
ABB INDUSTRIAL DRIVES

DCS880 drives

External DC voltage measurement H1 ... H5

DCS880 Drive Manuals

All the documents available for the drive system DCS880 are listed below:


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		IT	ES	FR	PL		RU
DCS880 Service manual	3ADW000488	EN							
DCS880 Hardparallel manual	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
Functional safety for enclosed converter									
+Q957 Prevention of unexpected Start Up	3ADW000504	EN							
+Q951 Emergency stop, category 0 with MC opening	3ADW000505	EN							
+Q952 Emergency stop, category 1 with MC opening	3ADW000506	EN							
+Q963 Emergency stop, category 0 without MC opening	3ADW000507	EN							
+Q964 Emergency stop, category 1 without MC opening	3ADW000508	EN							
Enclosed converter									
DCS800-A Installation manual	3ADW000352	EN	DE						
DCS800-A +S880 Enclosed converters, flyer	3ADW000523	EN							
Door mounting kits									
DPMP-01 mounting platform for ACS-AP control panel	3AUA0000100140	EN							
DPMP-02 mounting platform for ACS-AP control panel	3AUA0000136205	EN							
Serial communication									
FCAN-01 CANopen adapter module	3AFE68615500	EN	DE						
FDNA-01 DeviceNet™ adapter module	3AFE68573360	EN							
FECA-01 EtherCAT adapter module	3AUA0000068940	EN	DE		ES				
FENA-11/-21 Ethernet adapter module	3AUA0000093568	EN						ZH	
FEPL-02 Ethernet POWERLINK adapter module	3AUA0000123527	EN	DE						
FPBA-01 PROFIBUS DP adapter module	3AFE68573271	EN	DE				PL	ZH	
FSCA-01 RS-485 adapter module	3AUA0000109533	EN						ZH	
FDCO-01/02 DDCS communication modules	3AUA0000114058	EN							
Tool and maintenance manuals and guides									
Drive composer PC tool	3AUA0000094606	EN							
Drive application programming (IEC61131-3) manual	3AUA0000127808	EN							
Adaptive programming, Application guide	3AXD50000028574	EN							
NETA-21 remote monitoring tool	3AUA0000096939	EN							
NETA-21 remote monitoring tool guide	3AUA0000096881	EN							
DDCS branching unit NDBU-95 user's manual	3BFE64285513	EN							
Extension modules									
FIO-11 Analog extension module	3AFE68784930	EN	DE	IT					
FIO-01 Digital extension module	3AFE68784921	EN	DE	IT					
FAIO-01 Analog extension module	3AUA0000124968	EN	DE						
FDIO-01 Digital extension module	3AUA0000124966	EN							
FEN-01 TTL encoder interface	3AFE68784603	EN	DE	IT				ZH	
FEN-31 HTL encoder interface	3AUA0000031044	EN						ZH	
FEA-03 F series extension adapter	3AUA0000115811	EN							
FSO-21 Safety functions module	3AXD50000015614	EN							
FSPS-21 Safety functions fieldbus module	3AXD50000158638	EN							
Ethernet tool network for ACS880 drives appl. guide	3AUA0000125635	EN							
Status 03.2020									

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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 \oplus).
- 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 ($> 30 \Omega$) 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.

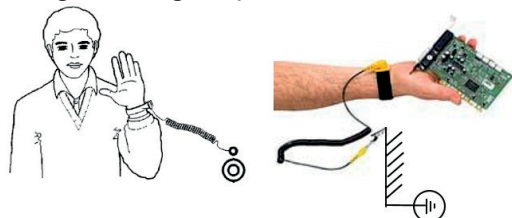
Printed circuit boards and fiber optic cables

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 unit. The unit will overturn from a tilt of about 6 degrees. An overturning drive can cause physical injury.
 - Do not lift the unit by the front cover.
 - Place units 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 .

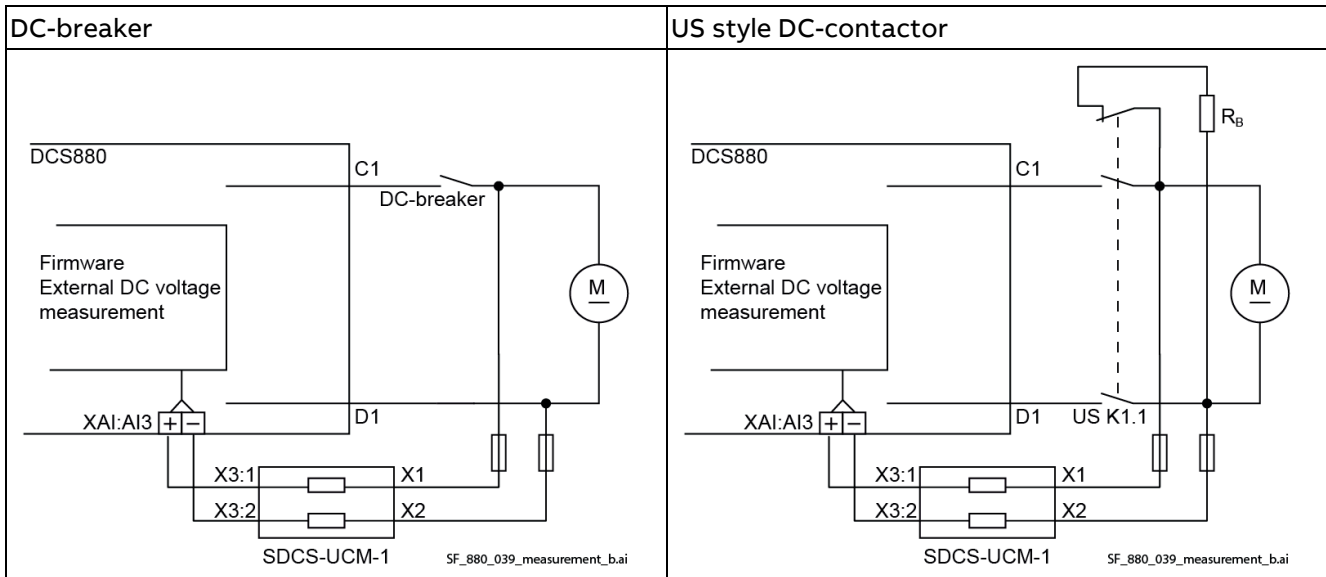
Introduction to this manual

External DC voltage measurement H1 ... H5

In the DCS880 units sizes H1 ... H5 the DC voltage measurement is integrated on the SDCS-PIN-H01. It is not possible to split the DC voltage measurement and measure the DC voltage externally direct at the motor. This is causing problems when using a DC-breaker or US style DC-contactor, because an exact DC voltage measurement in case of an open DC-breaker or US style DC-contactor is not possible.

With the help of the DC measurement-set SDCS-UCM-1 for H1 ... H5 (3ADT220184R0001) it is possible to achieve this task.

The picture below shows the connection between DCS880, SDCS-UCM-1 and the motor.



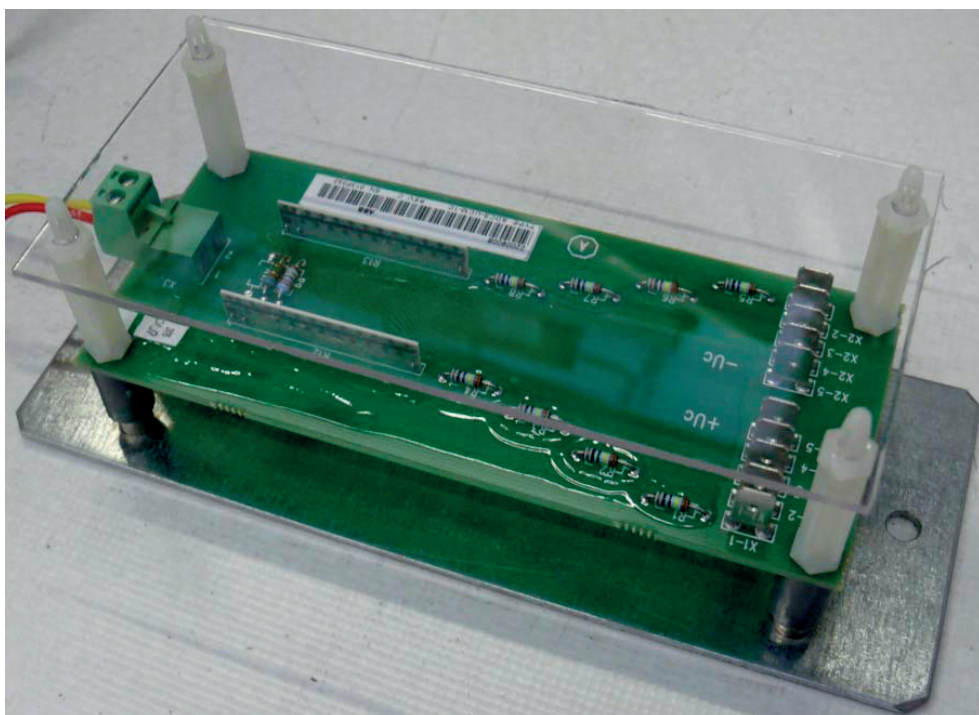
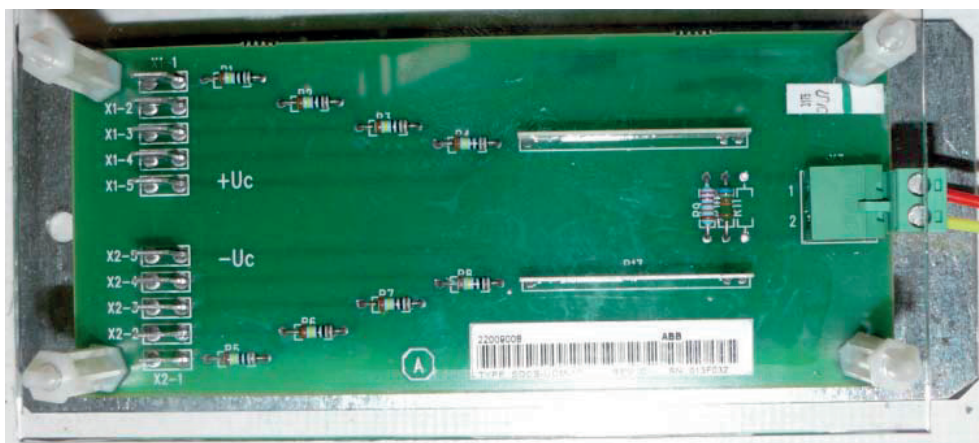
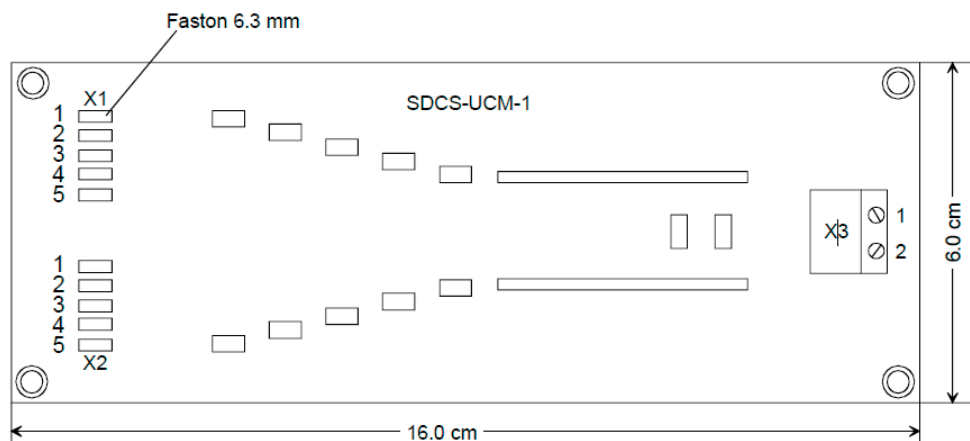
The external DC voltage measurement is needed in case all of the following 3 conditions apply:

- A DC-breaker or US style DC-contactor is used.
- The EMF is used as speed feedback. Thus, 90.41 M1 feedback selection = EMF or EMF voltage.
- Dynamic braking is used and the use of 20.44 Dynamic braking delay is not sufficient.

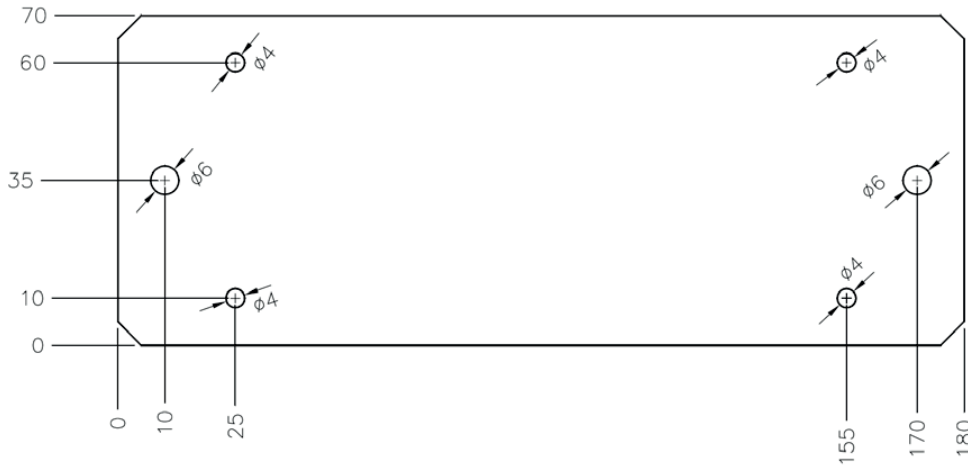
Hardware

Connection of the Resistor Board SDCS-UCM-1 and the DCS880

The SDCS-UCM-1



The holder for the SDCS-UCM-1



The connection



WARNING

The terminals X1 and X2 are at the DC voltage potential of the connected motor.

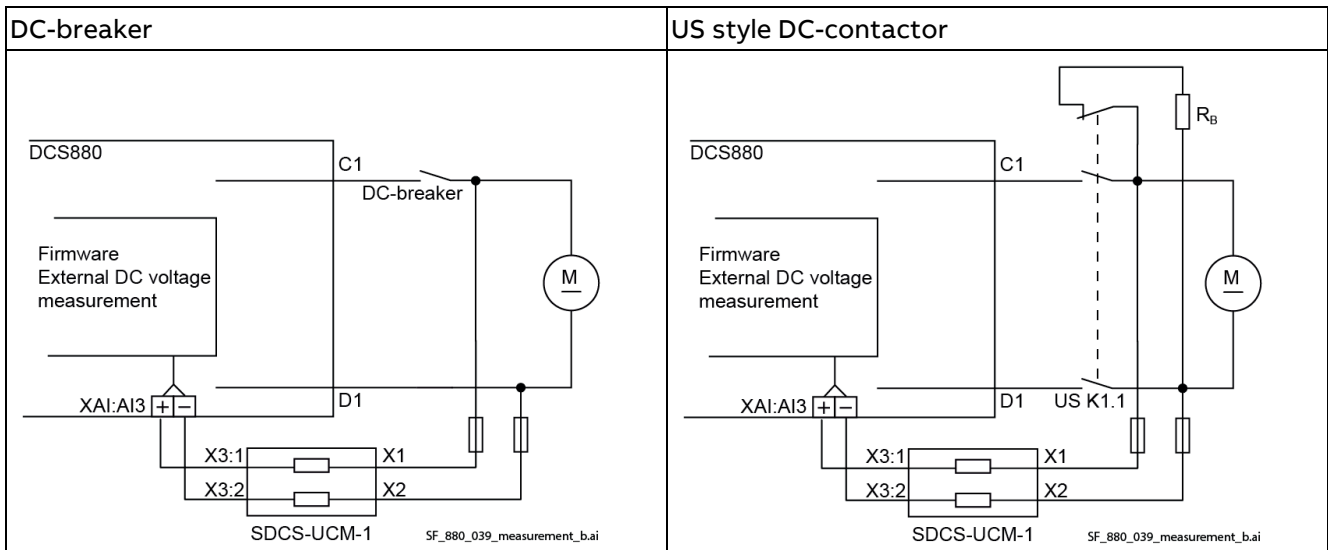
The SDCS-UCM-1 is to be mounted outside of the DCS880 module.

The board contains two resistor chains which are connected to the DC voltage (armature circuit) of the motor. The voltage reduced by the resistor chain (see X3) is connected to AI3 (XAI:AI3) of the DCS880.

The DC voltage is wired to connectors X1 and X2. The positive DC voltage (C1) is connected to connector X1 and the negative DC voltage (D1) to connector X2.

The connection of X1 and X2 is done according to the nominal motor voltage.

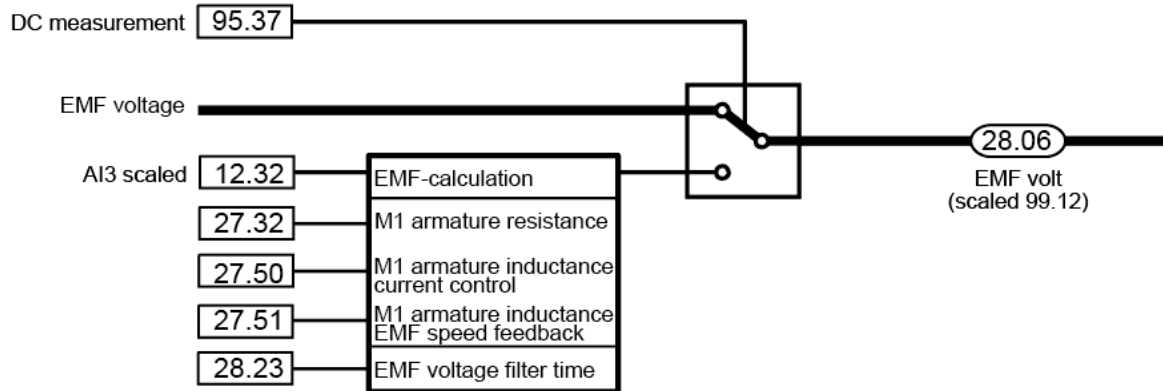
Nominal motor voltage	X1:	X2:
$\leq 400 V_{DC}$	4	4
$\leq 500 V_{DC}$	4	4
$\leq 600 V_{DC}$	3	3



Attention: The internal voltage measurement is still connected and can be used in the firmware.

Firmware

Connection of the external DC voltage measurement in the firmware



The external DC voltage measurement can be selected using 95.37 DC measurement.

Commissioning

1. Commission the drive according to the normal commissioning procedure.
2. Connect the hardware according to the description above.
3. Make a custom parameter file containing following signals and parameters:

Index	Name
{1}{1}Par.24.1	Used speed reference
{1}{1}Par.24.2	Used speed feedback
{1}{1}Par.94.1	EMF speed
{1}{1}Par.28.5	Armature voltage
{1}{1}Par.1.21	Armature voltage in V
{1}{1}Par.28.6	EMF voltage
{1}{1}Par.12.32	AI3 scaled value
{1}{1}Par.12.31	AI3 actual value
{1}{1}Par.12.34	AI3 offset
{1}{1}Par.12.36	AI3 filter time
{1}{1}Par.12.37	AI3 min
{1}{1}Par.12.38	AI3 max
{1}{1}Par.12.39	AI3 scaled at AI3 min
{1}{1}Par.12.40	AI3 scaled at AI3 max
{1}{1}Par.95.35	DC voltage measurement offset
{1}{1}Par.95.37	DC voltage measurement mode
{1}{1}Par.99.14	M1 nominal (base) speed

4. Start the drive and run to 50 % of the base speed. See 99.14 M1 nominal (base) speed.

{1}{1}Par.24.1	Used speed reference	750,00	0,00	rpm
{1}{1}Par.24.2	Used speed feedback	749,32	0,00	rpm
{1}{1}Par.94.1	EMF speed	798,69	0,00	rpm
{1}{1}Par.28.5	Armature voltage	54,75	0,00	%
{1}{1}Par.1.21	Armature voltage in V	32,7	0,0	V
{1}{1}Par.28.6	EMF voltage	53,02	0,00	%
{1}{1}Par.12.32	AI3 scaled value	3,223	0,066	NoUnit
{1}{1}Par.12.31	AI3 actual value	0,321	0,000	V

Make sure, that:

- 24.01 Used speed reference and 24.02 Used speed feedback match.
 - 28.06 EMF voltage is roughly 50 %.
 - 12.31 AI3 actual voltage has the same sign as 28.06 EMF voltage. If not, please stop the drive and swap cables at AI3. Then start the drive again and check for proper sign.
5. Scale both 12.39 AI3 scaled at AI3 min and 12.40 AI3 scaled at AI3 max to the same \pm value until 28.05 Armature voltage and 12.32 AI3 scaled value are roughly the same:

{1}{1}Par.28.5	Armature voltage	54,47	0,00	%
{1}{1}Par.1.21	Armature voltage in V	32,6	0,0	V
{1}{1}Par.28.6	EMF voltage	52,87	0,00	%
{1}{1}Par.12.32	AI3 scaled value	54,470	0,066	NoUnit
{1}{1}Par.12.31	AI3 actual value	0,321	0,000	V
{1}{1}Par.12.34	AI3 offset	0,000	-0,002	V
{1}{1}Par.12.36	AI3 filter time	0,100	0,100	s
{1}{1}Par.12.37	AI3 min	-10,000	-10,000	V
{1}{1}Par.12.38	AI3 max	10,000	10,000	V
{1}{1}Par.12.39	AI3 scaled at AI3 min	-1690,000	-1680,000	NoUnit
{1}{1}Par.12.40	AI3 scaled at AI3 max	1690,000	1680,000	NoUnit

Check also for the reversed direction, if used:

{1}{1}Par.28.5	Armature voltage	-54,61	0,00	%
{1}{1}Par.1.21	Armature voltage in V	-32,8	0,0	V
{1}{1}Par.28.6	EMF voltage	-53,23	0,00	%
{1}{1}Par.12.32	AI3 scaled value	-56,348	0,066	NoUnit
{1}{1}Par.12.31	AI3 actual value	-0,330	0,000	V
{1}{1}Par.12.34	AI3 offset	0,000	-0,002	V
{1}{1}Par.12.36	AI3 filter time	0,100	0,100	s
{1}{1}Par.12.37	AI3 min	-10,000	-10,000	V
{1}{1}Par.12.38	AI3 max	10,000	10,000	V
{1}{1}Par.12.39	AI3 scaled at AI3 min	-1690,000	-1680,000	NoUnit
{1}{1}Par.12.40	AI3 scaled at AI3 max	1690,000	1680,000	NoUnit

6. Stop the drive and set 95.37 DC voltage measurement mode = AI3 scaled.

{1}{1}Par.95.37 DC voltage measurement mode **AI3 scaled**

7. **Attention:** This step requires uttermost care!
Start the drive with a zero-speed reference. Then increase the speed slowly to half base speed.

{1}{1}Par.24.1	Used speed reference	750,00	0,00	rpm
{1}{1}Par.24.2	Used speed feedback	750,68	0,00	rpm
{1}{1}Par.94.1	EMF speed	785,58	0,00	rpm
{1}{1}Par.28.5	Armature voltage	53,92	0,00	%
{1}{1}Par.1.21	Armature voltage in V	32,5	0,0	V
{1}{1}Par.28.6	EMF voltage	52,41	0,00	%
{1}{1}Par.12.32	AI3 scaled value	53,894	0,066	NoUnit
{1}{1}Par.12.31	AI3 actual value	0,320	0,000	V

Make sure, that:

- 24.01 Used speed reference and 24.02 Used speed feedback match.
- 28.05 Armature voltage and 12.32 AI3 scaled value are roughly the same.
- Check also for the reversed direction, if used:

{1}{1}Par.24.1	Used speed reference	-750,00	0,00	rpm
{1}{1}Par.24.2	Used speed feedback	-752,69	0,00	rpm
{1}{1}Par.94.1	EMF speed	-815,18	0,00	rpm
{1}{1}Par.28.5	Armature voltage	-54,89	0,00	%
{1}{1}Par.1.21	Armature voltage in V	-32,8	0,0	V
{1}{1}Par.28.6	EMF voltage	-54,21	0,00	%
{1}{1}Par.12.32	AI3 scaled value	-55,587	0,066	NoUnit
{1}{1}Par.12.31	AI3 actual value	-0,330	0,000	V

8. For more accuracy it is possible to offset both AI3, using 12.34 AI3 offset, and the DC voltage measurement channel, using 95.35 DC voltage measurement offset.

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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