are resettable except of:

- 50FE Type code.
- 6000 Internal firmware.
- F501 Auxiliary undervoltage.
- F547 Drive hardware.

To reset a fault following steps are required:

- The above-mentioned faults can only be reset by cycling the power.
- Remove the Run and On commands.
- Eliminate the faults.
- Acknowledge the fault with Reset via digital input, overriding control system or with Control panel/PC tool.
- Depending on the systems condition, generate Run and On commands again.

Fault levels

The fault signals will switch the drive off completely or partly depending on its fault level.

The fault handling provides 6 fault levels.

Fault level 1

- The mains contactor is switched off immediately.
- The field contactor is switched off immediately.
- The fan contactor is switched off immediately.

Fault level 2

- The mains contactor is switched off immediately.
- The field contactor is switched off immediately.
- The fan contactor stays on as long as the fault is pending or if 20.40 Drive/Motor fan delay time is running.

Fault level 3

The drive is stopping via 31.14 Fault stop mode fault level 3, thus:

- The mains contactor is switched off immediately.
- The field contactor is switched off immediately in case of 31.14 Fault stop mode fault level 3 = Coast stop, but it stays on in case of field heating or 31.14 Fault stop mode fault level 3 = Dynamic braking (this is valid for all level 3 faults).
- The fan contactor stays on.

At standstill:

- The mains contactor cannot be switched on again.
- The field contactor stays on in case of field heating.
- The fan contactor stays on as long as 20.40 Drive/Motor fan delay time is running.

Fault level 4

The drive is stopping via 31.15 Fault stop mode fault level 4, thus:

- The mains contactor is switched off immediately in case of 31.15 Fault stop mode fault level 4 = Coast stop or Dynamic braking, but it stays on in case of 31.15 Fault stop mode fault level 4 = Ramp stop or Torque limit.
- The field contactor is switched off immediately in case of 31.15 Fault stop mode fault level 4 = Coast stop, but it stays on in case of field heating or 31.15 Fault stop mode fault level 4 = Ramp stop, Torque limit or Dynamic braking.

- The fan contactor is switched off immediately in case of 31.15 Fault stop mode fault level 4 = Coast stop but stays on in case of 31.15 Fault stop mode fault level 4 = Ramp stop, Torque limit or Dynamic braking.

At standstill:

- The mains contactor is switched off immediately.
- The field contactor stays on in case of field heating.
- The fan contactor stays on as long as 20.40 Drive/Motor fan delay time is running.

Fault level 5

The drive is stopping via any communication loss action - see 49.05 Communication loss action, 50.02 FBA A comm loss func, 50.32 FBA B comm loss func, 58.14 Communication loss action, 60.09 M/F comm loss function, 60.59 DDCS controller comm loss function and 70.07 DCSLink comm loss function - thus:

- The mains contactor is switched off immediately or stays on depending on the selected communication loss action.
- The field contactor is switched off immediately or stays on depending on the selected communication loss action, but it stays on in case of field heating.
- The fan contactor is switched off immediately or stays on depending on the selected communication loss action.

At standstill:

- The mains contactor is switched off immediately.
- The field contactor stays on in case of field heating.
- The fan contactor stays on as long as 20.40 Drive/Motor fan delay time is running.

Fault level 6

- Used for STO related faults. See Supplement for functional safety converters DCS880 (3ADW000452).

Fault messages

The list contains the fault code in hex, its name, the cause and hints what to do.

Code	Fault	Cause and what to do	Fault level
1411	CU logic error	The CPU of the control board, at some point, writes a value into a FPGA register and repeatedly reads the register. If the read value is not what the CPU thinks is correct, then it generates fault 1411 CU logic error. Possible causes could be, that: – The FPGA has been reset due to a disturbed mains/auxiliary voltage (e.g. a voltage dip). – The FPGA has been reset due to a loss of the clock signal or too high interference in the clock signal. Check: – The firmware version. See 07.05 Firmware version. – For any mains/auxiliary voltage network issues when the fault happens. – For strong disturbances when the fault happens. E.g. the start of a big machine etc. – How many drives are affected. – When several drives trip, if the trip happens at the same time (simultaneously) or if the drives trip one by one.	1
1412	Fault reset	A fault has been reset. Notice.	-
1414	Backup/Restore Timeout	The unit encountered problems creating a backup file or restoring one. Please try again. Check: – The control panel/PC-tool communication and if it is still in backup/restore state.	1
2310	Armature overcurrent.	The armature current has exceeded either 07.63 Drive DC overcurrent level or 31.44 Armature overcurrent level.	3

Code	Fault	Cause and what to do	Fault level

		Check:
		– That the start-up data in group 99 corresponds to the motor rating plate and that the drive is matching the motor.
		– The setting of 07.63 Drive DC overcurrent level and 31.44 Armature overcurrent level.
		If tripping while using the DCS880 Assistant, set 31.44 Armature overcurrent level = 230.00 %. When finished, set back to the original value.
		– The settings of the current controller in group 27 Armature current control.
		– The settings of current and torque limits in group 30 Control limits.
		– The motor and motor cables.
		– All connections in the armature circuit.
		– The incoming voltage for synchronizing. If the synchronizing voltage is not taken from the mains directly, but via a synchronizing transformer or the 230 V_{AC}/115 V_{AC} network, check that there is no phase shift between the same phases. Use an oscilloscope to verify.
		– The mains/branch fuses.
		– The thyristors.
		– That there are no contactors opening and closing in the motor cables.
		– That there are no power factor correction capacitors or surge absorbers between line reactor and drive.
		– The AUX code (format XXXYYYZZ).
		YYY identifies the power unit channel. In case of a hardparallel configuration.
		ZZ identifies the cause:
		  – 01: Overcurrent in 27.05 Motor current.
		  – 02: Overcurrent in 27.06 Motor peak current.
		In case of a rebuild kit check:
		– For proper connection of the firing pulses.
		– For proper connection of the CTs.
		– That 95.25 Set: Type code = None.
		– The setting of 95.27 Set: Drive DC current scaling, because 07.63 Drive DC overcurrent level = 2.3 • 95.27 Set: Drive DC current scaling.	

2330	Residual current detected. Programmable, see 31.18 Residual current detection type. See also warning A2B3.	The drive has detected an unbalance typically due to a residual current in the motor or the motor cables. Sum of IL1, IL2, IL3 ≠ zero. Check: – The settings of 31.17 Residual current detection source, 31.18 Residual current detection type, 31.19 Residual current detection level and 31.20 Residual current detection delay. – The insulation resistances of motor and motor cables. Disconnect the mains, verify safe isolation from supply in armature and field circuits and make insulation tests for the complete installation.	1

Code	Fault	Cause and what to do	Fault level
		– The residual current transformer, if necessary change transformer or connected drive hardware.	

3130	Mains phase loss.
	Programmable, see 31.21 Mains phase loss.
	See also warning A130.
		One or several mains voltage phase(s) are missing, or the mains voltage phases are imbalanced.
		The firing angle is forced to the value of 30.45 Maximum firing angle and single firing pulses to suppress the DC current are given.
		Check:
		– The condition of the mains (voltage, cabling, fuses, switchgear).
		– That all 3 phases are present directly at the drive.
		    – H1 … H5: measure the fuses F100 … F102 on the SDCS-PIN-H01.
		    – H6 … H8: check and measure the connections XU1/XU2, XV1/XV2 and XW1/XW2 on the SDCS-PIN-H51.
		– For mains supply imbalance.
		– For loose mains cable connections.
		– That the mains contactor closes and opens.
		– The AUX code:
		    – 0: All phase voltages U (L1), V (L2) and W (L3) are missing.
		    – 1: Mains voltage phases are imbalanced. Phase-to-phase voltage U_{UV} is the smallest voltage.
		    – 2: Mains voltage phases are imbalanced. Phase-to-phase voltage U_{VW} is the smallest voltage.
		    – 3: Phase V (L2) is missing.
		    – 4: Mains voltage phases are imbalanced. Phase-to-phase voltage U_{WU} is the smallest voltage.
		    – 5: Phase U (L1) is missing.
		    – 6: Phase W (L3) is missing.
			3

3280	Mains low voltage.
	Programmable, see 31.51. Mains loss mode.
	See also warning A111.
		Mains low (under-) voltage (AC side).
		The firing angle is forced to the value of 30.45 Maximum firing angle and single firing pulses to suppress the DC current are given.
		Check:
		– The setting of 31.51. Mains loss mode, 31.52 Mains loss down time, 31.53 Mains loss low level 1 and 31.54 Mains loss low level 2.
		– That the mains voltage scaling is correct. See 99.10 Nominal mains voltage.
		– The cutting of the voltage coding resistors on the SDCS-PIN-H51.
		– The condition of the mains (voltage, cabling, fuses, switchgear).
		– That all 3 phases are present directly at the drive.
		    – H1 … H5: measure the fuses F100 … F102 on the SDCS-PIN-H01.
		    – H6 … H8: check and measure the connections XU1/XU2, XV1/XV2 and XW1/XW2 on the SDCS-PIN-H51.
			3

Code	Fault	Cause and what to do	Fault level
		– That the mains voltage is within the set tolerance. – For mains supply imbalance. – For loose mains cable connections. – That the mains contactor closes and opens. – For H1 … H4, that the field circuit has no short circuit or ground fault. – In case an On command is given, and the measured mains voltage is too low for longer than 500 ms A111 Mains low voltage is set. If the problem persists for longer than 10 s 3280 Mains low voltage is generated.	
4310	Bridge temperature measured. See also warning A4B0.	Excessive bridge temperature. Wait until the bridge is cooled down. The fan contactor stays on as long as the fault is pending. Temperature fault level, see 07.65 Drive max bridge temperature set. The bridge overtemperature warning will already appear at approximately 5°C below the temperature fault level. Check: – The values of 05.11 Ch1 bridge temperature … 05.14 Ch4 bridge temperature. – The setting of 20.38 Drive fan acknowledge source. – The setting of 20.40 Drive/Motor fan delay time. – The ambient conditions (e.g. ambient temperature). – The airflow and fan operation. – The drive fan supply voltage. – The drive fan direction of rotation. – The drive fan components. – The heatsink fins for dust pick-up. – The drive cooling air inlet (e.g. filters). – The drive cooling air outlet. – For open drive doors. – The motor power against the drive power. – Inadmissible load cycle. – When 95.25 Set: Type code = None, that 95.29 Set: Drive max bridge temperature is set properly. – The AUX code (format XXXYYYZZ). YYY identifies the power unit channel. In case of a hardparallel configuration.	2
4981	Motor temperature 1 measured/ estimated. (Editable message text) See also warning A491.	Measured/Estimated motor temperature 1 has exceeded the fault level. Wait until the motor/motor model is cooled down under the warning level. The fan contactor stays on as long as the fault is pending. It is not possible to reset the fault as long as the motor remains too hot. Check: – The value of 35.02 Measured temperature 1. – The real motor temperature. Let motor cool down and restart. – The value of 35.12 Temperature 1 fault level. – The setting of 35.15 Supervision 1 klixon source, if klixons are used. – The cooling of the motor or other temperature measured equipment.	2

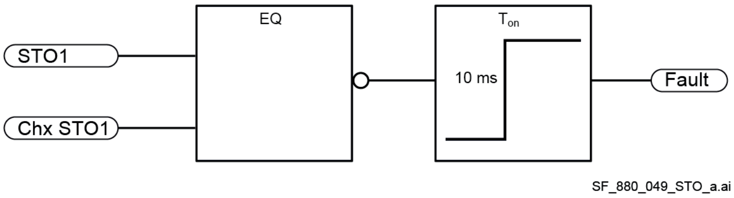
Code	Fault	Cause and what to do	Fault level
		– The ambient conditions (e.g. ambient temperature). – The airflow and fan operation. – The motor fan supply voltage. – The motor fan direction of rotation. – The motor fan components. – The motor cooling air inlet (e.g. filters). – The motor cooling air outlet. – The motor load and drive ratings. – Inadmissible load cycle. – The wiring of the temperature sensor. – The resistance of the temperature sensor by measuring it. Hint: – The measured/estimated motor temperature is blocked, if 35.11 Temperature 1 source = Disable.	
4982	Motor temperature 2 measured/ estimated. (Editable message text) See also warning A492.	Measured/Estimated motor temperature 2 has exceeded the fault level. Wait until the motor/motor model is cooled down under the warning level. The fan contactor stays on as long as the fault is pending. It is not possible to reset the fault as long as the motor remains too hot. Check: – The value of 35.03 Measured temperature 2. – The real motor temperature. Let motor cool down and restart. – The value of 35.22 Temperature 2 fault level. – The setting of 35.25 Supervision 2 klixon source, if klixons are used. – The cooling of the motor or other temperature measured equipment. – The ambient conditions (e.g. ambient temperature). – The airflow and fan operation. – The motor fan supply voltage. – The motor fan direction of rotation. – The motor fan components. – The motor cooling air inlet (e.g. filters). – The motor cooling air outlet. – The motor load and drive ratings. – Inadmissible load cycle. – The wiring of the temperature sensor. – The resistance of the temperature sensor by measuring it. Hint: – The measured/estimated motor temperature is blocked, if 35.21 Temperature 2 source = Disable.	2
4990	FPTC-xx module not found.	A thermistor protection module (FPTC-xx) was activated in 35.30 FPTC configuration word, but it is not detected. Power down the drive/control unit and make sure that the module is properly inserted in the correct slot. The last digit of the AUX code identifies the slot.	4
4991	Motor temperature slot 1 measured.	Depending on the used module, a PTC and/or	2

Code	Fault	Cause and what to do		Fault level
	(Editable message text) See also warning A497.	The thermistor protection module (FEN-xx or FPTC-xx) installed in slot 1 indicates overtemperature.	KTY temperature sensor can be attached. Check: – The cooling of the motor or other temperature measured equipment. – The motor load and drive ratings. – The wiring of the temperature sensor. – The resistance of the temperature sensor by measuring it.	
4992	Motor temperature slot 2 measured. (Editable message text) See also warning A498.	The thermistor protection module (FEN-xx or FPTC-xx) installed in slot 2 indicates overtemperature.		2
4993	Motor temperature slot 3 measured. (Editable message text) See also warning A499.	The thermistor protection module (FEN-xx or FPTC-xx) installed in slot 3 indicates overtemperature.		2
5080	Drive fan acknowledge. Programmable, see 31.41 Drive fan fault function. See also warning A581.	Drive cooling fan feedback at the DI is missing. Check: – The settings of 20.38 Drive fan acknowledge source and 20.40 Drive/Motor fan delay time. – The drive fan operation and connection. – The drive fan contactor. – The drive fan circuit. – The drive fan klixon. – The drive fan components. – The drive fan supply voltage. – The drive fan direction of rotation. – The drive door open. – The drive cooling air inlet (e.g. filter). – The drive cooling air outlet. – H7 an H8 pressure switch (setting should be 2 mbar). – The used digital inputs and outputs (groups 10 and 11).		4

5090	STO hardware fault.	Safe torque off hardware failure. This fault is generated when the SDCS-CON-H01 detects any hardware fault in the safe torque off circuit. Thus, the unit is shut down to safe torque off state.
		See Safety supplement for functional safety converter DCS880 (3ADW000452).
		Check:
		– Contact your local ABB representative quoting the AUX code to repair the converter.
		– The AUX code is in HEX and contains location information, especially with hardparallel power units. When converted into a 32-bit binary number, the bits of the code indicate the following:
		  – Bit 0: Ch1 power unit STO2.
		  – Bit 1: Ch2 power unit STO2.
		  – Bit 2: Ch3 power unit STO2.
		  – Bit 3: Ch4 power unit STO2.
		  Bits of non-existing power units are set to 1.
		  – Bits 4 … 11: N/A.
				6

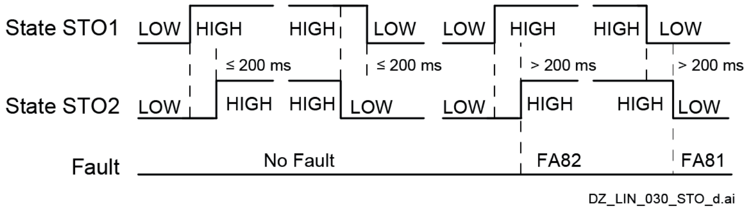
Code	Fault	Cause and what to do	Fault level
		– Bit 12: Ch1 power unit STO1. – Bit 13: Ch2 power unit STO1. – Bit 14: Ch3 power unit STO1. – Bit 15: Ch4 power unit STO1. Bits of non-existing power units are set to 1. – Bits 16 … 23: N/A. – Bit 24: STO2 drive/control unit. – Bit 25: STO1 drive/control unit. – Bit 26: STO Active drive/control unit. – Bit 27: STO Active power units. – Bits 31 … 28: Channel of the faulty power unit (0 …4). – 1111: STO Active of control unit and power units is in conflict.	
5091	Safe torque off. Programmable, see 31.22 STO indication run/stop. See also warning A5A0 and event B5A0.	Safe torque off active, no drive problem. See Safety supplement for functional safety converter DCS880 (3ADW000452). Check: – 31.22 STO indication run/stop. – The safe torque off circuit.	6
5092	STO overall fault.	OR function of faults 5090, 5093, 5095, FA81, FA82. It becomes active when any of the following faults is detected in the safe torque off related circuits: – 5090 STO hardware fault. – 5093 Safe off mains contactor XSMC:STO. – 5095 Power unit STO stuck at. – 5096 Power units STO discrepancy. – 5097 Power units STO hardware fault. – FA81 Safe torque off 1 loss fault. – FA82 Safe torque off 2 loss fault. See Safety supplement for functional safety converter DCS880 (3ADW000452).	6
5093	Safe off mains contactor XSMC:STO. Programmable, see 31.90 XSMC:STO Indication. See also warning A5A3 and event B5A3.	Safe torque off monitor DC current not zero (zero current time out). The DCS880 has the possibility to open the mains contactor using a hardware supervision of the DC current in case of a safe torque off request. This is called fault shutdown path. In case safe torque off is requested and current zero is detected in less than 300 ms the XSMC:STO relay is kept closed. In case safe torque off is requested and current zero is not detected in less than 300 ms the XSMC:STO relay is opened and the fault shutdown path becomes active. See Safety supplement for functional safety converter DCS880 (3ADW000452). **Note:** Reset is only possible by activating 96.27 Control board boot or by cycling the power. Check: – For broken parts (e.g. thyristors) in the unit. – The SDCS-CON-H01.	6

Code	Fault	Cause and what to do	Fault level
		– For high inductive loads.	
5094	Measurement circuit bridge temperature.	Problems with the internal temperature measurement of the bridge. Check: – The wiring of the temperature sensor. – The temperature sensor. – The AUX code (format XXXYYYZZ). YYY identifies the power unit channel. In case of a hardparallel configuration.	4

5095	Power units STO stuck at.	If a discrepancy between the safe torque off signals in the control unit and a power unit is detected the drive is shut down.
		
		Check:
		– For loose fiber optic cable connections and re-plug the cables.
		– For a broken SDCS-DSL-H12 or SDCS-DSL-H14 in the control unit and exchange it. Contact ABB to perform a revalidation test.
		– For a broken SDCS-OPL-H01 in a power unit and exchange it. Contact ABB to perform a revalidation test.
		– The AUX code (format 000000ZZ).
		  – 01: Ch1 power unit STO1.
		  – 02: Ch1 power unit STO2.
		  – 03: Ch1 power unit STO1 Diag.
		  – 04: Ch1 power unit STO2 Diag.
		  – 05: Ch2 power unit STO1.
		  – 06: Ch2 power unit STO2.
		  – 07: Ch2 power unit STO1 Diag.
		  – 08: Ch2 power unit STO2 Diag.
		  – 09: Ch3 power unit STO1.
		  – 10: Ch3 power unit STO2.
		  – 11: Ch3 power unit STO1 Diag.
		  – 12: Ch3 power unit STO2 Diag.
		  – 13: Ch4 power unit STO1.
		  – 14: Ch4 power unit STO2.
		  – 15: Ch4 power unit STO1 Diag.
		  – 16: Ch4 power unit STO2 Diag.
			6

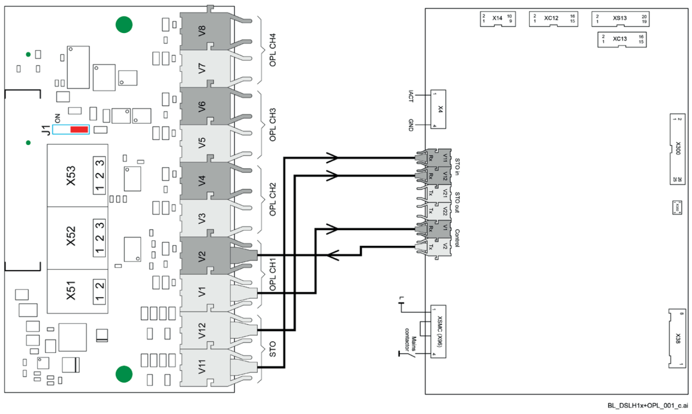
5096	Power units STO discrepancy.	If the state of STO1 and STO2 is different for longer than 200 ms fault 5096 is generated.	6

Code	Fault	Cause and what to do	Fault level

		
		See Safety supplement for functional safety converter DCS880 (3ADW000452).
		Check:
		– Operate the safety relay so that the On/Off timing of STO1 and STO2 are synchronized.
		– If the safety relay contacts are welded. If welded, replace the safety relay.
		– The gap between the On/Off timing of STO1 and STO2. Keep the gap smaller than 201 ms.
		– If the problem persists, contact your local ABB representative to repair the converter.
		– The AUX code (format 000000ZZ).
		    – 01: Ch1 power unit STO1 stuck at low.
		    – 02: Ch1 power unit STO1 stuck at high.
		    – 03: Ch1 power unit STO2 stuck at low.
		    – 04: Ch1 power unit STO2 stuck at high.
		    – 05: Ch2 power unit STO1 stuck at low.
		    – 06: Ch2 power unit STO1 stuck at high.
		    – 07: Ch2 power unit STO2 stuck at low.
		    – 08: Ch2 power unit STO2 stuck at high.
		    – 09: Ch3 power unit STO1 stuck at low.
		    – 10: Ch3 power unit STO1 stuck at high.
		    – 11: Ch3 power unit STO2 stuck at low.
		    – 12: Ch3 power unit STO2 stuck at high.
		    – 13: Ch4 power unit STO1 stuck at low.
		    – 14: Ch4 power unit STO1 stuck at high.
		    – 15: Ch4 power unit STO2 stuck at low.
		    – 16: Ch4 power unit STO2 stuck at high.	

5097	Power units STO hardware fault.	The unit is shut down: – If a discrepancy between the safe torque off signals in the control unit and a power unit is detected. – If a safety-relay does not switch off after the control unit has received a safe torque off request. Check: – For loose fiber optic cable connections and re-plug the cables. – For a broken SDCS-DSL-H12 or SDCS-DSL-H14 in the control unit and exchange it. Contact ABB to perform a revalidation test. – For a broken SDCS-OPL-H01 in a power unit and exchange it. Contact ABB to perform a revalidation test. – The AUX code is in HEX and contains location information. When converted into a 32-bit binary number, the bits of the code indicate the following:	6

Code	Fault	Cause and what to do	Fault level
		– Bit 0: Ch1 power unit STO1. – Bit 1: Ch1 power unit STO2. – Bit 2: Ch1 power unit STO1 Diag. – Bit 3: Ch1 power unit STO2 Diag. – Bit 4: Ch2 power unit STO1. – Bit 5: Ch2 power unit STO2. – Bit 6: Ch2 power unit STO1 Diag. – Bit 7: Ch2 power unit STO2 Diag. – Bit 8: Ch3 power unit STO1. – Bit 9: Ch3 power unit STO2. – Bit 10: Ch3 power unit STO1 Diag. – Bit 11: Ch3 power unit STO2 Diag. – Bit 12: Ch4 power unit STO1. – Bit 13: Ch4 power unit STO2. – Bit 14: Ch4 power unit STO1 Diag. – Bit 15: Ch4 power unit STO2 Diag. – Bit 16: Ch1 power unit safety relay timeout. – Bit 17: Ch2 power unit safety relay timeout. – Bit 18: Ch3 power unit safety relay timeout. – Bit 19: Ch4 power unit safety relay timeout. – Bits 20 … 23: N/A. – Bit 24: STO2 control unit. – Bit 25: STO1 control unit. – Bits 26, 27: N/A. – Bit 28: Ch1 power unit faulty. – Bit 29: Ch2 power unit faulty. – Bit 30: Ch3 power unit faulty. – Bit 31: Ch4 power unit faulty.	
50FE	Type code.	The hardware of the drive/SDCS-CON-H01 does not match the information stored in the memory unit. This may occur e.g. after a firmware update, memory unit replacement or replacement of the SDCS-CON-H01. To reset, cycle the auxiliary power of the drive. Check: – The settings of 95.14 Set: Power unit (if shown and available), 95.25 Set: Type code, 95.27 Set: Drive DC current scaling and 95.28 Set: Drive AC voltage scaling. – The AUX code (format ZZ). ZZ indicates the AUX code category. – 06 = Power unit rating ID invalid. – 07 = Reading power unit rating ID or power unit type failed on power unit connection. – 08 = Power unit not supported (illegal rating ID). – 10 = Type code out of range. For module sizes H1 … H5 the current and voltage range of the type code setting is limited to max 1190 A_{DC} and max 600 V_{AC}. – 20 = Saving of 95.25 Set: Type code failed. – 21 = Saving of 95.14 Set: Power unit failed.	1
5610 … 562F	User defined.	User defined fault by application program.	1
5681	Power unit, communication.	Communication errors between the control unit and a power unit.	1

Code	Fault	Cause and what to do	Fault level
	See also warning A113.	Check: – The connections between the control unit and the power unit.  – The auxiliary power of the SDCS-OPL-H01. – The AUX code (format XXXYYYZZ). XXX specifies the transmitter FIFO error code. – 000: No transmitter FIFO error. – 001: Internal error [invalid call parameter]. – 002: Internal error [configuration not supported]. – 003: Transmission buffer full. YYY identifies the power unit. – 000: Broadcast. – 001: Power unit connected to channel1 on SDCS-DSL-H1x. – 002: Power unit connected to channel2 on SDCS-DSL-H1x. – 003: Power unit connected to channel3 on SDCS-DSL-H1x. – 004: Power unit connected to channel4 on SDCS-DSL-H1x. ZZ specifies the error source. – 01: Transmitter side [link error] from power unit to control unit. – 02: Transmitter side [no communication] from power unit to control unit. – 03: Receiver side [link error] from control unit to power unit. – 04: Receiver side [no communication] from control unit to power unit. – 05: Transmitter FIFO error, see XXX. – 06: SDCS-OPL-H01 not found.	
5692	Power unit, power board failure.	Power unit, SDCS-POW-H01 failure. Check the AUX code (format XXXYYYZZ). YYY identifies the power unit channel. In case of a hardparallel configuration.	1
6000	Internal firmware.	Internal firmware error. To reset, cycle the auxiliary power of the drive. If the problem persists, contact your local ABB representative, quoting the AUX code. Check the AUX code (format YYYY).	1

Code	Fault	Cause and what to do	Fault level
		YYYY indicates the problem. Actions see below.	
	0001	Default setting of parameters wrong.	
	0002	Parameter flash memory image too small for all parameters.	
	0004	Illegal write attempt on a signal or write-protected parameter, e.g. writing on 06.01 Main control word or 06.09 Used main control word.	
	0006	Wrong type code.	
	0007	An un-initialized interrupt has occurred.	
	0010	Wrong parameter value.	
	0101 … 9999	The read only parameter, which is being written to by means of a pointer parameter, e.g. 62.51 Data set 10 data 1 selection, Adaptive Program or application program, can be identified by means of the last 4 digits.	
6306	FBA A mapping file.	Fieldbus adapter A mapping file read error. Contact your local ABB representative.	5
6307	FBA B mapping file.	Fieldbus adapter B mapping file read error. Contact your local ABB representative.	5
6481	Internal task overload.	Internal fault. Cycle the power of the drive or use 96.27 Control board boot. If the problem persists, contact your local ABB representative stating the AUX code.	1
6487	Internal stack overflow.	Internal fault. Cycle the power of the drive or use 96.27 Control board boot. If the problem persists, contact your local ABB representative stating the AUX code.	1
64A1	Internal file load.	File read error. Cycle the power of the drive or use 96.27 Control board boot. Check: – The memory unit. – Re-load the firmware. – Exchange the memory unit. – Exchange the SDCS-CON-H01. If the problem persists, contact your local ABB representative.	1
64A2	Internal record load.	Internal record load error. Contact your local ABB representative.	1
64A3	Application loading.	Application file incompatible or corrupted. Check the AUX code. Actions see below.	1
	8006	Not enough memory for the application.	
	8007	The application contains the wrong library version.	
	800A	The application contains an unknown target (system) library function.	
	800B … XXXX	The application load failed. For more details, check 05.22 Diagnostic.	
64A5	Licensing.	Running the control program is prevented either because a restrictive license exists, or because a required license is missing. Record the AUX codes of all active licensing faults and contact your product vendor for further instructions.	1

Code	Fault	Cause and what to do	Fault level
64A6	Adaptive program.	Error running the adaptive program. Check the AUX code (format XXXXYYYY). XXXX specifies the number of the function block. XXXX = 0000 is a generic error. YYYY indicates the problem. Actions see below.	1
	000A	Program corrupted or block non-existent. Restore the template program or download the program to the drive.	
	000C	Required block input missing. Check the inputs of the block.	
	000E	Program corrupted or block non-existent. Restore the template program or download the program to the drive.	
	0011	Program too large. Remove blocks until the error stops.	
	0012	Program is empty. Correct the program and download it to the drive.	
	001C	A nonexistent parameter or block is used in the program. Edit the program to correct the parameter reference, or to use an existing block.	
	001D	Parameter type invalid for selected input. Edit the program to correct the parameter reference.	
	001E	Output to parameter failed because the parameter was write-protected. Check: – The parameter reference in the program. – For other sources affecting the target parameter.	
	0023	Program file incompatible with current firmware version. Adapt the program to current block library and firmware version.	
	0024		
	002A	Too many blocks. Edit the program to reduce the number of blocks.	
	Other	Contact your local ABB representative, quoting the AUX code.	
64B0	Memory unit detached.	The memory unit was detached while the drive/control unit is powered. Switch off the power of the drive/control unit and reinstall the memory unit. In case the memory unit was not actually removed when the fault occurred, check that the memory unit is properly inserted into its connector and its mounting screw is tight. Then cycle the power of the drive or use 96.27 Control board boot. If the problem persists, contact your local ABB representative.	1
64B1	Internal firmware.	Internal firmware fault. Cycle the power of the drive or use 96.27 Control board boot. If the problem persists, contact your local ABB representative.	1
64B2	User set fault.	Loading of user parameter set failed. Ensure that a valid user parameter set exists. Reload if uncertain.	1

Code	Fault	Cause and what to do	Fault level
		Check: – That the requested set does exists. See 96.14 Macro select. – That the set is compatible with the control program. – If the drive was switched off during loading. – The memory unit.	
64E1	Kernel overload.	Operating system error. Cycle the power of the drive or use 96.27 Control board boot. If the problem persists, contact your local ABB representative.	1
6581	Parameter system.	Parameter load or save failed. Try forcing a save using 96.16 Parameter save manually.	3
65A1	FBA A parameter conflict. See also warning A6D1.	Fieldbus adapter A (FBA A): The drive does not have a functionality requested by a PLC or a requested functionality has not been activated. The settings of parameter groups 50 Fieldbus adapter (FBA) and 51 FBA A settings are not set according to the fieldbus adapter or the device has not been selected. Check: – The PLC programming. – The settings of parameter groups 50 Fieldbus adapter (FBA) and 51 FBA A settings. – The configuration of the fieldbus adapter.	5
65A2	FBA B parameter conflict. See also warning A6D2.	Fieldbus adapter B (FBA B): The drive does not have a functionality requested by a PLC or a requested functionality has not been activated. The settings of parameter groups 50 Fieldbus adapter (FBA) and 54 FBA B settings are not set according to the fieldbus adapter or the device has not been selected. Check: – The PLC programming. – The settings of parameter groups 50 Fieldbus adapter (FBA) and 54 FBA B settings. – The configuration of the fieldbus adapter.	5
65B1	Reference source parametrization. See also warning A6DA	A reference source is simultaneously connected to multiple parameters with different units. Check: – The reference source selection parameters. – The AUX code (format YYZZ). YY specifies the parameter group. ZZ specifies the parameter number.	3
6681	EFB communication. Programmable, see 58.14 Communication loss action. See also warning A7CE.	Cyclical communication to the embedded fieldbus (EFB) is lost. Fault 6681 EFB communication is only activated after the first data set from the overriding control is received by the drive. Before the first data set is received, only warning A7CE EFB communication is active. The reason is to suppress unnecessary faults (the startup of the overriding control is usually slower than the one of the drive). Check: – The status of the fieldbus master (online, offline, error etc.). – The settings of group 58 FBA Embedded fieldbus.	5

Code	Fault	Cause and what to do	Fault level
		– The cable connections to connector XD2D on the control board. – The fieldbus termination.	
6682	EFB configuration file.	Embedded fieldbus (EFB) configuration file could not be read. Reload firmware or replace the unit.	5
6683	EFB invalid parameterization.	Embedded fieldbus (EFB) parameter settings are inconsistent or not compatible with the selected protocol. Check the settings of group 58 Embedded fieldbus and verify they are consistent with the configured protocol.	5
6684	EFB load fault.	Embedded fieldbus (EFB) protocol firmware could not be loaded. Version mismatch between embedded fieldbus (EFB) protocol firmware and drive firmware. Reload firmware or replace the unit.	5
6881	Text data overflow.	Internal fault. Reset the fault. Contact your local ABB representative if the fault persists.	5
6882	Text 32-bit table overflow.		5
6883	Text 64-bit table overflow.		5
6885	Text file overflow.		5
7081	Control panel/PC tool link communication. Programmable, see 49.05 Communication loss action. See also warning A7EE.	This fault occurs only when the drive is controlled from the control panel/PC tool (local mode). The control panel/PC tool connected via USB or the PC tool connected via FENA-11/21 has stopped communicating. Check: – The setting of 49.04 Communication loss time. If needed extend the time out to 2000 ms. Do not forget to verify the setting by means of 49.06 Refresh settings Refresh. – The setting of 49.05 Communication loss action. If changed, do not forget to verify the setting by means of 49.06 Refresh settings Refresh. – The control panel/PC tool connection/cable. – The control panel connector. – The mounting platform if being used (e.g. DPMP-01). – Disconnect and reconnect the control panel/PC tool.	5
7082	I/O extension configuration. Programmable, see 70.07 DCSLink comm loss function. See also warning A7AB.	The I/O extension module/DCSLink board (SDCS-DSL-H1x) types and location specified by parameters do not match the detected configuration or do not communicate with the drive. Check: – The type and location settings of the modules/board. See parameters 14.01, 14.02, 15.01, 15.02, 16.01, 16.02, 70.01, 70.02, 70.05, 70.07 and 95.16. – That the module/board is properly seated in its slot. – That the module/board and the slot connector is not damaged. – Try installing the module into another slot.	1

Code	Fault	Cause and what to do	Fault level
		– The AUX code (format XXYYYYYY). XX specifies the number of the I/O extension module/board. – 01: Group 14 I/O extension module 1. – 02: Group 15 I/O extension module 2. – 03: Group 16 I/O extension module 3. – 04: Group 70 DCSLink Communication or group 95 HW configuration. YYYYYY indicates the problem. Actions see below.	
	00 0001	Communication with module/board failed.	
	00 0002	Module/Board not found.	
	00 0003	Configuration of module/board failed.	
	00 0004		
7083	Control panel reference conflict.	Use of saved control panel reference in multiple control modes attempted. The control panel reference can only be saved for one reference type at a time. Consider the possibility of using a copied reference instead of saved reference (see the reference selection parameter).	3
7084	Control panel/PC tool version conflict.	The current version of the control panel/PC tool does not support a function. E.g. older control panel versions cannot be used as a source of external references. Update the control panel/PC tool. Contact your local ABB representative if necessary.	4
7085	Incompatible option module.	Option module not supported. E.g. type Fxxx-xx-M fieldbus adapters are not supported. Replace the module with a supported type. Check the AUX code. It specifies the interface to which the unsupported module is connected: – 1: Fieldbus interface A. – 2: Fieldbus interface B.	4
7121	Motor stall. Programmable, see 31.24 Stall function. See also warning A780.	Selected motor, the motor is operating in the stall region because of excessive load or insufficient motor power. The motor torque exceeded 31.25 Stall torque level for a time longer than 31.28 Stall time while the speed feedback was below 31.26 Stall speed level. Check: – The motor load/mechanics (e.g. brake). – The drive ratings. – For correct field current. – The settings of 31.24 Stall function, 31.25 Stall torque level, 31.26 Stall speed level and 31.28 Stall time. – The settings for current and torque limits in group 30 Control limits.	4
71A2	Mechanical brake closing failed. Programmable, see 44.17 M1 brake fault function. See also warning A7A1.	Selected motor, the acknowledge signal at the DI for the mechanical brake closed (applied) stage is missing. Check: – The mechanical brake itself. – The mechanical brake cable connections. – The mechanical brake settings in group 44 Mechanical brake control.	3

Code	Fault	Cause and what to do	Fault level
		– That the acknowledgement signal, if used, matches actual status of brake. – The used digital inputs and outputs (groups 10 and 11).	
71A3	Mechanical brake opening failed. Programmable, see 44.17 M1 brake fault function. See also warning A7A2.	Selected motor, the acknowledge signal at the DI for the mechanical brake opened (lifted) stage is missing. Check: – The mechanical brake itself. – The mechanical brake cable connections. – The mechanical brake settings in group 44 Mechanical brake control. – That the acknowledgement signal, if used, matches actual status of brake. – The used digital inputs and outputs (groups 10 and 11).	3
71A5	Mechanical brake opening not allowed. Programmable, see 44.17 M1 brake fault function. See also warning A7A5.	Selected motor, open (lift) conditions of the mechanical brake are not fulfilled. The brake has been prevented from opening (lifting) by 44.11 M1 keep brake closed, 44.12 M1 Brake close request or torque actual does not reach 44.26 M1 Torque proving reference, during torque proving. Check: – The mechanical brake settings in group 44 Mechanical brake control. Especially 44.11 M1 keep brake closed and 44.12 M1 Brake close request. – That the acknowledgement signal, if used, matches the actual status of the brake. – The used digital inputs and outputs (groups 10 and 11).	3
71B1	Motor fan acknowledge. Programmable, see 20.39 Motor fan acknowledge source. See also warning A781.	Motor/External cooling fan feedback at the DI is missing. Check: – The setting of 20.39 Motor fan acknowledge source. – The fan operation and connection. Replace the motor/external fan if faulty. – The fan contactor. – The fan supply voltage.	4
7301	Motor speed feedback. Programmable, see 31.35 Motor feedback fault. See also warning A7B0.	Selected motor, no motor speed feedback is received. Check the AUX code (format XXYYZZZZ). XX specifies the location of the speed feedback device. Either an encoder interface module or the control board. – 01: Encoder interface module 1, see parameters 91.11 and 91.12. – 02: Encoder interface module 2, see parameters 91.13 and 91.14. – 03: Control board, see group 94 OnBoard speed feedback configuration. YY specifies the speed feedback device. – 01: Encoder 1, see group 92 Encoder 1 configuration. – 02: Encoder 2, see group 93 Encoder 2 configuration. – 03: OnBoard encoder, see group 94 OnBoard speed feedback configuration. – 04: Tacho, see group 94 OnBoard speed feedback configuration. ZZZZ indicates the problem. Actions see below.	3

Code	Fault	Cause and what to do	Fault level
	0002	Speed feedback device not configured. Check the settings of the speed feedback device: – Encoder 1, see group 92 Encoder 1 configuration. – Encoder 2, see group 93 Encoder 2 configuration. – The OnBoard encoder, see group 94 OnBoard speed feedback configuration. – The tacho, see group 94 OnBoard speed feedback configuration. Use 91.10 Encoder parameter refresh to validate any changes in the settings for an encoder.	
	0003	Speed feedback device stopped working. Check the status of the speed feedback device.	
	0004	Speed feedback device drift detected. Check for slippage between speed feedback device and motor.	
	0007	The comparison of measured speed feedback from pulse encoder or analog tacho to measured EMF has failed. Check: – The setting of 90.41 M1 feedback selection, 31.14 Fault stop mode fault level 3, 31.35 Motor feedback fault, 31.36 Speed feedback monitor level and 31.37 EMF feedback monitor level. – At the encoder: The encoder itself, alignment, cabling, coupling, power supply (feedback might be too low), mechanical disturbances, jumper J4 on the SDCS-CON-H01. – If an encoder is used as speed feedback device, run the drive in EMF speed feedback, 90.41 M1 feedback selection = EMF, look at 94.16 OnBoard encoder position and use a scope to measure the encoder pulses. – At the tacho: The tacho itself, tacho polarity and voltage, alignment, cabling, coupling, mechanical disturbances. – EMF: The armature cable connection form the drive to the motor and their polarity.	
7310	Overspeed.	Selected motor, the motor is turning faster than highest allowed speed due to incorrectly set minimum/maximum speed, insufficient braking torque or changes in load when in torque control. Check: – Record 23.03 Speed reference 7 and 90.01 Motor speed for control. – The settings of 30.11 M1 minimum speed, 30.12 M1 maximum speed and 31.30 M1 overspeed trip margin. – The settings of the speed controller in group 25 Speed control. – The setting of 46.02 M1 speed scaling actual. – The torque control settings. – For correct speed feedback when using an encoder or a tacho. Thus, compare the value of 90.01 Motor speed for control vs. the measured motor speed (handheld tacho).	3

<table>
<tr><th>Code</th><th>Fault</th><th colspan="2">Cause and what to do</th><th>Fault level</th></tr>
<tr><td></td><td></td><td colspan="2">– For proper connection of the speed feedback measurement.
– For correct field current.
– If the motor was accelerated by the load.
– If the DC-voltage measurement (C1, D1) might be swapped when EMF speed feedback is used.
– The DC voltage measurement is properly connected to the motor.
– If the armature circuit is open (e.g. DC-fuses, DC-breaker, …) when EMF speed feedback is used.</td><td></td></tr>
<tr><td>7380</td><td>Encoder internal.</td><td colspan="2">Internal encoder fault.
See the documentation of the encoder.
Contact your local ABB representative.</td><td>3</td></tr>
<tr><td rowspan="8">7381</td><td>Speed feedback device.
Programmable, see 31.35 Motor feedback fault.
See also warning A7E1.</td><td colspan="2">Speed feedback device error.
Check the AUX code (format XXYYZZZZ).
XX specifies the location of the speed feedback device. Either an encoder interface module or the control board.
– 01: Encoder interface module 1, see parameters 91.11 and 91.12.
– 02: Encoder interface module 2, see parameters 91.13 and 91.14.
– 03: Control board, see group 94 OnBoard speed feedback configuration.
YY specifies the speed feedback device.
– 01: Encoder 1, see group 92 Encoder 1 configuration.
– 02: Encoder 2, see group 93 Encoder 2 configuration.
– 03: OnBoard encoder, see group 94 OnBoard speed feedback configuration.
– 04: Tacho, see group 94 OnBoard speed feedback configuration.
– 05: EMF, see group 94 OnBoard speed feedback configuration.
ZZZZ indicates the problem. Actions see below.</td><td rowspan="8">3</td></tr>
<tr><td>0001</td><td colspan="2">Cable fault.
If the encoder was working previously, check the encoder, encoder cable and encoder interface module for damage.
Check:
– The conductor order at both ends of the encoder cable.
– The groundings of the encoder cable.
– 92.21 Encoder cable fault mode.
– 94.29 OnBoard encoder cable fault mode.</td></tr>
<tr><td>0002</td><td colspan="2">No encoder signal.
Check the condition of the encoder.</td></tr>
<tr><td>0003</td><td>Overspeed.</td><td rowspan="5">Contact your local ABB representative.</td></tr>
<tr><td>0004</td><td>Overfrequency.</td></tr>
<tr><td>0005</td><td>Resolver ID run failed.</td></tr>
<tr><td>0006</td><td>Resolver overcurrent fault.</td></tr>
<tr><td>0008</td><td>Absolute encoder communication error.</td></tr>
<tr><td></td><td>0009</td><td>Absolute encoder initialization error.</td><td></td><td></td></tr>
</table>

Code	Fault	Cause and what to do		Fault level
	000A	Absolute SSI encoder configuration error.		
	000B	Encoder reported an internal error.	See the documentation of the encoder.	
	000C	Encoder reported a battery error.		
	000D	Encoder reported overspeed or decreased resolution due to overspeed.		
	000E	Encoder reported a position counter error.		
	000F	Encoder reported an internal error.		
	0012	Selected motor, wrong direction of speed feedback. The speed feedback direction of tacho and encoders is checked against the speed feedback direction of the EMF. See 90.41 M1 feedback selection. Check: – The real direction of motor rotation. – The settings of 31.36 Speed feedback monitor level and 31.37 EMF feedback monitor level. – The connection of the tacho cable. To correct, swap the two wires. – The connection of the encoder cable. To correct, swap e.g. channels A and A-. – The connection of armature and field cables.		
	0013	Selected motor, tacho range. If Tacho range comes up for longer than 10 s, there is an overflow at the tacho input. Check: – That the tacho voltage at overspeed fits to the tacho input. It should not be higher than 270 V.		
73A0	Speed feedback configuration. Programmable, see 31.35 Motor feedback fault. See also warning A797.	The speed feedback configuration via encoder interface modules has changed. Check the AUX code (format XXYYZZZZ). XX specifies the encoder interface module. – 01: For module 1 see parameters 91.11 and 91.12. – 02: For module 2 see parameters 91.13 and 91.14. YY specifies the encoder. – 01: Group 92 Encoder 1 configuration. – 02: Group 93 Encoder 2 configuration. ZZZZ indicates the problem. Actions see below.		3
	0001	Adapter not found in specified slot. Check module location. See parameters 91.12 and 91.14.		
	0002	Detected type of interface module does not match parameter setting. Check the module type parameters 91.11 and 91.13 against status parameters 91.02 and 91.03.		
	0003	Logic version too old. Contact your local ABB representative.		
	0004	Firmware version too old. Contact your local ABB representative.		
	0006	Encoder type incompatible with interface module type. Check module type parameters 91.11 and 91.13 against encoder type parameters 92.01 and 93.01.		

Code	Fault	Cause and what to do	Fault level
	0007	Adapter not configured. Check module location parameters 91.12 and 91.14.	
	0008	Speed feedback configuration has changed. Use 91.10 Encoder parameter refresh to validate any changes in the settings.	
	0009	No encoders configured in the encoder module. Configure the encoder in group 92 Encoder 1 configuration or 93 Encoder 2 configuration.	
	000A	Non-existing emulation input. Check input selection parameters 91.31 and 91.41.	
	000B	Echo not supported by the selected input. E.g. resolver or absolute encoder. Check: – The input selection parameters 91.31 and 91.41. – The interface module type against the encoder type.	
	000C	Emulation in continuous mode not supported. Check: – The input selection parameters 91.31 and 91.41. – The serial link mode parameters 92.30 and 93.30.	
73A1	Load speed feedback. Programmable, see 31.38 Load feedback fault. See also warning A7B1.	Selected motor, no load speed feedback is received. Check the AUX code (format XXYYZZZZ). XX specifies the location of the speed feedback device. Either an encoder interface module or the control board. – 01: Encoder interface module 1, see parameters 91.11 and 91.12. – 02: Encoder interface module 2, see parameters 91.13 and 91.14. – 03: Control board, see group 94 OnBoard speed feedback configuration. YY specifies the speed feedback device. – 01: Encoder 1, see group 92 Encoder 1 configuration. – 02: Encoder 2, see group 93 Encoder 2 configuration. – 03: OnBoard encoder, see group 94 OnBoard speed feedback configuration. – 04: Tacho, see group 94 OnBoard speed feedback configuration. ZZZZ indicates the problem. Actions see below.	3
	0004	Speed feedback device not configured. Check the settings of the speed feedback device: – Encoder 1, see group 92 Encoder 1 configuration. – Encoder 2, see group 93 Encoder 2 configuration. – The OnBoard encoder, see group 94 OnBoard speed feedback configuration. – The tacho, see group 94 OnBoard speed feedback configuration. Use 91.10 Encoder parameter refresh to validate any changes in the settings for an encoder.	
	0005	Speed feedback device stopped working. Check the status of the speed feedback device.	
	0007	The comparison of the measured speed feedback from pulse encoder or analog tacho to measured EMF has failed. Check:	

Code	Fault	Cause and what to do	Fault level
		– The setting of 90.41 M1 feedback selection, 31.14 Fault stop mode fault level 3, 31.35 Motor feedback fault, 31.36 Speed feedback monitor level and 31.37 EMF feedback monitor level. – At the encoder: The encoder itself, alignment, cabling, coupling, power supply (feedback might be too low), mechanical disturbances, jumper J4 on the SDCS-CON-H01. – At the tacho: The tacho itself, tacho polarity and voltage, alignment, cabling, coupling, mechanical disturbances. – EMF: The armature cable connection form the drive to the motor and the polarity.	
73B0	Emergency ramp stop.	Emergency stop did not finish within the expected time. Check: – The settings of 31.31 Emergency ramp supervision and 31.32 Emergency ramp supervision delay. – The settings of parameters 23.11 … 23.19 for Off3 stop mode 1 (21.03 Emergency stop mode = Ramp stop). – The setting of 23.23 Emergency stop time for Off3 stop mode 2 (21.03 Emergency stop mode = Emergency ramp stop). – The current and torque limits in group 30 Control limits.	3
73B1	Normal ramp stop.	Normal (non-emergency) ramp stop did not finish within the expected time. Check: – The settings of 31.33 Ramp stop supervision and 31.34 Ramp stop supervision delay. – The settings of parameters 23.11 … 23.19.	3
7510	FBA A communication. Programmable, see 50.02 FBA A comm loss func. See also warning A7C1.	Fieldbus adapter A (FBA A): Cyclical communication between PLC and fieldbus adapter module A or between drive and fieldbus adapter module A is lost. Fault 7510 FBA A communication is only activated after the first data set from the overriding control is received by the drive. Before the first data set is received, only warning A7C1 FBA A communication is active. The reason is to suppress unnecessary faults (the startup of the overriding control is usually slower than the one of the drive). Check: – The status of the fieldbus communication. See user documentation of the fieldbus interface. – The settings of groups 50 Fieldbus adapter (FBA), 51 FBA A settings, 52 FBA A data in and 53 FBA A data out. – The cable connections. – The fieldbus termination. – The fieldbus adapter. – That the master can communicate.	5
7520	FBA B communication.		5

Code	Fault	Cause and what to do	Fault level
	Programmable, see 50.32 FBA B comm loss func. See also warning A7C2.	Fieldbus adapter B (FBA B): Cyclical communication between PLC and fieldbus adapter module B or between drive and fieldbus adapter module B is lost. Fault 7520 FBA B communication is only activated after the first data set from the overriding control is received by the drive. Before the first data set is received, only warning A7C2 FBA B communication is active. The reason is to suppress unnecessary faults (the startup of the overriding control is usually slower than the one of the drive). Check: – The status of the fieldbus communication. See user documentation of the fieldbus interface. – The settings of group 50 Fieldbus adapter (FBA), 54 FBA B settings, 55 FBA B data in and 56 FBA B data out. – The cable connections. – The fieldbus termination. – The fieldbus adapter. – That the master can communicate.	
7581	DDCS controller communication. Programmable, see 60.59 DDCS controller comm loss function. See also warning A7CA.	Cyclical communication between DDCS controller and drive is lost or there is no communication at all. The drive is waiting for the very first data set. Check: – The status/settings of the DDCS controller. See user documentation of the DDCS controller. – The adapters between DDCS controller and drive. – The setting of 20.01 Command location. – The settings of group 60 DDCS communication, 61 D2D and DDCS transmit data and 62 D2D and DDCS receive data. – The fiber optic cable connections.	5
7582	Master-follower link communication. Programmable, see 60.09 M/F comm loss function. See also warning A7CB.	Cyclical communication between master and a follower (DDCS/D2D) is lost or there is no communication at all. The drive is waiting for the very first data set. Check: – The AUX code. It indicates which node address on the master-follower link is affected. See 60.02 M/F node address in each drive. – The setting of 60.14 M/F follower selection. – The setting of 20.01 Command location. – The settings of group 60 DDCS communication. – The cable connections.	5
7A9A	FSx undefined fault.	See FSPS-21 PROFIsafe safety functions module (AXD50000158638).	-
7A9B	FSx internal fault.		
7A9C	FSx STO diagnostics fault.		
7A9D	FSx temperature fault.		
7A9F	FSx communication fault.		
7AA0	FSx safety ramp fault.		
8001	ULC underload.		1 (default)

Code	Fault	Cause and what to do	Fault level
	Programmable, see 37.04 ULC underload actions. See also warning A8BF.	Selected signal has fallen below the user underload curve. See group 37 User load curve. Check for any operating conditions decreasing the monitored signal. E.g., the loss of load if the torque or current is being monitored. Check the definition of the load curve.	1 … 6 user selectable
8002	ULC overload. Programmable, see 37.03 ULC overload actions. See also warning A8BE.	Selected signal has exceeded the user overload curve. See group 37 User load curve. Check: – For any operating conditions increasing the monitored signal. E.g., the load of the motor if the torque or current is being monitored. – The definition of the load curve.	1 (default) 1 … 6 user selectable
80A0	AI supervision. Programmable, see 12.03 AI supervision function. See also warning A8A0.	An analog signal is outside the limits specified for the analog input. Check: – The AUX code (format XYY). X specifies the location of the input. – 0: Control board. – 1: I/O extension module 1. – 2: I/O extension module 2 – 3: I/O extension module 3. – 4: …. YY specifies the input and limit. – 01: AI1 under minimum. – 02: AI1 over maximum. – 03: AI2 under minimum. – 04: AI2 over maximum. – 05: AI3 under minimum. – 06: AI3 over maximum. – The signal level at the analog input. – The wiring connected to the input. – Polarity of the connection. – The minimum and maximum limits of the input in groups 12 Standard AI, 14 I/O extension module 1, 15 I/O extension module 2 and 16 I/O extension module 3.	4
80B0	Signal supervision 1. (Editable message text) Programmable, see 32.06 Supervision 1 action. See also warning A8B0.	Fault generated by signal supervision 1. See group 32 Supervision. Check the source of the warning. See 32.07 Supervision 1 signal.	1 (default) 1 … 6 user selectable
80B1	Signal supervision 2. (Editable message text) Programmable, see 32.16 Supervision 2 action. See also warning A8B1.	Fault generated by signal supervision 2. See group 32 Supervision. Check the source of the warning. See 32.17 Supervision 2 signal.	1 (default) 1 … 6 user selectable
80B2	Signal supervision 3.		1 (default)

Code	Fault	Cause and what to do	Fault level
	(Editable message text) Programmable, see 32.26 Supervision 3 action. See also warning A8B2.	Fault generated by signal supervision 3. See group 32 Supervision. Check the source of the warning. See 32.27 Supervision 3 signal.	1 … 6 user selectable
9081	External fault 1. (Editable message text) Programmable, see 31.01 External event 1 source and 31.02 External event 1 type. See also warning A981.	There is no problem with the drive itself! Fault generated by external device 1. See group 31 Fault functions and fault levels. Check: – External device 1. – 31.01 External event 1 source.	1 (default) 1 … 6 user selectable
9082	External fault 2. (Editable message text) Programmable, see 31.03 External event 2 source and 31.04 External event 2 type. See also warning A982.	There is no problem with the drive itself! Fault generated by external device 2. See group 31 Fault functions and fault levels. Check: – External device 2. – 31.03 External event 2 source.	1 (default) 1 … 6 user selectable
9083	External fault 3. (Editable message text) Programmable, see 31.05 External event 3 source and 31.06 External event 3 type. See also warning A983.	There is no problem with the drive itself! Fault generated by external device 3. See group 31 Fault functions and fault levels. Check: – External device 3. – 31.05 External event 3 source.	1 (default) 1 … 6 user selectable
9084	External fault 4. (Editable message text) Programmable, see 31.07 External event 4 source and 31.08 External event 4 type. See also warning A984.	There is no problem with the drive itself! Fault generated by external device 4. See group 31 Fault functions and fault levels. Check: – External device 4. – 31.07 External event 4 source.	1 (default) 1 … 6 user selectable
9085	External fault 5. (Editable message text) Programmable, see 31.09 External event 5 source and 31.10	There is no problem with the drive itself! Fault generated by external device 5. See group 31 Fault functions and fault levels. Check: – External device 5. – 31.09 External event 5 source.	1 (default) 1 … 6 user selectable

Code	Fault	Cause and what to do	Fault level
	External event 5 type. See also warning A985.		
F501	Auxiliary undervoltage.	Too low auxiliary voltage, e.g. short dip, while Ready run = 1. To reset, cycle the auxiliary power of the drive. Check: – The auxiliary voltage itself. – The internal auxiliary voltages on the SDCS-CON-H01. – If the problem persists, change SDCS-CON-H01 and/or SDCS-PIN-H01 or SDCS-POW-H01 respectively. Auxiliary supply voltage: 230/115 V_{AC} – Trip level: < 96 V_{AC}	1
F503	Armature overvoltage.	Too high voltage on the armature/DC side. Check: – If the setting of 31.50 Overvoltage level is suitable for the system. – The settings of the field current controller, EMF controller, flux linearization in group 28 EMF and field current control. E.g. field weakening is not activated. – For too high field current (e.g. problems with field weakening). – If the motor was accelerated by the load. – For overspeed. – For proper speed scaling. See 46.02 M1 speed scaling actual. – For proper armature voltage feedback. – The cutting of the voltage coding resistors on the SDCS-PIN-H51.	1
F504	Reversal volt function. Programmable, see 31.60 Reversal volt function. See 06.25.b03 Current controller status word 2 and warning A104.	Reversal volt function active. The armature voltage is too high compared to the mains voltage, before braking (switching from motoring to generating). Check: – If the setting of 31.61 Reversal volt delay is suitable for the system. – For too low mains voltage. See 99.01 Mains voltage. – Too high motor voltage. Lower 99.12 M1 nominal voltage and 99.14 M1 nominal (base) speed accordingly. – If the motor is accelerating during reversal e.g. hanging load. – The settings of the field current controller, EMF controller, flux linearization in group 28 EMF and field current control. E.g. field weakening is not activated. – For too high field current (e.g. problems with field weakening). – For overspeed. – For proper speed scaling. See 46.02 M1 speed scaling actual. – For proper armature voltage feedback.	1

Code	Fault	Cause and what to do	Fault level
F513	Mains overvoltage.	Too high voltage on the mains/AC side. The actual mains voltage is > 1.3 * 99.10 Nominal mains voltage for longer than 10 s while Ready run = 1. Check: – If the mains voltage is within the set tolerance. – If the mains voltage scaling is correct. See 99.10 Nominal mains voltage. – The cutting of the voltage coding resistors on the SDCS-PIN-H51.	1

F514	Mains synchronization lost.	The synchronization with the mains has been lost.
		Check:
		– That 99.01 Mains voltage has the proper value after an On command has been given.
		– The mains frequency (50 Hz ±5 Hz; 60 Hz ±5 Hz) and stability (df/dt = 17 %/s) see 95.39 PLL input deviation and 95.40 PLL output, internal mains frequency.
		– The condition of the mains (voltage, cabling, fuses, switchgear).
		– That all 3 phases are present directly at the drive.
		   – H1 … H5: measure the fuses F100 … F102 on the SDCS-PIN-H01.
		   – H6 … H8: check and measure the connections XU1/XU2, XV1/XV2 and XW1/XW2 on the SDCS-PIN-H51.
		– For mains supply imbalance.
		– For loose mains cable connections.
		– That the mains contactor closes and opens.
		– For a ground fault.
		– The AUX code:
		   – 1: No synchronization signal.
		   – 2: Phase sequence lost.
		   – 3: Deviation level of PLL exceeded. See 95.44 PLL deviation level.
			3

F515	M1 field exciter overcurrent.	Motor 1 field exciter overcurrent. Check: – Record 28.14 M1 field current reference and 28.15 M1 field current. – In case this fault happens during field exciter autotuning, deactivate the supervision by setting 31.59 M1 field overcurrent level = 325 %. – The setting of 31.59 M1 field overcurrent level. – The settings of the field current controller in group 28 EMF and field current control. – The connections of the field exciter. – The insulation of cables and field winding. – The resistance of the field winding. – For fault messages at the field exciter itself (flashing LEDs). See 04.26 M1 field exciter fault word and 04.36 M1 field exciter warning word.	1
F516	M1 field exciter communication.	Motor 1 field exciter loss of communication. Check:	1

Code	Fault	Cause and what to do	Fault level

		– The settings of 99.07 M1 used field exciter type and 70.12 Field exciter timeout.
		– The auxiliary voltage for integrated and external field exciter.
		– The DCSLink cable connections.
		– The DCSLink termination. Set dipswitch S1100:1 = ON (DCF803-0016, DCF803-0035 and FEX-425-Int).
		– The DCSLink node ID settings. See 70.05 DCSLink node ID and 70.13 M1 field exciter node ID or switches S800 and S801 on DCF803-0016, DCF803-0035 and FEX-425-Int respectively.
		– For fault messages at the field exciter itself (flashing LEDs), 04.26 M1 field exciter fault word and 04.36 M1 field exciter warning word.
		– The AUX code:
		    – 2: Communication timeout in the armature converter.
		    – 3: Communication timeout in a field exciter.
		    – 4: Commination timeout in a field exciter running as multi FEX.	

F517	Armature current ripple. See also warning A117.	One or several thyristors may carry no current. Check: – The values of 01.50 Current ripple and 01.51 Current ripple filtered1. – The setting of 31.46 Current ripple function and 31.47 Current ripple level. – For too high gain of current controller. See 27.29 M1 current proportional gain. – The positive/negative current feedback with an oscilloscope (6 pulses within one cycle visible?). – The thyristor gate-cathode resistance. – The thyristor gate connection. – The current transformers (T51, T52). – The condition of the mains (voltage, cabling, fuses, switchgear).	3
F518	M2 field exciter overcurrent.	Motor 2 field exciter overcurrent. Check: – Record 42.45 M2 field current reference and 42.46 M2 field current. – In case this fault happens during field exciter autotuning, deactivate the supervision by setting 42.63 M2 field overcurrent level = 325 %. – The setting of 42.63 M2 field overcurrent level. – The settings of the field current controller in group 42 Shared motion (2nd motor). – The connections of the field exciter. – The insulation of cables and field winding. – The resistance of the field winding. – For fault messages at the field exciter itself (flashing LEDs), 04.27 M2 field exciter fault word and 04.37 M2 field exciter warning word.	1
F519	M2 field exciter communication.	Motor 2 field exciter loss of communication. Check:	1

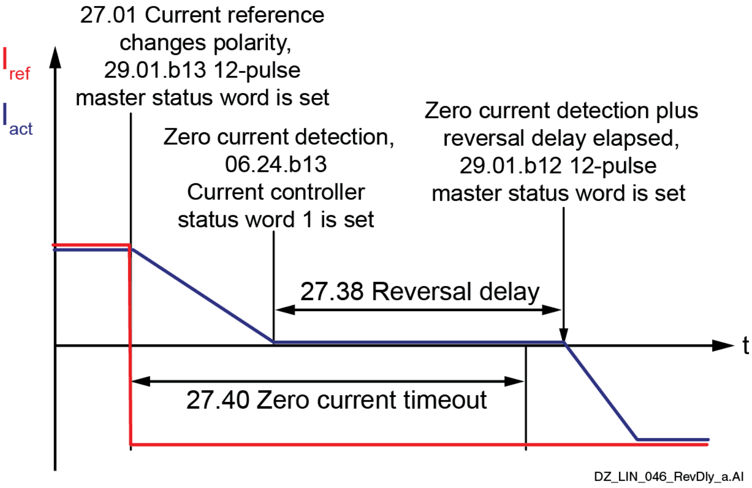
Code	Fault	Cause and what to do	Fault level

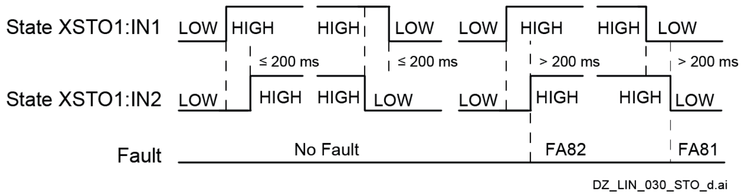
		– The settings of 42.49 M2 used field exciter type and 70.12 Field exciter timeout.
		– The auxiliary voltage for integrated and external field exciter.
		– The DCSLink cable connections.
		– The DCSLink termination set dipswitch S1100:1 = ON (DCF803-0016, DCF803-0035 and FEX-425-Int).
		– The DCSLink node ID settings. See 70.05 DCSLink node ID and 70.14 M2 field exciter node ID or switches S800 and S801 on DCF803-0016, DCF803-0035 and FEX-425-Int respectively.
		– For fault messages at the field exciter itself (flashing LEDs), 04.27 M2 field exciter fault word and 04.37 M2 field exciter warning word.
		– The AUX code:
		  – 2: Communication timeout in the armature converter.
		  – 3: Communication timeout in a field exciter.
		  – 4: Commination timeout in a field exciter running as multi FEX.	

F521	Field acknowledge.	Selected motor, field acknowledge at the DI is missing. Check: – The setting of 99.07 M1 used field exciter type. The selection must match the connected field exciter type. – 06.26 M1 field exciter status word. – For fault messages at the field exciter itself (flashing LEDs), 04.26 M1 field exciter fault word and 04.36 M1 field exciter warning word. F521 Field acknowledge missing is the sum fault for all field related faults like: – F515 M1 field exciter overcurrent. – F516 M1 field exciter communication. – F529 M1 field exciter not OK. – F537 M1 field exciter ready lost. – F541 M1 field exciter low current.	1
F524	Mains contactor acknowledge.	Mains contactor acknowledge at the DI is missing. Check: – The settings of 20.33 Mains contactor control mode and 20.34 Mains contactor acknowledge source. – The switch on/off sequence. – The auxiliary contactor/relay switching the mains contactor after an On/Off command. – The safety relays if existing. – The used digital inputs and outputs (groups 10 and 11).	4
F529	M1 field exciter not OK.	Motor 1 field exciter is not okay. A fault was found during self-diagnosis of the field exciter or a power failure happened in the field exciter. Check: – The field exciter operation. E.g. the field contactor or mains contactor (in case of an OnBoard field exciter) is not closed or closing too late.	1

Code	Fault	Cause and what to do	Fault level
		– For fault messages at the field exciter itself (flashing LEDs), 04.26 M1 field exciter fault word and 04.36 M1 field exciter warning word.	
F530	M2 field exciter not OK.	Motor 2 field exciter is not okay. A fault was found during self-diagnosis of the field exciter or a power failure happened in the field exciter. Check: – The field exciter operation. E.g. the field contactor or mains contactor (in case of an OnBoard field exciter) is not closed or closing too late. – For fault messages at the field exciter itself (flashing LEDs), 04.27 M2 field exciter fault word and 04.37 M2 field exciter warning word.	1
F533	12-pulse reversal timeout.	The current direction is not changed before 29.06 12-pulse reversal timeout is elapsed. Check: – For high inductive motor and increase the timeout. – Too high motor voltage compared to mains voltage.	3
F534	12-pulse current difference. Programmable, see 29.09 12-pulse parallel current difference type. See also warning A534.	The current of difference of a 12-pulse parallel configuration exceeded the current difference level. Check: – The settings of 29.07 12-pulse parallel current difference level and 29.08 12-pulse parallel current difference delay. – The settings of the current controller in group 27 Armature current control.	3
F535	12-pulse communication.	12-pulse communication is disturbed. Check: – The settings of 70.05 DCSLink node ID, 70.07 DCSLink comm loss function, 70.08 12-pulse timeout and 70.09 12-pulse slave node ID. – DCSLink cable connections. – DCSLink termination.	3
F536	12-pulse slave.	The 12-pulse slave has tripped. 12-pulse master is tripped by a fault of the 12-pulse slave. Correct the fault in the 12-pulse slave.	4
F537	M1 field exciter ready lost.	Motor 1 field exciter lost the ready-for-operation message while working. The mains voltage of the field exciter is missing or not in synchronism. Check: – If all mains phases are present. – If the mains voltage is within the set tolerance. – For fault messages at a DCF803/DCF804/FEX-425 see the flashing LEDs, 04.26 M1 field exciter fault word and 04.36 M1 field exciter warning word. – For fault messages at a large field exciter (DCS880-S0b) see the seven-segment display and the event logger.	1
F538	M2 field exciter ready lost.	Motor 2 field exciter lost the ready-for-operation message while working. The mains voltage of the field exciter is missing or not in synchronism. Check: – If all mains phases are present.	1

Code	Fault	Cause and what to do	Fault level
		– If the mains voltage is within the set tolerance. – For fault messages at a DCF803/DCF804/FEX-425 see the flashing LEDs, 04.27 M2 field exciter fault word and 04.37 M2 field exciter warning word. – For fault messages at a large field exciter (DCS880-S0b) see the seven-segment display and the event logger.	
F539	Fast current rise.	The rise of the current (di/dt) is too fast. This indicates a short circuit or a commutation fault during regenerative braking. Check: – The setting of 31.45 Maximum current rise level.	1
F541	M1 field exciter low current.	Motor 1 field exciter low (under-) current. Check: – Record 28.14 M1 field current reference and 28.15 M1 field current. – The settings of 31.57 Minimum field current trip delay and 31.58 M1 field current low level. – The settings of the EMF controller, flux linearization and field current controller in group 28 EMF and field current control. – The motor nameplate for minimum current at maximum field weakening ≡ maximum speed. – The field circuit fuses. – The field auxiliary supply voltage. – The field contactor is not closed. – If the field current oscillates. – If the motor is not compensated and has a high armature reaction. – For fault messages at the field exciter itself (flashing LEDs), 04.26 M1 field exciter fault word and 04.36 M1 field exciter warning word.	1
F542	M2 field exciter low current.	Motor 2 field exciter low (under-) current. Check: – Record 42.45 M2 field current reference and 42.46 M2 field current. – The settings of 31.57 Minimum field current trip delay and 42.62 M2 field current low level. – The settings of the EMF controller, flux linearization and field current controller in group 42 Shared motion (2nd motor). – The motor nameplate for minimum current at maximum field weakening ≡ maximum speed. – The field circuit fuses. – The field auxiliary supply voltage. – The field contactor is not closed. – If the field current oscillates. – If the motor is not compensated and has a high armature reaction. – For fault messages at the field exciter itself (flashing LEDs), 04.27 M2 field exciter fault word and 04.37 M2 field exciter warning word.	1

Code	Fault	Cause and what to do	Fault level
F544	P2P and M/F communication. Programmable, see 70.07 DCSLink comm loss function. See also warning A112.	DCSLink communication and DCSLink board (SDCS-DSL-H1x) communication loss. Check: – DCSLink node ID settings. See 70.05 DCSLink node ID. – The setting of 31.13 Fault stop mode communication and 70.07 DCSLink comm loss function. – The setting of 70.17 Mailbox 1 node ID, 70.23 Mailbox 2 node ID, 70.29 Mailbox 3 node ID and 70.35 Mailbox 4 node ID. – The setting of 70.18 Mailbox 1 cycle time/timeout, 70.24 Mailbox 2 cycle time/timeout, 70.30 Mailbox 3 cycle time/timeout and 70.36 Mailbox 4 cycle time/timeout. – The DCSLink cable connections. – The DCSLink terminations.	5
F547	Drive hardware.	Drive hardware failure. To reset, cycle the auxiliary power of the drive. If the problem persists, check the AUX code (format YYYY). YYYY indicates the problem. Actions see below.	1
	0050	Parameter flash memory faulty (erase).	
	0051	Parameter flash memory faulty (program).	
	0052	Check connector XC12 on SDCS-CON-H01 and connector XC12 on SDCS-PIN-H01/H51.	
F556	Torque proving.	Selected motor, torque proving. The acknowledge signal for torque proving is missing. Check: – The setting of 44.25 M1 brake torque proving time. – The Adaptive Program, application program or overriding control providing the torque proving OK signal. See 06.11.b04 Auxiliary control word 2.	3
F557	Reversal time.	The current direction was not changed before 27.40 Zero current timeout is elapsed.  Check: – For high inductive motor and increase the timeout. – Too high motor voltage compared to mains voltage. – If possible lower 27.38 Reversal delay and increase 27.40 Zero current timeout. – The AUX code (format XX).	3

<table>
<tr><th>Code</th><th>Fault</th><th>Cause and what to do</th><th>Fault level</th></tr>
<tr><td></td><td></td><td>– 12: Changing current direction from bridge 1 to bridge 2 did not take place.
– 10: Extinguishing bridge 1 current after switching off the drive did not take place.
– 20: Extinguishing bridge 2 current after switching off the drive did not take place.
– 21: Changing current direction from bridge 2 to bridge 1 did not take place.
– The following table:</td><td></td></tr>
<tr><td></td><td colspan="3">
<table>
<tr><td>27.31 M1 discontinuous current limit</td><td>27.38 Reversal delay</td><td>Delta</td><td>27.40 Zero current timeout</td></tr>
<tr><td>≤ 50 %</td><td>5 ms</td><td>15</td><td>20 ms</td></tr>
<tr><td>≤ 35 %</td><td>10 ms</td><td>25</td><td>35 ms</td></tr>
<tr><td>≤ 20 %</td><td>15 ms</td><td>35</td><td>50 ms</td></tr>
<tr><td>≤ 10 %</td><td>20 ms</td><td>50</td><td>70 ms</td></tr>
</table>
</td></tr>
<tr><td>F560</td><td>Power unit, unbalanced current.
Programmable, see 29.63 Power unit unbalanced current function.
See also warning A560.</td><td>The unbalanced current between hardparallel connected power units is excessive.
Check:
– That the mains and motor cable routing is according to the specification for hardparallel configurations.
– The branch fuses.
– The thyristors.
– The AUX code (format XXXYYYZZ).
YYY identifies the power unit channel.
ZZ identifies the affected thyristor.
Example: 00000314 means thyristor14 in the power unit connected to channel3.</td><td>3</td></tr>
<tr><td>F561</td><td>Power unit, thyristor loss function.
Programmable, see 29.68 Power unit thyristor loss function.
See also warning A561.</td><td>Displays the thyristors/branch fuses of a power unit which are lost, in other words not conducting any current.
Check:
– The branch fuses.
– The thyristors.
– The AUX code (format XXXYYYZZ).
YYY identifies the power unit channel.
ZZ identifies the affected thyristor.
Example: 00000314 means thyristor14 in the power unit connected to channel3.</td><td>3</td></tr>
<tr><td>FA81</td><td>Safe torque off 1 loss fault.</td><td rowspan="2">If the state of XSTO:IN1 and XSTO:IN2 is different for longer than 200 ms a fault, FA81 or FA82, is generated.


See safety supplement for functional safety converter DCS880 (3ADW000452).
Check:
– For poor contact of XSTO:IN1 and XSTO:IN2.</td><td>6</td></tr>
<tr><td>FA82</td><td>Safe torque off 2 loss fault.</td><td>6</td></tr>
</table>

Code	Fault	Cause and what to do	Fault level
		– The On/Off timing of XSTO:IN1 and XSTO:IN2. – That the jumpers between XSTO:OUT1 and XSTO:IN1 and XSTO:OUT1 and XSTO:IN2 are removed. – Operate the safety relay so that the On/Off timing of XSTO:IN1 and XSTO:IN2 are synchronized. – If the safety relay contacts are welded. If welded, replace the safety relay. – The gap between the On/Off timing of XSTO:IN1 and XSTO:IN2. Keep the gap smaller than 201 ms. If the problem persists, contact your local ABB representative to repair the converter.	
FB11	Memory unit missing.	No memory unit is attached to the control board. Power down the drive/control unit. Check that the memory unit is properly inserted into the control board. The memory unit attached to the control board is empty. Power down the drive/control unit. Attach a memory unit with the appropriate firmware to the control board.	1
FB12	Memory unit incompatible.	The memory unit attached to the control board is incompatible. Try to download a compatible firmware. If the problem persists, power down the drive/control unit. Attach a compatible memory unit.	1
-	Panel and Drive not compatible.  Panel and Drive not Compatible	The control panel attached to the control board is incompatible or broken. Attach a working and compatible control panel.	1
FB13	Memory unit, firmware incompatible.	The firmware on the attached memory unit is incompatible with the control board. Try to download a compatible firmware. If the problem persists, power down the drive/control unit. Attach a memory unit with a compatible firmware.	1
FB14	Memory unit, firmware load failed.	The firmware on the attached memory unit could not be loaded to the control board. Memory unit might be empty, download a compatible firmware. If the problem persists, power down the drive/control unit. Check that the memory unit is properly inserted into the control board. If the problem persists, replace the memory unit.	1
FF7E	Follower Programmable, see 60.17 Follower fault action. See also warning AFE7.	A follower has tripped. Check the AUX code to find out the node address of the faulted follower. See 60.02 M/F node address. Correct the fault in the follower.	4
FF81	FBA A force fault.	A fault has been forced through fieldbus adapter A. Check the fault information provided by the PLC.	1 (default) 1 … 6 user selectable

Code	Fault	Cause and what to do	Fault level
FF82	FBA B force fault.	A fault has been forced through fieldbus adapter B. Check the fault information provided by the PLC.	1 (default) 1 … 6 user selectable
FF8E	EFB force fault.	A fault has been forced through the embedded fieldbus (EFB) interface. Check the fault information provided by the Modbus controller.	1 (default) 1 … 6 user selectable

Fieldbus control via embedded fieldbus (EFB)

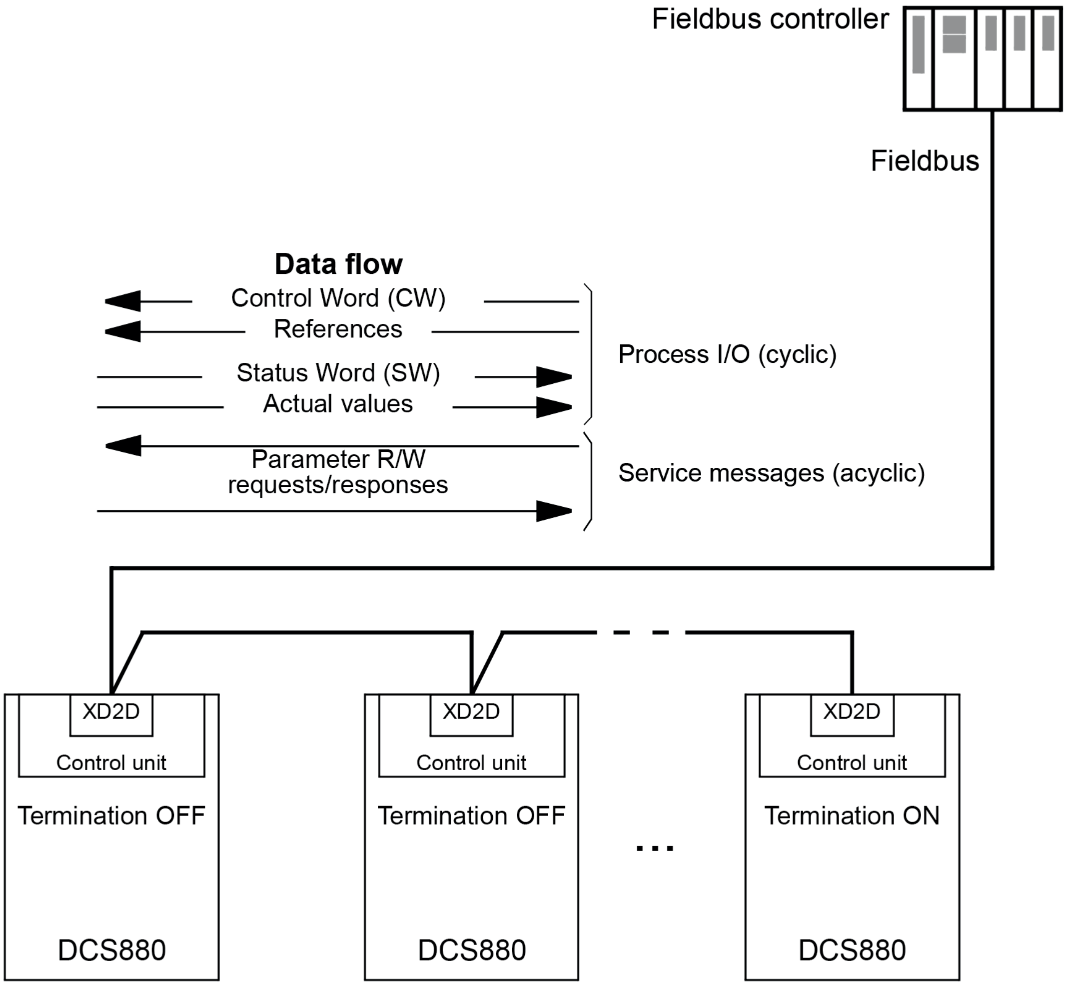
What this chapter contains

The chapter describes how the drive can be controlled via a fieldbus using the embedded fieldbus.

System overview

The drive can be connected to an external control system through the embedded fieldbus. The embedded fieldbus supports the Modbus RTU protocol. The drive control program can handle 10 Modbus registers in a 10-millisecond time level. For example, if the drive receives a request to read 20 registers, it will start its response within 22 ms of receiving the request. 20 ms for processing the request and 2 ms overhead for handling the bus. The actual response time depends on other factors as well, such as the baud rate, see 58.04 Baud rate.

The drive can be set to receive all control information through the fieldbus, or the control can be distributed between the embedded fieldbus and other available sources, for example, digital and analog inputs.



SB_880_025_fieldbus_a.ai

Connecting the fieldbus to the drive

Connect the fieldbus to terminal XD2D on the control board of the drive. See the DCS880 Hardware manual (3ADW000462) for more information on the connection, chaining and termination of the link.

Note: When connector XD2D is reserved by the embedded fieldbus interface, see 58.01 Protocol enable is set to Modbus RTU, the device-to-device link is automatically disabled.

Setting up the embedded fieldbus

Setup of the embedded fieldbus communication using the table below. The column Setting for fieldbus control shows the value to be used or the default value. The column Function/Information gives a short description of the parameter.

Parameter	**Setting for fieldbus control**	**Function/Information**
Communication initialization		
58.01 Protocol enable	Modbus RTU.	Initializes embedded fieldbus communication. The device-to-device link is automatically disabled.
Embedded Modbus configuration		
58.03 Node address	1 (default).	Node address. All drives connected to the network must have a unique node address.
58.04 Baud rate	19.2 kbps (default).	Defines the communication speed of the link. Use the same setting as in the master station.
58.05 Parity	8 EVEN 1 (default).	Selects the parity and stop bit setting. Use the same setting as in the master station.
58.14 Communication loss action	Fault.	Defines the action taken when a communication loss is detected.
58.15 Communication loss mode	CW/Ref1/Ref2 (default).	Enables/Disables communication loss monitoring and defines the means for resetting the counter of the communication loss delay.
58.16 Communication loss time	0.3 s (default).	Defines the timeout limit for the communication monitoring.
58.17 Transmit delay	0 ms (default).	Defines a response delay for the drive.
58.25 Control profile	ABB Drives Profile (default), Transparent.	Selects the control profile used by the drive. See chapter Basics of the embedded fieldbus interface.
58.26 EFB ref1 type … 58.29 EFB act2 type	Auto, Transparent, General, Torque, Speed, Current.	Selects the reference and actual value types. With the Auto setting, the type is selected automatically according to which reference chain the incoming reference is connected to.
58.30 EFB status word transparent source	Other.	Defines the source of status word when 58.25 Control profile = Transparent.
58.31 EFB act1 transparent source	Other.	Defines the source of actual value 1 when 58.28 EFB act1 type = Transparent or General.
58.32 EFB act2 transparent source	Other.	Defines the source of actual value 2 when 58.29 EFB act2 type = Transparent or General.
58.33 Addressing mode	E.g. Mode 0 (default).	Defines the mapping between parameters and holding registers in the 400001 … 465536 (100…65535) Modbus register range.
58.34 Word order	LO-HI (default).	Defines the order of the data words in the Modbus message frame.
58.101 Data I/O 1	CW 16bit.	Define the address of the drive parameter which the Modbus master accesses when it reads from or writes to the register address corresponding to Modbus In/Out parameters. Select the parameters that you want to read or write through the Modbus I/O words.
58.102 Data I/O 2	Ref1 16bit.	
58.103 Data I/O 3	Ref2 16bit.	
58.104 Data I/O 4	SW 16bit.	
58.105 Data I/O 5	Act1 16bit.	

58.106 Data I/O 6	Act2 16bit.	
58.107 Data I/O 7 … 58.124 Data I/O 24	None (default).	
58.06 Communication control	Refresh settings.	Validates the settings of the configuration parameters.

Note: The new settings will take effect when the drive is powered up the next time, or when they are validated by 58.06 Communication control.

Setting the drive control parameters

After the embedded fieldbus interface has been set up, check and adjust the drive control parameters listed in the table below. The column Setting for fieldbus control shows the value to be used when the embedded fieldbus signal is the desired source or destination for that particular drive control signal. The column Function/Information gives a short description of the parameter.

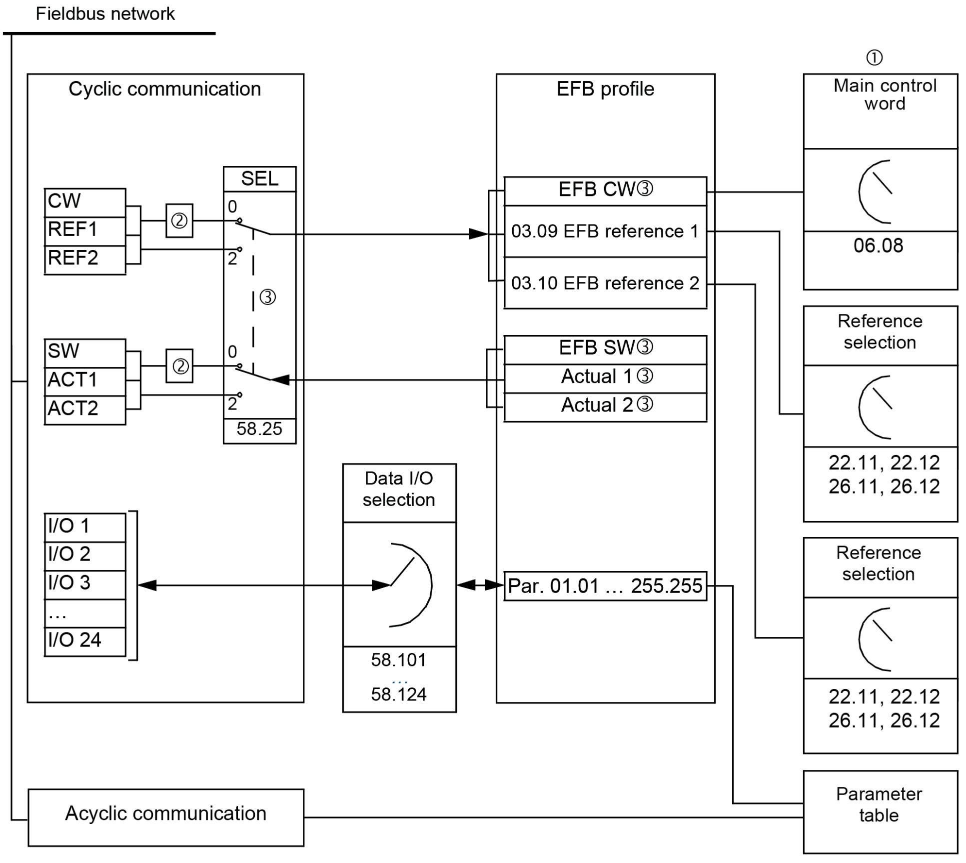
Parameter	**Setting for fieldbus control**	**Function/Information**
Control command source selection		
06.08 Main control word source	EFB.	Selects 06.05 EFB transparent control word as source for 06.01 Main control word.
20.01 Command location	Main control word.	Selects 06.01 Main control word as source for 06.09 Used main control word.
Speed reference selection		
22.11 Speed reference 1 source	EFB reference 1, EFB reference 2.	Selects a reference received through the embedded fieldbus interface as speed reference 1.
22.12 Speed reference 2 source	EFB reference 1, EFB reference 2.	Selects a reference received through the embedded fieldbus interface as speed reference 2.
Torque reference selection		
26.11 Torque reference 1 source	EFB reference 1, EFB reference 2.	Selects a reference received through the embedded fieldbus interface as torque reference 1.
26.12 Torque reference 2 source	EFB reference 1, EFB reference 2.	Selects a reference received through the embedded fieldbus interface as torque reference 2.
Other selections		
EFB references can be selected as the source at virtually any signal selector parameter by selecting Other, then either 03.09 EFB reference 1 or 03.10 EFB reference 2.		
10.24 RO1 source	RO/DIO control word bit 0.	Connects storage parameter bit 10.99.b00 RO/DIO control word to relay output RO1.
10.27 RO2 source	RO/DIO control word bit 1.	Connects storage parameter bit 10.99.b01 RO/DIO control word to relay output RO2.
10.30 RO3 source	RO/DIO control word bit 2.	Connects storage parameter bit 10.99.b02 RO/DIO control word to relay output RO3.
11.05 DIO1 function, 11.09 DIO2 function	Output (default).	Sets the digital input/output to output mode.
11.06 DIO1 output source	RO/DIO control word bit 8.	Connects storage parameter bit 10.99.b08 RO/DIO control word to digital input/output DIO1.

11.10 DIO2 output source	RO/DIO control word bit 9.	Connects storage parameter bit 10.99.b09 RO/DIO control word to digital input/output DIO2.
13.12 AO1 source	AO1 data storage.	Connects storage parameter 13.91 AO1 data storage to analog output AO1.
13.22 AO2 source	AO2 data storage.	Connects storage parameter 13.92 AO2 data storage to analog output AO2.
System control inputs		
96.16 Parameter save manually	Save (reverts automatically to Done).	Saves parameter value changes (including those made through fieldbus control) to the flash memory.

Basics of the embedded fieldbus interface

The cyclic communication between a fieldbus system and the drive consists of 16-bit or 32-bit data words, with the transparent control profiles.

The diagram below illustrates the operation of the embedded fieldbus interface. The signals transferred in the cyclic communication are explained further below the diagram.



SB_880_027_fieldbus-EFB_a.ai

① See also other parameters which can be controlled from the fieldbus.

② Data conversion if 58.25 Control profile is set to ABB Drives profile.
See chapter About the control profiles.

Profile/Instance selection parameters. Fieldbus module specific parameters. For more information, see the User’s Manual of the appropriate fieldbus adapter module.

③ If 58.25 Control profile is set to Transparent:

- The sources of the status word and actual values are selected by parameters 58.30 … 58.32. Otherwise, actual values 1 and 2 are automatically selected according to their reference type.
- The control word is displayed by 06.05 EFB transparent control word.

Control word (CW) and status word (SW)

The control word is a 16-bit or 32-bit packed boolean word. It is the principal means of controlling the drive from a fieldbus system. It is sent by the fieldbus controller to the drive. By drive parameters, the user selects the EFB CW as the source of drive control commands, such as Start/Stop, Emergency stop or Reset. The drive switches between its states according to the bit-coded instructions of the control word and returns status information to the fieldbus controller in the status word.

The control word from the fieldbus is either written to the drive as it is, see 06.05 EFB transparent control word, or the data is converted. See chapter About the control profiles.

The status word is a 16-bit or 32-bit packed boolean word. The status word contains status information from the drive to the fieldbus controller. The status word is either written to the fieldbus controller as it is, or the data is converted. See chapter About the control profiles.

References

EFB references 1 and 2 are 16-bit or 32-bit signed integers.

The contents of each reference word can be used as the source of virtually any signal, such as speed, torque, current or a process reference. The embedded fieldbus communication displays references 1 and 2 in 03.09 EFB reference 1 and 03.10 EFB reference 2. Whether the references are scaled or not depends on the settings of 58.26 EFB ref1 type and 58.27 EFB ref2 type. See chapter About the control profiles.

Actual values

Actual values are 16-bit or 32-bit signed integers containing information on the operation of the drive. They convey selected drive values from the drive to the fieldbus controller. Whether the actual values are scaled or not depends on the settings of 58.28 EFB act1 type and 58.29 EFB act2 type. See chapter About the control profiles.

Data input/outputs

Data input/outputs are 16-bit or 32-bit words containing selected drive values. The address selection parameters 58.101 Data I/O 1 … 58.124 Data I/O 24 define the addresses from which the fieldbus controller either reads data (input) or to which it writes data (output).

Control of drive outputs through EFB

The address selection parameters of the data input/outputs have a setting with which the data can be written into a storage parameter in the drive. These storage parameters are readily selectable as signal sources of the drive outputs.

The desired values of the relay outputs (RO1 … RO3) and digital input/outputs (DIO1, DIO2) can be written into 10.99 RO/DIO control word, which is then selected as the source for those outputs. Each of the analog outputs (AO1, AO2) of the drive has a dedicated storage parameter called 13.91 AO1 data storage and 13.92 AO2 data storage. They are available in 13.12 AO1 source and 13.22 AO2 source.

Register addressing

The address field of Modbus requests for accessing holding registers is 16 bits. This allows the Modbus protocol to support addressing of 65536 holding registers.

Historically, Modbus master devices used 5-digit decimal addresses from 40001 ... 49999 to represent holding register addresses. The 5-digit decimal addressing limited to 9999 the number of holding registers that could be addressed.

Modern Modbus master devices typically provide a means to access the full range of 65536 Modbus holding registers. One of these methods is to use 6-digit decimal addresses from 400001 ... 465536. This manual uses 6-digit decimal addressing to represent Modbus holding register addresses.

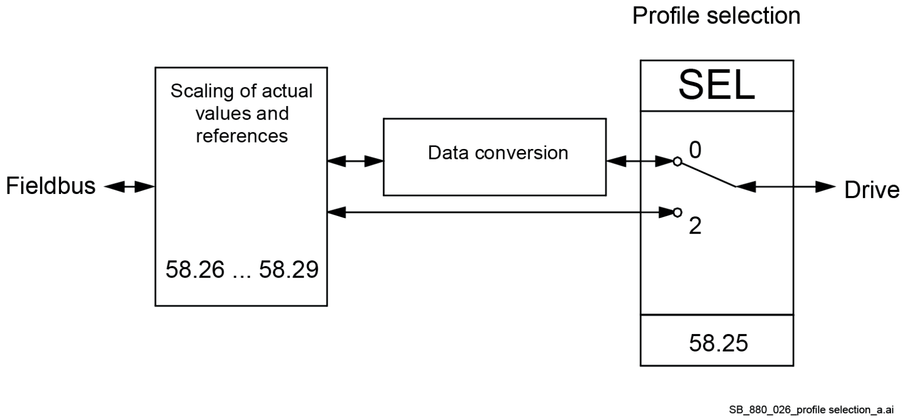
Modbus master devices that are limited to the 5-digit decimal addressing may still access registers 400001 ... 409999 by using 5-digit decimal addresses 40001 ... 49999. Registers 410000 ... 465536 are inaccessible to these masters.

Note: Register addresses of 32-bit values cannot be accessed by using 5-digit register numbers.

About the control profiles

A control profile defines the rules for data transfer between the drive and the fieldbus master, for example if packed boolean words are converted and how drive register addresses are mapped for the fieldbus master.

You can configure the drive to receive and send messages according to the ABB Drives profile or the Transparent profile. With the ABB Drives profile, the embedded fieldbus interface of the drive converts the control word and status word to and from the native data used in the drive. The Transparent profile involves no data conversion. The figure below illustrates the effect of the profile selection.



Control profile selection with 58.25 Control profile = ABB Drives profile or Transparent.

Note: Scaling of references and actual values can be selected independent of the profile selection by parameters 58.26 … 58.29.

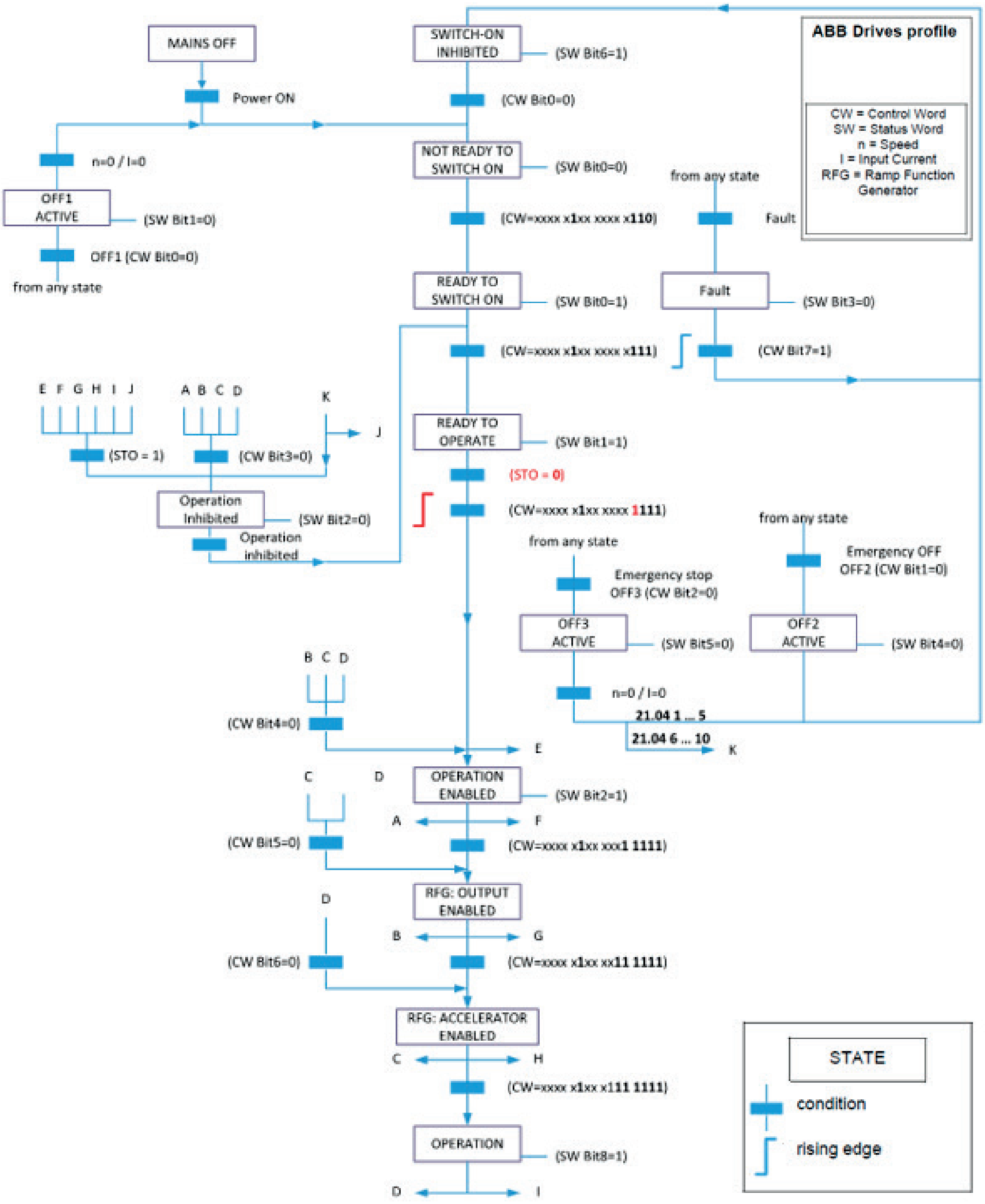
The ABB Drives profile

06.01 Main control word shows the contents of the fieldbus control word for the ABB Drives profile. The embedded fieldbus converts this word to the form in which it is used in the drive. The state machine is shown below.

06.15 Main status word shows the fieldbus status word for the ABB Drives profile. The embedded fieldbus converts the drive status word into this form for the fieldbus. The state machine is shown below.

State machine

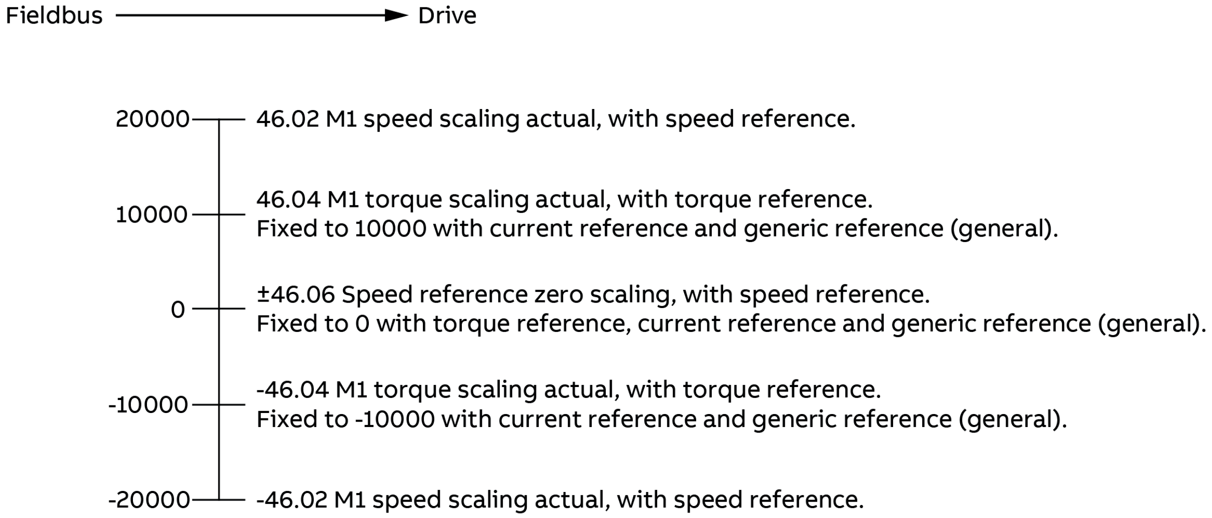
The diagram below shows the state transitions in the drive when the drive is using the ABB Drives profile and configured to follow the commands of the control word from the embedded fieldbus interface.



Additional information can be found in chapter Start/Stop sequences.

References

The ABB Drives profile supports the use of two references, EFB reference 1 and EFB reference 2. The references are 16-bit words containing a sign bit and a 15-bit integer.
The references are scaled as defined by parameters 46.01 … 46.06. The used scaling depends on the setting of 58.26 EFB ref1 type and 58.27 EFB ref2 type.



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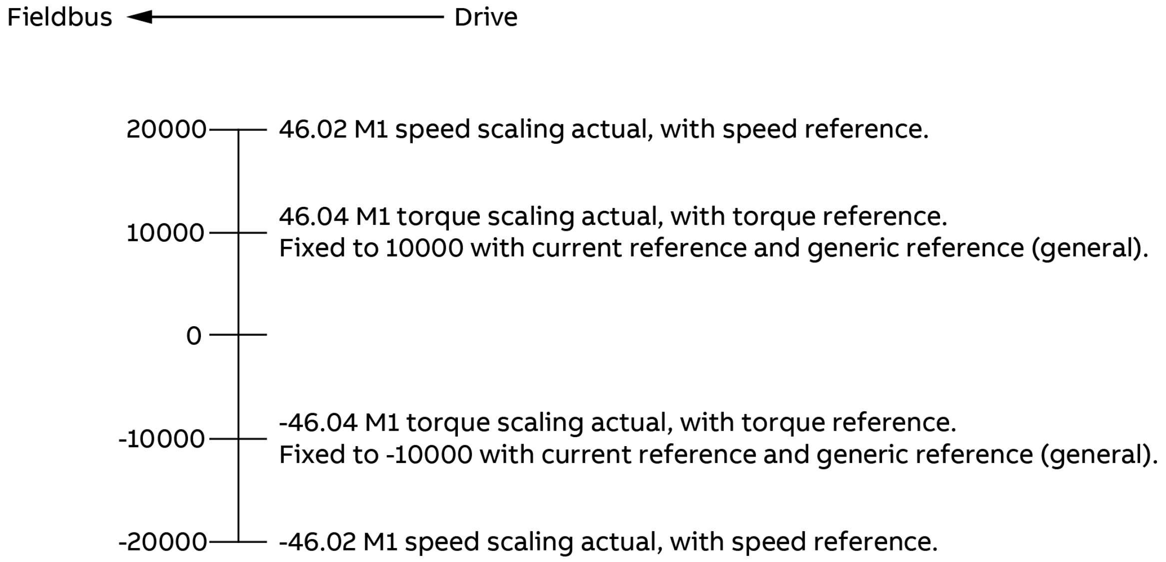
The scaled references are shown in 03.09 EFB reference 1 and 03.10 EFB reference 2.

Actual values

The ABB Drives profile supports the use of two actual values, ACT1 and ACT2. Actual values are 16-bit words containing information on the operation of the drive.
The actual values are scaled as defined by parameters 46.01 … 46.06. The used scaling depends on the setting of 58.28 EFB act1 type and 58.29 EFB act2 type.



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Modbus holding register addresses

The table below shows the default Modbus holding register addresses for drive data. This profile provides a converted 16-bit access to the data.

Register address	**Register data (16-bit words)**
400001	Control Word (CW), see 06.01 Main control word. The selection can be done using 58.101 Data I/O 1.
400002	Reference 1 (REF1). The selection can be done using 58.102 Data I/O 2.
400003	Reference 2 (REF2). The selection can be done using 58.103 Data I/O 3.
400004	Status Word (SW), see 06.15 Main status word. The selection can be done using 58.104 Data I/O 4.
400005	Actual value 1 (ACT1). The selection can be done using 58.105 Data I/O 5.
400006	Actual value 2 (ACT2). The selection can be done using 58.106 Data I/O 6.
400007 … 400024	Data in/out 7 … 24. The selection can be done using 58.107 Data I/O 7 … 58.124 Data I/O 24.
400025 … 400089	Unused.
400090 … 400100	Error code access. See chapter Error code registers, holding registers 400090 … 400100.
400101 … 465536	Parameter read/write. Parameters are mapped to register addresses according to 58.33 Addressing mode.

The Transparent profile

The Transparent profile enables a customizable access to the drive.

The content of the control word is user-definable. The control word received from the fieldbus is visible in 06.05 EFB transparent control word and can be used to control the drive using pointer parameters and/or application programming.

The status word to be sent to the fieldbus controller is selected by 58.30 EFB status word transparent source. This can be, for example, the user-configurable status word in 06.50 User status word 1.

The Transparent profile involves no data conversion of the control- or status word.

Whether references or actual values are scaled depends on the setting of parameters 58.26 … 58.29. The references received from the fieldbus are visible in 03.09 EFB reference 1 and 03.10 EFB reference 2.

The Modbus holding register addresses for the Transparent profile are the same as with the ABB Drives profile. See chapter Modbus holding register addresses.

Modbus function codes

The table below shows the Modbus function codes supported by the embedded fieldbus.

Code	**Function name**	**Description**
01h	Read Coils.	Reads the 0/1 status of coils (0X references).
02h	Read Discrete Inputs.	Reads the 0/1 status of discrete inputs (1X references).
03h	Read Holding Registers.	Reads the binary contents of holding registers (4X references).
05h	Write Single Coil.	Forces a single coil (0X reference) to 0 or 1.
06h	Write Single Register.	Writes a single holding register (4X reference).
08h	Diagnostics.	Provides a series of tests for checking the communication, or for checking various internal error conditions.

		Supported sub codes: – 00h Return Query Data: Echo/loopback test. – 01h Restart Communication Option: Restarts and initializes the EFB, clears communications event counters. – 04h Force Listen Only Mode. – 0Ah Clear Counters and Diagnostic Register. – 0Bh Return Bus Message Count. – 0Ch Return Bus Communication Error Count. – 0Dh Return Bus Exception Error Count. – 0Eh Return Slave Message Count. – 0Fh Return Slave No Response Count. – 10h Return Slave NAK (negative acknowledge) Count. – 11h Return Slave Busy Count. – 12h Return Bus Character Overrun Count. – 14h Clear Overrun Counter and Flag.
0Bh	Get Communication Event Counter.	Returns a status word and an event count.
0Fh	Write Multiple Coils.	Forces a sequence of coils (0X references) to 0 or 1.
16h	Mask Write Register.	Modifies the contents of a 4X register using a combination of an AND mask, an OR mask, and the register's current contents.
17h	Read/Write Multiple Registers.	Writes the contents of a contiguous block of 4X registers, then reads the contents of another group of registers (the same or different than those written) in a server device.
2Bh/0Eh	Encapsulated Interface Transport.	Supported sub codes: – 0Eh Read Device Identification: Allows reading the identification and other information. Supported ID codes (access type): – 00h: Request to get the basic device identification (stream access). – 04h: Request to get one specific identification object (individual access). Supported Object IDs: – 00h: Vendor Name ("ABB"). – 01h: Product Code (for example "S02-0025-04"). – 02h: Major Minor Revision (combination of contents of 07.05 Firmware version and 58.02 Protocol ID). – 03h: Vendor URL ("www.abb.com/dc-drives"). – 04h: Product name (for example "DCS880").

Exception codes

The table below shows the Modbus exception codes supported by the embedded fieldbus interface.

Code	**Name**	**Description**
01h	ILLEGAL FUNCTION.	The function code received in the query is not an allowable action for the server.
02h	ILLEGAL DATA ADDRESS.	The data address received in the query is not an allowable address for the server.
03h	ILLEGAL DATA VALUE.	The requested Quantity of Registers is larger than the drive can handle. **Note:** This error does not mean that a value written to a drive parameter is outside the valid range.

04h	SLAVE DEVICE FAILURE.	The value written to a drive parameter is outside the valid range. See chapter Error code registers (holding registers 400090 … 400100).
06h	SLAVE DEVICE BUSY.	The server is engaged in processing a long-duration program command.

Coils (0xxxx reference set)

Coils are 1-bit read/write values. Control word bits are exposed with this data type. The table below summarizes the Modbus coils (0xxxx reference set).

Reference	ABB drives profile	Transparent profile
00001	On/Off1 control.	Control word bit 0.
00002	Off2 control.	Control word bit 1.
00003	Off3 control.	Control word bit 2.
00004	Run.	Control word bit 3.
00005	Ramp out zero.	Control word bit 4.
00006	Ramp halt.	Control word bit 5.
00007	Ramp in zero.	Control word bit 6.
00008	Reset.	Control word bit 7.
00009	Inching 1.	Control word bit 8.
00010	Inching 2.	Control word bit 9.
00011	Remote command.	Control word bit 10.
00012	reserved.	Control word bit 11
00013	Main control 12.	Control word bit 12.
00014	Main control 13.	Control word bit 13.
00015	Main control 14.	Control word bit 14.
00016	Main control 15.	Control word bit 15.
00017	reserved.	Control word bit 16.
00018	reserved.	Control word bit 17.
00019	reserved.	Control word bit 18.
00020	reserved.	Control word bit 19.
00021	reserved.	Control word bit 20.
00022	reserved.	Control word bit 21.
00023	reserved.	Control word bit 22.
00024	reserved.	Control word bit 23.
00025	reserved.	Control word bit 24.
00026	reserved.	Control word bit 25.
00027	reserved.	Control word bit 26.
00028	reserved.	Control word bit 27.
00029	reserved.	Control word bit 28.
00030	reserved.	Control word bit 29.
00031	reserved.	Control word bit 30.
00032	reserved.	Control word bit 31.
00033	reserved.	10.99.b00 RO/DIO control word.

00034	reserved.	10.99.b01 RO/DIO control word.
00035	reserved.	10.99.b02 RO/DIO control word.
00036	reserved.	10.99.b03 RO/DIO control word.
00037	reserved.	10.99.b04 RO/DIO control word.
00038	reserved.	10.99.b05 RO/DIO control word.
00039	reserved.	10.99.b06 RO/DIO control word.
00040	reserved.	10.99.b07 RO/DIO control word.
00041	reserved.	10.99.b08 RO/DIO control word.
00042	reserved.	10.99.b09 RO/DIO control word.

Discrete inputs (1xxxx reference set)

Discrete inputs are 1-bit read-only values. Status word bits are exposed with this data type. The table below summarizes the Modbus discrete inputs (1xxxx reference set).

Reference	**ABB drives profile**	**Transparent profile**
00001	Ready on.	Status word bit 0.
00002	Ready run.	Status word bit 1.
00003	Ready reference.	Status word bit 2.
00004	Tripped.	Status word bit 3.
00005	Off2 inactive.	Status word bit 4.
00006	Off3 inactive.	Status word bit 5.
00007	Switch-on inhibited.	Status word bit 6.
00008	Warning.	Status word bit 7.
00009	At setpoint.	Status word bit 8.
00010	Remote.	Status word bit 9.
00011	Above level.	Status word bit 10.
00012	Status control 11.	Status word bit 11
00013	Status control 12.	Status word bit 12.
00014	Status control 13.	Status word bit 13.
00015	Status control 14.	Status word bit 14.
00016	reserved.	Status word bit 15.
00017	reserved.	Status word bit 16.
00018	reserved.	Status word bit 17.
00019	reserved.	Status word bit 18.
00020	reserved.	Status word bit 19.
00021	reserved.	Status word bit 20.
00022	reserved.	Status word bit 21.

00023	reserved.	Status word bit 22.
00024	reserved.	Status word bit 23.
00025	reserved.	Status word bit 24.
00026	reserved.	Status word bit 25.
00027	reserved.	Status word bit 26.
00028	reserved.	Status word bit 27.
00029	reserved.	Status word bit 28.
00030	reserved.	Status word bit 29.
00031	reserved.	Status word bit 30.
00032	reserved.	Status word bit 31.
00033	reserved.	10.02.b00 DI delayed status.
00034	reserved.	10.02.b01 DI delayed status.
00035	reserved.	10.02.b02 DI delayed status.
00036	reserved.	10.02.b03 DI delayed status.
00037	reserved.	10.02.b04 DI delayed status.
00038	reserved.	10.02.b05 DI delayed status.
00039	reserved.	10.02.b06 DI delayed status.
00040	reserved.	10.02.b07 DI delayed status.
00041	reserved.	10.02.b08 DI delayed status.
00042	reserved.	10.02.b09 DI delayed status.
00043	reserved.	10.02.b10 DI delayed status.
00044	reserved.	10.02.b11 DI delayed status.
00045	reserved.	10.02.b12 DI delayed status.
00046	reserved.	10.02.b13 DI delayed status.
00047	reserved.	10.02.b14 DI delayed status.
00048	reserved.	10.02.b15 DI delayed status.

Error code registers (holding registers 400090 … 400100)

These registers contain information about the last query. The error register is cleared when a query has finished successfully.

Reference	Name	Description
89	Reset Error Registers.	1 = Reset internal error registers (91 … 95).
90	Error Function Code.	Function code of the failed query.
91	Error Code.	Set when exception code 04h is generated (see table above). – 00h No error. – 02h Low/High limit exceeded. – 03h Faulty Index: Unavailable index of an array parameter. – 05h Incorrect Data Type: Value does not match the data type of the parameter. – 65h General Error: Undefined error when handling query.
92	Failed Register.	The last register (discrete input, coil, or holding register) that failed to be read or written.
93	Last Register Written Successfully.	The last register that was written successfully.
94	Last Register Read Successfully	The last register that was read successfully.

Fieldbus control via fieldbus adapter

What this chapter contains

This chapter describes how the drive can be controlled via a fieldbus through a fieldbus adapter.

System overview

The drive can be connected to an external control system through a fieldbus adapter mounted onto the electronic unit of the drive. The drive has two independent interfaces for fieldbus connection, called FieldBus Adapter A (FBA A) and FieldBus Adapter B (FBA B). The drive can be configured to receive all control information through fieldbus interface A, fieldbus interface B or local I/O such as digital and analog inputs.

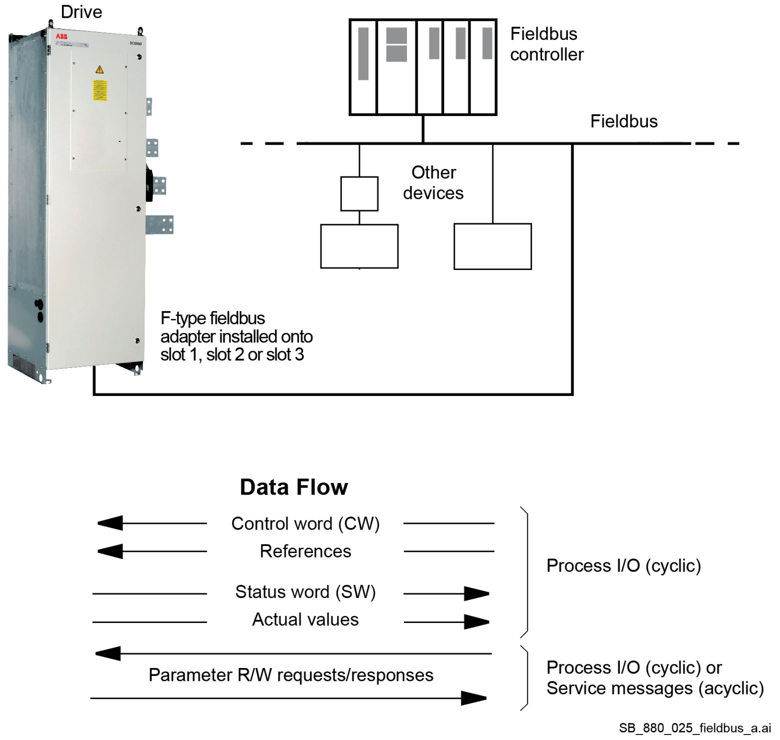
Note: The text and examples in this chapter describe the configuration of FieldBus Adapter A (FBA A) by parameters 50.01 … 50.29 and parameter groups 51 … 53.

FieldBus Adapter B (FBA B), if present, is configured in a similar fashion by parameters 50.31 … 50.59 and parameter groups 54 … 56. It is recommended that the FBA B interface is only used for monitoring.

Fieldbus adapters are available for various communication systems and protocols, for example:

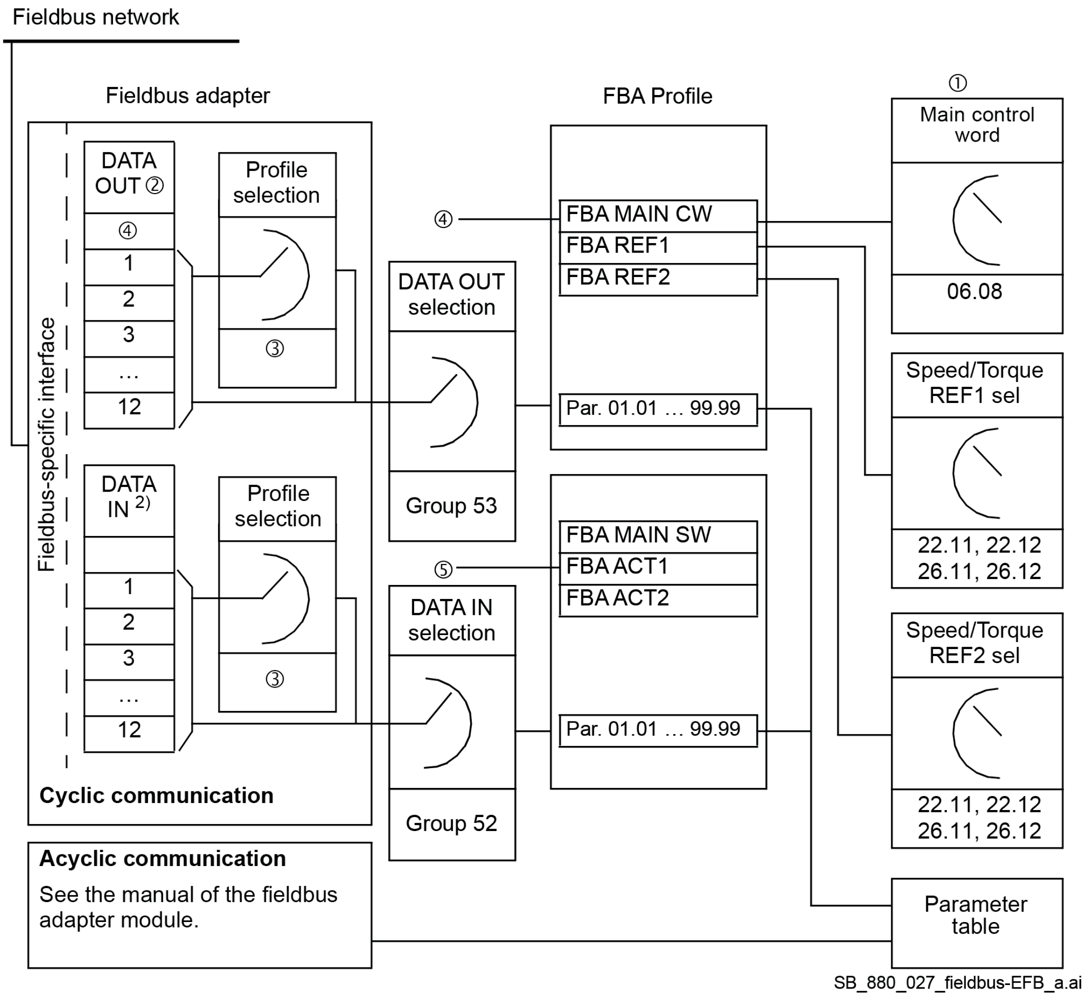
- FCAN-01 for CANopen®.
- FCNA-01 for ControlNet™.
- FDNA-01 for DeviceNet™.
- FECA-01 for EtherCAT®.
- FENA-21 for EtherNet/IP™, Modbus TCP and PROFINET IO.
- FEIP-21 for EtherNet/IP™.
- FMBT-21 for Modbus TCP.
- FPNO-21 for PROFINET IO.
- FSCA-01 for Modbus RTU.
- FEPL-02 for PowerLink.
- FPBA-01 for PROFIBUS DP, DPV0/DPV1.
- FSPS-21 for PROFIsafe via PROFINET IO.

Note: Fieldbus adapters with the suffix “M”, e.g. FPBA-01-M, are not supported.



Basics of the fieldbus control interface

The cyclic communication between a fieldbus system and the drive consists of 16-bit or 32-bit input and output data words. The drive can support a maximum of 12 data words of 16 bits in each direction. Data transmitted from the drive to the fieldbus controller is defined by 52.01 FBA A data in1 … 52.12 FBA A data in12. The data transmitted from the fieldbus controller to the drive is defined by 53.01 FBA A data out1 … 53.12 FBA A data out12.



① See also other parameters which can be controlled from the fieldbus.
② The maximum number of data words used is protocol-dependent.
③ Profile/Instance selection parameters. Fieldbus module specific parameters. For more information, see the User's Manual of the appropriate fieldbus adapter module.
④ With DeviceNet, the control part is transmitted directly.
⑤ With DeviceNet, the actual value part is transmitted directly.

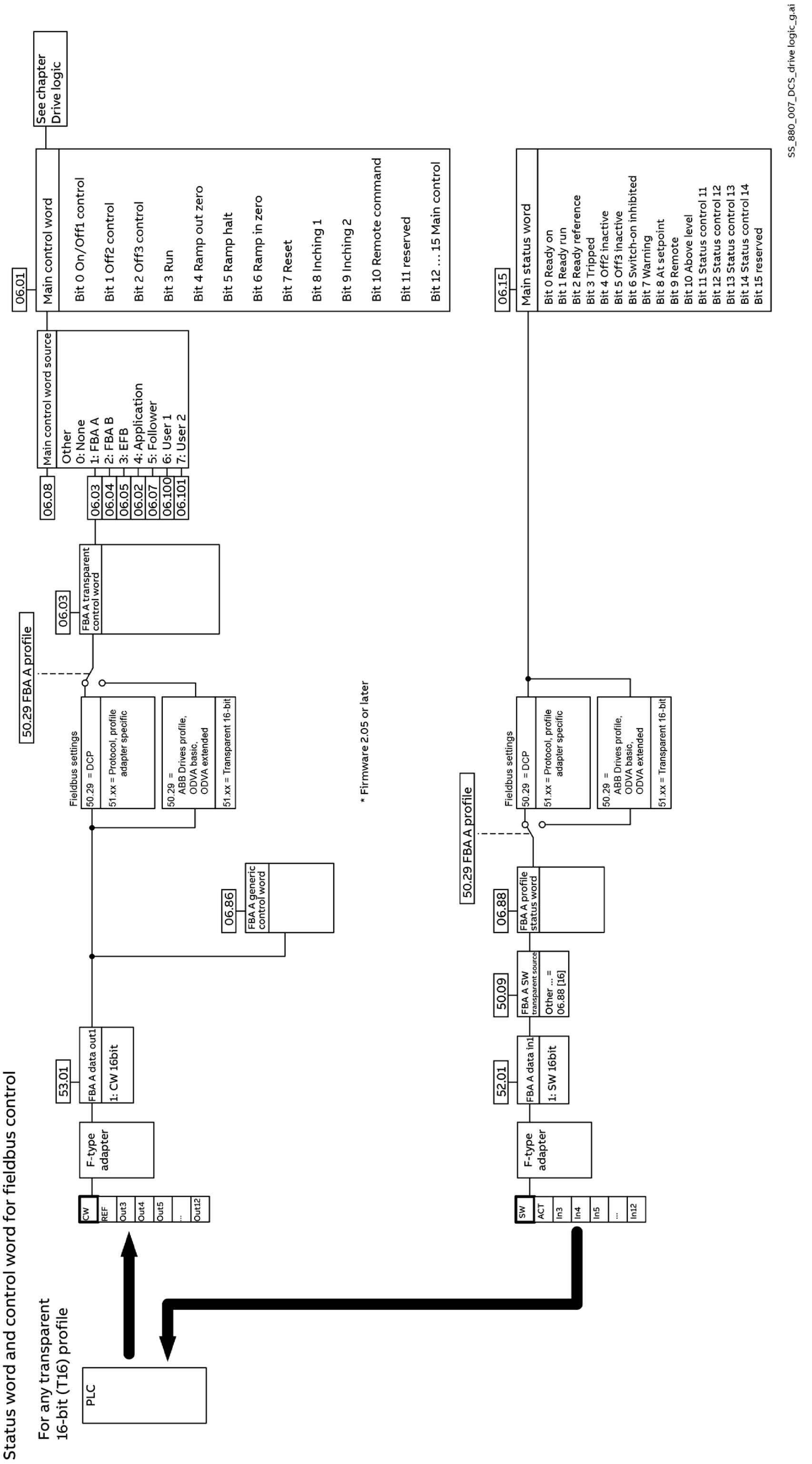
Control word (CW) and status word (SW)

The control word is a 16-bit or 32-bit packed boolean word. It is the principal means for controlling the drive from a fieldbus system. It is sent by the fieldbus controller to the drive through the adapter module. The drive switches between its states according to the bit-coded instructions in the control word and returns status information to the fieldbus controller in the status word.

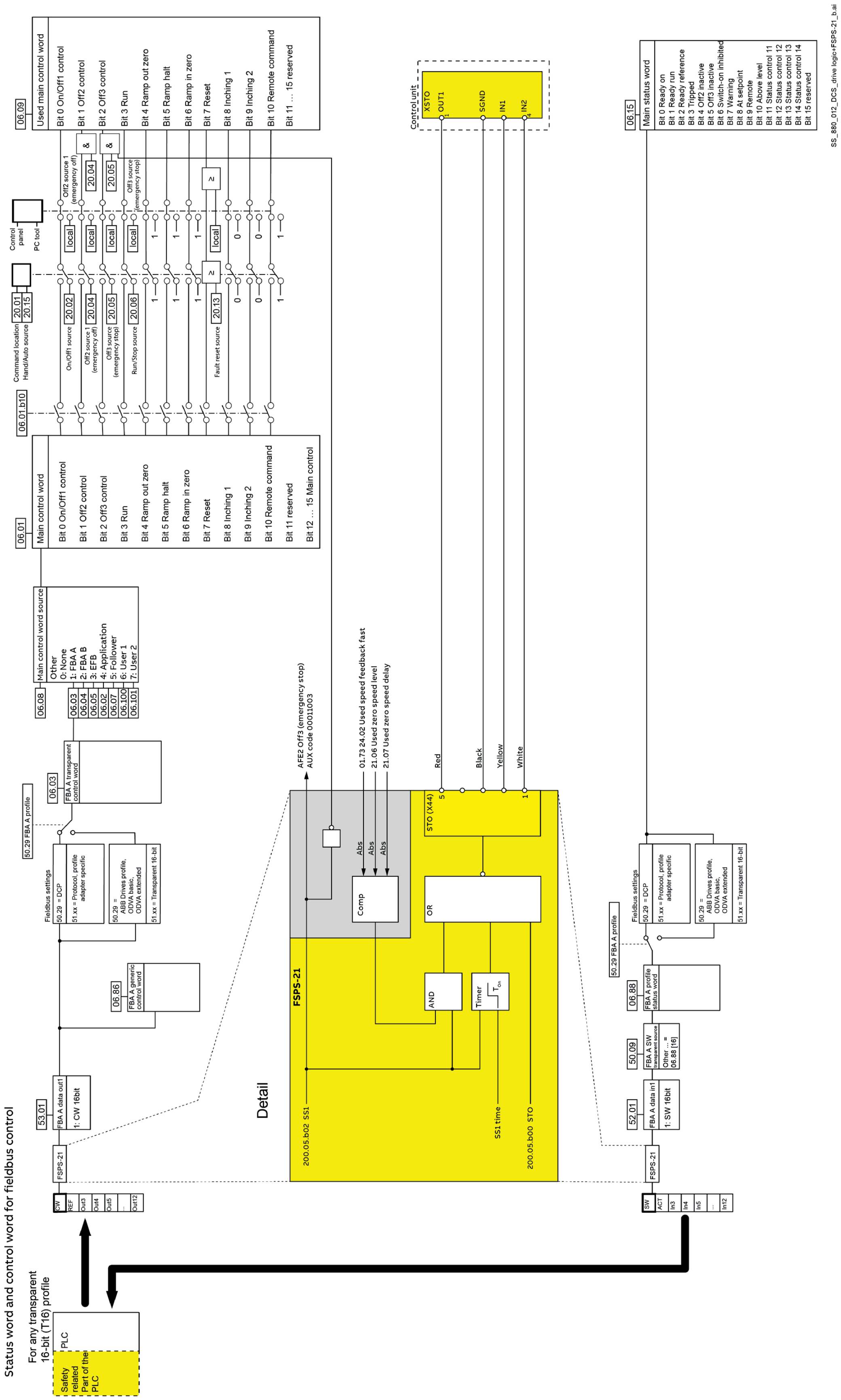
For the ABB drives profile, the bit assignment of the control word and the status word are detailed in 06.01 Main control word and 06.15 Main status word. The drive states are presented in chapter Start/Stop sequences and in chapter State machine (ABB Drives profile).

For the DCS880 always select a transparent 16-bit communication profile in group 51 FBA A settings. Additionally, the drive profile must be set in 50.29 FBA A profile. Then the control word received from the PLC is available in 06.03 FBA A transparent control word.
The status word is a 16-bit or 32-bit packed boolean word. The source of the status word is selected by means of 50.09 FBA A SW transparent source. Usually 06.88 FBA A profile status word is taken. This is 06.15 Main status word after being modified by 50.29 FBA A profile.

Profile conversion, control word (CW) and status word (SW) handling
Profile conversion using a standard fieldbus adapter.



Profile conversion using a FSPS-21 fieldbus adapter.



Debugging the network (control word and status word)

The control word received from the fieldbus is shown in 06.86 FBA A generic control word, and the status word sent to the fieldbus is shown in 06.88 FBA A profile status word.

Additionally, if 50.12 FBA A debug mode is set to Enable, the control word received from the fieldbus is shown in 50.13 FBA A control word, and the status word sent to the fieldbus in 50.16 FBA A status word. This data is useful to determine if the fieldbus master is transmitting the correct data before handing control to the fieldbus network.

References

References are 16-bit words containing a sign bit and a 15-bit integer.

ABB drives can receive control information from multiple sources including analog- and digital inputs, the control panel and a fieldbus adapter module. To control the drive via the fieldbus, the module must be defined as the source of control information such as references. This is done using the source selection parameters in groups 22 Speed reference selection and 26 Torque reference chain.

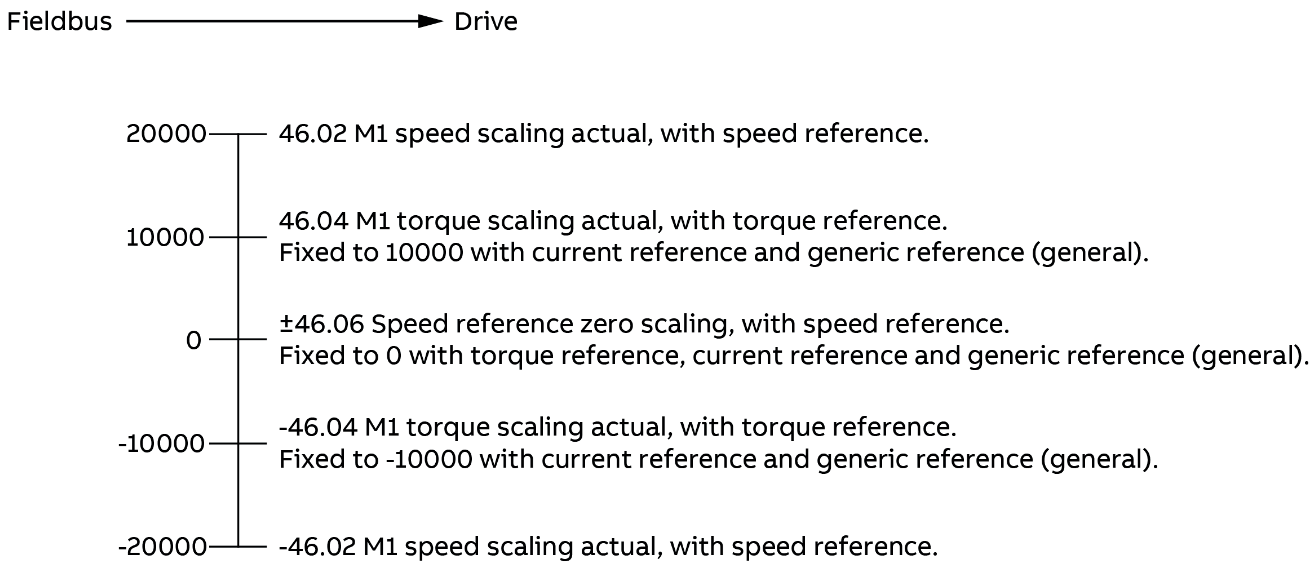
Debugging the network (references)

If 50.12 FBA A debug mode is set to Enable, the references received from the fieldbus are displayed in 50.14 FBA A reference 1 and 50.15 FBA A reference 2.

Scaling of references

Note: The scaling described below are for the ABB Drives profile. Fieldbus-specific communication profiles may use different scaling. For more information, see the manual of the fieldbus adapter.

The references are scaled as defined by parameters 46.01 … 46.06; which scaling is in use depends on the setting of 50.04 FBA A ref1 type and 50.05 FBA A ref2 type.



DZ_LIN_065_fieldbus-drive_a.ai

The scaled references are shown in 03.05 FBA A reference 1 and 03.06 FBA A reference 2.

Actual values

Actual values are 16-bit words containing information on the operation of the drive.

Selection is done by 50.10 FBA A act1 transparent source and 50.11 FBA A act2 transparent source.

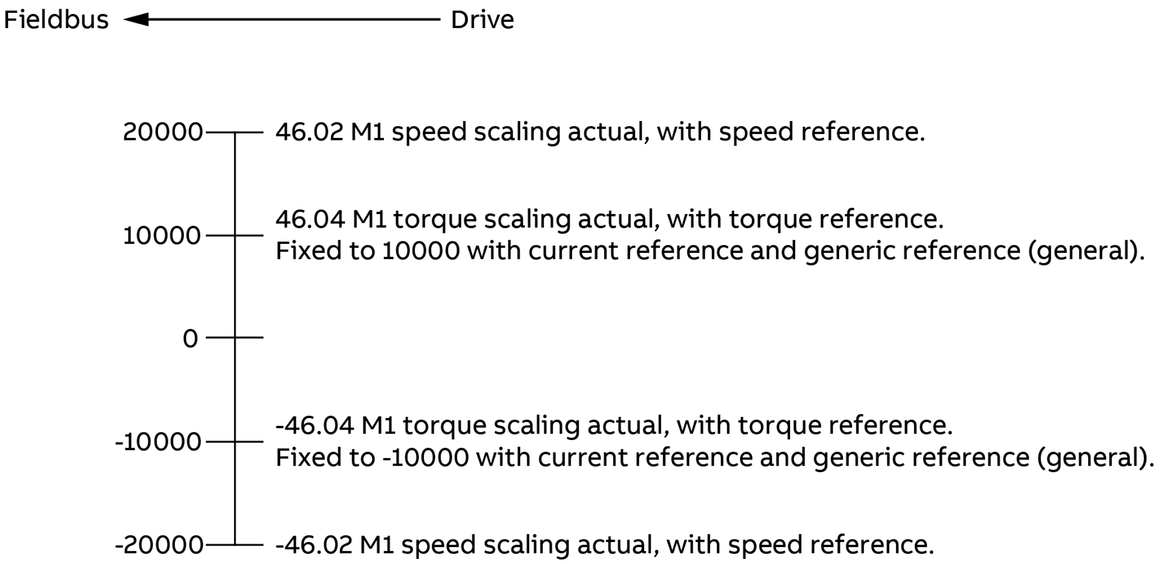
Debugging the network (actual values)

If 50.12 FBA A debug mode is set to Enable, the actual values sent to the fieldbus are displayed in 50.17 FBA A actual value 1 and 50.18 FBA A actual value 2.

Scaling of actual values

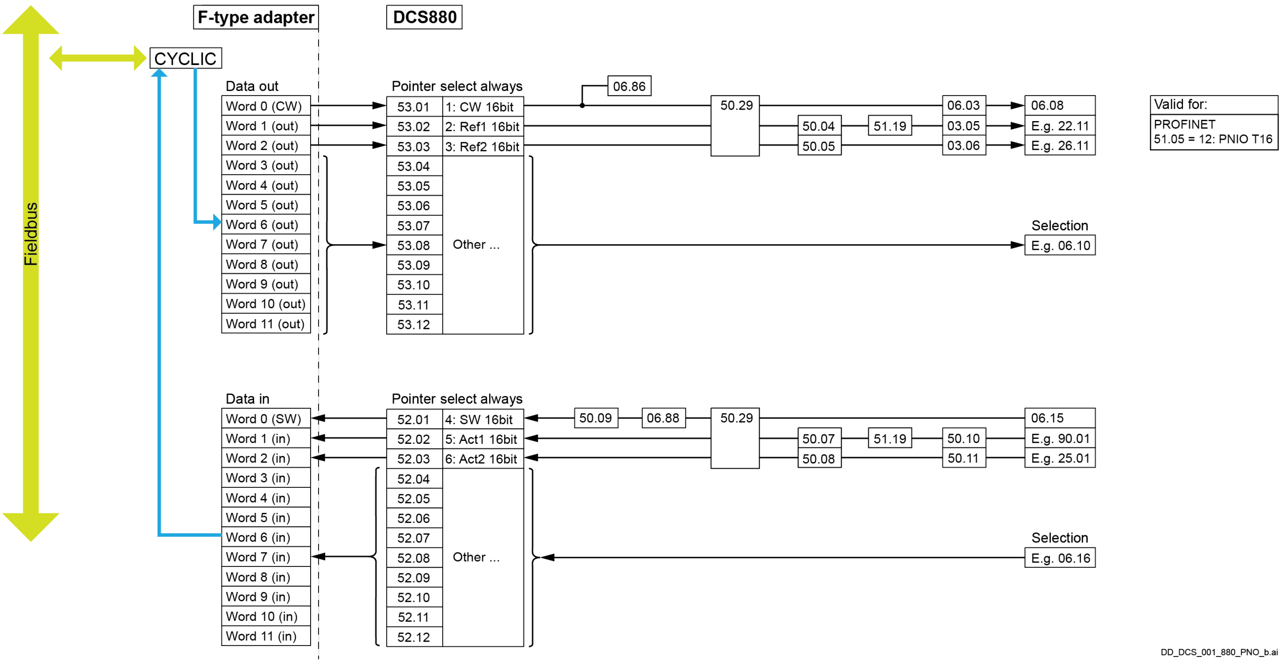
Note: The scaling described below are for the ABB Drives profile. Fieldbus-specific communication profiles may use different scaling. For more information, see the manual of the fieldbus adapter.

The actual values are scaled as defined by parameters 46.01…46.04; which scaling is in use depends on the setting of 50.07 FBA A actual 1 type and 50.08 FBA A actual 2 type.



DZ_LIN_065_fieldbus-drive_a.ai

Configuration using CW 16bit, Ref1 16bit, Ref2 16bit and Other



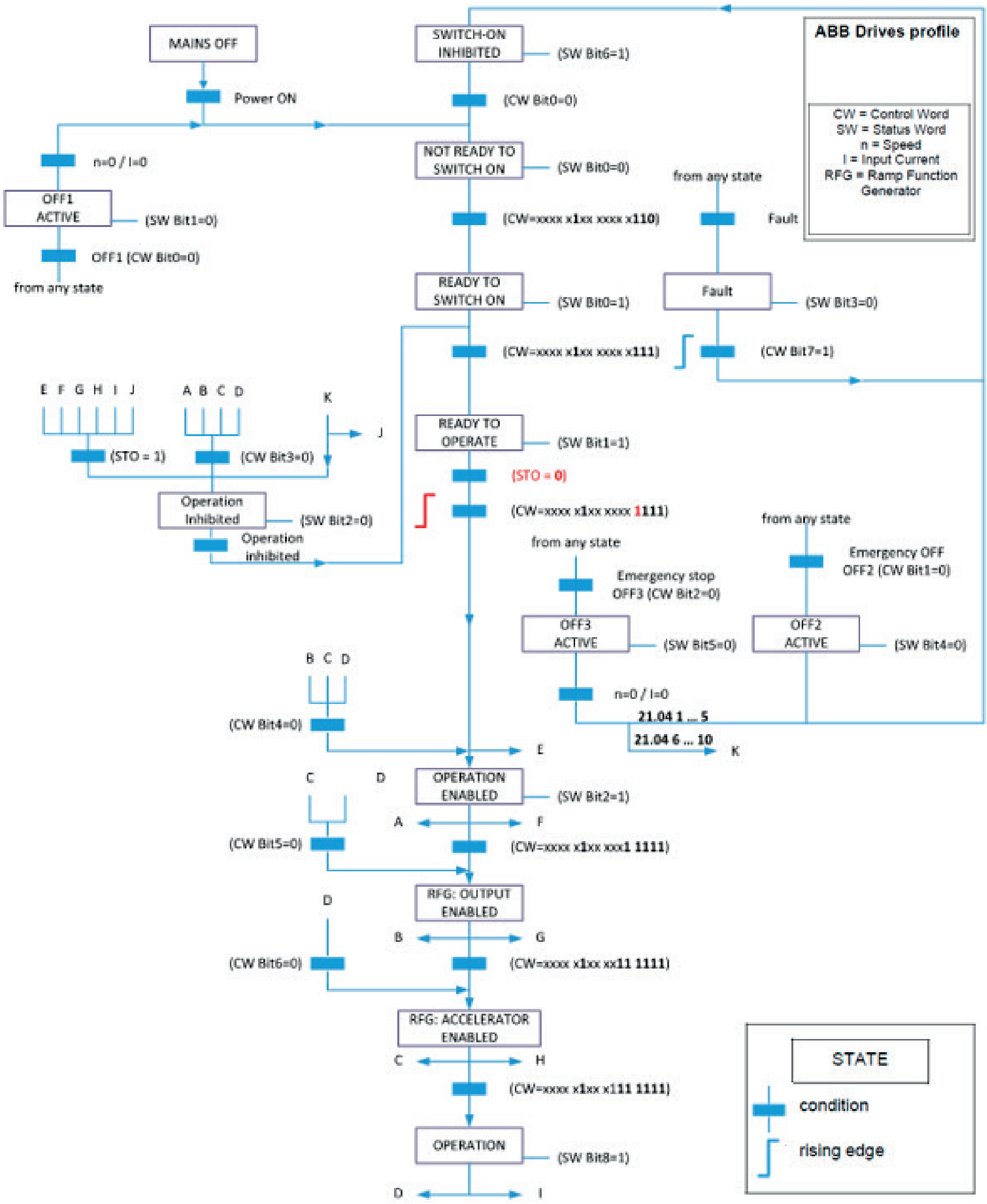
DD_DCS_001_880_PNO_b.ai

The ABB Drives profile

06.01 Main control word shows the contents of the fieldbus control word for the ABB Drives profile. The fieldbus converts this word to the form in which it is used in the drive. The state machine is shown below. 06.15 Main status word shows the fieldbus status word for the ABB Drives profile. The embedded fieldbus converts the drive status word into this form for the fieldbus. The state machine is shown below.

State machine

The diagram below shows the state transitions in the drive when the drive is using the ABB Drives profile and configured to follow the commands of the control word from the fieldbus.



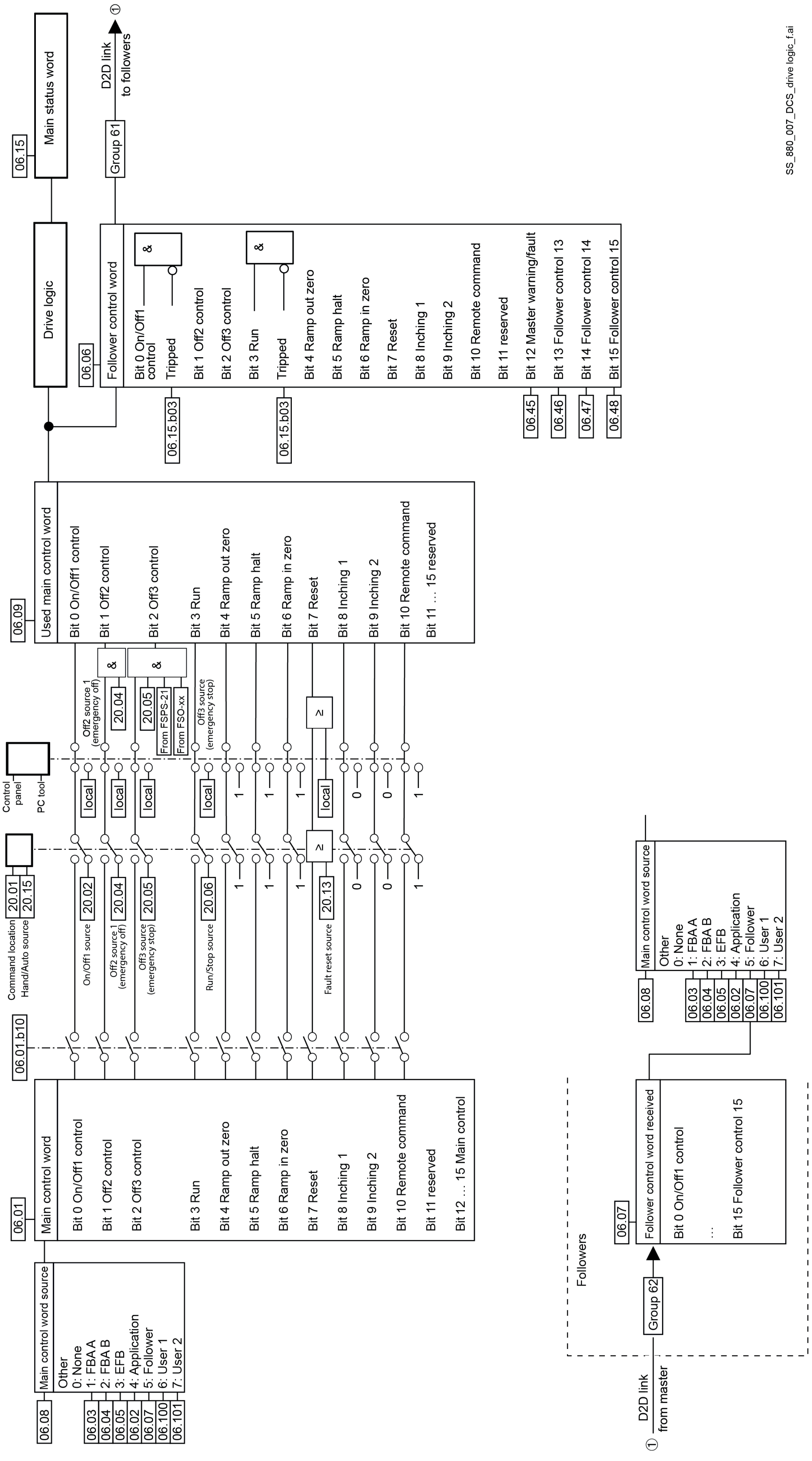
Additional information can be found in chapter Start/Stop sequences.

Setting up the drive for fieldbus control

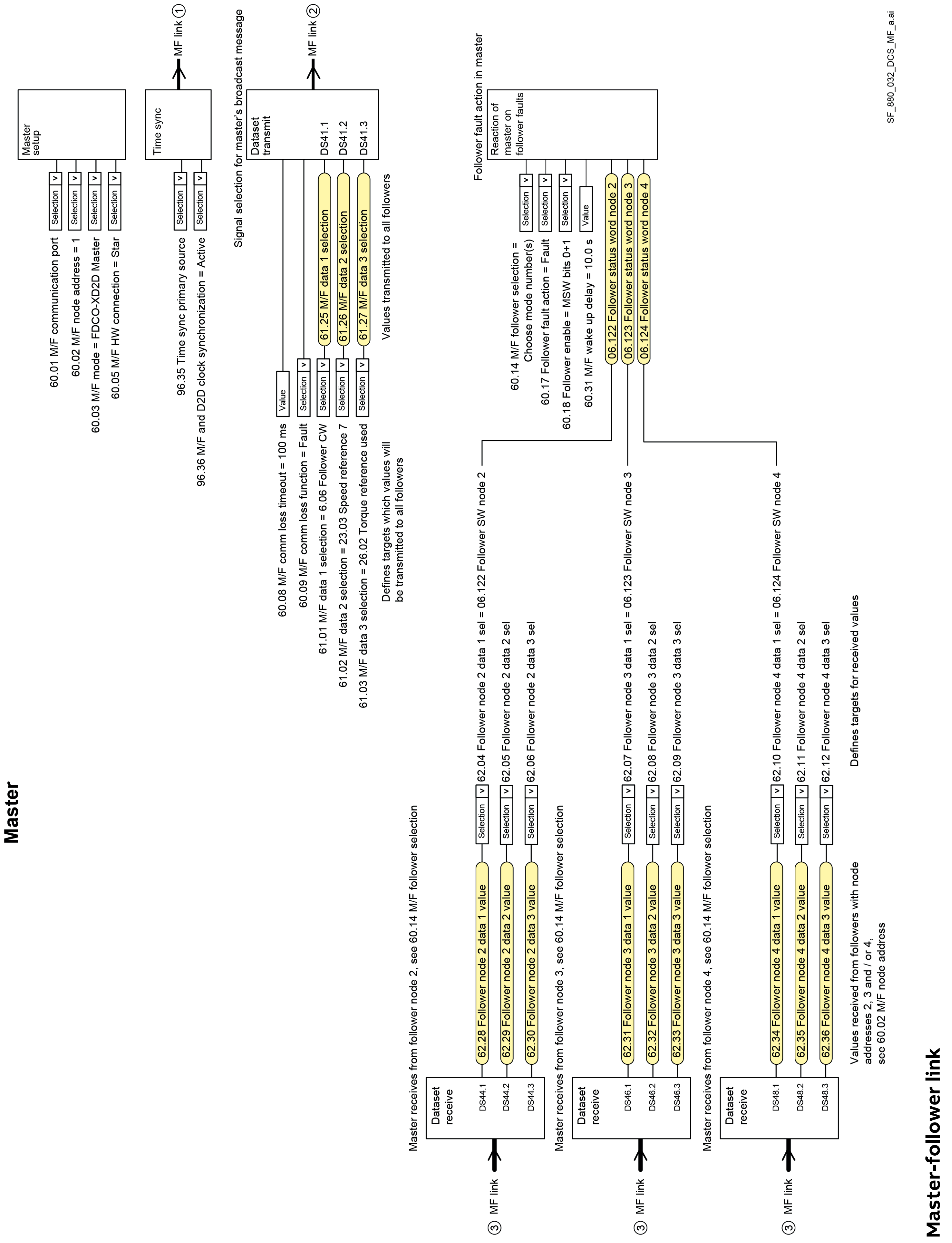
Setup information can be found in the Quick commissioning instructions of the different fieldbus types.

Firmware structure diagrams

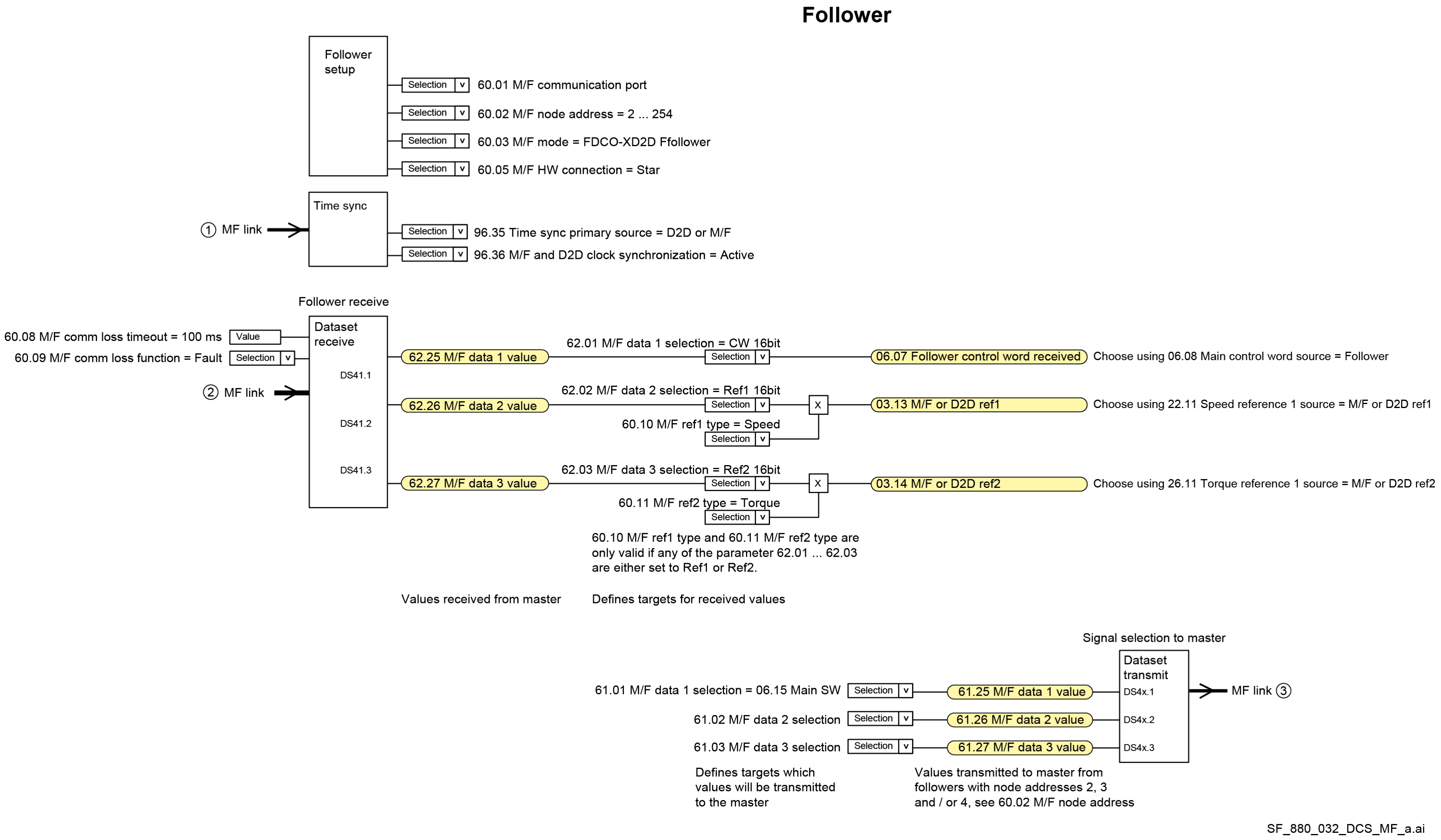
Drive logic



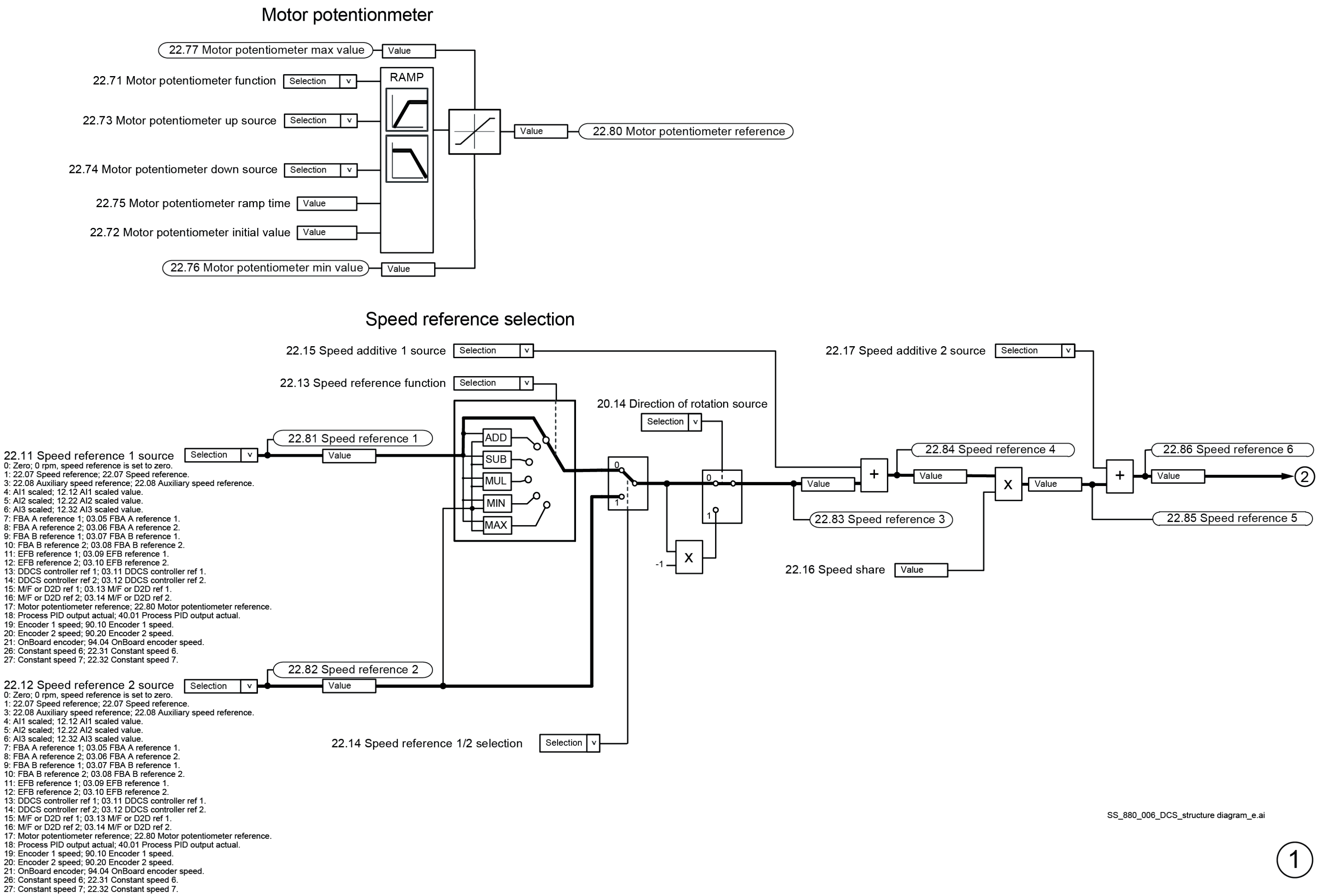
Master-follower link



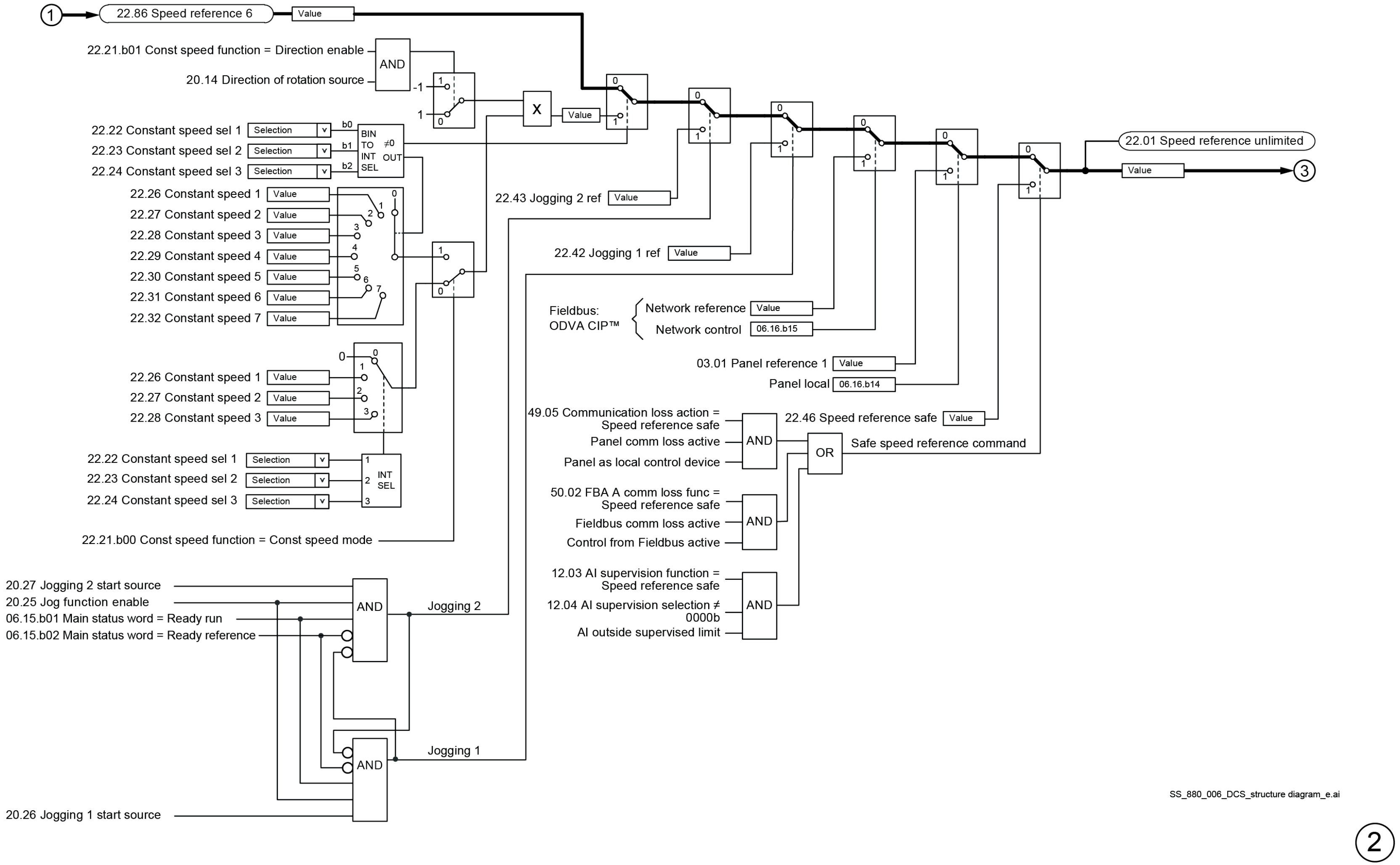
Master-follower link



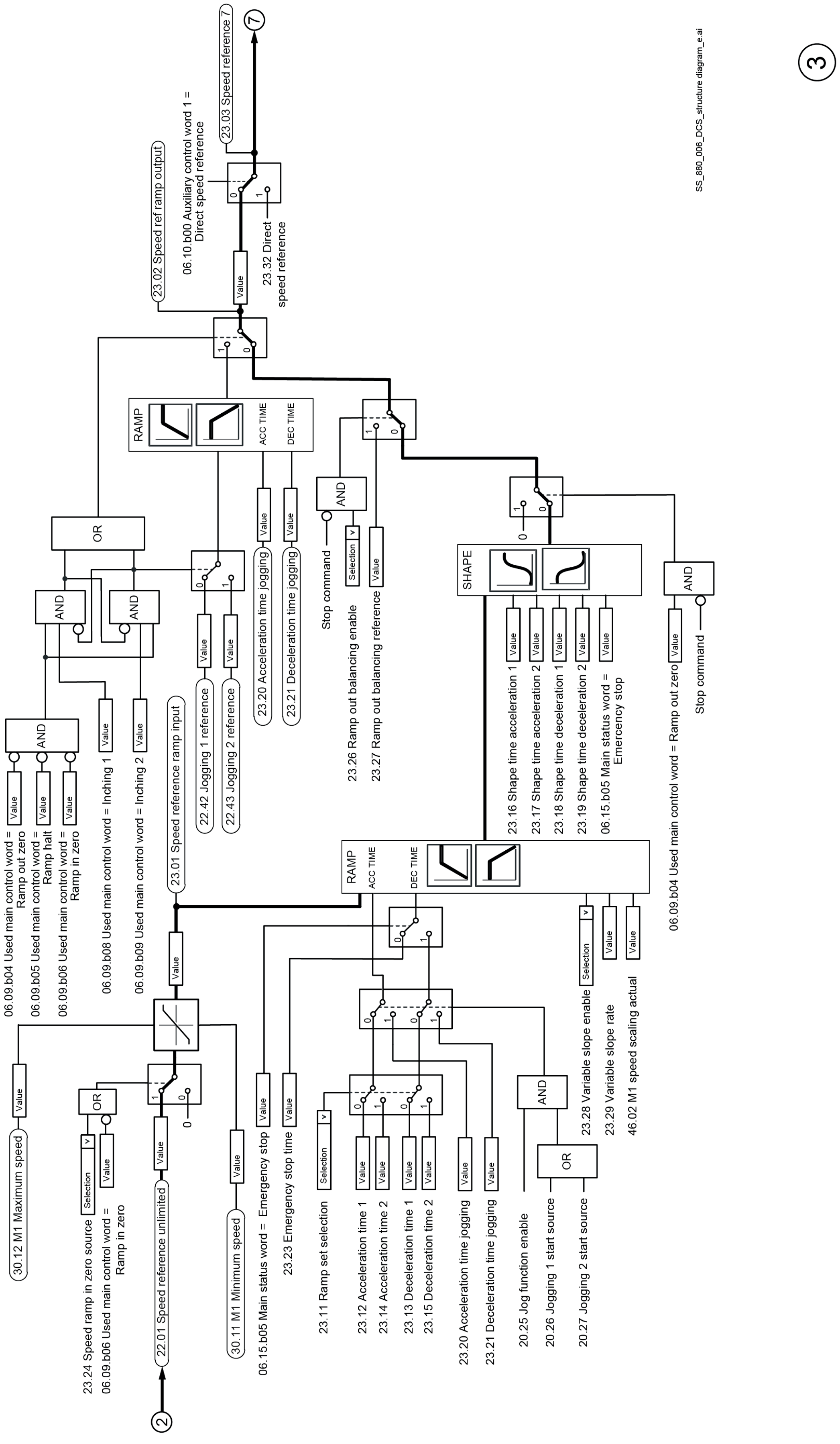
Diagrams

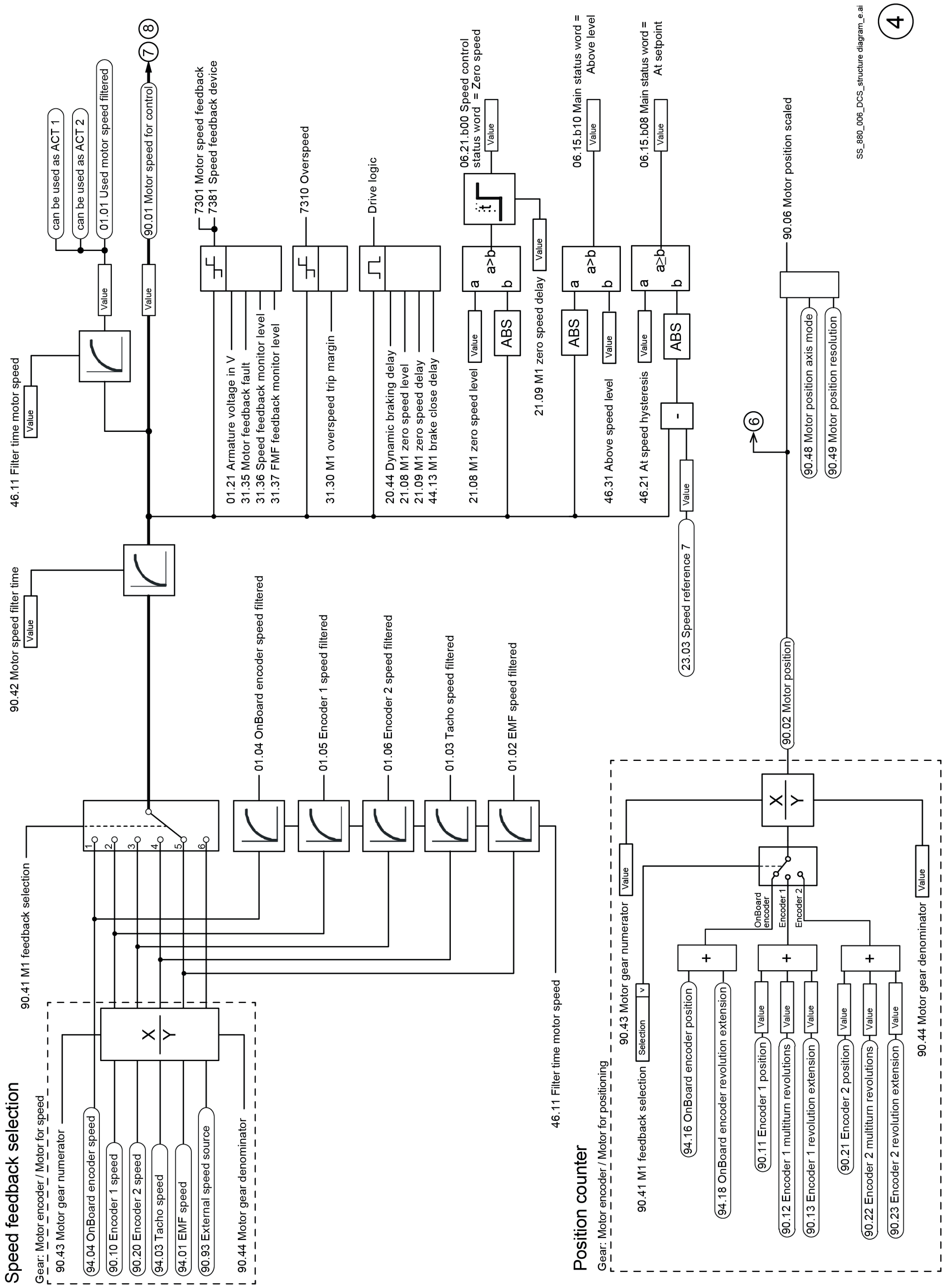

Motor potentionmeter
22.77 Motor potentiometer max value
Value
22.71 Motor potentiometer function
Selection
22.73 Motor potentiometer up source
Selection
22.74 Motor potentiometer down source
Selection
22.75 Motor potentiometer ramp time
Value
22.72 Motor potentiometer initial value
Value
22.76 Motor potentiometer min value
Value
RAMP
Value
22.80 Motor potentiometer reference
Speed reference selection
22.15 Speed additive 1 source
Selection
22.13 Speed reference function
Selection
ADD
SUB
MUL
MIN
MAX
20.14 Direction of rotation source
Selection
22.17 Speed additive 2 source
Selection
22.11 Speed reference 1 source
Selection
0: Zero; 0 rpm, speed reference is set to zero.
1: 22.07 Speed reference; 22.07 Speed reference.
3: 22.08 Auxiliary speed reference; 22.08 Auxiliary speed reference.
4: AI1 scaled; 12.12 AI1 scaled value.
5: AI2 scaled; 12.22 AI2 scaled value.
6: AI3 scaled; 12.32 AI3 scaled value.
7: FBA A reference 1; 03.05 FBA A reference 1.
8: FBA A reference 2; 03.06 FBA A reference 2.
9: FBA B reference 1; 03.07 FBA B reference 1.
10: FBA B reference 2; 03.08 FBA B reference 2.
11: EFB reference 1; 03.09 EFB reference 1.
12: EFB reference 2; 03.10 EFB reference 2.
13: DDCS controller ref 1; 03.11 DDCS controller ref 1.
14: DDCS controller ref 2; 03.12 DDCS controller ref 2.
15: M/F or D2D ref 1; 03.13 M/F or D2D ref 1.
16: M/F or D2D ref 2; 03.14 M/F or D2D ref 2.
17: Motor potentiometer reference; 22.80 Motor potentiometer reference.
18: Process PID output actual; 40.01 Process PID output actual.
19: Encoder 1 speed; 90.10 Encoder 1 speed.
20: Encoder 2 speed; 90.20 Encoder 2 speed.
21: OnBoard encoder; 94.04 OnBoard encoder speed.
26: Constant speed 6; 22.31 Constant speed 6.
27: Constant speed 7; 22.32 Constant speed 7.
22.81 Speed reference 1
Value
0
1
X
-1
0
1
Value
+
22.84 Speed reference 4
Value
X
Value
+
22.86 Speed reference 6
Value
2
22.83 Speed reference 3
22.16 Speed share
Value
22.85 Speed reference 5
22.12 Speed reference 2 source
Selection
0: Zero; 0 rpm, speed reference is set to zero.
1: 22.07 Speed reference; 22.07 Speed reference.
3: 22.08 Auxiliary speed reference; 22.08 Auxiliary speed reference.
4: AI1 scaled; 12.12 AI1 scaled value.
5: AI2 scaled; 12.22 AI2 scaled value.
6: AI3 scaled; 12.32 AI3 scaled value.
7: FBA A reference 1; 03.05 FBA A reference 1.
8: FBA A reference 2; 03.06 FBA A reference 2.
9: FBA B reference 1; 03.07 FBA B reference 1.
10: FBA B reference 2; 03.08 FBA B reference 2.
11: EFB reference 1; 03.09 EFB reference 1.
12: EFB reference 2; 03.10 EFB reference 2.
13: DDCS controller ref 1; 03.11 DDCS controller ref 1.
14: DDCS controller ref 2; 03.12 DDCS controller ref 2.
15: M/F or D2D ref 1; 03.13 M/F or D2D ref 1.
16: M/F or D2D ref 2; 03.14 M/F or D2D ref 2.
17: Motor potentiometer reference; 22.80 Motor potentiometer reference.
18: Process PID output actual; 40.01 Process PID output actual.
19: Encoder 1 speed; 90.10 Encoder 1 speed.
20: Encoder 2 speed; 90.20 Encoder 2 speed.
21: OnBoard encoder; 94.04 OnBoard encoder speed.
26: Constant speed 6; 22.31 Constant speed 6.
27: Constant speed 7; 22.32 Constant speed 7.
22.82 Speed reference 2
Value
22.14 Speed reference 1/2 selection
Selection
SS_880_006_DCS_structure diagram_e.ai
1

Jogging, constant speed references and speed reference chain



Speed reference ramp and shaping




Speed feedback selection
Gear: Motor encoder / Motor for speed
90.43 Motor gear numerator
94.04 OnBoard encoder speed
90.10 Encoder 1 speed
90.20 Encoder 2 speed
94.03 Tacho speed
94.01 EMF speed
90.93 External speed source
90.44 Motor gear denominator
X
Y
90.41 M1 feedback selection
1
2
3
4
5
6
46.11 Filter time motor speed
01.04 OnBoard encoder speed filtered
01.05 Encoder 1 speed filtered
01.06 Encoder 2 speed filtered
01.03 Tacho speed filtered
01.02 EMF speed filtered
90.42 Motor speed filter time
Value
46.11 Filter time motor speed
Value
Value
Value
can be used as ACT 1
can be used as ACT 2
01.01 Used motor speed filtered
90.01 Motor speed for control
7
8
7301 Motor speed feedback
7381 Speed feedback device
01.21 Armature voltage in V
31.35 Motor feedback fault
31.36 Speed feedback monitor level
31.37 FMF feedback monitor level
7310 Overspeed
31.30 M1 overspeed trip margin
Drive logic
20.44 Dynamic braking delay
21.08 M1 zero speed level
21.09 M1 zero speed delay
44.13 M1 brake close delay
21.08 M1 zero speed level
Value
ABS
a
b
a>b
21.09 M1 zero speed delay
Value
t
06.21.b00 Speed control status word = Zero speed
Value
46.31 Above speed level
ABS
Value
a
b
a>b
06.15.b10 Main status word = Above level
Value
46.21 At speed hysteresis
Value
ABS
-
Value
a
b
a≥b
06.15.b08 Main status word = At setpoint
Value
23.03 Speed reference 7
Position counter
Gear: Motor encoder / Motor for positioning
90.41 M1 feedback selection
Selection
v
90.43 Motor gear numerator
Value
94.16 OnBoard encoder position
94.18 OnBoard encoder revolution extension
+
90.11 Encoder 1 position
90.12 Encoder 1 multiturn revolutions
90.13 Encoder 1 revolution extension
Value
Value
Value
+
90.21 Encoder 2 position
90.22 Encoder 2 multiturn revolutions
90.23 Encoder 2 revolution extension
Value
Value
Value
+
OnBoard encoder
Encoder 1
Encoder 2
90.44 Motor gear denominator
Value
X
Y
90.02 Motor position
6
90.48 Motor position axis mode
90.49 Motor position resolution
90.06 Motor position scaled
SS_880_006_DCS_structure diagram_e.ai
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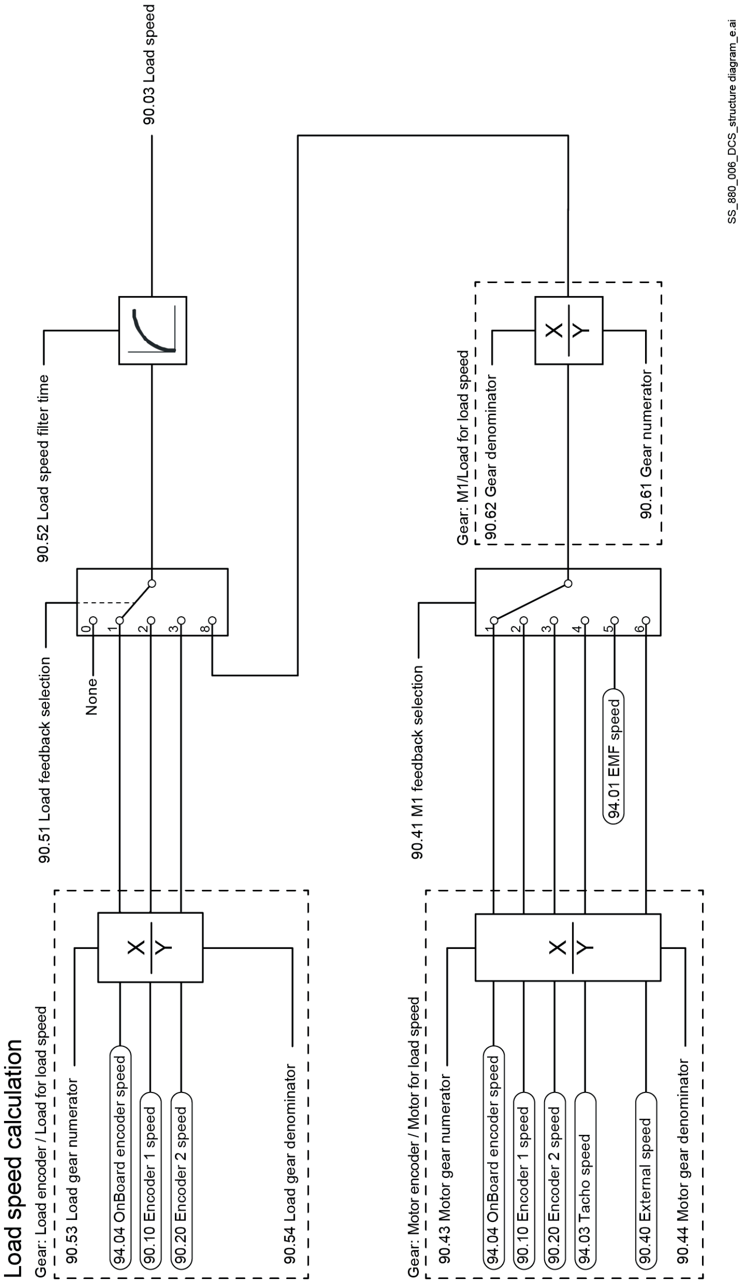
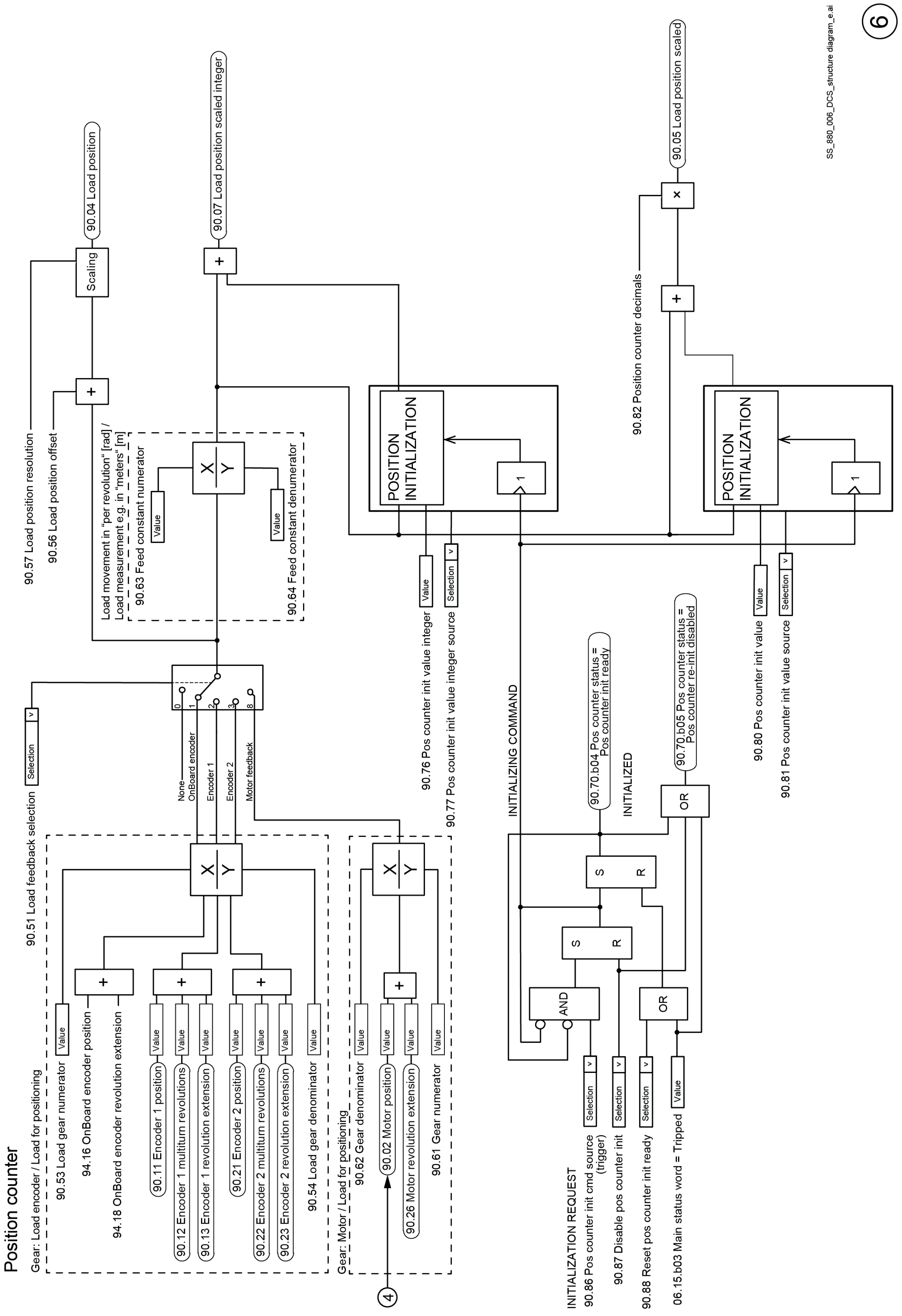
⑤



Load speed calculation


Position counter
Gear: Load encoder / Load for positioning
90.53 Load gear numerator
Value
94.16 OnBoard encoder position
94.18 OnBoard encoder revolution extension
90.11 Encoder 1 position
90.12 Encoder 1 multiturn revolutions
90.13 Encoder 1 revolution extension
90.21 Encoder 2 position
90.22 Encoder 2 multiturn revolutions
90.23 Encoder 2 revolution extension
90.54 Load gear denominator
Gear: Motor / Load for positioning
90.62 Gear denominator
90.02 Motor position
90.26 Motor revolution extension
90.61 Gear numerator
4
+
X
Y
90.51 Load feedback selection
Selection
None
OnBoard encoder
Encoder 1
Encoder 2
Motor feedback
0
1
2
3
8
Load movement in "per revolution" [rad] /
Load measurement e.g. in "meters" [m]
90.63 Feed constant numerator
90.64 Feed constant denumerator
90.57 Load position resolution
90.56 Load position offset
Scaling
90.04 Load position
90.07 Load position scaled integer
POSITION INITIALIZATION
1
90.76 Pos counter init value integer
90.77 Pos counter init value integer source
INITIALIZING COMMAND
90.70.b04 Pos counter status =
Pos counter init ready
INITIALIZED
90.70.b05 Pos counter status =
Pos counter re-init disabled
OR
S
R
AND
INITIALIZATION REQUEST
90.86 Pos counter init cmd source
(trigger)
90.87 Disable pos counter init
90.88 Reset pos counter init ready
06.15.b03 Main status word = Tripped
90.82 Position counter decimals
×
90.05 Load position scaled
90.80 Pos counter init value
90.81 Pos counter init value source
SS_880_006_DCS_structure diagram_e.ai
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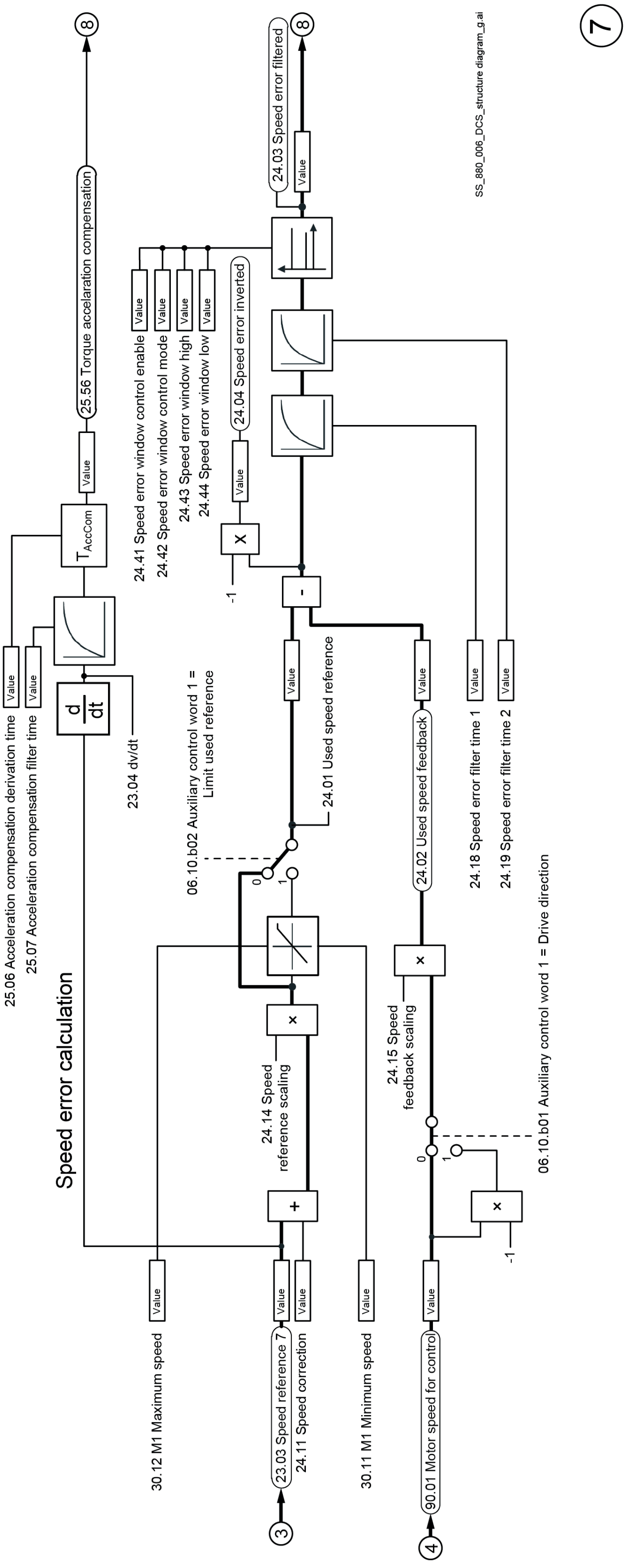
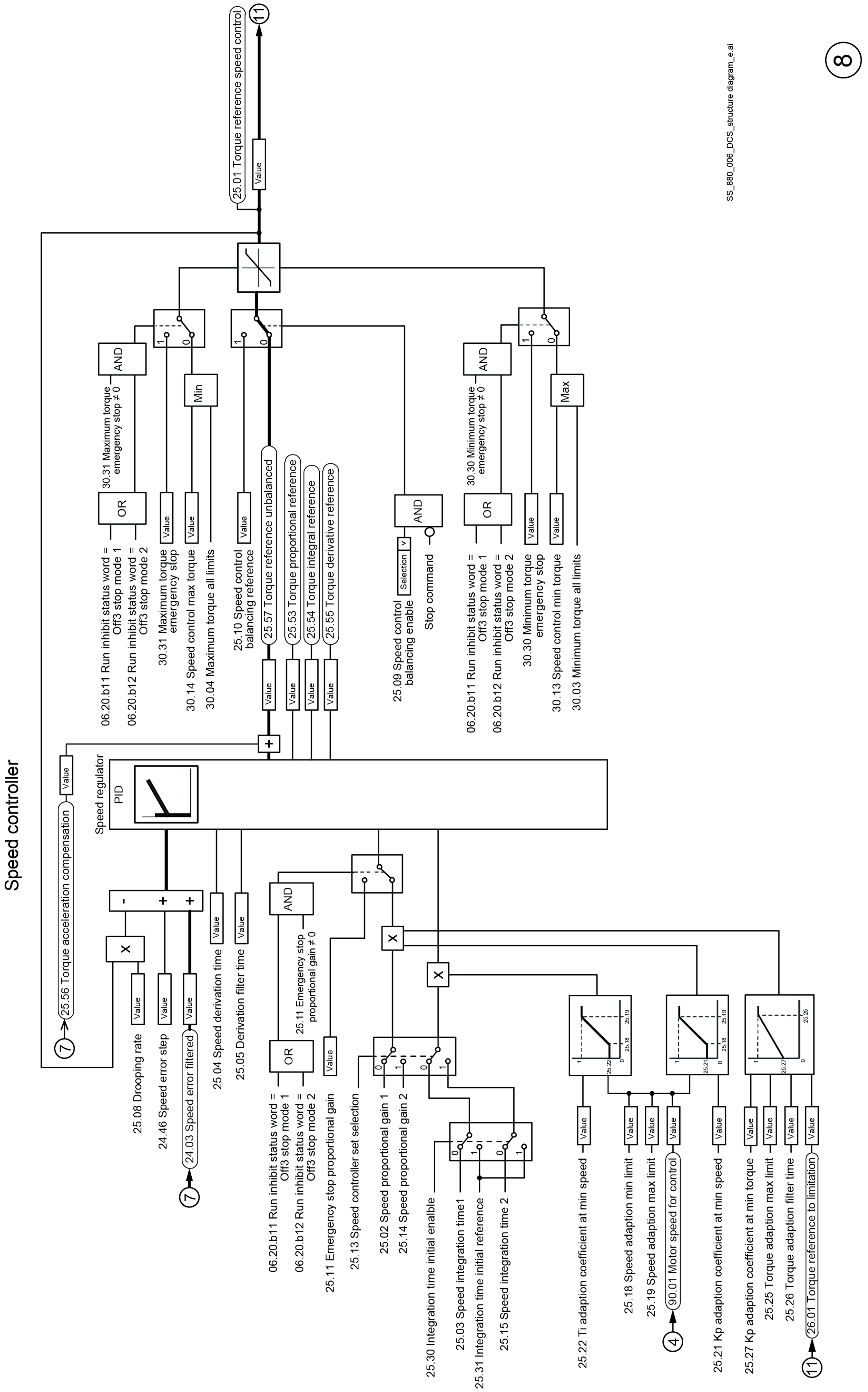

Speed error calculation
30.12 M1 Maximum speed
Value
23.03 Speed reference 7
24.11 Speed correction
Value
Value
30.11 M1 Minimum speed
Value
90.01 Motor speed for control
Value
3
4
+
24.14 Speed reference scaling
x
0
1
06.10.b02 Auxiliary control word 1 = Limit used reference
24.01 Used speed reference
Value
24.15 Speed feedback scaling
x
0
1
06.10.b01 Auxiliary control word 1 = Drive direction
x
-1
24.02 Used speed feedback
Value
-
-1
X
24.04 Speed error inverted
Value
24.18 Speed error filter time 1
Value
24.19 Speed error filter time 2
Value
24.41 Speed error window control enable
Value
24.42 Speed error window control mode
Value
24.43 Speed error window high
Value
24.44 Speed error window low
Value
24.03 Speed error filtered
Value
8
25.06 Acceleration compensation derivation time
Value
25.07 Acceleration compensation filter time
Value
d/dt
23.04 dv/dt
T_AccCom
Value
25.56 Torque accelaration compensation
8
SS_880_006_DCS_structure diagram_g.ai
7


Speed controller
7
25.56 Torque acceleration compensation
Value
Speed regulator
PID
x
-
+
+
25.08 Drooping rate
24.46 Speed error step
24.03 Speed error filtered
7
25.04 Speed derivation time
25.05 Derivation filter time
06.20.b11 Run inhibit status word = Off3 stop mode 1
06.20.b12 Run inhibit status word = Off3 stop mode 2
OR
25.11 Emergency stop proportional gain ≠ 0
AND
25.11 Emergency stop proportional gain
25.13 Speed controller set selection
25.02 Speed proportional gain 1
25.14 Speed proportional gain 2
25.30 Integration time initial enable
25.03 Speed integration time1
25.31 Integration time initial reference
25.15 Speed integration time 2
0
1
25.22 Ti adaption coefficient at min speed
25.18 Speed adaption min limit
25.19 Speed adaption max limit
4
90.01 Motor speed for control
25.21 Kp adaption coefficient at min speed
25.27 Kp adaption coefficient at min torque
25.25 Torque adaption max limit
25.26 Torque adaption filter time
11
26.01 Torque reference to limitation
25.22
25.18
25.19
25.21
25.27
06.20.b11 Run inhibit status word = Off3 stop mode 1
06.20.b12 Run inhibit status word = Off3 stop mode 2
30.31 Maximum torque emergency stop ≠ 0
30.31 Maximum torque emergency stop
30.14 Speed control max torque
30.04 Maximum torque all limits
Min
25.10 Speed control balancing reference
25.57 Torque reference unbalanced
25.53 Torque proportional reference
25.54 Torque integral reference
25.55 Torque derivative reference
25.09 Speed control balancing enable
Selection
Stop command
06.20.b11 Run inhibit status word = Off3 stop mode 1
06.20.b12 Run inhibit status word = Off3 stop mode 2
30.30 Minimum torque emergency stop ≠ 0
30.30 Minimum torque emergency stop
30.13 Speed control min torque
30.03 Minimum torque all limits
Max
25.01 Torque reference speed control
11
SS_880_006_DCS_structure diagram_e.ai
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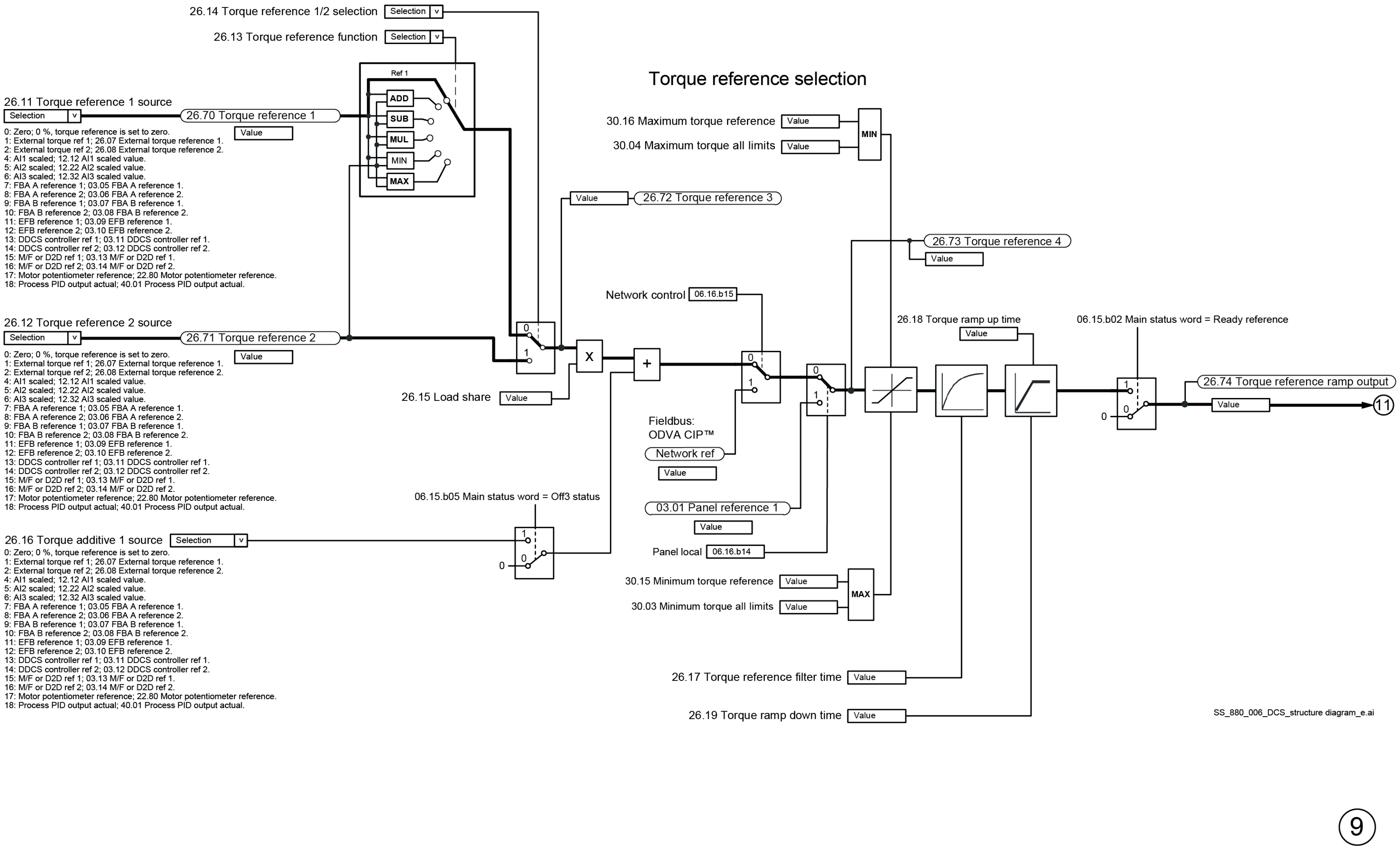


26.11 Torque reference 1 source

0: Zero; 0 %, torque reference is set to zero.
1: External torque ref 1; 26.07 External torque reference 1.
2: External torque ref 2; 26.08 External torque reference 2.
4: AI1 scaled; 12.12 AI1 scaled value.
5: AI2 scaled; 12.22 AI2 scaled value.
6: AI3 scaled; 12.32 AI3 scaled value.
7: FBA A reference 1; 03.05 FBA A reference 1.
8: FBA A reference 2; 03.06 FBA A reference 2.
9: FBA B reference 1; 03.07 FBA B reference 1.
10: FBA B reference 2; 03.08 FBA B reference 2.
11: EFB reference 1; 03.09 EFB reference 1.
12: EFB reference 2; 03.10 EFB reference 2.
13: DDCS controller ref 1; 03.11 DDCS controller ref 1.
14: DDCS controller ref 2; 03.12 DDCS controller ref 2.
15: M/F or D2D ref 1; 03.13 M/F or D2D ref 1.
16: M/F or D2D ref 2; 03.14 M/F or D2D ref 2.
17: Motor potentiometer reference; 22.80 Motor potentiometer reference.
18: Process PID output actual; 40.01 Process PID output actual.

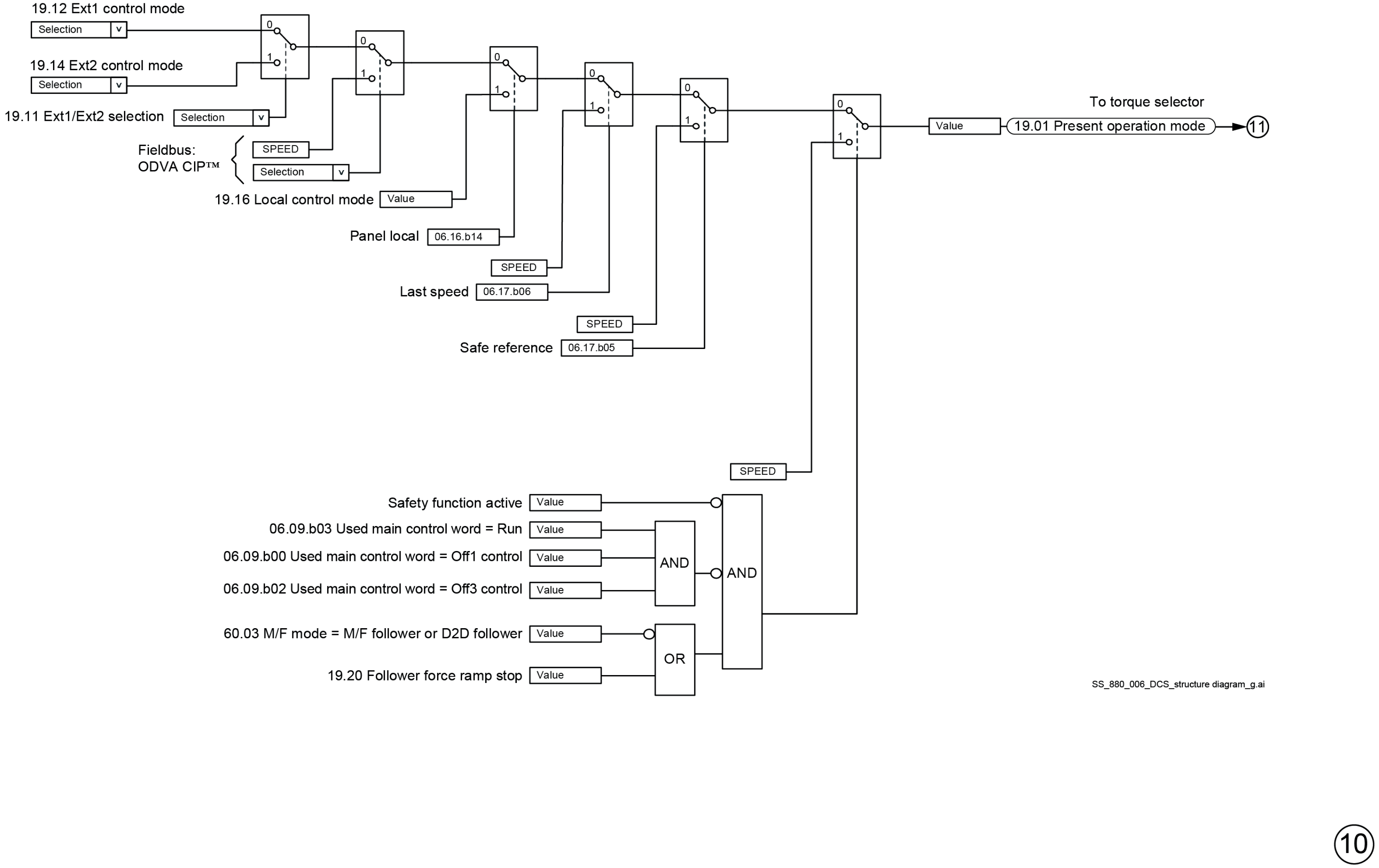
26.12 Torque reference 2 source

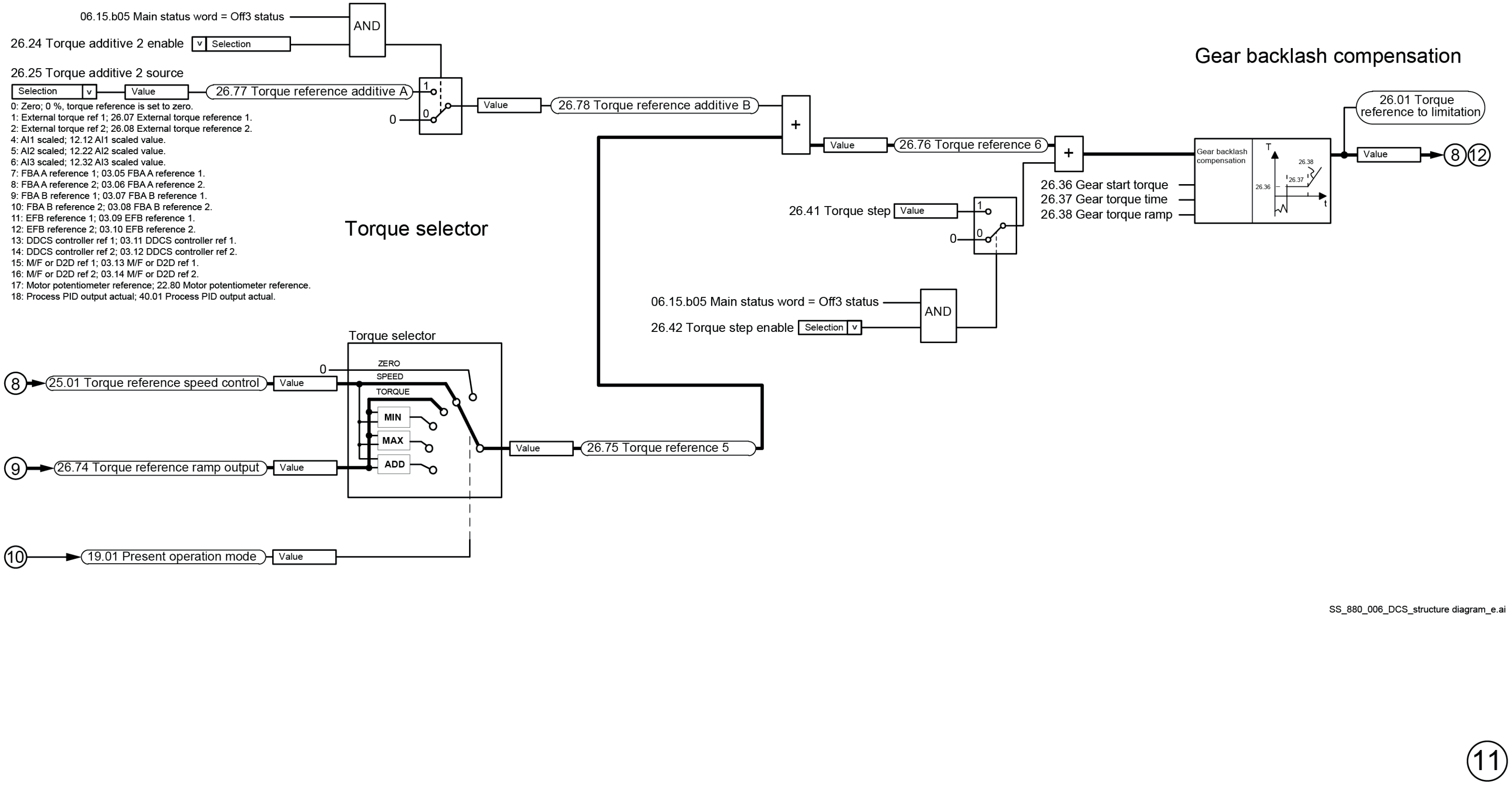
0: Zero; 0 %, torque reference is set to zero.
1: External torque ref 1; 26.07 External torque reference 1.
2: External torque ref 2; 26.08 External torque reference 2.
4: AI1 scaled; 12.12 AI1 scaled value.
5: AI2 scaled; 12.22 AI2 scaled value.
6: AI3 scaled; 12.32 AI3 scaled value.
7: FBA A reference 1; 03.05 FBA A reference 1.
8: FBA A reference 2; 03.06 FBA A reference 2.
9: FBA B reference 1; 03.07 FBA B reference 1.
10: FBA B reference 2; 03.08 FBA B reference 2.
11: EFB reference 1; 03.09 EFB reference 1.
12: EFB reference 2; 03.10 EFB reference 2.
13: DDCS controller ref 1; 03.11 DDCS controller ref 1.
14: DDCS controller ref 2; 03.12 DDCS controller ref 2.
15: M/F or D2D ref 1; 03.13 M/F or D2D ref 1.
16: M/F or D2D ref 2; 03.14 M/F or D2D ref 2.
17: Motor potentiometer reference; 22.80 Motor potentiometer reference.
18: Process PID output actual; 40.01 Process PID output actual.

26.16 Torque additive 1 source

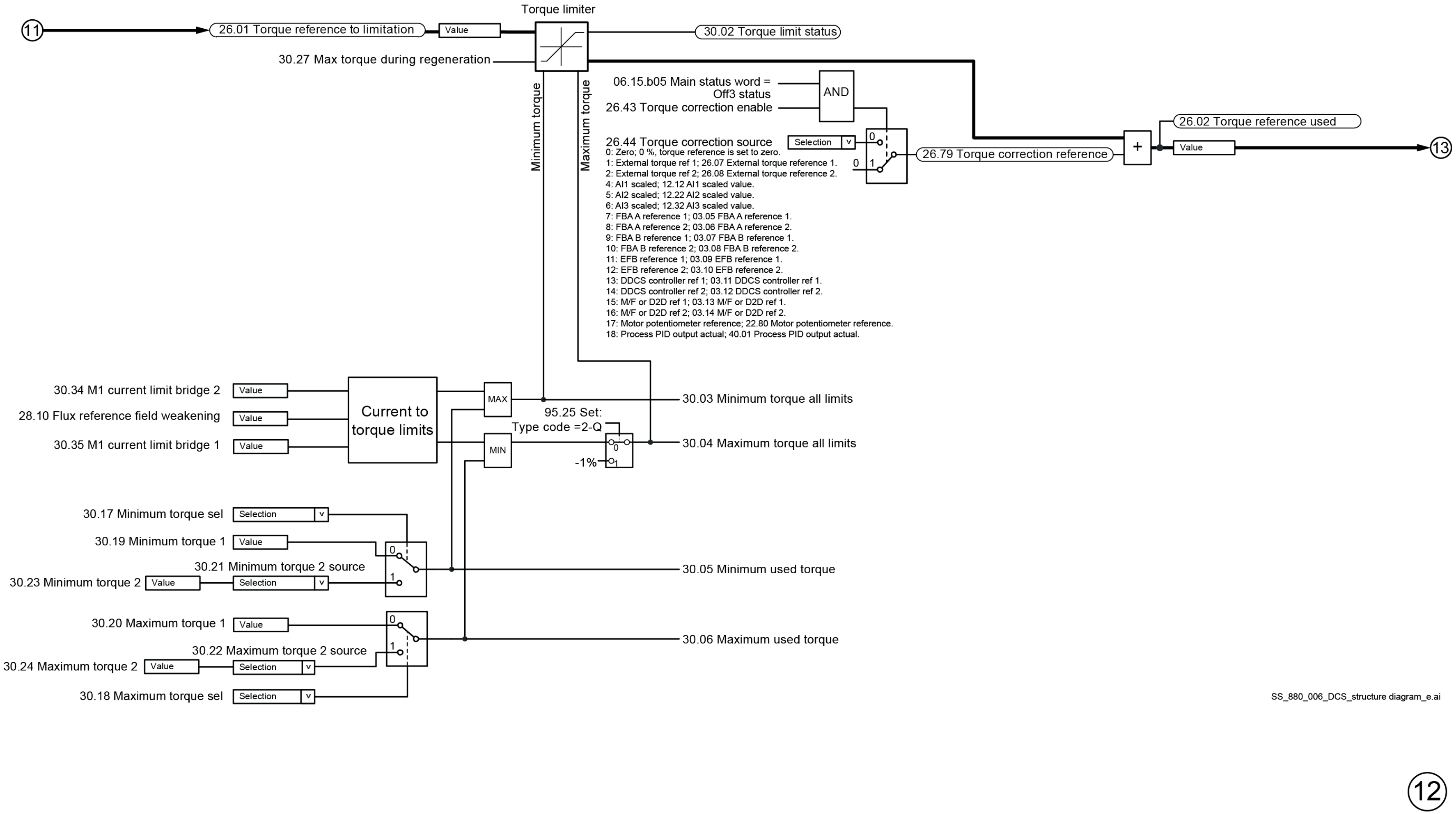
0: Zero; 0 %, torque reference is set to zero.
1: External torque ref 1; 26.07 External torque reference 1.
2: External torque ref 2; 26.08 External torque reference 2.
4: AI1 scaled; 12.12 AI1 scaled value.
5: AI2 scaled; 12.22 AI2 scaled value.
6: AI3 scaled; 12.32 AI3 scaled value.
7: FBA A reference 1; 03.05 FBA A reference 1.
8: FBA A reference 2; 03.06 FBA A reference 2.
9: FBA B reference 1; 03.07 FBA B reference 1.
10: FBA B reference 2; 03.08 FBA B reference 2.
11: EFB reference 1; 03.09 EFB reference 1.
12: EFB reference 2; 03.10 EFB reference 2.
13: DDCS controller ref 1; 03.11 DDCS controller ref 1.
14: DDCS controller ref 2; 03.12 DDCS controller ref 2.
15: M/F or D2D ref 1; 03.13 M/F or D2D ref 1.
16: M/F or D2D ref 2; 03.14 M/F or D2D ref 2.
17: Motor potentiometer reference; 22.80 Motor potentiometer reference.
18: Process PID output actual; 40.01 Process PID output actual.

Control mode selection

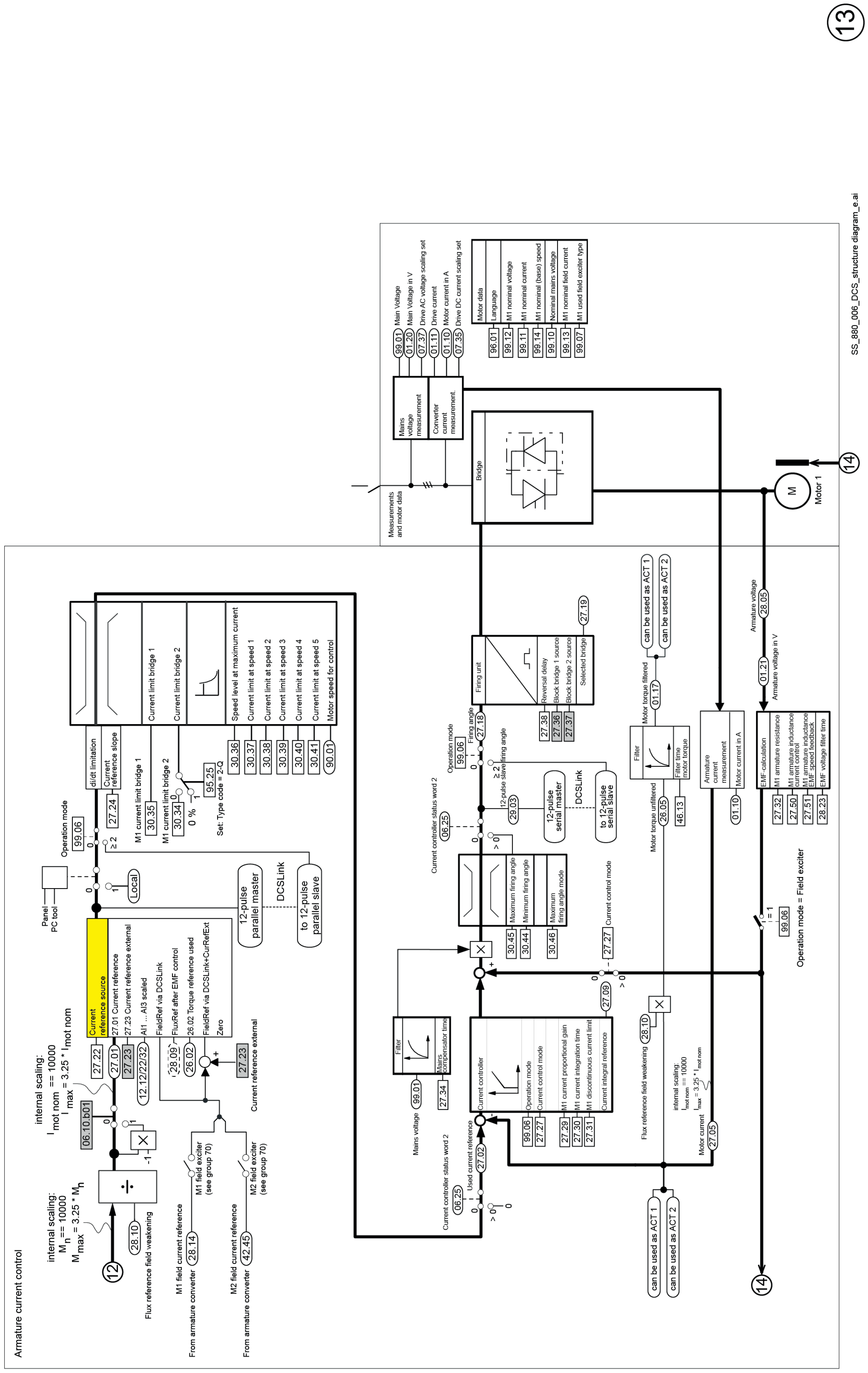



06.15.b05 Main status word = Off3 status
AND
26.24 Torque additive 2 enable
v
Selection
26.25 Torque additive 2 source
Selection
v
Value
26.77 Torque reference additive A
0: Zero; 0 %, torque reference is set to zero.
1: External torque ref 1; 26.07 External torque reference 1.
2: External torque ref 2; 26.08 External torque reference 2.
4: AI1 scaled; 12.12 AI1 scaled value.
5: AI2 scaled; 12.22 AI2 scaled value.
6: AI3 scaled; 12.32 AI3 scaled value.
7: FBA A reference 1; 03.05 FBA A reference 1.
8: FBA A reference 2; 03.06 FBA A reference 2.
9: FBA B reference 1; 03.07 FBA B reference 1.
10: FBA B reference 2; 03.08 FBA B reference 2.
11: EFB reference 1; 03.09 EFB reference 1.
12: EFB reference 2; 03.10 EFB reference 2.
13: DDCS controller ref 1; 03.11 DDCS controller ref 1.
14: DDCS controller ref 2; 03.12 DDCS controller ref 2.
15: M/F or D2D ref 1; 03.13 M/F or D2D ref 1.
16: M/F or D2D ref 2; 03.14 M/F or D2D ref 2.
17: Motor potentiometer reference; 22.80 Motor potentiometer reference.
18: Process PID output actual; 40.01 Process PID output actual.
1
0
0
Value
26.78 Torque reference additive B
+
Value
26.76 Torque reference 6
+
Torque selector
Torque selector
0
ZERO
SPEED
TORQUE
MIN
MAX
ADD
⑧
25.01 Torque reference speed control
Value
⑨
26.74 Torque reference ramp output
Value
⑩
19.01 Present operation mode
Value
Value
26.75 Torque reference 5
26.41 Torque step
Value
1
0
0
06.15.b05 Main status word = Off3 status
26.42 Torque step enable
Selection
v
AND
Gear backlash compensation
26.36 Gear start torque
26.37 Gear torque time
26.38 Gear torque ramp
Gear backlash compensation
T
t
26.36
26.37
26.38
26.01 Torque reference to limitation
Value
⑧
⑫
SS_880_006_DCS_structure diagram_e.ai
⑪

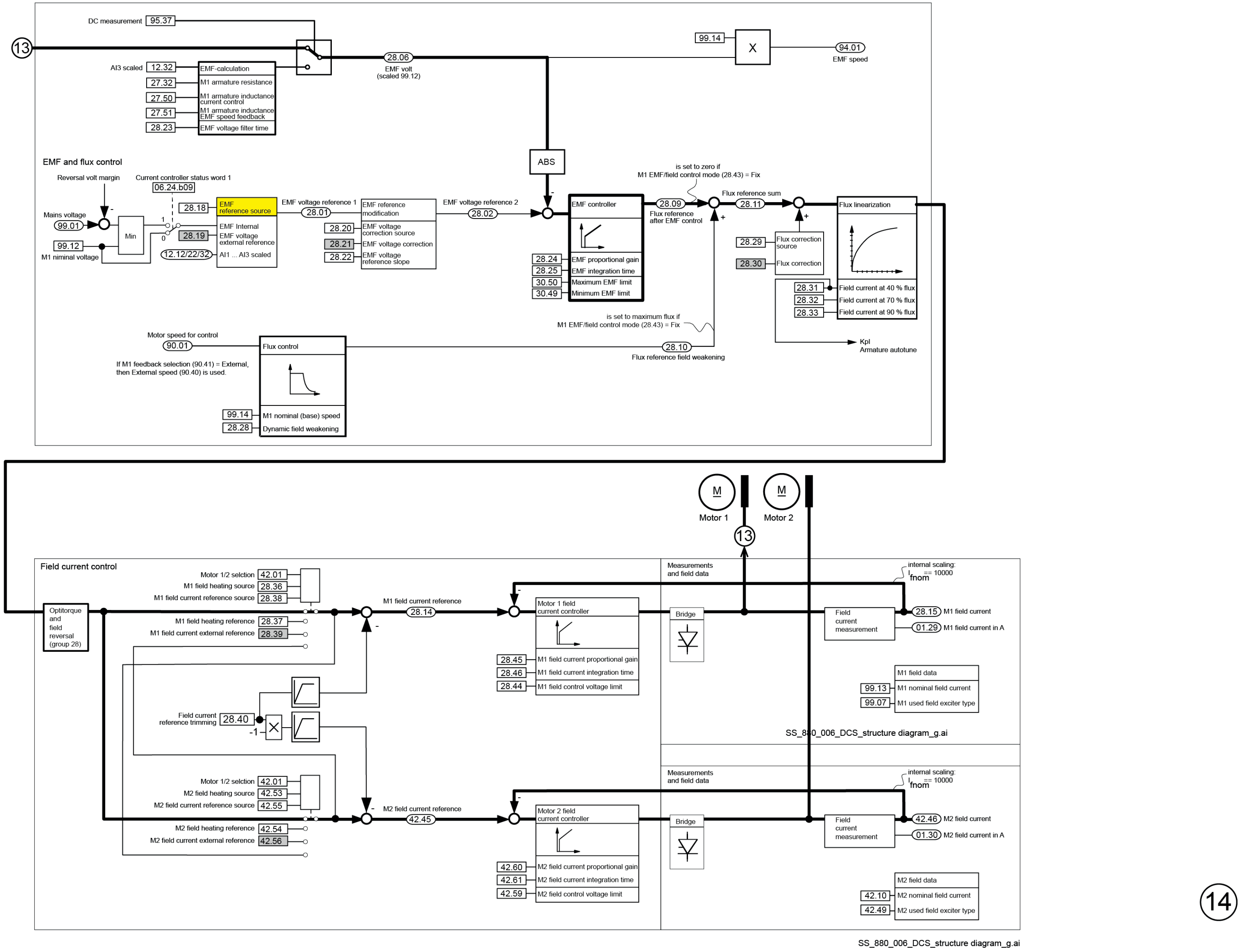
Torque limitation



Armature current control



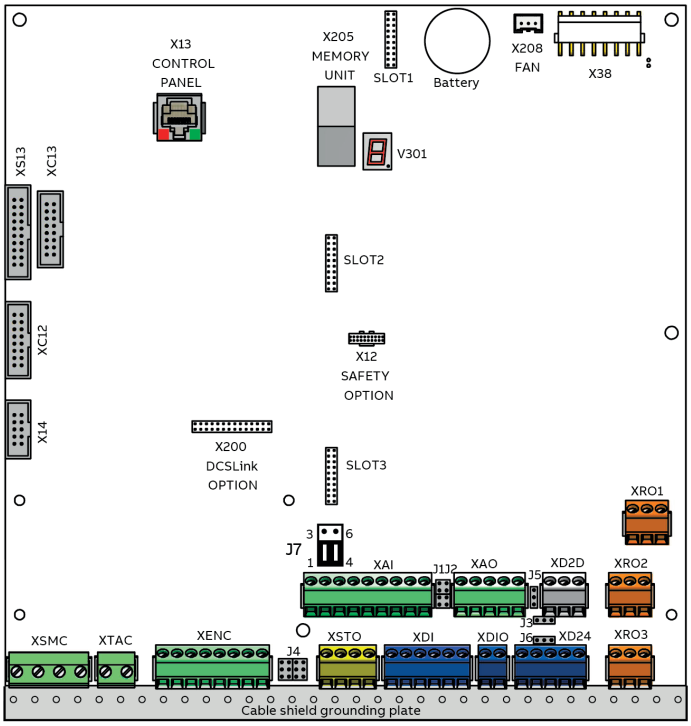
Field current and EMF control



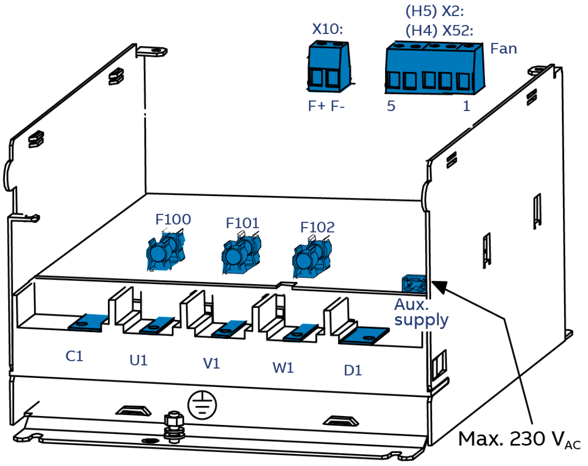
SS_880_006_DCS_structure diagram_g.ai

Terminal locations of the converter

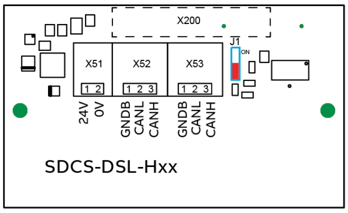
SDCS-CON-H: Connector allocation



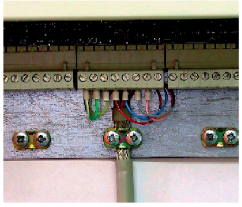
DCS880 module: Connector allocation



DCS880 Accessories



Cable shield grounding plate



SDCS-CON-H: Terminal allocation

XSMC	XENC (Encoder)	XSTO	XDI	XDO	XD24	XAI	XAO	XD2D	XRO1	XRO2	XRO3
1 2 3 4	1 2 3 4 5 6 7 8	1 2 3 4	1 2 3 4 5 6	1 2	1 2 3 4 5	1 2 3 4 5 6 7 8 9	1 2 3 4 5	1 2 3	11 12 13	21 22 23	31 32 33
COM NO COM NO	Ch. A+ Ch. A- Ch. B+ Ch. B- Ch. Z+ Ch. Z- GND +5V or +24V	OUT1 SGND IN1 IN2	DI1 DI2 DI3 DI4 DI5 DI6	DO1 DO2	DIL +24VD DICOM +24VD DIOGND	+10V -10V AGND AI1+ AI1- AI2+ AI2- AI3+ AI3-	AO1 AGND AO2 AGND IACT	B A BGND	NC COM NO	NC COM NO	NC COM NO

BL_CONH01_002_allocation_d.ai

DCS Family

DCS550-S modules
The compact drive for machinery application

20 … 1,000 A_{DC}
0 … 610 V_{DC}
230 … 525 V_{AC}
IP00

- Compact
- Robust design
- Adaptive and winder program
- High field exciter current

DCS880 modules
For safe productivity

20 … 5,200 A_{DC}
0 … 1,600 V_{DC}
230 … 1,000 V_{AC}
IP00

- Safe torque off (STO) built in as standard
- Compact and robust
- Single drives, 20 A to 5,200 A, up to 1,600 V_{DC}
- IEC 61131 programmable
- Intuitive control panel and PC tool with USB connection and start up assistant
- Wide range of options to serve any DC motor application

DCS800-A enclosed converters
Complete drive solutions

20 … 20,000 A_{DC}
0 … 1,500 V_{DC}
230 … 1,200 V_{AC}
IP21 – IP54

- Individually adaptable to customer requirements
- User-defined accessories like external PLC or automation systems can be included
- High power solutions in 6- and 12-pulse up to 20,000 A, 1,500 V
- In accordance to usual standards
- Individually factory load tested
- Detailed documentation

DCT880 modules
Thyristor controller

20 … 4,200 A_{AC}
110 … 990 V_{AC}
IP00

- Precise power control in industrial heating applications
- Two or three phase devices
- Power optimizer for peak load reduction
- Built on ABB‘s all-compatible drives architecture
- Intuitive control panel and PC tool with USB connection and start up assistant
- Application control programs and drive application programming with IEC 61131 programming

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