AquaMaster4
Electromagnetic flowmeter transmitter

The ideal flowmeter for potable water distribution networks, revenue metering and irrigation applications

Measurement made easy

—
Harness the power of electromagnetic flowmeters

Introduction

AquaMaster4 is a high performance electromagnetic flowmeter for the measurement of electrically-conductive fluids and is normally supplied as a factory-configured, calibrated system.

This publication provides end-user details for AquaMaster4 integral and remote transmitters.

For more information

Further publications for AquaMaster4 are available for free download from:
http://new.abb.com/products/measurement-products

Contents

1   Health, safety and security

Document symbols

Symbols that appear in this document are explained below:

> **DANGER – SERIOUS DAMAGE TO HEALTH**
> This symbol in conjunction with the signal word 'DANGER' indicates an imminent electrical hazard. Failure to observe this safety information will result in death or severe injury.

> **WARNING – BODILY INJURY**
> This symbol in conjunction with the signal word 'WARNING' indicates a potential electrical hazard. Failure to observe this safety information will result in death or severe injury.

> **CAUTION – MINOR INJURIES**
> This symbol in conjunction with the signal word 'CAUTION' indicates a potentially dangerous situation. Failure to observe this safety information may result in minor or moderate injury. The symbol may also be used for property damage warnings.

> **IMPORTANT (NOTE)**
> This symbol indicates operator tips, particularly useful information or important information about the product or its further uses. The signal word 'IMPORTANT (NOTE)' does not indicate a dangerous or harmful situation.

Safety precautions

Be sure to read, understand and follow the instructions contained within this manual before and during use of the equipment. Failure to do so could result in bodily harm or damage to the equipment.

> **WARNING – BODILY INJURY**
> Installation, operation, maintenance and servicing must be performed:
> - by suitably trained personnel only
> - in accordance with the information provided in this manual
> - in accordance with relevant national and local regulations

Security

> **IMPORTANT (NOTE)**
> This product is designed to be connected to and to communicate information and data via a network interface. It is your sole responsibility to provide and continuously ensure a secure connection between the product and your network or any other network (as the case may be). You shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data and installation of anti-virus programs) 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 Limited 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.

Intended use

This flowmeter is intended for the following uses:
- To transmit fluid media with electrical conductivity.
- To measure flow rate, flow velocity, volume flow (forward, reverse and net) and pressure (option).

The flowmeter has been designed for use exclusively within the technical limit values indicated on the identification plate and in the data sheets.

In terms of the measuring medium, observe the following points:
- Wetted parts such as measuring electrodes, liner, grounding electrodes, grounding rings, protection flanges must not be damaged because of the chemical and physical characteristic of the measuring medium.
- The information on the name plate must be observed.

Improper use

The following are considered to be instances of improper use of the flowmeter:
- For operating as a flexible adapter in piping, for example. for compensating pipe offsets, pipe vibrations, pipe expansions.
- For use as a climbing aid, e.g. for mounting purposes.
- For use as a support for external loads, e.g. as a support for piping, etc.
- Material application, e.g. by painting over the name plate or welding/soldering on parts.
- Material removal, e.g. by spot drilling the housing.

Potential safety hazards

AquaMaster4 transmitter – electrical

⚠️ **WARNING – BODILY INJURY**
To ensure safe use when operating this equipment, the following points must be observed:
- Up to 240 V AC may be present. Be sure to isolate the supply before removing the terminal cover.

- Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and/or temperature.

Safety advice concerning the use of the equipment described in this manual or any relevant Material Safety Data Sheets (where applicable) can be obtained from the Company, together with servicing and spares information.

Safety standards

This product has been designed to satisfy the requirements of IEC61010-1:2010 3rd edition 'Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use' and complies with US NEC 500, NIST and OSHA.

This equipment complies with the requirements of CEI/IEC 61010-1:2010 'Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use' and complies with US NEC 500 and Occupational Safety & Health Administration. If the equipment is used in a manner NOT specified by the Company, the protection provided by the equipment may be impaired.

Battery hazard, handling, shipping and recycling/disposal

⚠️ **WARNING – DANGER**
AquaMaster4 is available with choice of power options including lithium thionyl chloride battery power. This warning covers the health and safety issues regarding the product with such batteries. The following warnings must be observed:
- Only batteries approved by ABB that comply with the safety requirements of IEC60086-4 (see list under **Battery power supply** on page 15), or contained in the latest documentation from ABB may be fitted. Fitting of other types is not recommended by ABB.

- Do not use spiral wound lithium thionyl chloride batteries. These pose a very high hazard to personnel and a very high fire and explosion hazard.
NEVER FIT THIS TYPE.

- Fitting of battery technologies other than lithium thionyl chloride is NOT permitted.

- Some forms of D batteries do not conform the 'D' battery standard and may result in intermittent connection and incorrect product operation.

- Incorrect use or operation of batteries may result in potentially serious hazards to personnel.

- DO NOT expose batteries to fire or temperatures above 85 °C (185 °F) and DO NOT crush or puncture – they may leak, explode or rupture violently.

- DO NOT ship or transport the AquaMaster4 with lithium batteries fitted unless the following instruction is complied with:

Transporting lithium batteries or product containing lithium batteries:
- These are classified in 'category UN3091 – Class 9' of the UN list of hazardous materials. The transport of such battery packs must conform to the prevailing rules that are specific to the means of transport used, both in terms of packing, identification and accompanying documents. The carrier must always be informed of the contents. A warning label 'Hazardous Label for Class 9 – Miscellaneous Hazardous Goods' must be attached to the packing and remain visible on the outside of the package.

- DO NOT dispose of depleted or partially depleted batteries. They MUST be recycled in accordance with local regulations (for example, sent to a specialist recycling centre that handles such batteries). The batteries must be packed, labeled and transported in accordance with the regulations. Ensure the battery cannot be short circuited.

- Recycling in Europe must be in accordance with 91/157/EEC and 93/86/EEC Directives.

- Damaged, leaking or overheated batteries require urgent specialist handling and treatment. Immediately evacuate all personnel from the area
and seek professional assistance.

…1   Health, safety and security

Waste Electrical and Electronic Equipment (WEEE)

WEEE EU Directive 2012/19/EU covers disposal and recycling of electronic equipment at the end of life for reasons of environmental protection.

For industrial installations, portable equipment is included. This means that when the AquaMaster4 transmitter is used with a remote insertion sensor, it is included in directive's scope and has the WEEE symbol (left) on its data label. Therefore, at the end of life, contact the supplier for specialist waste recycling. It must not be disposed of as municipal waste.

Permanent Industrial installations are not designated within this directive for recycling. At the point of supply the intended use is not always known, so the WEEE symbol is included on all remote forms of the AquaMaster4 transmitter.

Product recycling and disposal (Europe only)

Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August 2005. To conform to European local and national regulations (EU Directive 2012/19/EU), European electrical equipment users can now return old or end-of-life equipment to the manufacturer for disposal at no charge to the user. ABB is committed to ensuring that the risk of any environmental damage or pollution caused by any of its products is minimized as far as possible.

> **i   IMPORTANT (NOTE)**
> For return for recycling, please contact the equipment manufacturer or supplier for instructions on how to return end-of-life equipment for proper disposal.

End-of-life battery disposal
The transmitter contains lithium batteries that must be removed and disposed of responsibly in accordance with local environmental regulations.

Information on ROHS Directive 2011/65/EU (RoHS II)

ABB, Industrial Automation, Measurement & Analytics, UK, fully supports the objectives of the ROHS II directive. All in-scope products placed on the market by IAMA UK on and following the 22nd of July 2017 and without any specific exemption, will be compliant to the ROHS II directive, 2011/65/EU.

Product symbols

Symbols that may appear on this product are shown below:

Risk of electric shock.

This symbol, when noted on a product, indicates a potential hazard which could cause serious personal injury and/or death. The user should reference this instruction manual for operation and/or safety information.

Protective earth (ground) terminal.

Functional earth (ground) terminal.

Direct current supply only.

Alternating current supply only.

This symbol, when noted on a product enclosure or barrier, indicates that a risk of electrical shock and/or electrocution exists and indicates that only individuals qualified to work with hazardous voltages should open the enclosure or remove the barrier.

Recycle separately from general waste under the WEEE directive.
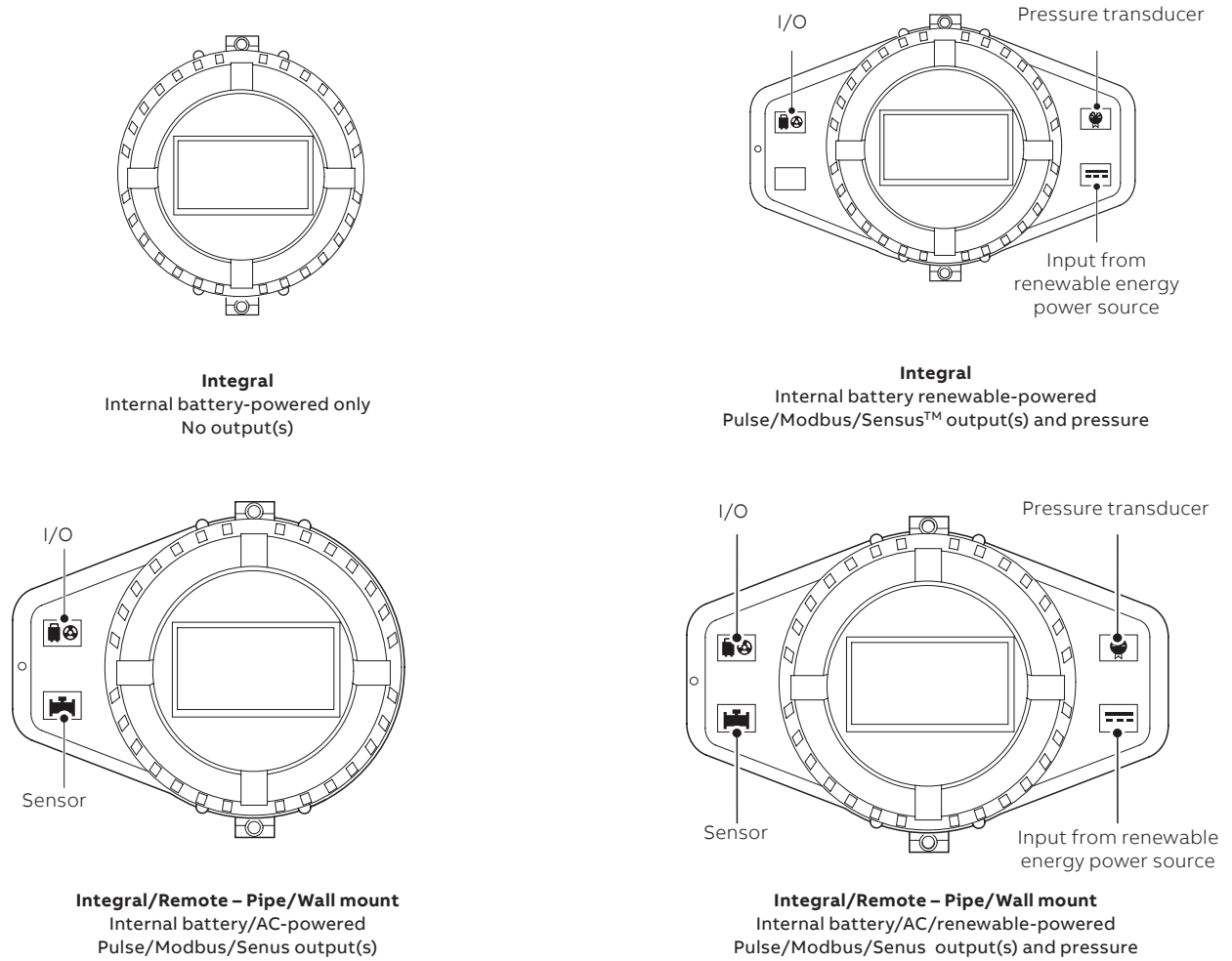
2 Transmitter overview

Integral
Internal battery-powered only
No output(s)

Integral
Internal battery renewable-powered
Pulse/Modbus/Sensus™ output(s) and pressure

Integral/Remote – Pipe/Wall mount
Internal battery/AC-powered
Pulse/Modbus/Senus output(s)

Integral/Remote – Pipe/Wall mount
Internal battery/AC/renewable-powered
Pulse/Modbus/Senus output(s) and pressure
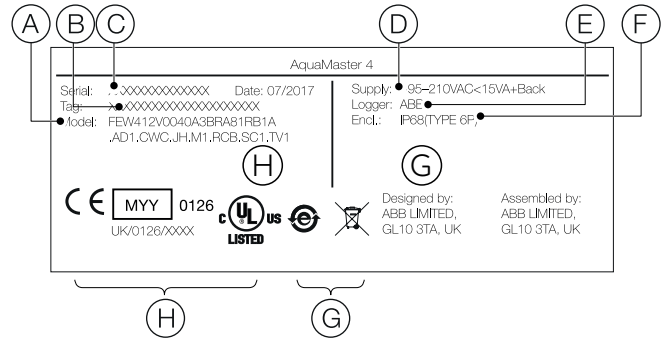
Figure 1   AquaMaster4 configuration options

3   Product identification labels

Nameplate

Integral transmitter
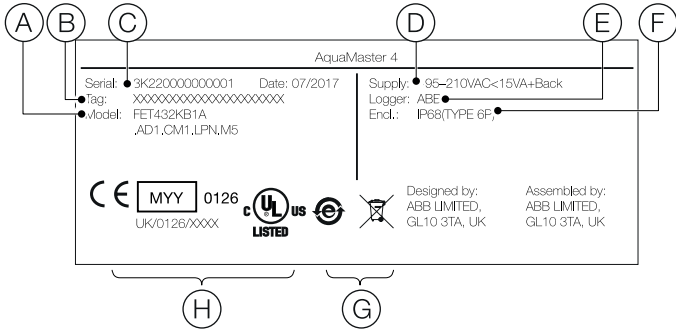
(A)   Model type/number

(B)   Transmitter-specific tag

(C)   ABB-defined product serial number

(D)   Min./Max. voltage rating

(E)   Logger (shown if available)

(F)   Enclosure ingress protection rating

(G)   Transmitter disposal categories

(H)   Applicable certification

Figure 2   Name plate – integral transmitter (example)

Remote-mount transmitter

(A)   Model type/number

(B)   Transmitter-specific tag

(C)   ABB-defined product serial number

(D)   Min./Max. voltage rating

(E)   Logger (shown if available)

(F)   Enclosure ingress protection rating

(G)   Transmitter disposal categories

(H)   Applicable certification

Figure 3   Name plate – remote-mount transmitter (example)

4 Transport and storage

Inspection

Check the transmitter immediately after unpacking for possible damage that may have occurred from improper transport. Details of any damage that has occurred in transit must be recorded on the transport documents. All claims for damages must be submitted to the shipper without delay and before installation.

Transport

> ⚠ **WARNING – BODILY INJURY**
> Life-threatening danger due to suspended loads. In the case of suspended loads, a danger of the load falling exists.
>
> Remaining under suspended loads is prohibited.

> ⚠ **WARNING – RISK OF INJURY DUE TO FLOWMETER SLIPPING.**
> The flowmeter's center of gravity may be higher than the harness suspension points.
> - Ensure that the flowmeter does not slip or turn during transport.
> - Support the flowmeter laterally during transport.

Storing the flowmeter

Bear the following points in mind when storing transmitters:
- Store the transmitter in its original packaging in a dry and dust-free location.
- Observe the permitted ambient conditions for transport and storage.
- Do not store the transmitter in direct sunlight.

Storage temperature
–20 to 60 °C (–4 to 140 °F).

The ambient conditions for the transport and storage of the transmitter correspond to the ambient conditions for operation of the transmitter.

Adhere to the transmitter data sheet (DS/FET400-EN).
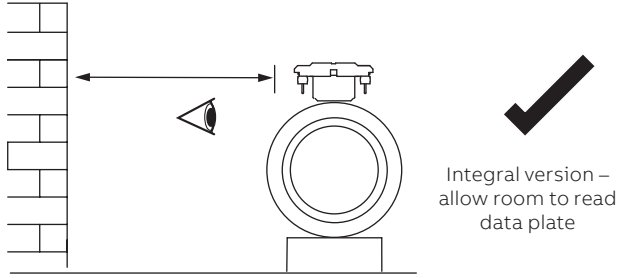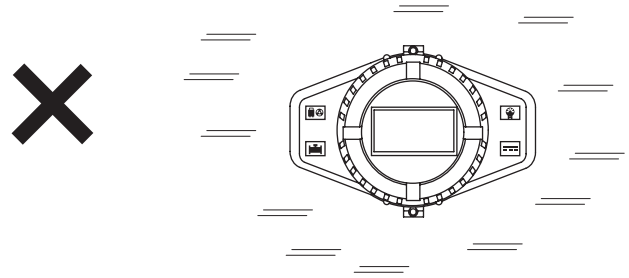
5   Installation

Installation conditions

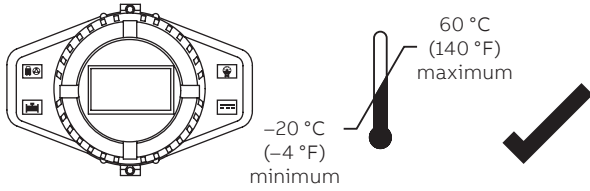Integral version – allow room to read data plate

Figure 4   Siting

60 °C (140 °F) maximum

–20 °C (–4 °F) minimum

Figure 5   Within temperature limits

Figure 6   Shade

Figure 7   Vibration

Figure 8   Spillage
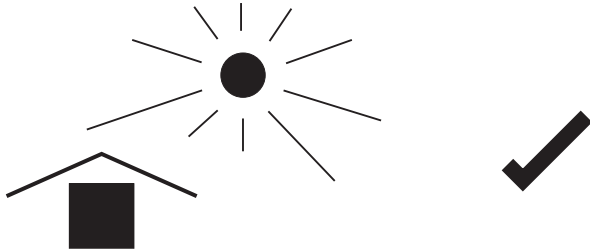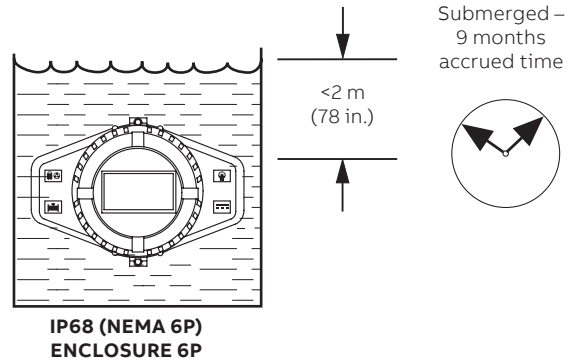

<2 m (78 in.)

Submerged – 9 months accrued time

IP68 (NEMA 6P) ENCLOSURE 6P
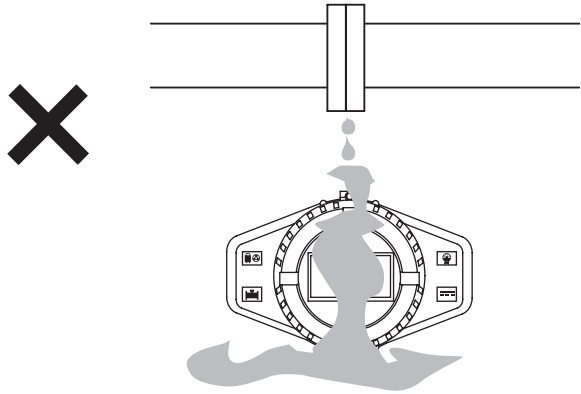
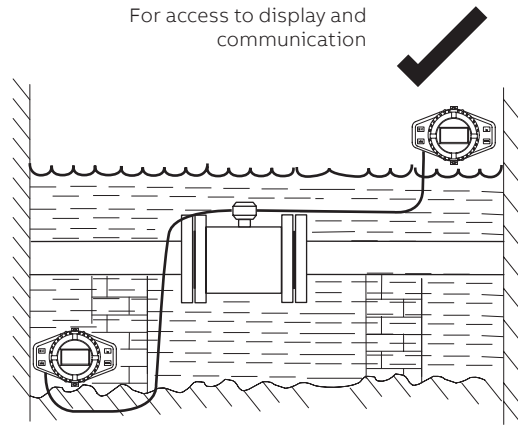**Figure 9   Within environmental rating**

For access to display and
communication
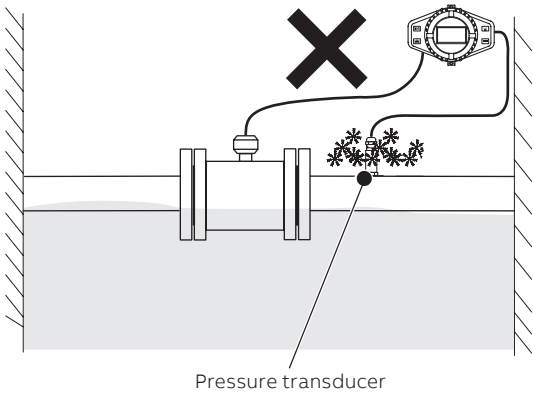
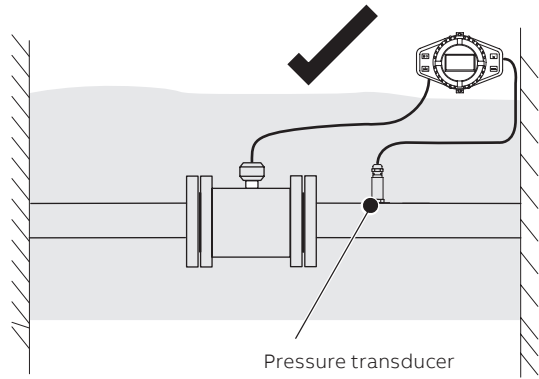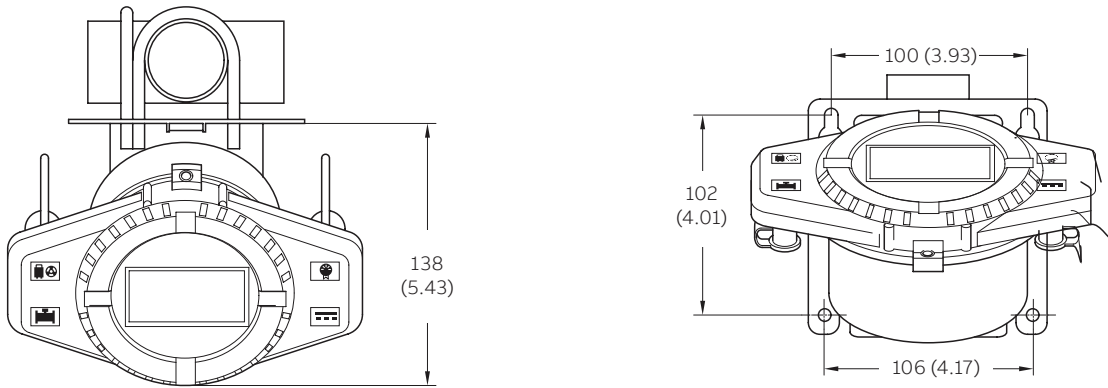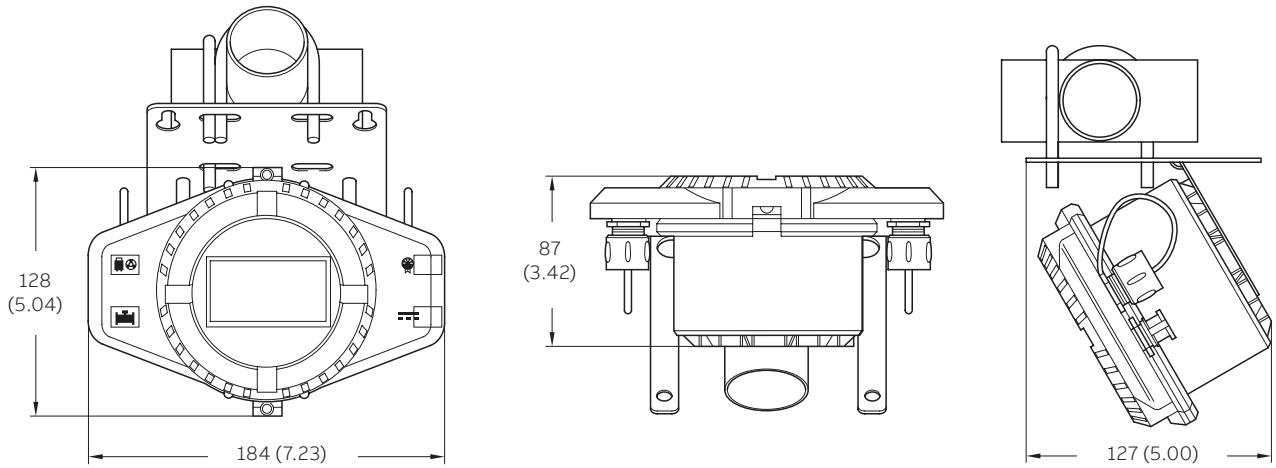**Figure 11   Access to transmitter**

Pressure transducer

Pressure transducer

Figure 10   Pressure transducer – protect from frost

...5 Installation

Dimensions

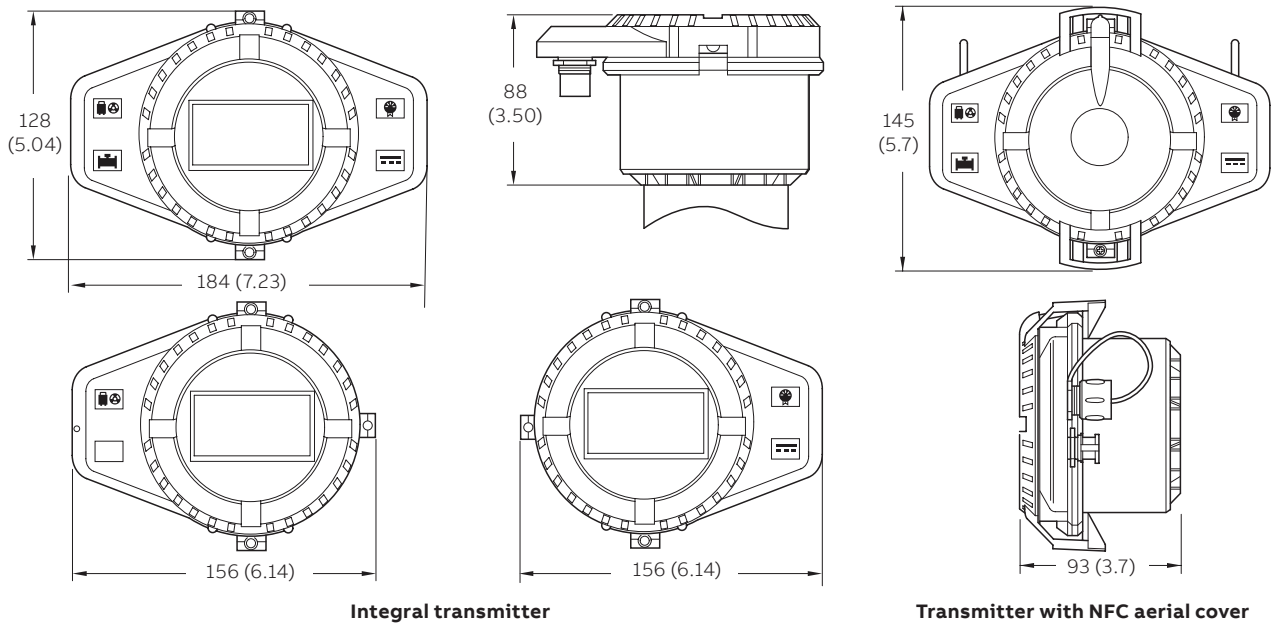Dimensions in mm (in.)

Wall-/Pipe-mount remote transmitter

Integral transmitter   **Transmitter with NFC aerial cover**

Figure 12   AquaMaster4 transmitter dimensions

Grounding

> **i** **IMPORTANT (NOTE)**
> The grounding arrangements shown in Figure 13 to Figure 15 are applicable to both cathodic and non-cathodic protected installations.
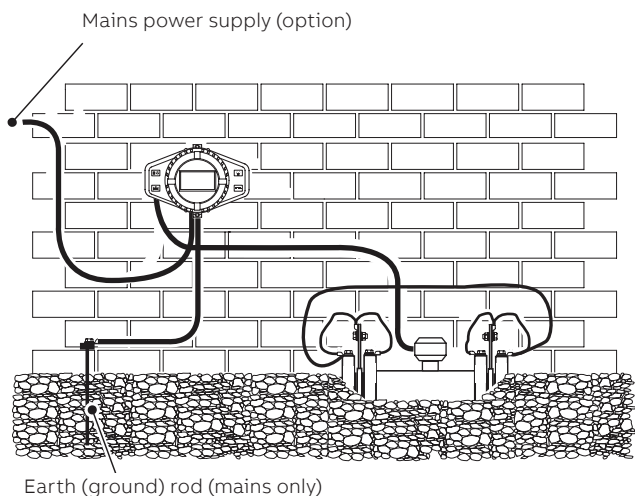

Figure 13   AquaMaster4 transmitter mounted in a chamber – flanged sensor

Figure 14   AquaMaster4 transmitter mounted in a cabinet – flanged sensor

Figure 15   AquaMaster4 transmitter mounted in a cabinet – insertion sensor

> **i** **IMPORTANT (NOTE)**
> The grounding arrangements shown in Figure 16 are applicable ONLY to:
> • cathodic protected installations
> • installations where E2 and E3 are different to E1

> ⚠ **CAUTION – DAMAGE TO EQUIPMENT**
> Incorrect installation will result in fault currents flowing through the meter resulting in unstable readings.

Figure 16   Cathodic protected installations with different cathodic potential generators

…5   Installation

Connections

⚠ **DANGER – SERIOUS DAMAGE TO HEALTH**
- The mains/line-powered transmitter option is not fitted with a switch – an isolator such as a switch or circuit breaker conforming to 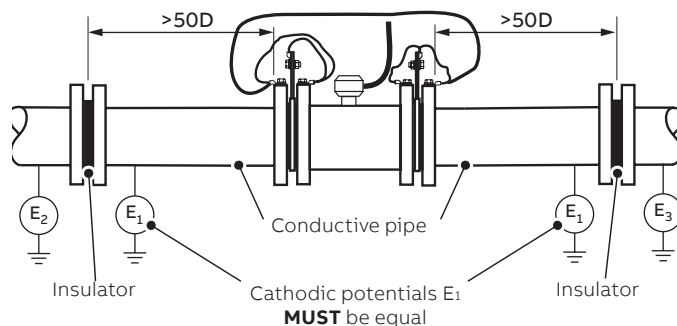local safety standards must be fitted to the final installation. It must be fitted in close proximity to the transmitter, within easy reach of the operator and marked clearly as the isolator for the transmitter.
- Remove all power from supply, relay, any powered control circuits and high common mode voltages before accessing or making any connections.
- All connections to secondary circuits must have insulation to required local safety standards. After installation, there must be no access to live parts. Use screened cable for signal inputs and relay connections. Route signal leads and power cables separately, preferably in an earthed (grounded) flexible metal conduit.

⚠ **WARNING – BODILY INJURY**
- If the transmitter is used in a manner not specified by the Company, the protection provided by the equipment may be impaired.
- Replacement of the internal battery must be carried out by an approved technician only.
- The transmitter conforms to Installation Category II of IEC 61010.
- All equipment connected to the transmitter's terminals must comply with local safety standards (IEC 60950, IEC61010-1).

Power supply connections

AquaMaster4 is available with three power options – battery, AC with internal back-up and renewable with internal back-up. Refer to Table 1 to identify valid combinations between transmitter electronics and enclosure. **NEVER** mix and match between different power options.

		Transmitter electronics power option		
		B (Battery)	K (AC + int'l back-up)	R (Renewable+ int'l back-up)
Transmitter enclosure power option	B/L (Battery)	Yes	No	No
	K (AC + int'l back-up)	No	Yes	No
	R (Renewable+ int'l back-up)	No	No	Yes

Table 1   Mix and match compatibility between transmitter enclosure and transmitter electronics

See **Transmitter overview** on page 7 for power supply options by transmitter type.

⚠ **WARNING – BODILY INJURY**
- Disconnect the supply from any cables that are terminated on the transmitter.
- Electrical installation and earthing (grounding) must be in accordance with relevant national and local standards.
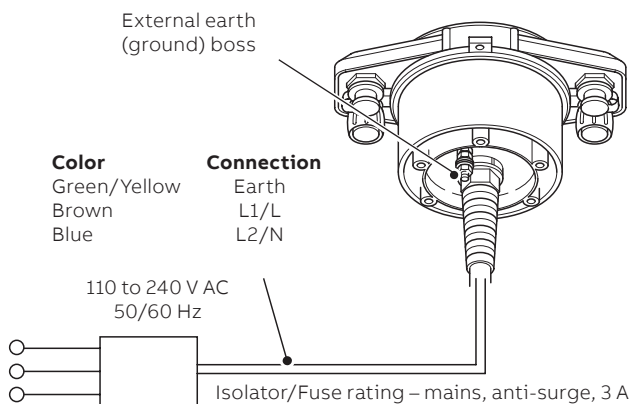
ℹ **IMPORTANT (NOTE)**
Power supply connections/earthing arrangements are identical for cathodically-protected remote transmitter systems. For cathodically-protected integral transmitter systems, follow cathodic installation practices.

Mains power supply (remote transmitter)
Mains power requirements:
- 95 to 240 V AC, 50/60 Hz @ <3 VA
- Cable length 3 m (9.8 ft.)
- Protected by a fused isolator, rating – mains, anti-surge 3 A

Make connections as shown in Figure 17.

External earth (ground) boss

Color	Connection
Green/Yellow	Earth
Brown	L1/L
Blue	L2/N

110 to 240 V AC 50/60 Hz

Isolator/Fuse rating – mains, anti-surge, 3 A

Figure 17   Connecting a mains power supply (remote transmitter)

Renewable energy supply

i	**IMPORTANT (NOTE)** • Before making connections, check the Data label to confirm power supply requirements. • Renewable energy generators do not operate at maximum capacity. Wind turbines are affected by low wind speeds and solar panels by coatings of dust, wildlife droppings and short daylight periods in winter. For these reasons, in some installations, generators with a capacity greater then the specified 5 W minimum should be used. Contact ABB for a technical note, giving guidance on the selection of suitably sized generators for AquaMaster4.

Renewable energy supply requirements:
- Input 12 V (nominal)
- V in: max. 22 V DC, min. 8 V DC
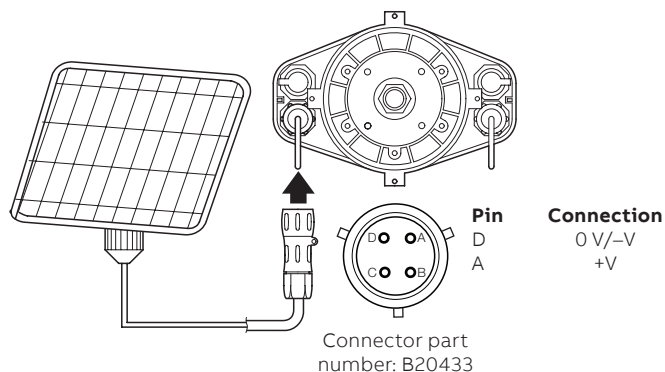- Solar panel or wind generator 5 W or greater

Pin	Connection
D	0 V/−V
A	+V

Connector part number: B20433

Figure 18   Connecting a renewable energy supply

Battery power supply

i	**IMPORTANT (NOTE)**
	• Observe all warnings in **Battery hazard, handling, shipping and recycling/disposal** on page 5.
	
	• Never remove the transmitter lid assembly when the water level around the flowmeter is close to the enclosure.
	
	• Only use 3.6 V lithium thionyl chloride D batteries recommended by ABB.
	Recommended/preferred batteries are:
	  – SAFT LS33600
	  – Eve ER34615
	  – GB Cell ER34615
	  – cT-energy ER34615
	  – OmniCel ER34615
	  – GEBC ER34615
	  – LiYa ER34615
	  – Fanzo ER34615H
	
	The above batteries comply with the safety requirements of IEC60086-4 and have a maximum peak discharge current of less than 500mA.

...5   Installation

Fitting internal batteries

> **i**   **IMPORTANT (NOTE)**
> - If fitting batteries for the first time, perform steps 2, 3 and 8 to 14 of the procedure below.
>
> - If replacing existing batteries, refer to page 34.
>
> - Always fit batteries as new pairs.
>
> - The transmitter assembly is not attached to the housing by a restraining cord/cable. After removal, place it in a clean dry accessible location.
>
> - On small flanged sensors, the transmitter should be 90 ° to the pipe to avoid connectors impacting the flanges.

Referring to Figure 19:

1 If tamper detection seals or locking screw(s) are fitted remove them – see page 22.

2 Rotate transmitter assembly (A) anticlockwise to disengage it from transmitter housing (B).

3 Carefully lift transmitter assembly (A) away from transmitter housing (B) avoiding strain/damage to any attached internal wiring (C).

4 Carefully disconnect battery connection plug (D).

5 Carefully disconnect sensor connection plug (E).

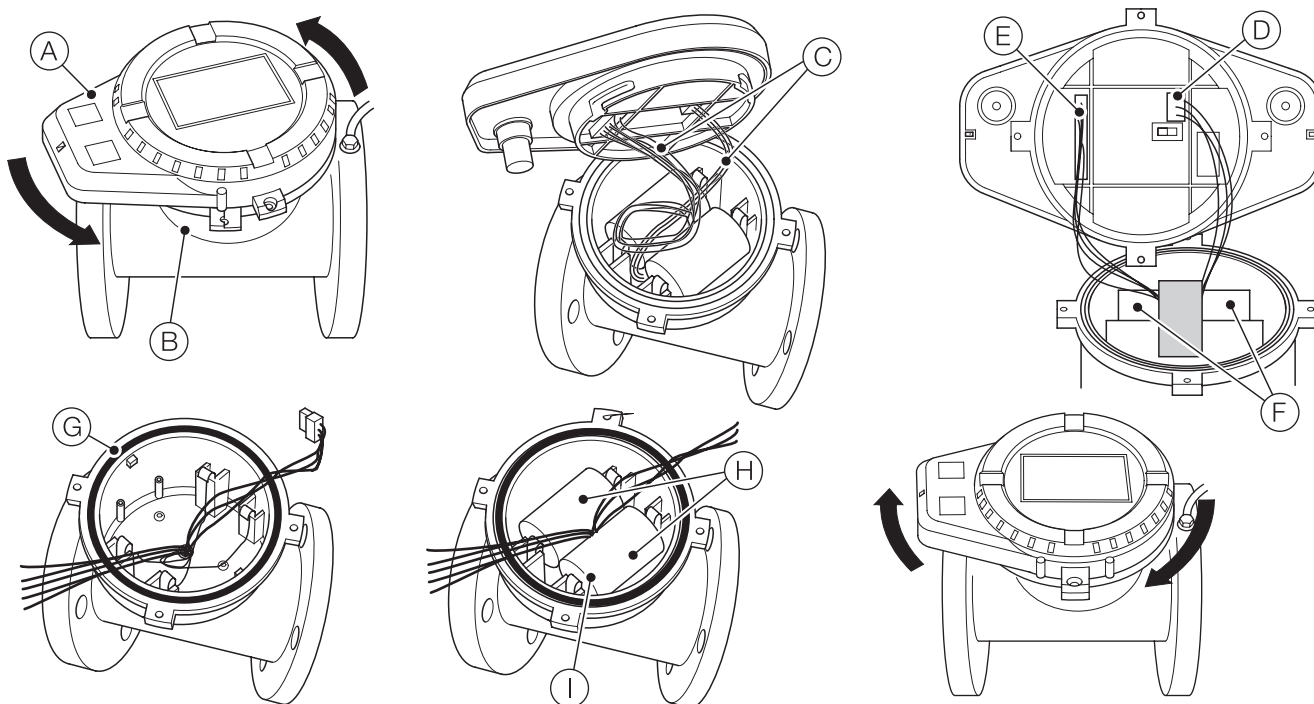6 Remove existing batteries (F) and discard safely – refer to page 5.

7 Remove O-ring (G) from the recess in the transmitter housing and ensure transmitter/housing mating sealing faces are clean. If contaminated, clean recess and sealing faces and fit a new O-ring using supplied grease type (ABB kit no. 3K220).

8 Remove and discard any silica gel bags (not illustrated).

9 Insert new batteries (H) of the correct type into the holders, ensuring the correct polarity ((I) = positive [+]).

10 Place new silica gel bags from spares kit (not illustrated) in the housing.

11 Carefully connect sensor connection cable plug (E) avoiding strain/damage to the cable loom.

12 Carefully connect battery connection plug (D) avoiding strain/damage to the cable loom.

13 Fit transmitter assembly (A) onto transmitter housing (B) and rotate clockwise until the tamper seal openings in the housing and transmitter assembly align fully.

14 If required fit tamper seals or refit locking screw(s) – see page 22.

Figure 19   Fitting internal batteries

AquaMaster4 remote sensor connections

Referring to Figure 20:

1 Remove screwed cap Ⓐ on sensor connector Ⓑ.

2 Carefully push sensor plug C into the socket and rotate until it engages.

> **i IMPORTANT (NOTE)**
> If the sensor cable is terminated with fly leads, connection is via a sensor cable adapter box (part number WABC2035 available separately).
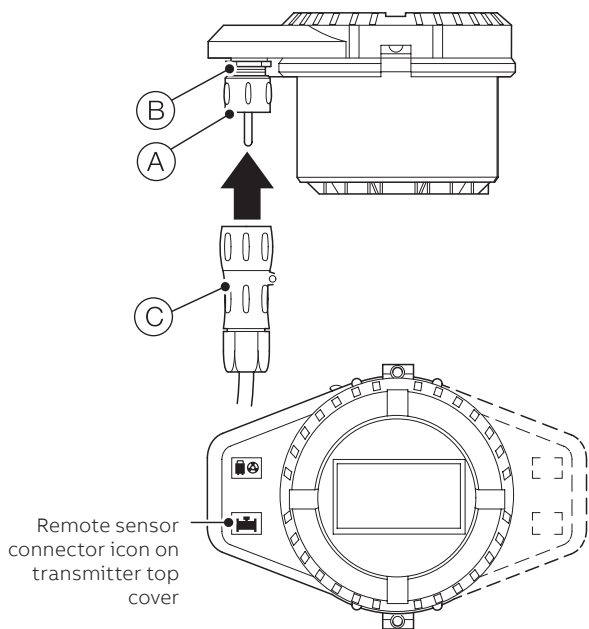

Figure 20   Remote sensor connections

Integral sensor connections

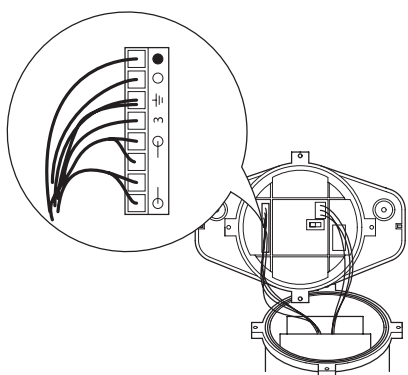Pre-wired sensor connections to the connector plug are shown in Figure 21.

Figure 21   Integral sensor connections (pre-wired)

Input/Output connections

> **⚠ CAUTION – DAMAGE TO EQUIPMENT**
> • Refer to the **Specification** on page 37 for input/output ratings.
> • Inductive loads must be suppressed or clamped to limit voltage swings.
> • Operation of outputs is programmable.
> • External isolators are not normally required as the pulse and alarm circuit is electrically-separated from all other AquaMaster4 connections.
> • Capacitive loads must be inrush current limited.
> • Fully-floating pulse outputs may be subject to static damage, for example connecting to a floating datalogger, unless 'COM' is operated within its galvanic isolation range (±35 V) from earth.
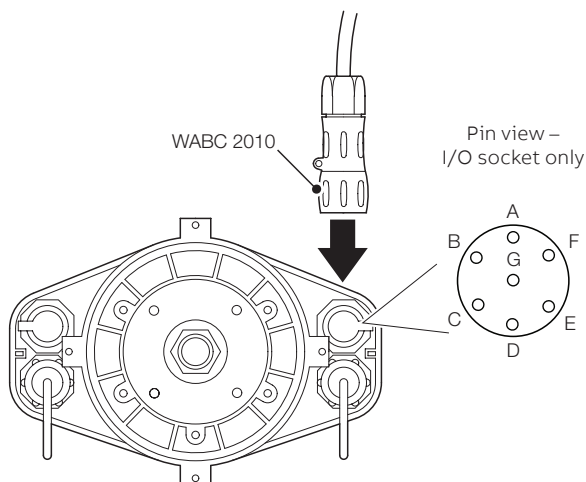
Input/Output connection socket

Figure 22   Input/Output connection socket (rear view)

| Pin	Signal	Function	Color (output cable)
A	DATA	Sensus Encoder	Violet
B	DATA CLOCK	Sensus Encoder	Blue
C	O/P COM	Output common	Yellow
D	O/P2	Reverse pulses	Red
E	O/P3	Alarm output	Brown
F	O/P1	Forward pulses	Orange
G	0V	Sensus Encoder	Screen

Table 2   Connector input/output connections

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Pulse outputs

> ℹ **IMPORTANT (NOTE)**
> Outputs 1 and 2 are polarity-sensitive. The common connection for these outputs is designated 'COM' and is the negative connection.

For example, telemetry, electronic and counters
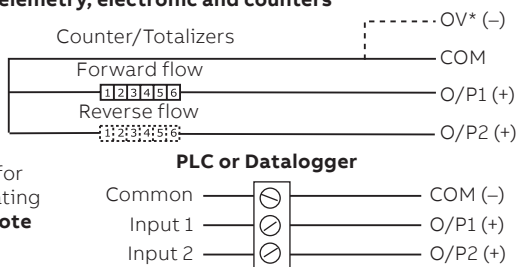
*Optional link for grounding floating output – see **Note** above.

Figure 23   Pulse output connections

Alarm interface

> ℹ **IMPORTANT (NOTE)**
> Output 3 is not polarity-sensitive. The common connection for these outputs is designated 'COM'.
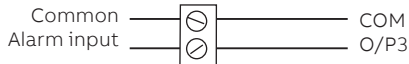
Figure 24   Alarm output connections

Pressure transducer (optional)
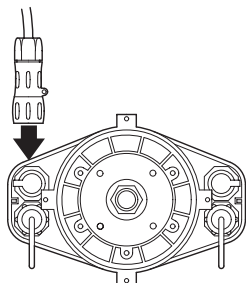Optional pressure transducers are available for a range of pressures and cable lengths.

Figure 25   Optional pressure transducer connector

> ⚠ **CAUTION – DAMAGE TO EQUIPMENT**
> • Use only the pressure transducer supplied with the transmitter – other types may not function.
>
> • Use of different ABB pressure transducers requires alteration of the pressure span and zero factors in the transmitter.

Transmitter protective cover

An optional protective cover can be fitted over the transmitter front panel for locations where damage could occur.

Fitting the transmitter protective cover
Referring to Figure 26:
1   Stretch retaining strap (A) (included with cover (B)) over transmitter face (C).

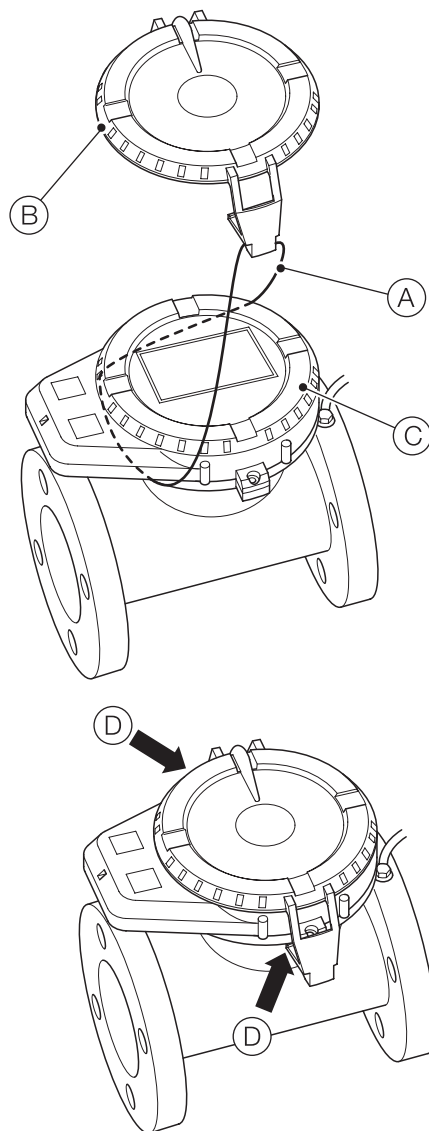2   Position optional protective cover (B) over transmitter face (C) and clip it into the fitted position (D).

Figure 26   Fitting the transmitter protective cover

Near Field Communication (NFC)

AquaMaster4 has a smart contactless Near Field Communications (NFC) interface located on its front face where the ABB logo is just above the LCD. This enables users to interact directly with the transmitter locally using the ABB Velox phone/tablet productivity app and other compatible ABB phone/tablet productivity apps.

NFC wall-mount coupler
In some installations the transmitter may be relatively inaccessible, for example, below ground level in a chamber. In such locations an optional remote configuration/reading interface connected to an NFC wall-mount coupler can be fitted to make remote reading or access for configuration via smartphone/tablet easier.

This interface clips over the front face of the transmitter and connects to an NFC wall-mount coupler (mounted in an accessible location) using a short connecting cable.
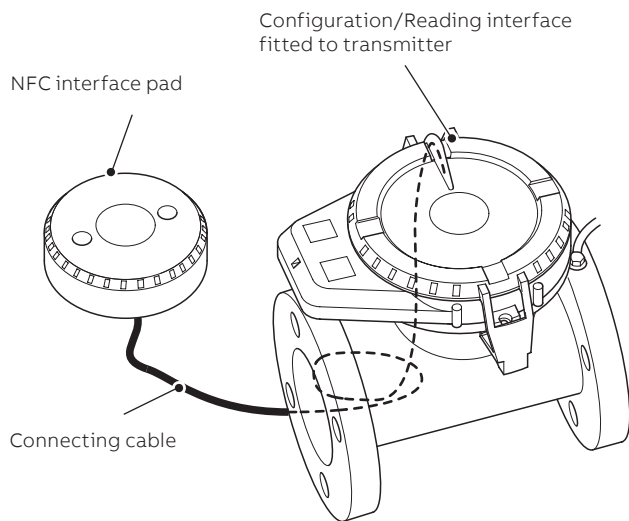

Figure 27   Remote configuration/reading interface and NFC wall-mount coupler

Fitting the configuration/reading interface and connecting the NFC wall-mount coupler
Referring to Figure 26:
1   Stretch retaining strap (A) (included with cover (B)) over transmitter face (C).

Referring to Figure 28:
2   Clip the configuration/reading interface (A) over the front of the transmitter (B), ensuring correct orientation.

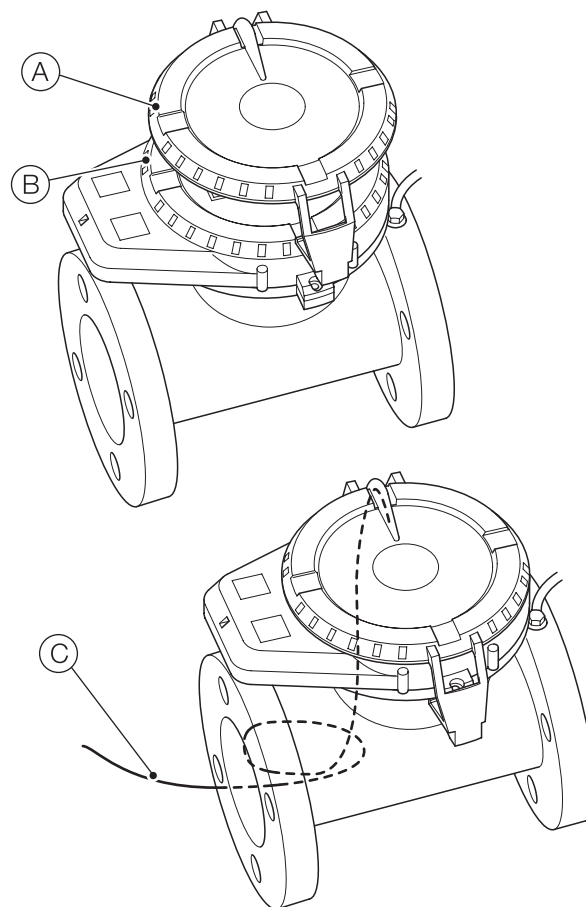3   Route connection cable (C) to the required location for the wall-mount coupler.

Figure 28   Fitting the configuration/reading interface

...5   Installation

Referring to Figure 29:

4 The fitted cable can be shortened if required – do not extend this cable.

5 Loosen cable clamp screws Ⓐ, pass free end of cable Ⓑ through to terminal connections Ⓒ, make cable connections and re-tighten cable clamp screws Ⓐ.

6 Power up and check connections between the 2 interfaces before proceeding with step 7.

7 Seal the wall-mount coupler connections Ⓒ with sealant (supplied) to seal against water ingress. Allow the sealant to cure.

⚠️ **WARNING – BODILY INJURY**
- Potting materials can be toxic. Read the manufacturers' instructions carefully before preparing the potting material and use suitable safety precautions when required.

- Do not overfill or allow the potting material to come into contact with seals or grooves.

- Do not let potting material enter conduit (if used).

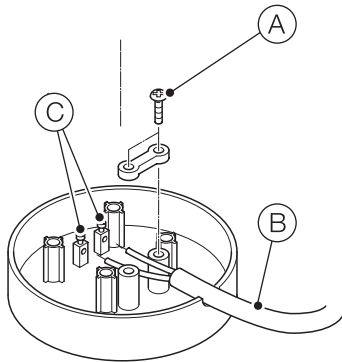**8** Fix/mount wall-mount coupler in the required location/position using 2 screws.

Figure 29   Connecting and sealing the NFC wall-mount coupler

6   Commissioning

Safety instruction

⚠️ **WARNING – INTEGRAL FLOWMETERS**
Risk of burns due to hot measuring media.
The sensor surface temperature may exceed 70 °C (158 °F), depending on the measuring medium temperature! Before starting work on the flowmeter, make sure that it has cooled sufficiently.

If there is a chance that safe operation is no longer possible, take the flowmeter out of operation and secure it against unintended startup.

Checks prior to commissioning

The following points must be checked before commissioning the flowmeter:

- The wiring must have been completed as described in Installation – page 10.
- The sensor must be grounded correctly.
- The ambient conditions must meet the requirements set out in the technical data.
- The power supply must meet the requirements printed on the identification plate.
- The sensor and transmitter must be correctly assigned – see page 8 for label information.

ℹ️ **IMPORTANT (NOTE)**
The Flow Settings > Mains Noise Rejection Frequency (Hz) setting must match the mains frequency in the country of installation – see page 29.

MID/Anti-tamper seals

For flowmeters ordered with the Measuring Instrument Directive (MID) option it is a legal requirement that, at the end of installation, the flowmeter is sealed to prevent unauthorized changes to the meter settings and configuration.

A read-only switch is used to prevent login through any communication means and modification of any parameters on the AquaMaster4 – see Figure 30.

For MID flowmeters this switch must be set to MID Read-only position. A suitable anti-tamper seal (see page 22) must be fitted such that, in the event of unauthorized tampering, it is clearly visible that the fitted legal metrology seal has been broken.
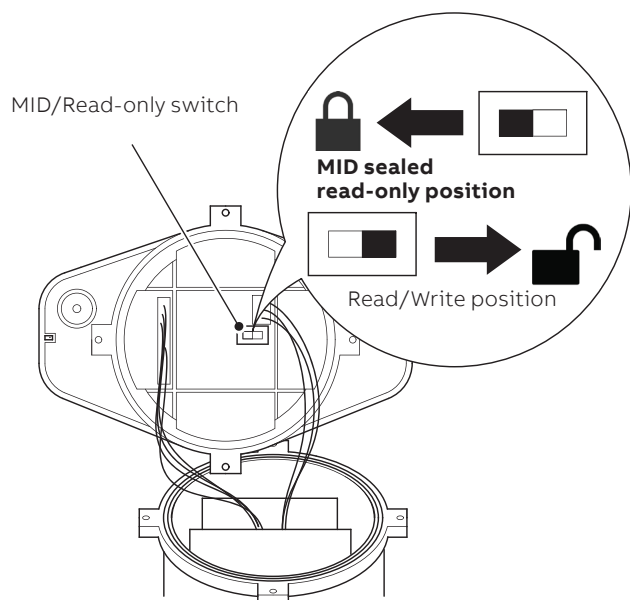

Figure 30   Read-only switch

...6   Commissioning

Integral transmitter – tamper-detection seals/locking screws

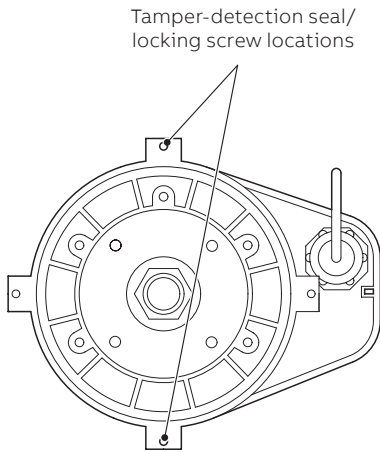Locations for tamper-detection seals/locking screws on integral transmitters are shown in Figure 31.

Tamper-detection seal/
locking screw locations

Figure 31   Integral transmitter – tamper detection seal/locking screw locations (rear view)

Remote transmitter – tamper-detection seals/locking screws

ℹ **IMPORTANT (NOTE)**
It is a legal requirement for MID-compliant flowmeters to fit tamper-detection seals at installation to the case and remote sensor connector.

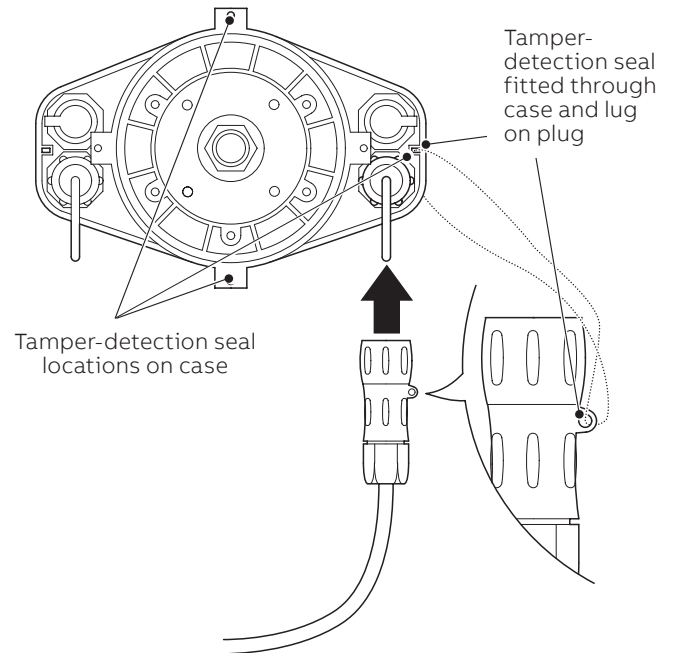Locations for tamper-detection seals are shown in Figure 32.

Tamper-detection seal fitted through case and lug on plug

Tamper-detection seal locations on case

Figure 32   Remote transmitter tamper-detection seal locations (rear view)
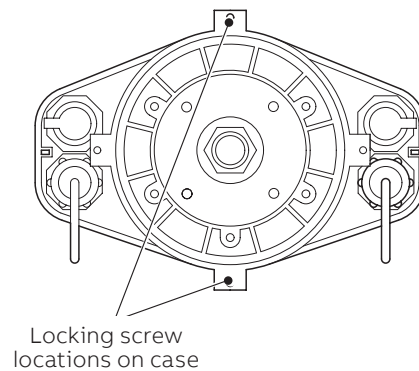
Locations for locking screws are shown in Figure 33.

Locking screw locations on case

Figure 33   Remote transmitter locking screw locations (rear view)

7   Operation

Start-up

> ⚠ **WARNING – BODILY INJURY**
> - Observe all battery and other warnings in Section 1, page 5.
> - Operation at temperature extremes significantly shortens the battery capacity and life – see **Specification** on page 37.

To start the AquaMaster4 for the first time connect the battery connector (ⓓ on page 16)/apply mains or renewable power.

Operating display

The LCD is configurable, but by default it displays the flowrate and volume in selected units, which are programmable. For volume totals, the display cycles between forward, reverse and net totals by default, with the direction indicated by the arrows above the volume total. Volume is shown to 2 significant digits and further accuracy is available if the flowmeter is read via the Velox app.

The LCD display shows the configured display values, such as flow totals, flowrate and alarm icons.
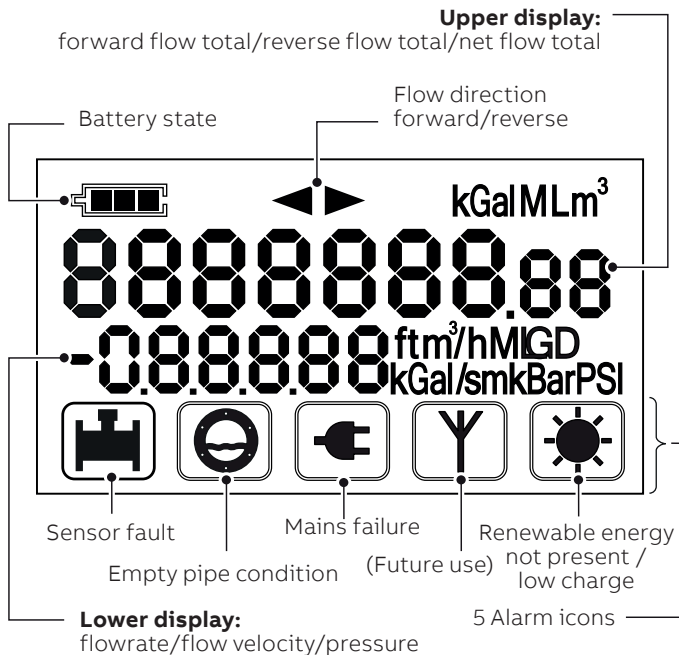

Figure 34   AquaMaster4 display information

If an alarm, fault or power issue occurs, warning icons are displayed on the bottom line.

The battery state indicator has 3 segments that indicate the following conditions:

Icon state	Battery only	Mains + backup and renewable
	Both batteries in good condition	Backup battery fully charged
	Both batteries in use	Backup battery ⅔rd full
	One battery empty (red wire connection)	Backup battery ⅓rd full
	Replace both batteries	
	No power left no flow measurement	Backup battery empty*

*Backup energy is replaced when mains power is restored.

Figure 35   Battery icon – status indicators

> ⚠ **WARNING – BODILY INJURY**
> Batteries must be disposed of in accordance with regulations – refer to page 5.

...7   Operation

Factory -configuration/calibration

AquaMaster4 flowmeters are factory-configured and calibrated. If changes to the configuration are required, these are made via an Android® or Windows® phone/tablet productivity app using a local communications interface (NFC) app for connectivity.

The NFC interface is located on the AquaMaster4 front face where the ABB logo is (just above the LCD) or on the wall-mount coupler (if used). The interface enables direct interaction with AquaMaster4 locally using the ABB Velox phone/tablet productivity app (or other compatible ABB phone/tablet productivity apps).

> **i   IMPORTANT (NOTE)**
> Before attempting to exchange data, launch the Velox phone/tablet productivity app and enable the NFC option on your phone/tablet (configuration device). On an Android device this is normally found in the Settings...> menu).

The Velox phone/tablet productivity app enables:
- process values (PV); flow rate, totalizer values to be read
- logger data to be retrieved
- configuration settings to be read or changed
- diagnostic conditions to be read
- firmware updates to be download into the transmitter

Obtain and install the ABB Velox phone/tablet productivity app from Google Playstore, Windows store or ABB portal.

The Velox phone/tablet productivity app exchanges data with the AquaMaster4 when a configuration device is placed on the AquaMaster4's NFC interface (or the user end of the AquaMaster4 Passive NFC Coupler if this is connected to the transmitter) – see Figure 36.

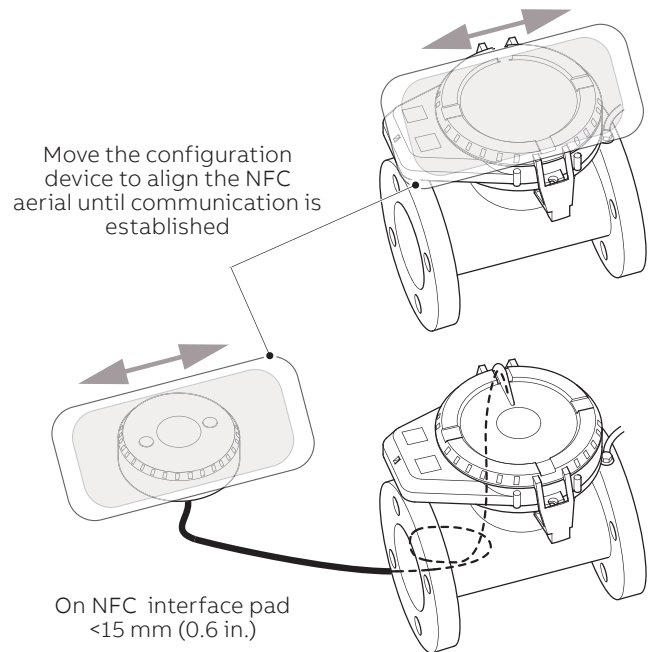Each time data is captured from a transmitter a new file is written; historical data is retained.

Move the configuration device to align the NFC aerial until communication is established

On NFC interface pad
<15 mm (0.6 in.)

Figure 36   Using a configuration device to capture data via NFC

Security and password access

Access to the transmitter via the NFC interface requires the use of an authentication password. The NFC interface supports two access accounts, each with a separate password: a user account for normal use and an account to reset the user account password.

Enter the account authentication password in the Velox phone/tablet productivity app before bringing the configuration device into contact with the transmitter. Data exchange will not be successful if an incorrect password is used.

> **ⓘ IMPORTANT (NOTE)**
> Password and PIN details are entered via the Setting option in the Instrument List pane – refer to page 26 for navigation details.

User account – standard level privileges
Factory default password: **am2k**

This is the main user account for general access to the transmitter and has a user-settable password.
Process values, user configuration settings, transmitter diagnostics conditions and logger data are accessible with the standard level privileges provided by the User account.

These are the only items that users are expected to need during normal flowmeter use. Advanced settings and factory-specific configuration (not needed to for normal flowmeter configuration and control) are accessible only with high levels of access privilege. Temporary elevated access privileges can be obtained only with a meter specific one-time use command generated by ABB technical support and service teams.

> **ⓘ IMPORTANT (NOTES)**
> • It is strongly recommended that the account's factory default authentication password is changed from the factory default on commissioning the flowmeter.
>
> • When changing a password, record it somewhere secure, especially if each flowmeter has a unique password. If a password is lost or unknown, the flowmeter must be reset to its factory default settings to regain access.

Contact your ABB technical support or service engineer for help if needing access to advanced settings or factory configuration. (Note, more data is exchanged via the NFC connection with higher levels of access so it takes longer to read from the flowmeter when these privileges are being granted.)
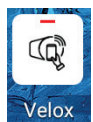
> **ⓘ IMPORTANT (NOTE)**
> The command code is a meter-specific one-time user hash code generated by ABB technical support/service teams only. Contact your regular ABB technical support or service engineer for help if needing to reset the user account password.
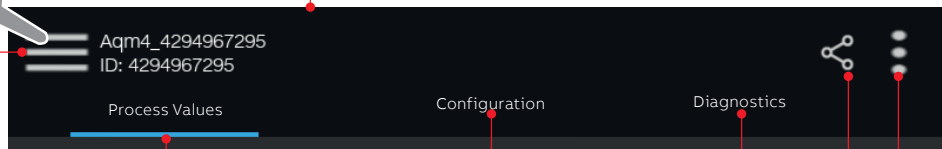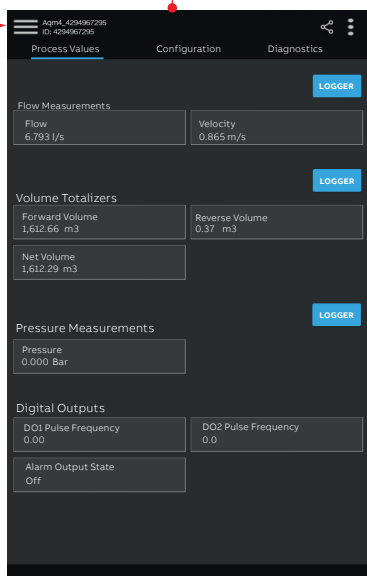
…7   Operation

Velox phone/tablet productivity app

Velox
phone/tablet
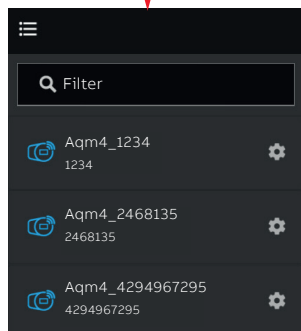productivity app

Common menu ribbon

Flow Measurements

Flow
6.793 l/s

Velocity
0.865 m/s

LOGGER

Volume Totalizers

Forward Volume
1,612.66 m3

Reverse Volume
0.37   m3

Net Volume
1,612.29 m3

LOGGER

Pressure Measurements

Pressure
0.000 Bar

LOGGER

Digital Outputs

DO1 Pulse Frequency
0.00

DO2 Pulse Frequency
0.0

Alarm Output State
Off

Aqm4_4294967295
ID: 4294967295

Process Values

Configuration

Diagnostics

Refer to page 27

Refer to page 28

Refer to page 32

Context menu

Share data icon
(digital share)

Android Beam   Add to Dropbox   Bluetooth

Email   Gmail   Memo

Outlook   Save to Drive   Wi-Fi Direct

Filter

Aqm4_1234
1234

Aqm4_2468135
2468135

Aqm4_4294967295
4294967295

List of
captured AQM4 flowmeters

List of configuration
templates
(settings), resident
in the phone/tablet
productivity app –
these enable
flowmeter settings
to be changed via
the phone/tablet

Settings

Use PIN

PIN   EDIT

Master password   EDIT

Enable factory
reset
operations
Language   English

SUPPORTED DEVICES

User-set PIN
(prompted at launch)

User-entered flowmeter
access password

Language displayed on the phone/tablet
productivity app –
user-selectable

Select and download a
compatible firmware file

FIRMWARE DOWNLOAD

CONFIG TEMPLATES

SETTINGS

ABOUT

Enter/Edit/Save
passwords and PIN

List of supported flowmeters –
enables new flowmeters to be added
and existing flowmeters to be
deleted

Software version and
associated software
details

When enabled, the user can make use of the user access
password reset action (located on Configuration tab-page/
User Access Rights). When these operations are enabled, the
user can read the transmitter ID and password, reset PIN values
and invoke the user access password reset action.
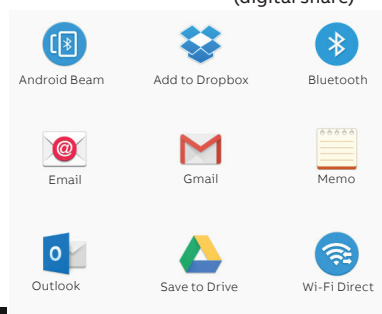
Figure 37   Overview – Velox interface

Process values

This window displays operating values for the selected flowmeter:
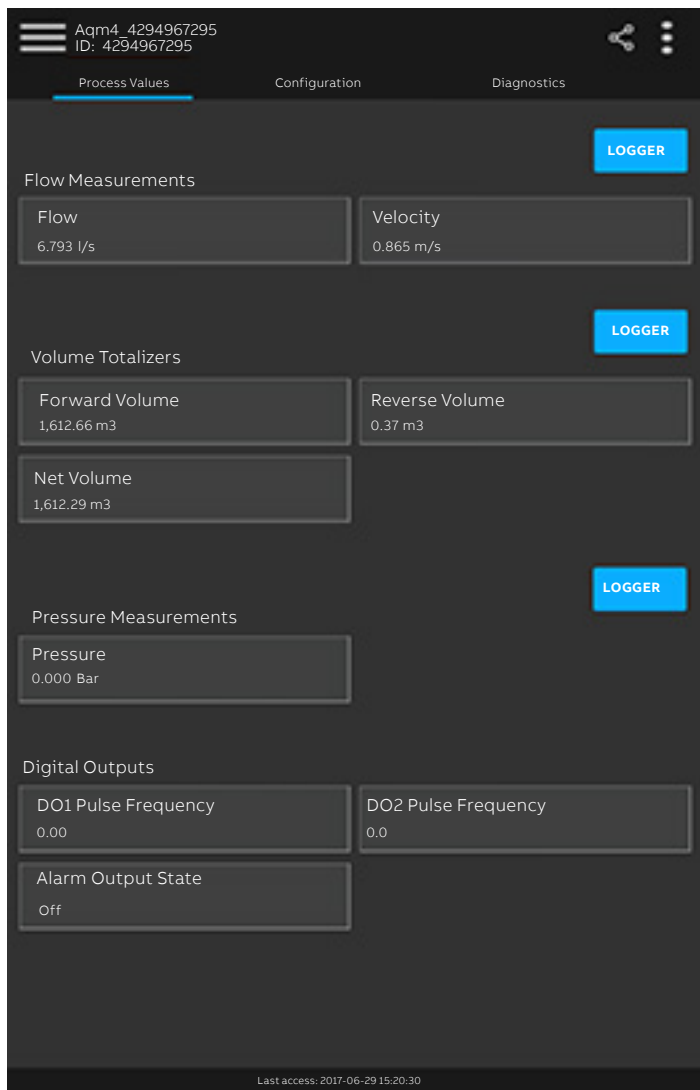

Figure 38   Process values window

Logger data

If the (optional) logger functionality was ordered, logger data is acquired by pressing the **LOGGER** button when the Process Values window is displayed. The log type and a date/time range must be specified.

Data acquisition is started by pressing the **GET LOGGER DATA** button and holding the configuration device within NFC range of the associated transmitter.

Logger menu options comprise:

Menu	Function
Get … Log	A drop-down menu used to select one of the following log types:
	Get Flow and Pressure Log
	Get Flow Log
	Get Pressure Log (pressure transducer option required)
	Get Totalizer Log
Date (from)	A user-set calendar used to enter the date to start logging
Date (to)	A user-set calendar used to enter the date to cease logging
Time (from)	A user-set clock used to enter the time to start logging
Time (to)	A user-set calendar used to enter the time to cease logging

Acquired data is displayed on a chart (see below) and can be shared via Bluetooth/email or saved to a drive – see page 26:
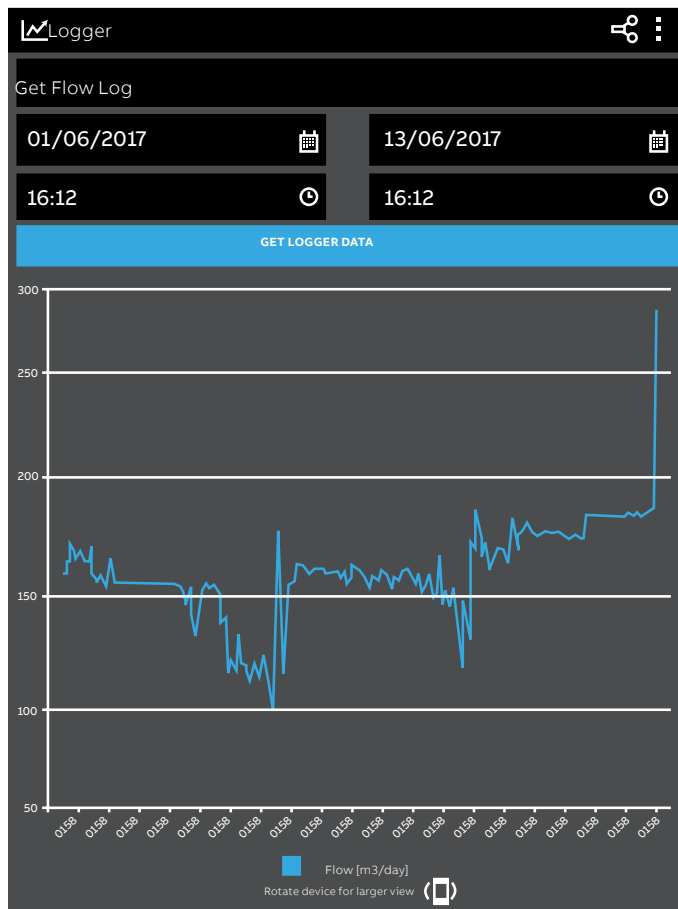
Figure 39   Example of logger data displayed on a chart

...7   Operation

Configuration

> ℹ️ **IMPORTANT (NOTE)**
> - Access rights are transmitter-specific. Protected read-only fields cannot be overwritten via Velox even if read/write access is displayed on the configuration device (at Configuration level).
>
> - **Pressure Settings** and **Logger Settings** menus are enabled only if the transmitter was ordered with these options. Menus are not displayed if an option is not ordered.

This window displays a list of Configuration menus.
Menus with a ✏️ icon can be edited by the end-user. All other menus are factory presets and cannot be modified by the end-user.
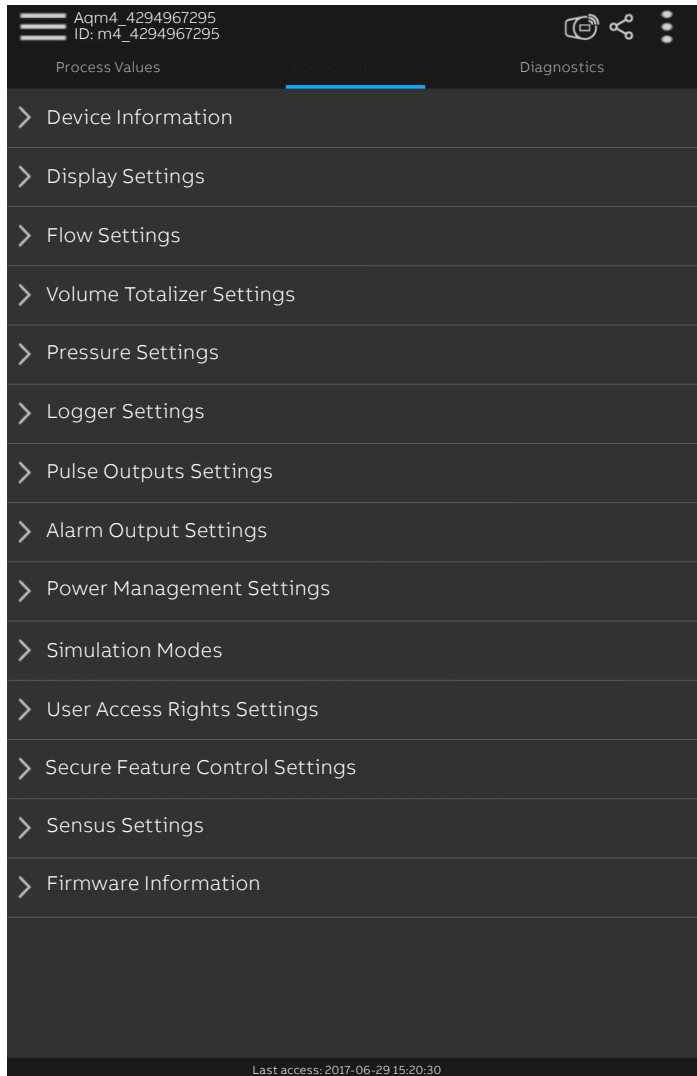
Device Information	Note
Transmitter Unique Id	
Transmitter-specific.	
Transmitter Serial Number	
Transmitter-specific.	
Sensor Unique Id	
Sensor-specific.	
Sensor Serial Number	
Sensor-specific.	
Transmitter Build Type	
Factory-set. Options: Integral Sensor | Remote Sensor.	
ID	✏️
Used to enter a unique ID for the transmitter.	
Meter Owner	✏️
Used to enter the ID of the meter owner.	
Sensor Location	✏️
Used to enter the location of the sensor.	
Sensor Type	
The sensor type. Types: Full Bore | Probe.	
Calibration Accuracy	Normal
Options: Normal | Class 1 | Class 2| MID Class 1| MID Class 2.	
Calendar Date/Time	
Used to set the date from date/time pop-up pages (format DD/MM/YYYY and time (format hr/min/sec. A prompt is displayed if the set date/time differs from device values.	✏️

Figure 40   Configuration window

Display Settings	Note
Selected settings are displayed on the transmitter display – see page 24.	Options (all parameters): Yes | No
Velocity	✏️
Used to select if the velocity is displayed on the transmitter.	
Flow	✏️
Used to select if the flow value is displayed on the transmitter.	
Pressure	✏️
If option is ordered, used to select if pressure is displayed on the transmitter.	
Forward Totalizer	✏️
Used to select if the forward flow total is displayed on the transmitter.	
Reverse Totalizer	✏️
Used to select if the reverse flow total is displayed on the transmitter.	
Net Totalizer	✏️
Used to select if the net total flow is displayed on the transmitter.	

Flow Settings	Note
Velocity Units	
Used to select the unit for velocity displayed on the transmitter. Options: mm/s | m/s | ft/s | ft/min	✏
Flow Units	
Used to select the unit for flow displayed on the transmitter. Options: Custom units | l/s | l/min | l/hr | Ml/day | m^3/s | m^3/min | m^3/hr | m^3/day | gal/s | gal/min | gal/hr | Mgal/day | ft^3/s | ft^3/min | ft^3/hr | us-gal/s | us-gal/min | us-gal/hr | us-Mgal/day.	✏
Custom Flow Units Name	
Used to enter the name for custom flow units (if required) displayed on the transmitter. Ensure Custom units is selected in the Flow Units parameter before entering a name here.	✏
Custom Flow Units Scaling Factor (from m^3/s)	
Used to enter a value to be used as the scaling factor for custom flow units. Ensure Custom units is selected in the Flow Units parameter before entering this value.	✏
Probe On Off	
Note. Displayed only if an insertion sensor is connected.	
Meter Bore	
The bore size of the sensor/probe pipe connected to the transmitter.	
Meter Bore (Probe)	
Note. Displayed only if an insertion sensor (probe-type) is connected to the transmitter.	✏
Probe Profile Factor (F_P)	
Note. Displayed only if an insertion sensor (probe-type) is connected to the transmitter.	✏
Probe Insertion Factor (F_i)	
Note. Displayed only if an insertion sensor (probe-type) is connected to the transmitter.	✏
Filter Response Time (seconds)	
Flowmeter time constant, default 3 s.	✏
Mains Noise Rejection Frequency (Hz)	
Selectable between 60 and 50 Hz. Applicable only to mains-powered transmitters. Important note: see page 21 before setting this option.	✏

Volume Totalizer Settings	Note
Volume Units	
Used to select the unit for volume displayed on the transmitter. Options: Custom Units | l | m^3 | imp-gal | ft^3 | us-gal | Ml | us-Mgal | imp-Mgal | ml | hl | kgal | acre-feet.	✏
Custom Volume Units Name	
Used to enter the name for custom volume units displayed on the transmitter. Ensure (Custom Units) is selected in the Volume Units parameter before entering a name at this parameter.	✏
Custom Volume Units Scaling Factor (from m^3)	
Used to enter a value to be used as the scaling factor for custom volume units. Ensure (Custom Units) is selected in the Volume Units parameter before entering a value here.	✏

Pressure Settings	Note
Pressure Units	
Used to select the unit for pressure displayed on the transmitter. Options: Custom units | Bar | mBar | kPa | mmHg | mH2O | psi | ftH2O | Pa	✏
Custom Pressure Units Name	
Used to enter the name for custom pressure units displayed on the transmitter. Ensure Custom Units is selected in the Pressure Units parameter before entering a name at this parameter.	✏
Custom Pressure Units Scaling Factor (from bar)	
Used to enter a value to be used as the scaling factor for custom pressure units. Ensure Custom Units is selected in the Pressure Units parameter before entering a value here.	✏
Transducer Height Offset (mm)	
The height difference between the pressure transducer and the top of the flow pipe.	✏
Pressure Transducer Output (mV/V)	
Read from the tag of the transducer span factor and enter it.	✏
Pressure Transducer Zero Offset (mV/V)	
Read from the tag of the transducer zero factor and enter it.	✏

...7   Operation

Logger Settings	Note
Flow and Pressure Logging Interval (seconds)	Readable level 3
Used to enter an interval time in seconds between logging of flow and pressure values.	Writable level 4
Flow and Pressure Retrieved Record Interval (seconds)	
Used to enter an interval time in seconds between data capture when retrieving flow and pressure values.	✏
Totalizer Logging Hour	
Hour of day totals are recorded.	✏
Clear Logging Data	
Erases all logging data.	✏
Earliest Logger Data/Time	
Informs start date/time of log.	

Pulse Output Settings	Note
Pulse Outputs Configuration	✏
Used to enable/disable pulse outputs. Options: Disabled | Enabled.	Default = Disabled
Pulses Per Unit Volume*	
Used to enter a value (the quantity) of pulses per unit volume. Ensure Enabled is selected at the Pulse Outputs Configuration parameter before entering a value at this parameter.	✏
Pulse Width (ms)*	
Used to enter the pulse duration (in ms).	✏

*Use of high pulse output frequencies and long pulse widths will significantly shorten battery life. Ideally F≤ 5 Hz with width ≤ 2 ms.

Alarm Output Settings	Note
Clear All Alarms	✏
Erases All Alarm state.	
Alarm Output Configuration	✏
Used to enable/disable alarm output. Options: Disabled | Always on | Normally off | Normally on.	Default = Disabled
Totalizer Rollover	✏
O (Off), 1 (On)	
Totalizer Reset	✏
O (Off)	
Flow Sensor Communication	✏
O (Off)	
High Flow Alarm	✏
O (Off)	
Low Flow Alarm	✏
O (Off)	
Empty Pipe	✏
1 (On)	
Pulse Output Error	✏
O (Off)	

Power Management Settings	Note
System Power Type	
Battery (2 batteries), Mains, Renewable (Factory-set)	
Current Power Source	
Mains, AC power, Internal battery supply	
Process Cycle Period (seconds)	✏
15 s – factory setting	

Simulation Modes	Note
Flow Simulation Mode	
Used to select the simulation mode. Options: Off | Velocity (mm/s) | Flow (system units).	✏
Flow Simulation Value	
Used to set a value for flow simulation.	✏
Pulse Output Simulation Configuration	
Used to select the simulation mode for pulse outputs. Options: Off | Forward (DO1) | Reverse (DO2).	✏
Pulse Output Simulation Frequency (Hz)	
Range 0 to 50 Hz	✏
Pressure Simulation Mode	
Options: Off | On	✏
Pressure Simulation Value	
Used to set a value for pressure simulation.	✏

User Access Rights Settings	Note
Current Access Level	Default at level 3
The current level of access.	
Transmitter Unique ID	
Read-only.	
Elevated Access PIN	
Read-only.	
Change User Access Password	✏️
Used to enter a different/new access password.	
Confirm User Access Password Change	✏️
Used to re-enter/confirm the access password set at the Change User Access Password menu.	
Elevated Access Request	✏️
Transmitter unique ID (see above) and Elevated Access PIN. Enter into 'Hasher',' result of 'Hasher' is a string; enter the value in this field.	
Advanced Access Level Enable	✏️
Enables/Disable advanced level access	
User Password Reset PIN	
Read only.	
User Password Reset Request	✏️
Transmitter unique ID (see above) and User Password Reset PIN. Enter into 'Hasher',' result of 'Hasher' is a string; enter the value in this field.	
Lock Switch Function	✏️
Indicator MID settings.	

Secure Feature Control Settings	Note
Secure Feature Control PIN	
Read only.	
Secure Feature Request	✏️
Transmitter Unique ID (see above) and Secure Feature Control PIN. Enter into 'Hasher',' result of 'Hasher' is a string; enter the value in this field.	

Sensus Settings	Note
Sensus Serial Numbers	✏️
Sensus Totalizer Source:	✏️
0 Totalizer Fwd x 1	
1 Totalizer Rev x 1	
2 Totalizer Net x 1	
3 Totalizer Fwd x 10	
4 Totalizer Rev x 10	
5 Totalizer Net x 10	
6 Totalizer Fwd x 100	
7 Totalizer Rev x 100	
8 Totalizer Net x 100	

Firmware Information	Note
Flowmeter Firmware Part Code	
3KXF004476U0113	
Flowmeter Firmware Version	
The version of firmware installed on the transmitter.	
Flowmeter Firmware Date	
The firmware date on the transmitter.	
Bootloader Firmware Version	
ID of the bootloader firmware.	
UAM Firmware Version	
ID of the update application manager firmware.	
Range Error LIst	
System Error Message	
Reboot System	✏️
Use to reboot the system.	

8   Diagnostics

Diagnostic error messages are displayed by pressing the Diagnostics tab:

Figure 41   Example Diagnostics window

Messages displayed are for the last flowmeter selected from the Instruments List – see page 26.

The following icons indicate the diagnostic status:

Icon	Status	Icon	Status
	Failure		Out of specification
	Check function		Maintenance required

Table 3   Diagnostic icons

Diagnostic error messages

Flow Measurement

Icon	Message	Corrective action
	Flow Sensor Communications	Remote sensor is not plugged in, or not connected. If connected, this error indicates a connection problem, with no sensor data connection. Check the sensor terminal box wiring.
	Empty Pipe	The pipe is not full of water. Check the pipe. An empty pipe is indicated when either, or both measuring electrodes have resistances which exceed the resistance trip level. Check each electrode SigA & SigB Impedance. If one electrode resistance is far higher than the other, it could indicate a wiring fault. For very low conductivity application (< 20 uS/cm) the electrode trip level may need to be increased to prevent unwanted empty pipe alarms.
	High Flow Alarm	The flowrate has exceed the upper flowrate alarm trip level. Ensure this alarm threshold is set correctly. Disable this alarm if not required.
	Low Flow Alarm	The flowrate is lower than the low flowrate alarm trip level. Ensure this alarm threshold is set correctly. Disable this alarm if not required.

Table 4   Flow Measurement – diagnostic messages

Totalizers

Icon	Message	Corrective action
	Totalizer Reset	A user has reset the totalizers.
	Pulse Output Saturation Warning	The pulse output has saturated at the maximum output frequency. An external counter will under read compared to the true volume. Reduce the Pulses per unit volume on the Pulse Output Setting menu to lower the output frequency.

Table 5   Totalizers – diagnostic messages

Maintenance Operating Modes

Icon	Message	Corrective action
	Simulation Mode Active	The user has put the flowmeter into simulation mode. The displays and outputs are set based on the entered simulated input value. This error is cleared by turning off simulation mode.
	Calibration Mode Active	The user has put the flowmeter into calibration mode. This error is cleared by turning off calibration mode.

Table 6   Maintenance Operating Modes – diagnostic messages
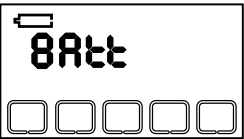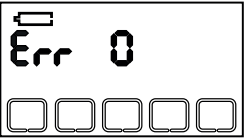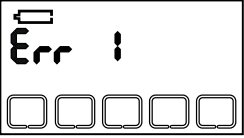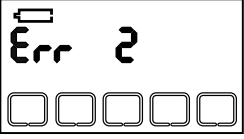
Other errors/required action
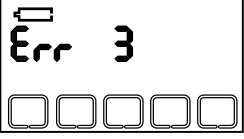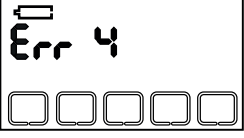
Error displayed	Corrective action
8Att	Not enough power to operate flowmeter optimally. Connect the flowmeter to power source (battery/AC mains/renewable).
Err 0	Flowmeter has stopped working due to no power. Connect the flowmeter to power source (battery/AC mains/renewable) and wait for 5 mins for the flowmeter to recover.
Err 1	Remote sensor not connected. Connect a remote ABB sensor or if already connected, check wiring.
Err 2	Contact ABB Service.
Err 3	Contact ABB Service.
Err 4	Contact ABB Service.

Table 7   Other errors/required action

9   Maintenance

Replacing internal batteries

> **ℹ IMPORTANT (NOTE)**
> - Observe all warnings in **Health, safety and security** on page 4.
> - Never remove the transmitter lid assembly when water level around the flowmeter is close to enclosure.
> - Only use 3.6 V lithium thionyl chloride D batteries recommended by ABB – see list under **Battery power supply** on page 15 .

> **ℹ IMPORTANT (NOTE)**
> - If replacing batteries, perform steps all steps of this procedure.
> - Always fit batteries as new pairs.
> - The transmitter assembly is not attached to the housing by a restraining cord/cable. After removal, place it in a clean dry accessible location

Referring to Figure 42:

1 If tamper detection seals or locking screw(s) are fitted remove them – see page 22.

2 Rotate transmitter assembly Ⓐ anticlockwise to disengage it from transmitter housing Ⓑ.

3 Carefully lift transmitter assembly Ⓐ away from transmitter housing Ⓑ avoiding strain/damage to any attached internal wiring Ⓒ.

4 Carefully disconnect battery connection plug Ⓓ.

5 Carefully disconnect sensor connection plug Ⓔ.

6 Remove existing batteries Ⓕ and discard safely – refer to page 6.

7 Remove O-ring Ⓖ from the recess in the transmitter housing and ensure transmitter/housing mating sealing faces are clean. If contaminated, clean recess and sealing faces and fit a new O-ring using supplied grease type (ABB kit no. 3K220).

8 Remove and discard any silica gel bags (not illustrated).

9 Insert new batteries Ⓗ of the correct type into the holders, ensuring the correct polarity (Ⓘ = positive [+]).

10 Place new silica gel bags from spares kit (not illustrated) in the housing.

11 Carefully connect sensor connection cable plug Ⓔ avoiding strain/damage to the cable loom.

12 Carefully connect battery connection plug Ⓓ avoiding strain/damage to the cable loom.

13 Fit transmitter assembly Ⓐ onto transmitter housing Ⓑ and rotate it clockwise until the tamper seal openings in the housing and transmitter assembly align fully.

14 If required fit tamper seals or refit locking screw(s) – see page 22.

Figure 42   Replacing internal batteries

10 Legacy support

AquaMaster4 is fully compatible with legacy AquaMaster remote sensors.

> ⚠️ **WARNING – BODILY INJURY**
> Isolate the legacy transmitter from power supplies before performing this procedure.

1 Refer to the installation requirements/instructions on page-5 and Figure 10 on page 11 and install the AquaMaster4 430 transmitter in a suitable location.

2 Remove the grounding connection from the AquaMaster3 transmitter and connect it to AquaMaster4 – see page 13.

3 Make power supply connections (internal batteries/mains/renewable) as shown on pages 14, 15 and 16.

4 Disconnect the remote sensor connections from AquaMaster3 and make connections to AquaMaster4 as shown in Figure 20 on page 17.

5 Open the Velox phone/tablet productivity app and perform a system reboot: (Configuration > Firmware Information > Reboot System). Once AquaMaster4 has rebooted, all flowmeter-specific parameters are read automatically. No further inputs are required to operate the legacy sensor with the new AquaMaster4.

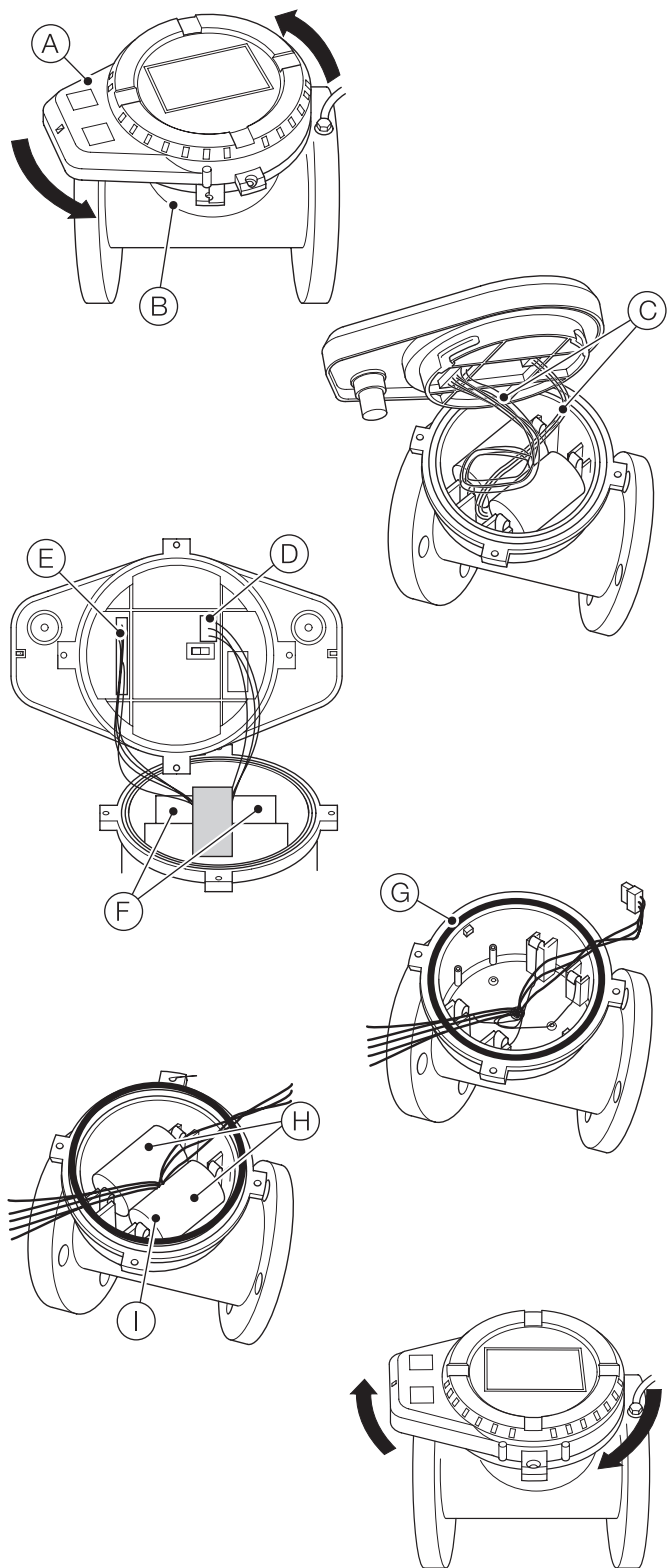6 Configuration changes can be made as detailed on pages 28 to 31.

11 Spares/Accessories

Part No.	Description
3KXF0044 38U0100	Display protective cover without NFC
3KXF0044 55U0100	Display protective cover with NFC, 5 m cable (approx. 15 ft.)
3KXF004455U0200	Display protective cover with NFC, 20 m cable (approx. 66 ft.)
3KXF004482U0100	Sensus cable, 5 m (approx. 15 ft.)
3KXF004482U0300	Sensus cable, 20 m (approx. 66 ft.)
WABC2010/05	Sensor cable, 5 m (approx. 15 ft.)
WABC2010/10	Sensor cable, 10 m (approx. 30 ft.)
WABC2010/20	Sensor cable, 20 m (approx. 66 ft.)
WABC2010/30	Sensor cable, 30 m (approx. 98 ft.)
WABC2010/50	Sensor cable, 50 m (approx. 164 ft.)
WABC2010/100	Sensor cable, 100 m (approx. 328 ft.)
WABC2010/150	Sensor cable, 150 m (approx. 492 ft.)

12 Recycling and disposal

Disassembly

⚠️ **WARNING**
Risk of injury due to process conditions
The process conditions, e.g. high pressures and temperatures, toxic and aggressive measuring media, can give rise to hazards when dismantling the flowmeter.
- If necessary, wear suitable personal protective equipment during disassembly.

- Before disassembly, ensure that the process conditions do not pose any safety risks.

- Depressurize and empty the flowmeter/piping, allow to cool and purge if necessary.

Disposal

This product and its packaging are manufactured from materials that can be recycled by specialist recycling companies.
Note the following points when disposing of the product:
- This product is not subject to WEEE Directive 2012/19/EU or relevant national laws (for example, ElektroG in Germany).
- The product must be surrendered to a specialist recycling company. Do not use municipal garbage collection points.
- According to WEEE Directive 2012/19/EU, only products used in private applications may be disposed of at municipal garbage collection points.
- If it is not possible to dispose of old equipment properly, ABB Service can take receipt of and dispose of returns. Contact your local ABB Sales or Service representatives for a quotation.
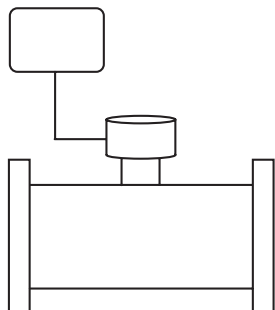
Products that are marked with this symbol may not be disposed of through municipal garbage collection points.

13 Specification

Mounting on flow sensor
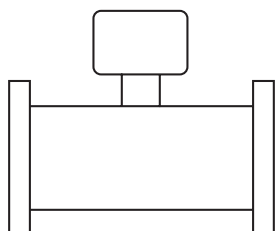
| Integral with sensor | Remote with up to 200 m (650 ft.) cable |

Power supply

| Battery | AC mains | Solar | Wind |

Battery power

2 lithium thionyl chloride 'D' batteries.

Note. Recommended/preferred batteries are:

- SAFT LS33600
- Eve ER34615
- GB Cell ER34615
- cT-energy ER34615
- OmniCel ER34615
- GEBC ER34615
- LiYa ER34615
- Fanso ER34615H

The above batteries comply with the safety requirements of IEC60086-4, and have a maximum peak discharge current of less than 500mA.

Nominal battery life

Sensor style	Size	Integral-mount transmitter	Remote-mount transmitter
Reduced bore	DN40 to 80	10 years	7 years
	DN100 to 300	7 years	5 years
	DN350 to 600	4 years	3 years
Virtual bore	DN40 to 200	10 years	7 years
Full bore	DN250 to 600	4 years	3 years
	DN700 to 2400	2 years	2 years
Probe	300 to 1000 mm	10 years	7 years

Test conditions:
- acquisition = 15 seconds
- pulse output = 2 Hz @ 2 ms
- alarm output on = 25 %
- logger rate = 1 minute
- no pressure
- integral verification self check = 15 minutes
- ambient temperature = 20 °C

Battery capacity and life are significantly shortened:
- when the operating environment temperature ranges between –20 and 0 °C or 50 and 70 °C (–4° and 32 °F or 122 and 158 °F)
- when data acquisition is less than 15 seconds
- when pulse output width > 2 ms and output frequency is set high
- with extended NFC interface use

Mains supply (option – remote only)

- 85 to 240 V AC, 50/60 Hz @ <3 VA
- Mains connection cable: approx. 3 m (9.8 ft.)

Internal backup power time for:
- DN40 to 200:   16 days
- DN250 to 600:   6 days
- DN700 to 2400: 3 days

Renewable power (option)

- Solar or wind
- Input voltage: 6 to32 V DC @ <5 W
- Max. current: 200 mA

Internal backup time for:
- DN40 to 200:   48 days
- DN250 to 600:   18 days
- DN700 to 2400: 9 days

Note. Renewable energy generators do not operate at maximum capacity. For example, low wind speeds, dirty solar panels and shorter daylight periods all reduce capacity. Consequently, some installations may require generators with a capacity greater than the specified 5 W minimum.

Inputs

- IP68 connectors, mains cable (remote only)
- Sensor cable (remote only). ABB sensor cable supplied as standard. SWA cable available (via adapter box) on application
- Pressure transducer connection (option)

Configuration/User interface

ABB Velox phone/tablet productivity app. Operating systems of smartphone or tablet are Android (Kit Kat or newer) and Windows (10 mobile or newer). Functions of Velox phone/tablet productivity app include configuration, diagnostics, logger data retrieval and transmitter flash update.

…13 Specification

Outputs
Pulse/Alarm
Modbus
Sensus protocol

Pulse outputs (option)
- Output 1: forward pulses
- Output 2: reverse pulses
- +35 V @ 20 mA solid state, unipolar
- Isolated with one common, shared with alarm output Max ±50 V to earth
- 50 Hz max., programmable pulse width, default 2 ms *

* Increasing pulse width beyond 2 ms at frequencies greater than 10 Hz reduces battery life

Alarm outputs (option)
- Indicates any problem with measurement, power supply or flowrate alarm
- Bi-directional, solid state
- +35 V @ 50 mA
- Isolated with one common, shared with pulse outputs

Automatic meter reading (AMR)
3-wire Sensus compatible

Logger

Logger function	Flow and pressure	Forward, reverse, and net flow totals
No. of records	45871	3120
Logging interval *	15 seconds 30 seconds 1 minute 5 minutes 15 minutes (selectable)	24 hours (fixed)
Logger capacity	31 days @ 1 minute 477 days @ 15 minutes	8 years

* Based on a default 15 second measurement rate when operating on battery or renewable power

Retrieval of logger data file via smartphone/tablet – see page 27

Logger data file format
- .csv for easy import into databases/spreadsheets
- Time-stamped records with flow, pressure and totalizers in user-configured units of measurement

Response time (programmable)
>0.1 second (mains-powered)
15 seconds (battery-powered + external renewable energy)

Environmental and operating conditions
Ingress rating
IP68 (NEMA 6P), <2m (6 ft.)
Submerged
9 months accrued time
Humidity
0 to 100 %
Temperature ranges
Storage: –20 to 60 °C (–4 to 140 °F)
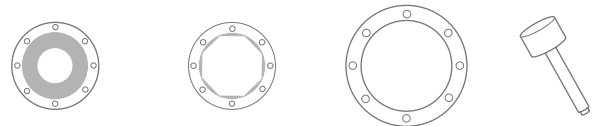Ambient: –20 to 60 °C (–4 to 140 °F)

Transmitter vibration
IEC 60068-2-6 (2007)
Vibration level 2g

Options and certifications
Compatible sensors

| Reduced bore DN40 to 600 | Virtual bore DN40 to 200 | Full bore DN250 to 2400 | Probe 300 to 1000 mm |

External pressure transducer (option)
10, 16, 20 and 40 bar absolute

Backward compatibility (option)
- Full compatibility with legacy AquaMaster remote sensors. Plugs directly into AquaMaster 4 with no specific configuration required.

MID/Tamper detection (option) (approval pending)
- Switch selectable inside the tamper-evident, seal-protected enclosure
- Prevents changes to meter configuration that affect the meter/output accuracy

DS/FET400-EN

14 Appendix

Declarations of conformity

> **ℹ️ IMPORTANT (NOTE)**
> All documentation, declarations of conformity, and certificates are available in ABB's download area: www.abb.com/flow.

Acknowledgments

- Sensus is a registered trademark of Sensus USA, Inc.
- Windows is a registered trademark of Microsoft Corporation USA
- Android is a registered trademark of Google Inc.
- Velox is a registered trademark of Velox Solutions, Inc.

ABB