



The Company

We are an established world force in the design and manufacture of instrumentation for industrial process control, flow measurement, gas and liquid analysis and environmental applications.

As a part of ABB, a world leader in process automation technology, we offer customers application expertise, service and support worldwide.

We are committed to teamwork, high quality manufacturing, advanced technology and unrivalled service and support.

The quality, accuracy and performance of the Company's products result from over 100 years experience, combined with a continuous program of innovative design and development to incorporate the latest technology.

The UKAS Calibration Laboratory No. 0255 is just one of the ten flow calibration plants operated by the Company and is indicative of our dedication to quality and accuracy.

EN ISO 9001:2000



Cert. No. Q 05907

EN 29001 (ISO 9001)



Lenno, Italy – Cert. No. 9/90A

Stonehouse, U.K.



Electrical Safety

This equipment complies with the requirements of CEI/IEC 61010-1:2001-2 'Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use'. If the equipment is used in a manner NOT specified by the Company, the protection provided by the equipment may be impaired.

Symbols

One or more of the following symbols may appear on the equipment labelling:

	Warning – Refer to the manual for instructions
	Caution – Risk of electric shock
	Protective earth (ground) terminal
	Earth (ground) terminal

	Direct current supply only
	Alternating current supply only
	Both direct and alternating current supply
	The equipment is protected through double insulation

Information in this manual is intended only to assist our customers in the efficient operation of our equipment. Use of this manual for any other purpose is specifically prohibited and its contents are not to be reproduced in full or part without prior approval of the Technical Publications Department.

Health and Safety

To ensure that our products are safe and without risk to health, the following points must be noted:

1. The relevant sections of these instructions must be read carefully before proceeding.
2. Warning labels on containers and packages must be observed.
3. Installation, operation, maintenance and servicing must only be carried out by suitably trained personnel and in accordance with the information given.
4. Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and/or temperature.
5. Chemicals must be stored away from heat, protected from temperature extremes and powders kept dry. Normal safe handling procedures must be used.
6. When disposing of chemicals ensure that no two chemicals are mixed.

Safety advice concerning the use of the equipment described in this manual or any relevant hazard data sheets (where applicable) may be obtained from the Company address on the back cover, together with servicing and spares information.

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Electromagnetic Flowmeter

AquaMaster™

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1 Introduction

AquaMaster™ is a range of high performance electromagnetic flowmeters for the measurement of electrically conductive fluids and are normally supplied as factory configured, calibrated systems.

This manual provides end-user details for AquaMaster Integral and Remote transmitters. For details of the sensor used with the transmitter, please refer to the sensor manual supplied at time of ordering.

Warning.

- Installation and maintenance must be carried out only by suitably trained personnel.
- Read all relevant sections of this manual before selecting a location.
- The safety requirements of this equipment, any associated equipment and the local environment must be taken into consideration during installation.
- Install and use this equipment in accordance with relevant national and local standards.
- Specific safety precautions apply to the use of the GSM engine which forms part of the GSM-equipped version of this product. If the unit purchased has GSM-capability, read Appendix A on page 49 before selecting a location.

2 Mechanical Installation

2.1 Unpacking

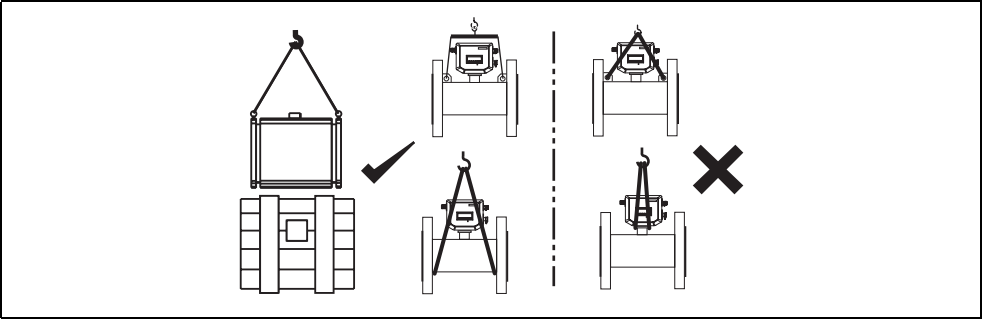


Fig. 2.1 Unpacking

2.2 Installation Conditions

Caution. Do NOT exceed the maximum working pressure marked on the equipment.

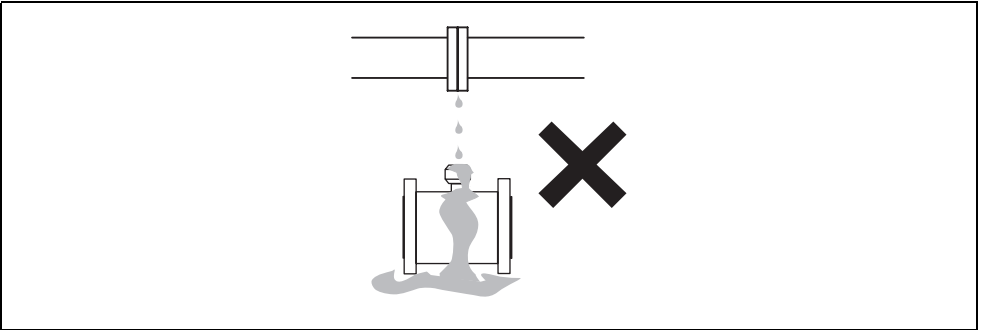


Fig. 2.2 Spillage

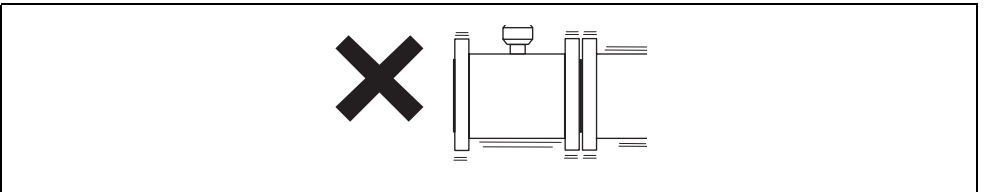


Fig. 2.3 Vibration

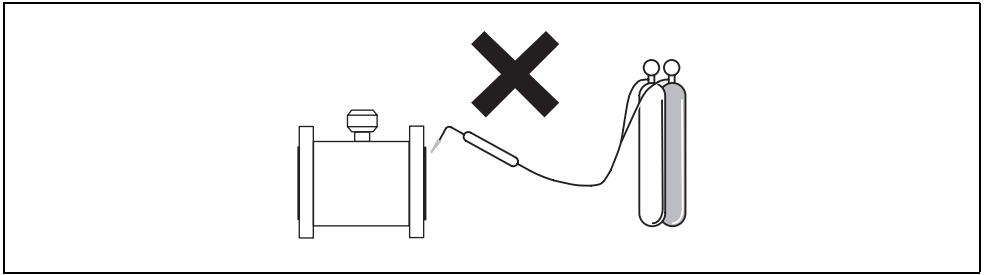


Fig. 2.4 Localized Heat

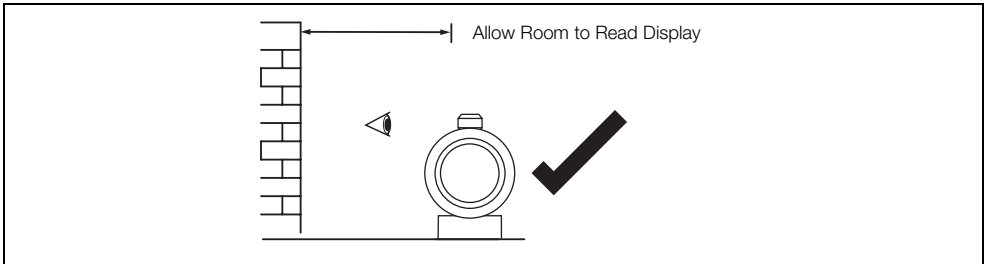


Fig. 2.5 Siting

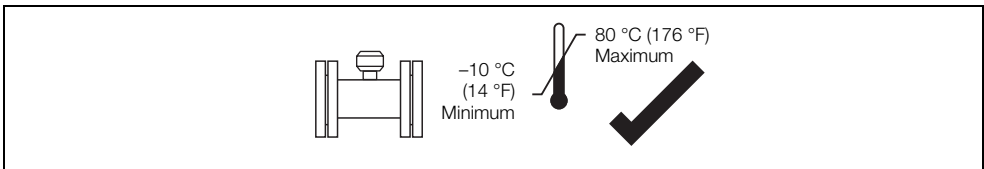


Fig. 2.6 Within Temperature Limits

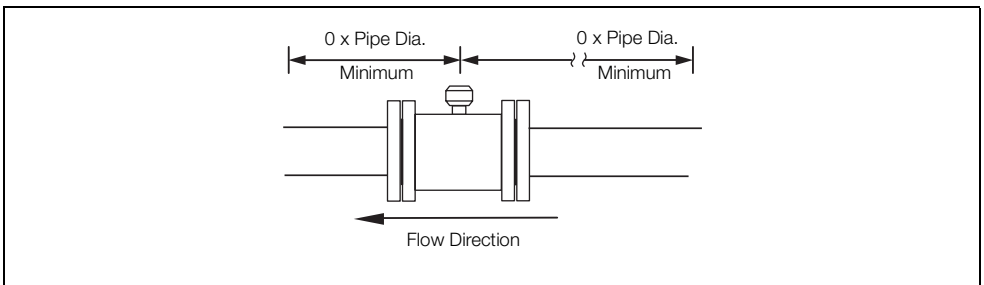


Fig. 2.7 Straight Pipe Requirements

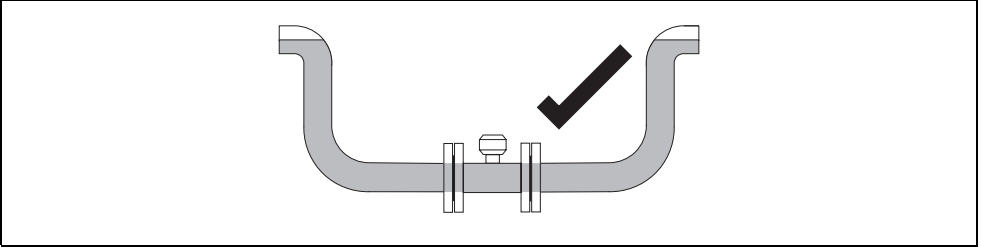


Fig. 2.8 Fluid Level

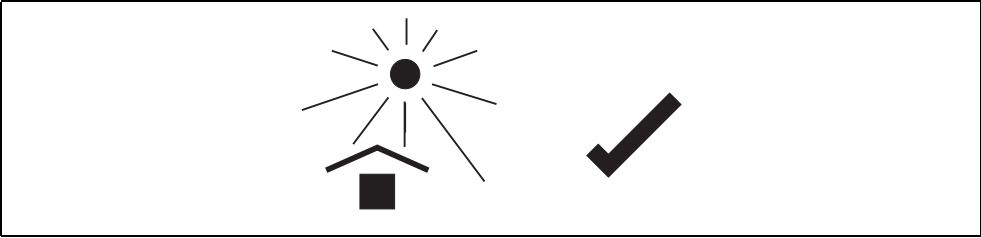


Fig. 2.9 Shade

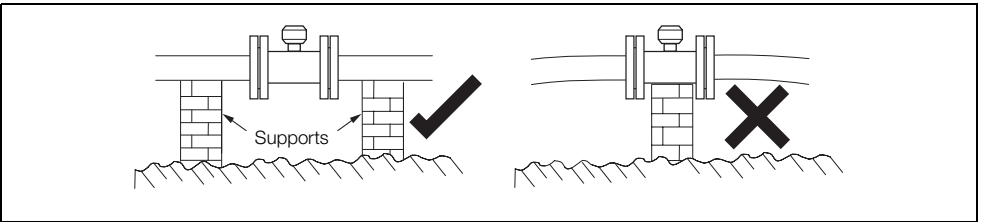


Fig. 2.10 Above Ground

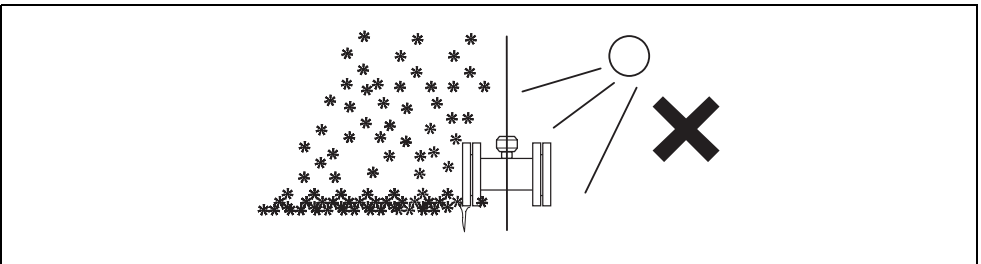


Fig. 2.11 Temperature Difference

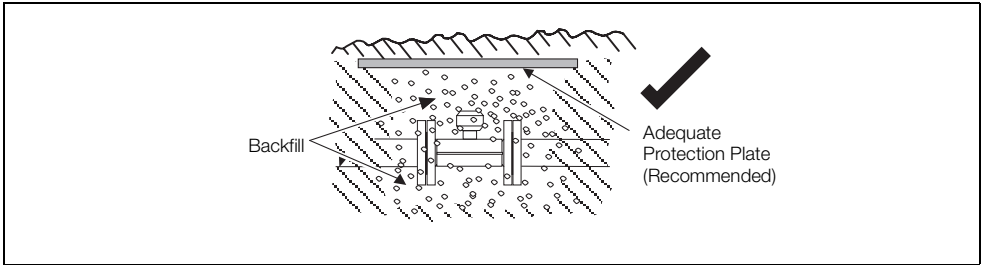


Fig. 2.12 Underground

Note. For further details when burying flow sensors contact the ABB Service Organisation.

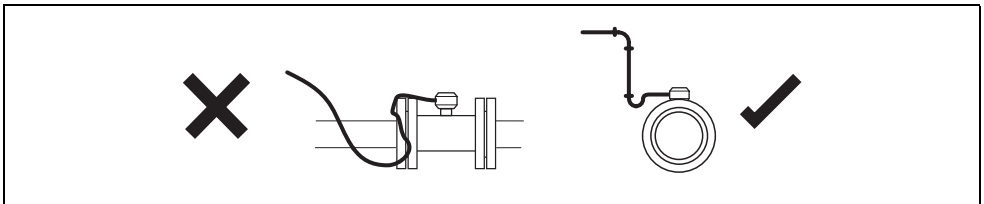


Fig. 2.13 Cable Routing

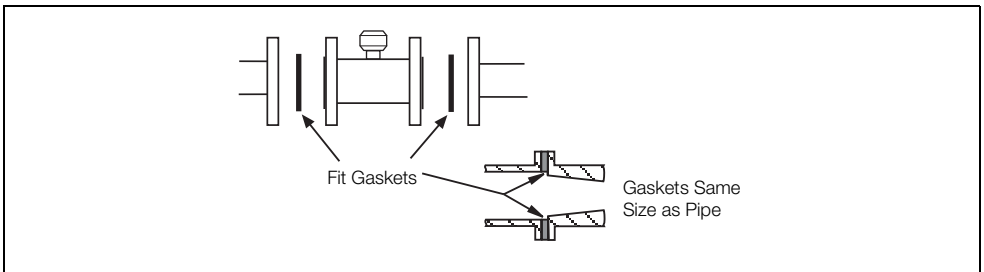


Fig. 2.14 Gasket Fitting

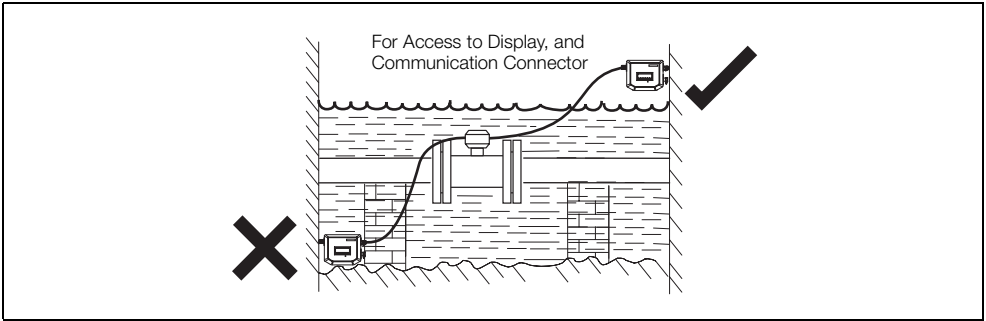


Fig. 2.15 Access to Transmitter

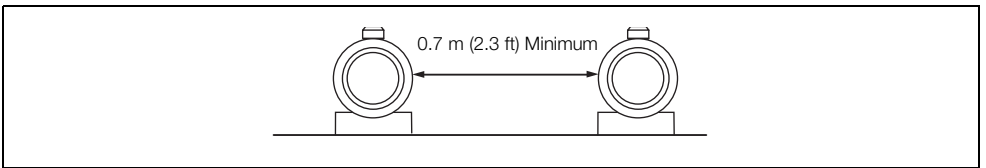


Fig. 2.16 Separation of Sensors

2.3 Transmitter Dimensions

2.3.1 Terminal Box – Sensor-mounted

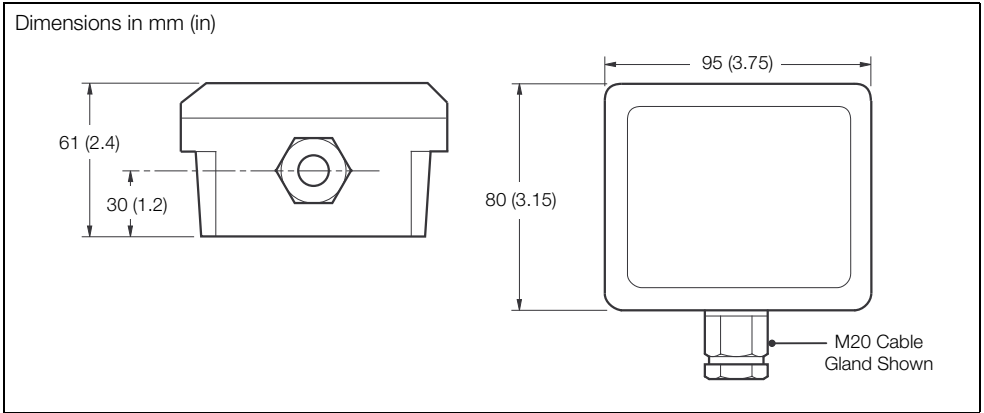


Fig. 2.17 AquaMaster terminal box

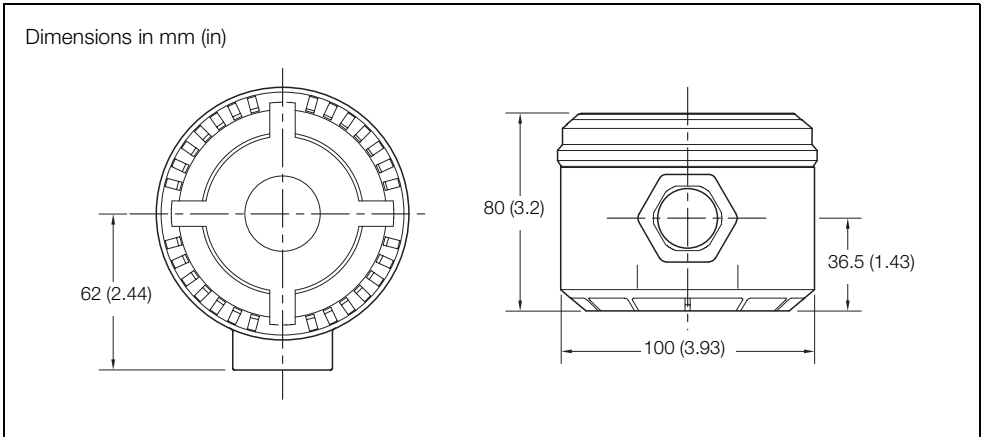


Fig. 2.18 Round Terminal Box

2.3.2 AquaMaster

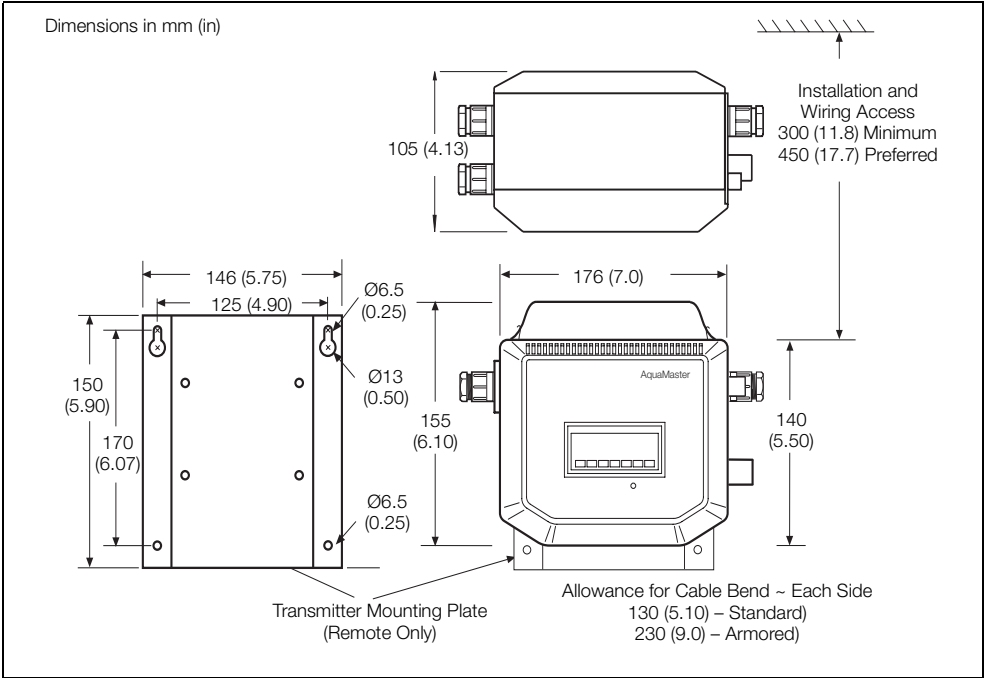


Fig. 2.19 AquaMaster– Dimensions

2.4 GSM-equipped Transmitters

2.4.1 GSM Antenna Installation

Before deciding on an antenna mounting location, check that the local signal strength for the chosen mobile phone network is satisfactory. Use the GSM-equipped transmitter's integral signal strength test facility to establish signal strength. Refer to 'Commissioning test for signal strength' in the Quick Reference Guide for the AquaMaster S with GSM (IM/AMG-QRG).

If a GSM-equipped transmitter is not available, a standard mobile phone on the same network, positioned as close as possible to the intended location, will give a good indication of local signal strength. For GSM and logger download services, a minimum of two visible signal strength indicator 'bars' are recommended. For SMS text, a minimum of one visible signal strength indicator 'bar' is recommended.

The following must also be observed when deciding on the antenna mounting location:

- For best results, mount the antenna as high above local ground level as possible.
- If the antenna must be mounted below ground, achieve optimum results by ensuring:
 - there is a strong mobile phone network signal at ground level
 - the antenna is mounted 50 mm below the chamber cover, which must be plastic – see Fig. 2.20
- Ensure the antenna will not become submerged under water – see Fig. 2.20.
- Metallic enclosures will seriously degrade the signal. If an enclosure is used it must be non-metallic.
- Do not mount the antenna closer than 50 mm to any solid wall or surface – see Fig. 2.21.
- Do not mount the antenna beneath a solid surface (e.g. metal cover, floor/ceiling, etc).

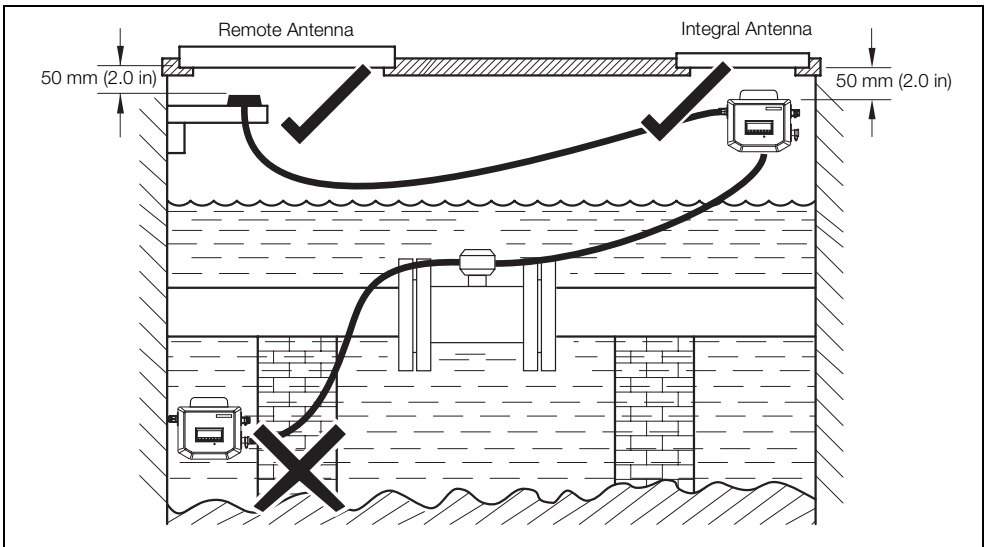


Fig. 2.20 GSM Antenna Installation

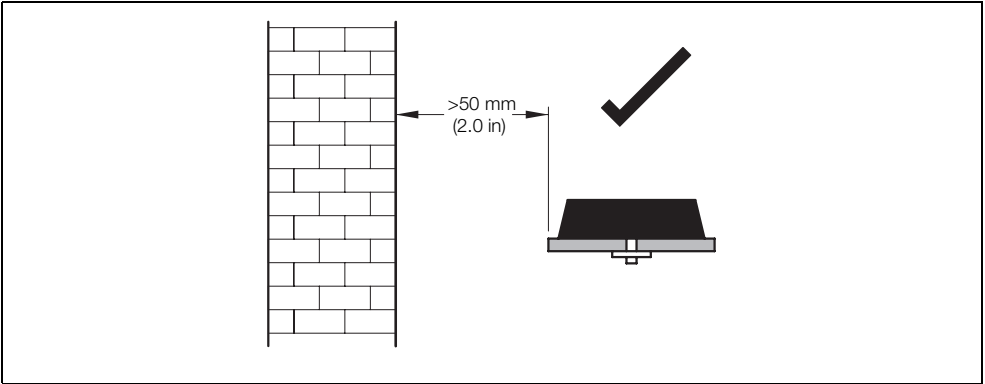


Fig. 2.21 GSM Antenna Installation

2.4.2 Connecting a Remote Antenna

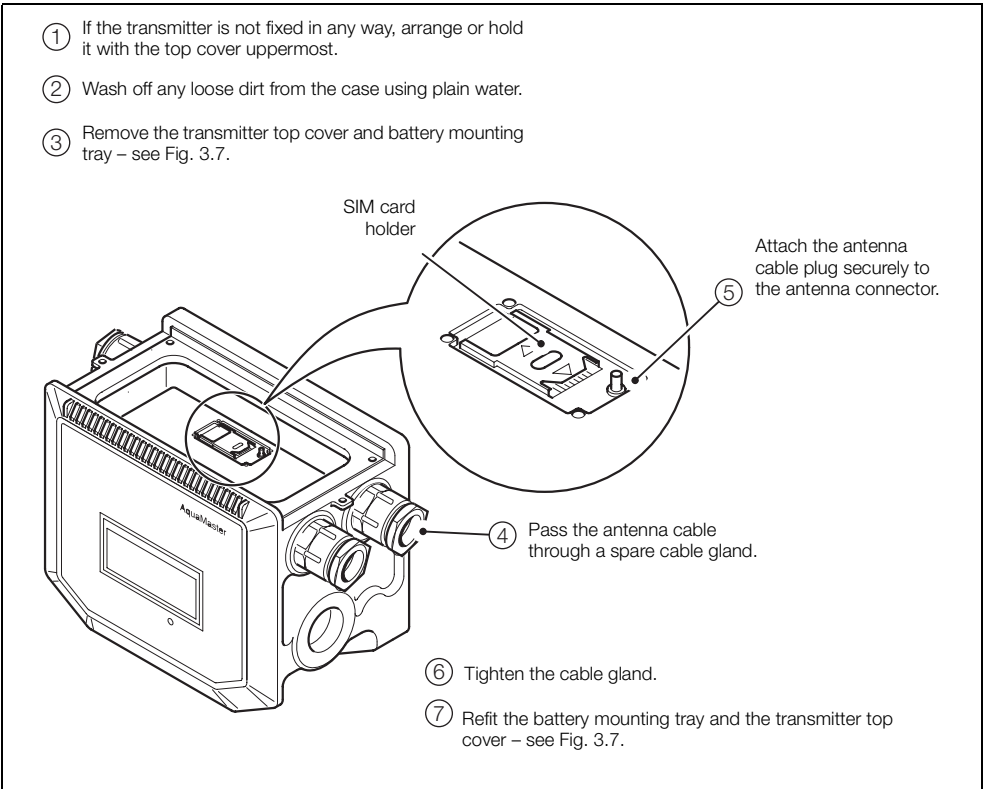


Fig. 2.22 Connecting a Remote Antenna – AquaMaster

2.4.3 Installing a SIM Card

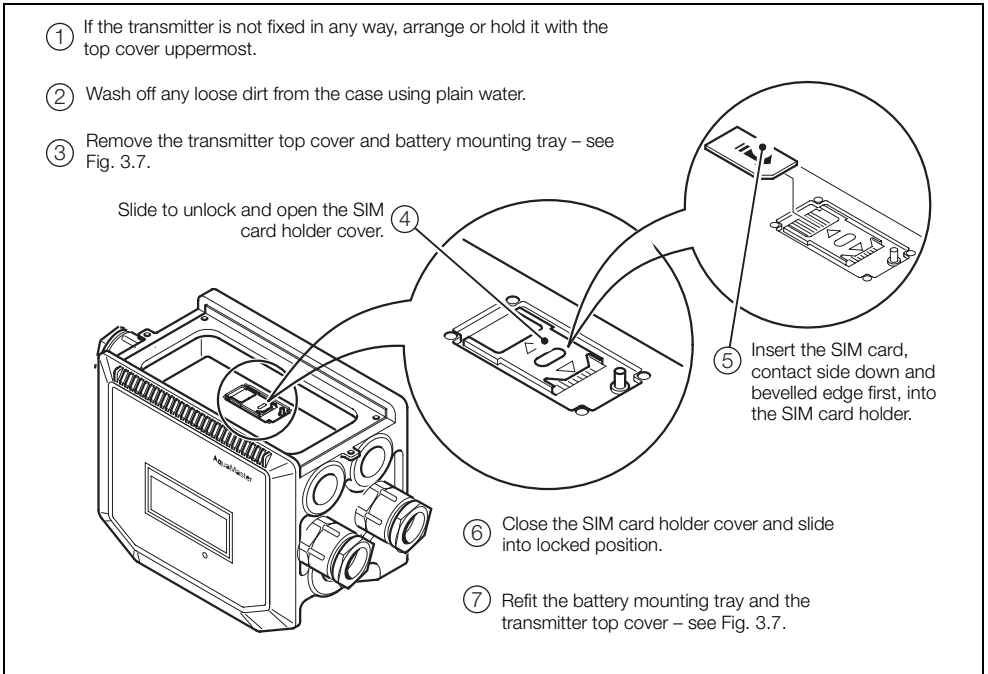


Fig. 2.23 Installing a SIM Card – AquaMaster

3 Electrical Installation

3.1 Grounding

Caution. For safety reasons and optimum performance, the flowmeter, pipelines and medium must be correctly bonded and grounded according to regulations.

Note.

- Connect the transmitter ground connection to the flowmeter body ground – see Fig. 3.3 and Fig. 3.4.
- The flow sensor must not be connected to a ground spike.
- For bonding connections use $\geq 4 \text{ mm}^2$ (<10AWG) cable.
- Older sensors from DN40 to DN80, that are fitted with bare metal stainless steel flanges, do not require fluid contact rings.

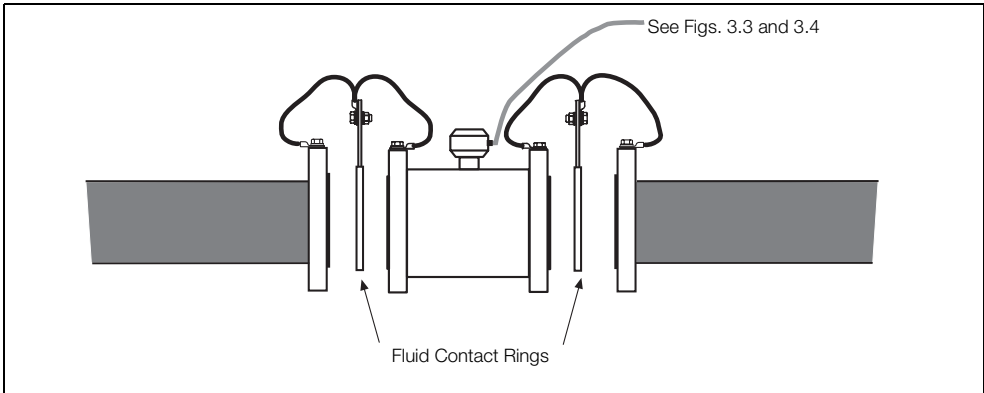


Fig. 3.1 All Metal Pipe, Including Lined Metal Pipe

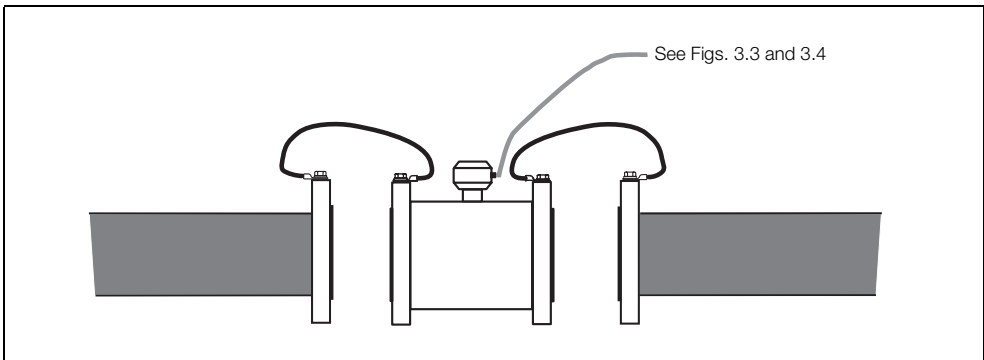


Fig. 3.2 All Metal pipe, including lined metal pipe. Also sizes DN40, DN50 & DN80 if fitted with bare metal stainless steel flanges

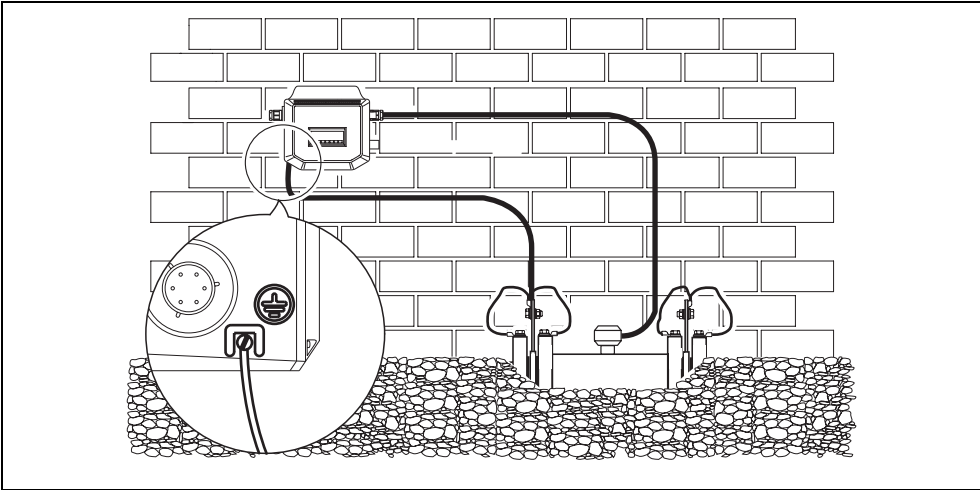


Fig. 3.3 Battery-powered AquaMaster Transmitter Mounted in a Chamber

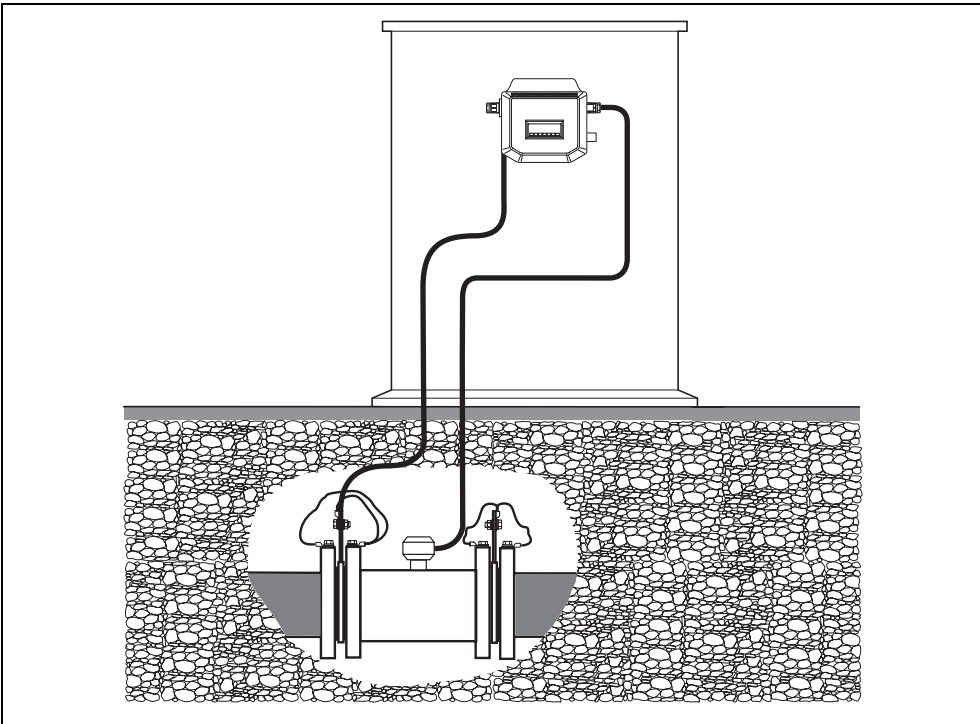


Fig. 3.4 Mains- or Battery-powered AquaMaster Transmitter Mounted in a Cabinet

3.2 Connections

3.2.1 Sensor Terminal Box Connections (Remote Versions only)

Caution. (Remote versions)

- Remove foil screens completely, and plastic/foil screens and any fillers
- Twist the three screen wires together and sleeve them.
- Keep cable pairs twisted.
- Make connections only as shown.
- Maintain Environmental Protection at all times.
- Conduit connections must provide cable entry sealing.

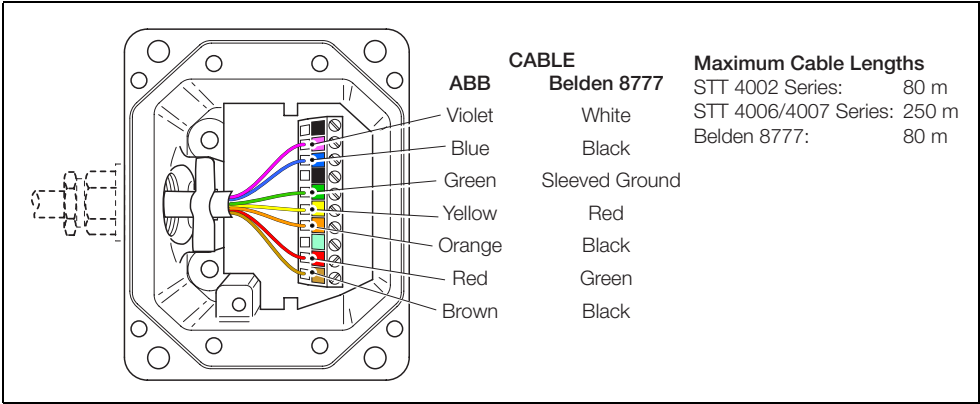


Fig. 3.5 Sensor Terminal Box Connections (Remote Version)

Caution. With Belden Cable 8777, ensure that the black wires are not interchanged and remain with the associated pair.

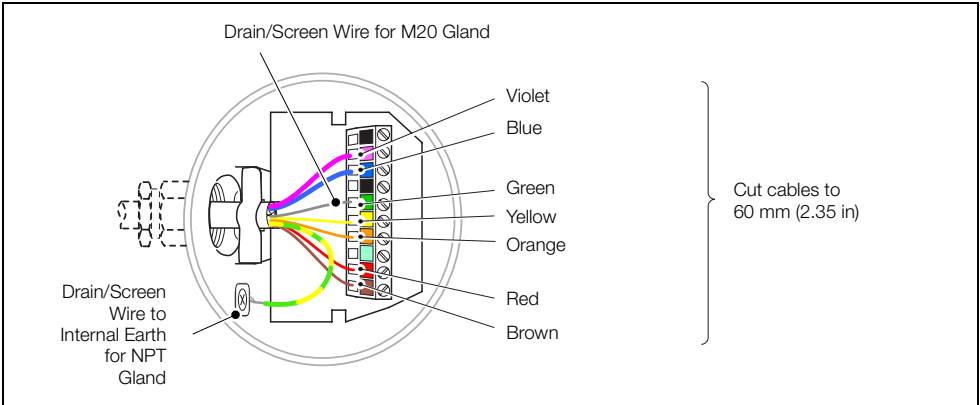


Fig. 3.6 Round Sensor Terminal Block Connections

3.2.2 AquaMaster Connections

Caution.

- To ensure cable glands seal, use cable of diameter 2 to 6 mm (0.08 to 0.24 in) [M16] only.
- Ensure cable glands are tightened after wiring. However, overtightening a plastic cable gland will break it and destroy its sealing property. It is recommended that cable glands are tightened fingertight initially, then a further 1/2 to 3/4 turn applied using a suitable spanner.
- Ensure that 'O' ring seals and mating surfaces are clean, to maintain environmental rating.
- For IP68 protection where the transmitter could be submerged, the termination area must be potted – see Section 3.3.9.

Note. The batteries are mounted in the lid of early style transmitters.

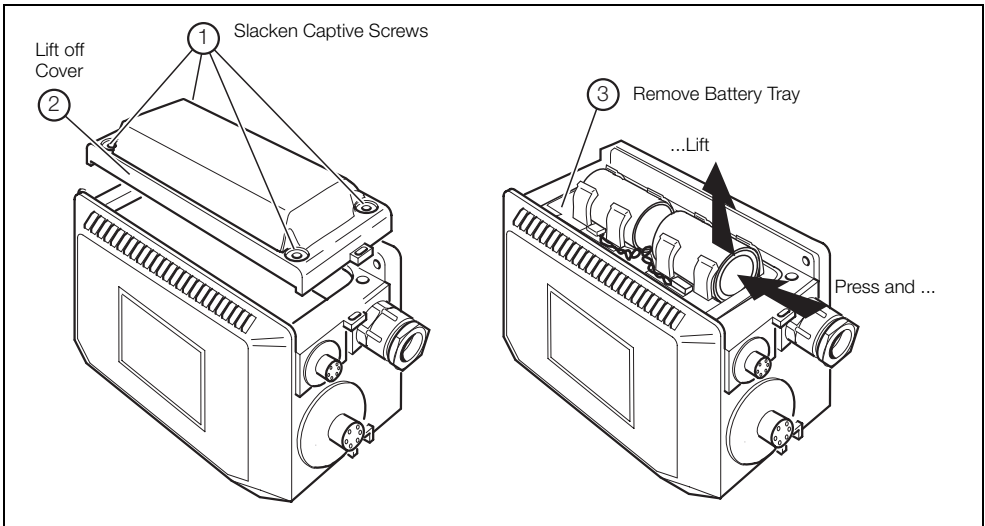


Fig. 3.7 AquaMaster – Connection Terminal Access

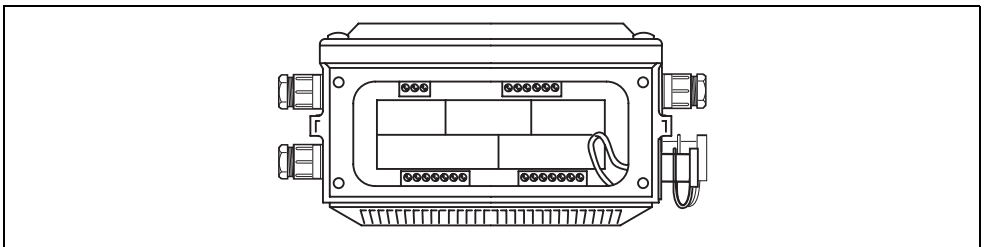


Fig. 3.8 AquaMaster – Connections (Glands/Conduit Entry)

Caution. (Remote versions)

- Remove foil screens completely, and plastic/foil screens and any fillers
- Twist the three screen wires together and sleeve them.
- Keep cable pairs twisted.
- Make connections only as shown.
- Maintain Environmental Protection at all times.
- Conduit connections must provide cable entry sealing.

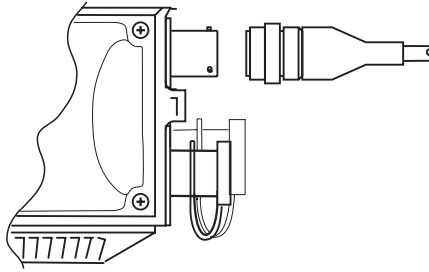


Fig. 3.9 AquaMaster – Sensor Cable Connections (Connector, Remote version)

3.3 Input/Output Connections

Caution.

- Refer to the associated Data Sheets for input/output ratings.
- Inductive loads must be suppressed or clamped to limit voltage swings
- Operation of outputs is programmable – see Quick Reference Programming Guide for details.
- External isolators are not normally required as the pulse and alarm circuit is electrically separated from all other AquaMaster connections.
- Capacitive loads must be inrush current limited.
- Fully-floating pulse outputs may be subject to static damage, e.g. connecting to a floating datalogger, unless 'COM' is operated within its galvanic isolation range (± 35 V) from earth.

3.3.1 Frequency Outputs – AquaMaster

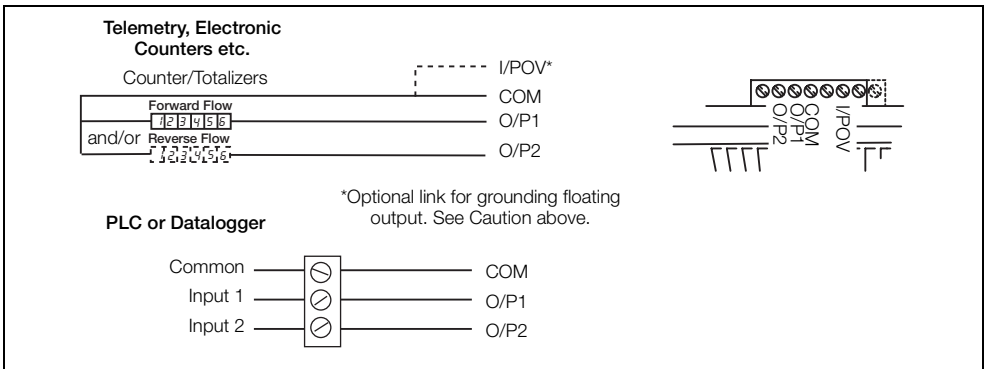


Fig. 3.10 Frequency Output Connections – AquaMaster

Note. Outputs 1 & 2 are not polarity sensitive. The common connection for these outputs is designated 'COM'.

3.3.2 Alarm Interface

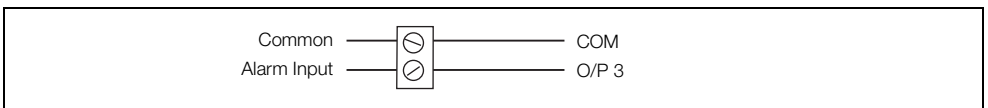


Fig. 3.11 Alarm Output Connections – AquaMaster

Note. Output 3 is not polarity sensitive. The common connection for these outputs is designated 'COM'. Alarm functions are available only with product software versions: ≥ 1.1 (Release 1) ≥ 2.1 (release 2). See Programming Guide to determine software version.

3.3.3 19-Pin MIL Connector Input/Output Connections – AquaMaster

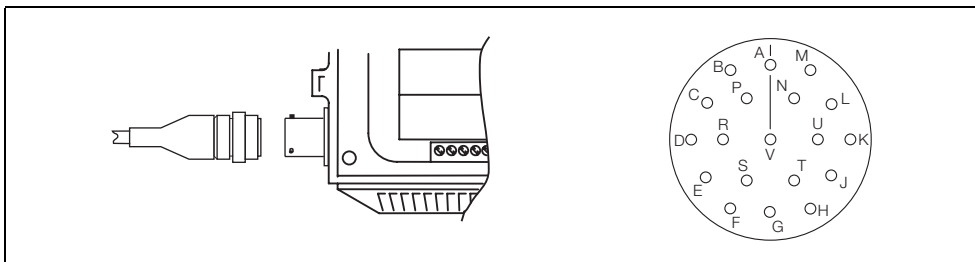


Fig. 3.12 AquaMaster – 19-Pin MIL Connector Connections

Pin	Signal	Function	Color (Output Cable)
A	–	Reserved	
B	–	Reserved	
C	–	Reserved	
D	O/P 1	Forward Pulses or Forward & Reverse Pulses	Orange
E	O/P 3	Alarm Output	White/Red
F	O/P 2	Reverse Pulses or Direction Indicator	Blue
G	O/P Com†	Common	Drain Wire/Screen
H	–	Reserved	
J	I/P Gnd	Input Common	White
K	I/P+	Contact Input	Violet
L	RXD	Receive data (serial input connection) #	Turquoise
M	TXD	Transmit data (serial output connection) #	Brown
N	RTS	Request to send #	Red/Black *
P	CTS	Clear to send #	Yellow/Red *
R	–	Reserved	
S	–	Reserved	
T	RI	Ring Indicator #	Yellow
U	–	Reserved	
V	Serial GND	Comms Ground #	Green

When Remote Comms. Option is fitted

*Not fitted on older cables

† Note Caution regarding fully floating outputs. Recommended protection for floating output systems is to connect G to J.

Table 3.1 AquaMaster – 19-Pin MIL Connector Connections

3.3.4 7-Pin MIL Connector Input/Output Connections – AquaMaster

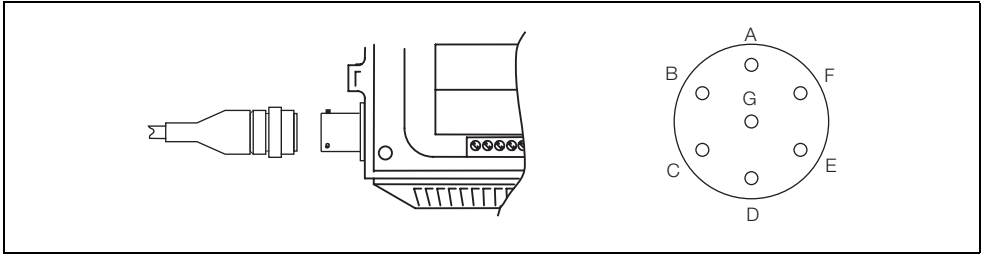


Fig. 3.13 AquaMaster – 7-Pin MIL Connector Connections

Pin	Signal	Function	Color (Output Cable)
A	+V	ScanReader +V	Violet
B	Data	ScanReader	Blue
C	O/P COM	Output Common	Yellow
D	O/P 2	Reverse Pulse or Direction Indicator	Red
E	O/P 3	Alarm Output	Brown
F	O/P 1	Forward Pulse or Direction Indicator	Orange
G	0V	ScanReader 0V	Green

Table 3.2 AquaMaster – 7-Pin MIL Connector Connections

3.3.5 ScanReader Interface (Option)

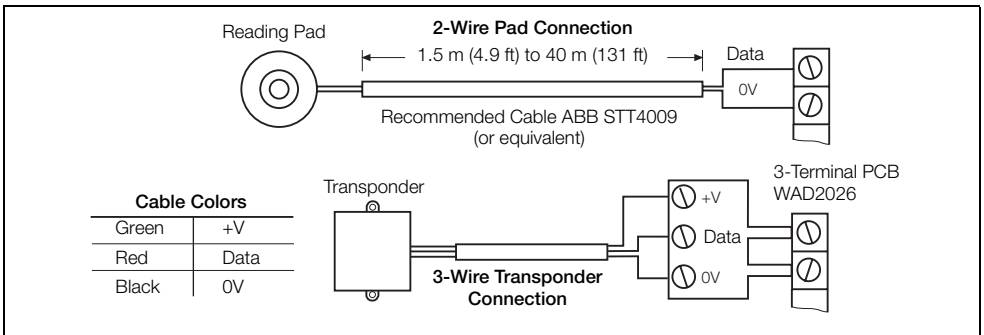


Fig. 3.14 ScanReader Connections

3.3.6 Local Computer Connection

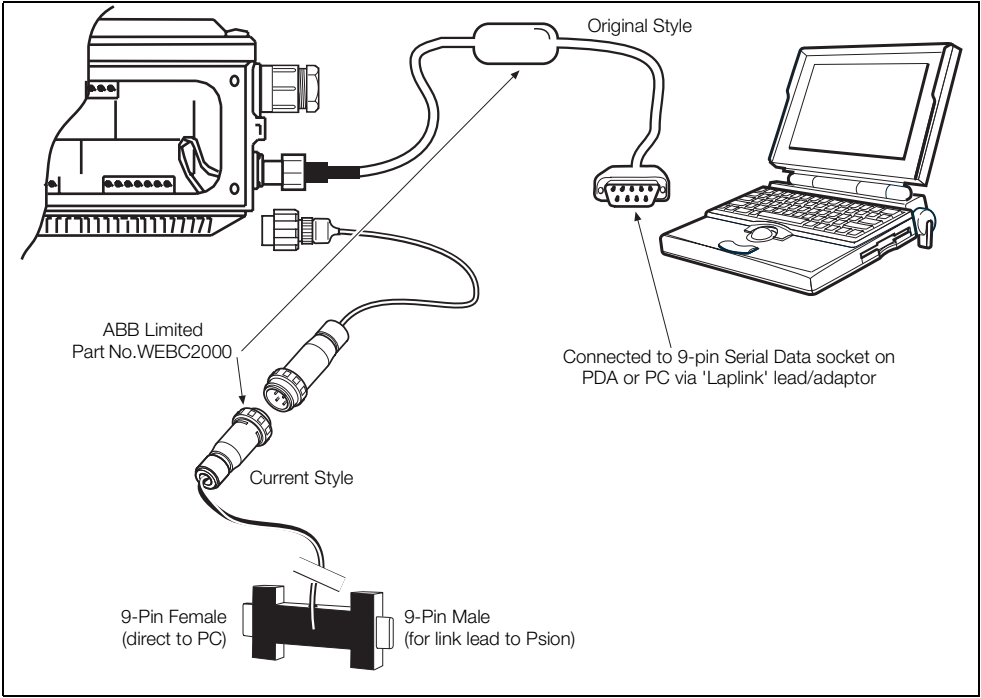


Fig. 3.15 Local Computer Connections – AquaMaster

3.3.7 Remote Computer Connection (RS232C Option)

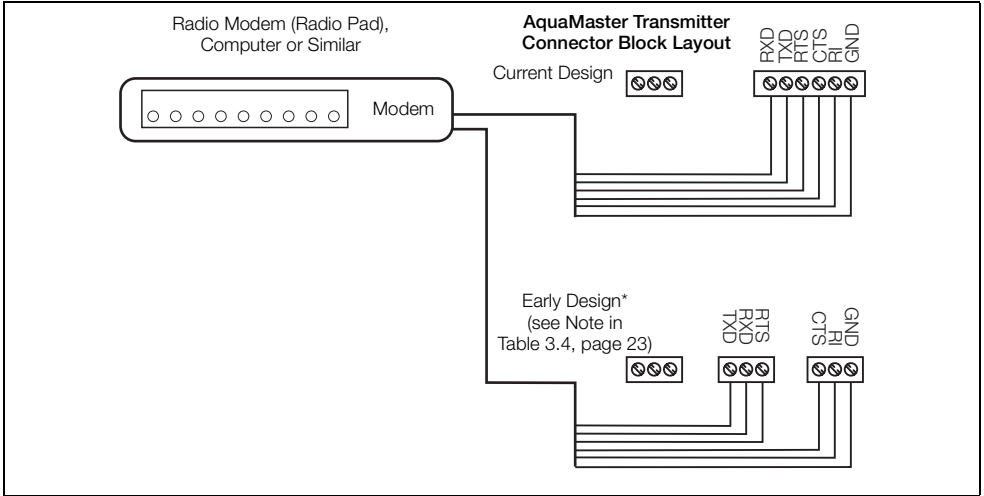


Fig. 3.16 RS232 Connections – AquaMaster

AquaMaster Signal (DTE)	Modem (DCE) Plug *			Terminal/PC (DTE) Socket		
	Name	DB9	DB25	Name	DB9	DB25
RXD	RXD	2	3	TXD	3	2
TXD	TXD	3	2	RXD	2	3
RTS	RTS	7	4	CTS	8	5
CTS	CTS	8	5	RTS	7	4
RI	RI	9	22	-	NC	NC
GND	GND	5	7	GND	5	7

* Also mates with PDA PC-Link cables

Table 3.3 RS232 Connections – AquaMaster

3.3.8 Anti-Tamper Protection

In some applications, such as those covered by the Measuring Instruments Directive (MID) 2004/22/EEC or OIML R49 the flowmeter can be sealed to prevent unauthorized changes to the instrument settings and configuration. A "read only" switch is used as detailed in Fig. 3.17, which prevents login through any communication means and modification of any parameters on the AquaMaster / Explorer. Physical security tags / seals can be fitted which detect unauthorised physical access as shown in Fig. 3.18.

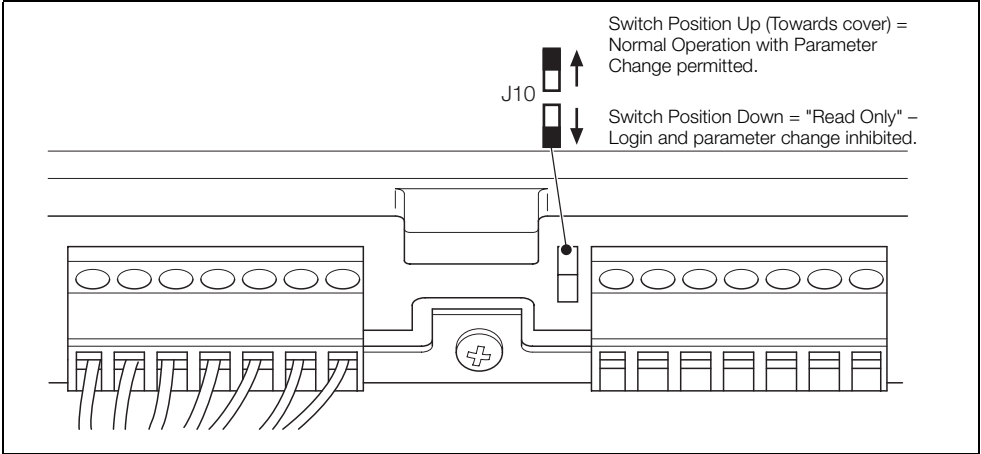


Fig. 3.17 Location of the Read Only switch

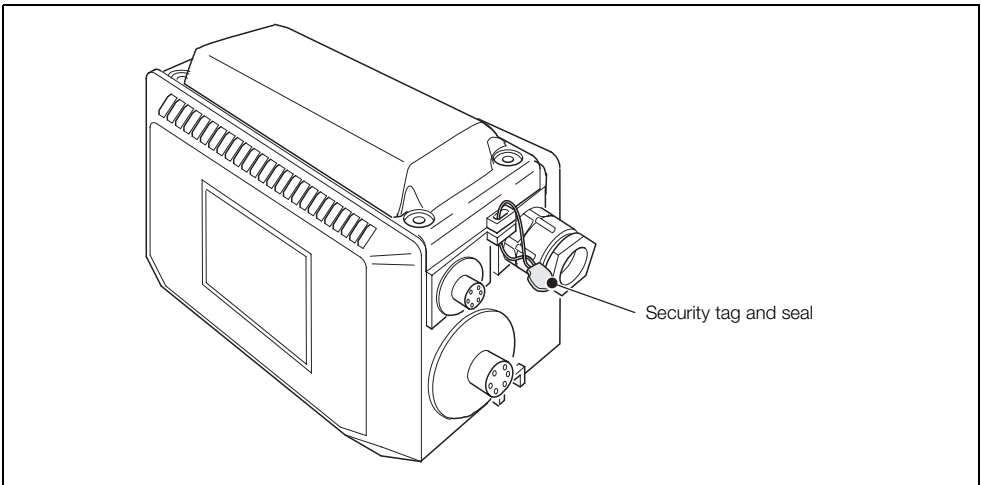


Fig. 3.18 Security Tagging

Note. Suitable security tags should be applied to detect unauthorised physical access.

3.3.9 Power Supply Connections

Warning.

- DISCONNECT THE SUPPLY FROM ANY CABLES BEING TERMINATED ON THE TRANSMITTER.
- Electrical installation and earthing (grounding) must be in accordance with relevant national and local standards.

Note. Power supply connections/earthing arrangements are identical for cathodically protected remote transmitter systems. For cathodically protected integral transmitter systems, follow cathodic installation practices.

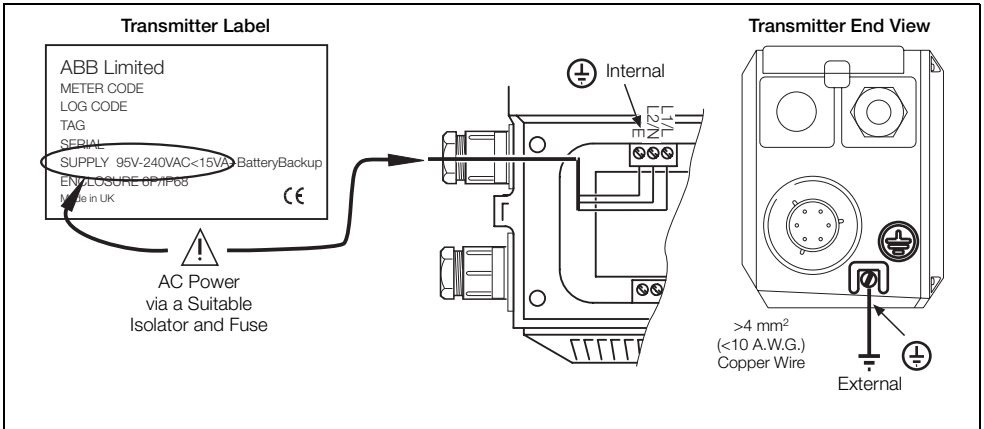


Fig. 3.19 Power Supply Connections – AquaMaster

3.3.10 Pressure Transducer (Optional)

Optional pressure transducer cables are available for a range of pressures and cable lengths.

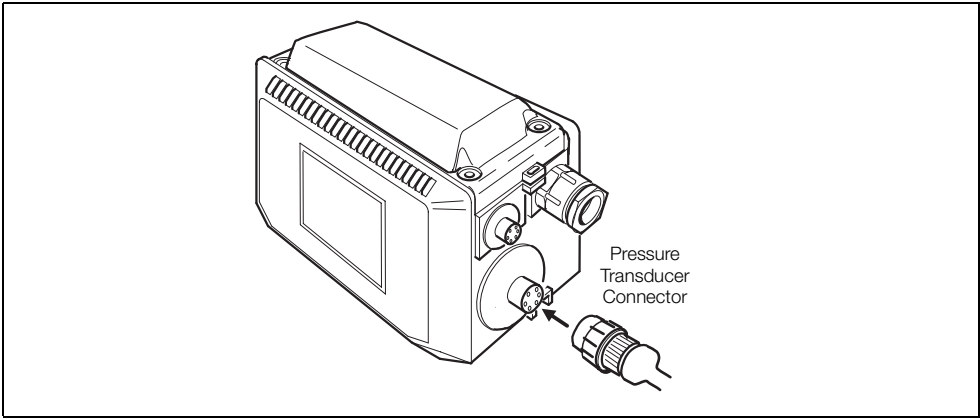


Fig. 3.20 AquaMaster fitted with Optional Pressure Transducer Connector

Caution. Use only the pressure transducer supplied with the transmitter. Use of other pressure transducers will require alteration of the pressure span and zero factors in the transmitter.

3.3.11 Environmental Protection

Warning.

- Potting materials are toxic – use suitable safety precautions.
- Read the manufacturers instructions carefully before preparing the potting material.

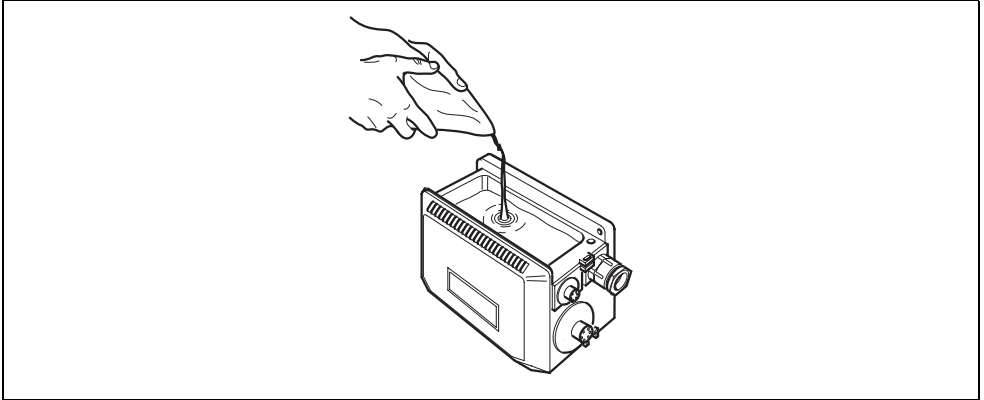


Fig. 3.21 Potting the AquaMaster Transmitter

Caution.

- For IP68 protection against water ingress, pot the termination area on the metal transmitter versions.
- Check all connections and operations before potting.
- Do not overfill or allow the potting material to come into contact with O-rings or grooves; allow for inserting battery tray.
- Do not let potting material enter conduit(s), if used.
- Insert battery tray into potting before it sets and pull through the battery connection wires, thereby ensuring they are above the potting level.
- Keep unit upright whilst potting sets (minimum – two hours).
- Insert battery tray into potting before it sets and pull through the battery connection wires, thereby ensuring they are above the potting level.

4 Start-Up And Operation

Warning.

- The battery used in this device may present a risk of fire or chemical burns if mistreated. Do not recharge, disassemble, heat above 100 °C or incinerate.
- Replace battery pack with an ABB supplied part only. Use of another battery may present a risk of fire or explosion.
- Dispose of all battery packs promptly. Keep away from children.
- Dispose of battery packs in accordance with local regulations.
- Where possible, recycle used batteries.
- Contact the local environmental authority for further information regarding disposal or recycling schemes for used batteries.

Note. Each battery must be connected to the cable from the same side of the termination area as the battery position.

4.1 Connecting Batteries

The AquaMaster is supplied with one or two batteries, but batteries are not connected. To connect see Figs. 4.1.

Note. GSM-equipped transmitters are supplied with the batteries connected but in transportation mode – refer to the label attached to the equipment.

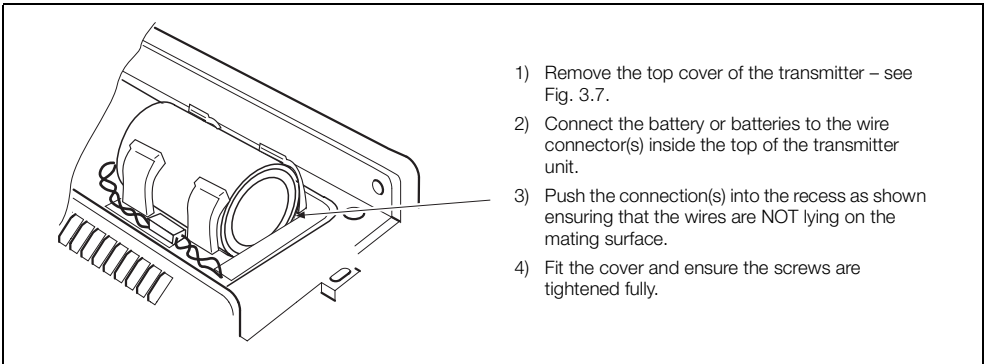


Fig. 4.1 Connecting Batteries – AquaMaster

Note. Operation at elevated temperatures (>50 °C) will significantly shorten the battery capacity and life.

4.2 Start-up

Remove any plastic film from the AquaMaster light sensitive display window before commencing normal operation.

When electrical power is connected, or the plastic film is removed from the display window with electrical power connected, the AquaMaster performs a self-test operation. If successful, 'Pass' is indicated in the display window.

If the display shows 'Err 1', check the sensor wiring. If the fault is rectified, the transmitter restarts automatically.

If the display shows 'Err 2 or 3', contact ABB.

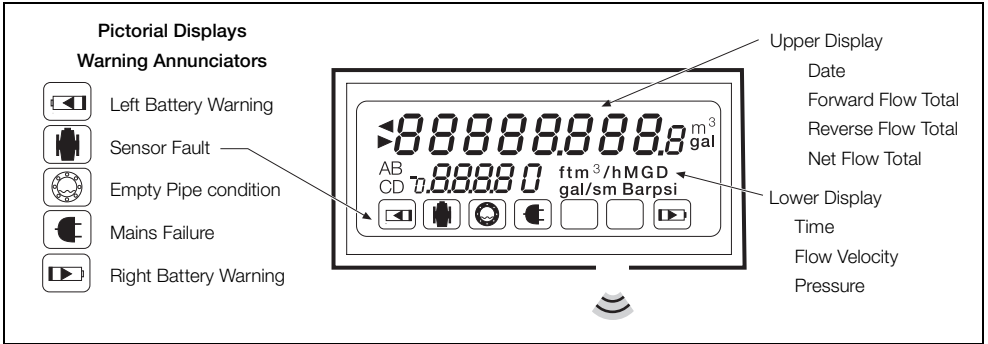


Fig. 4.2 Location of Controls

4.3 Display Activation

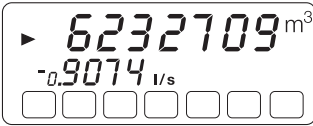
For normal operation, activate the light sensitive display by first covering the display area totally.

On removing the covering, the display activates and cycles through the programmed set of display measurements.

Note. For the use of local or remote serial communication and how to alter the displayed set of measurements, or instrument setup, see the Quick Reference Programming Guide.

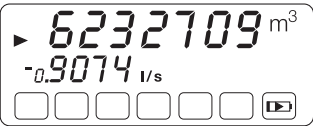
4.4 Replacing a Battery

Note. Each battery must be connected to the cable from the same side of the termination area as the battery position in the battery holder or lid. For dual battery units, replace only the battery indicated by the battery legend described below.



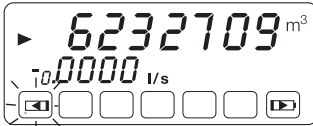
Normal Operation

If both batteries are good, no battery icons are displayed.



Replace Battery

When a single, **steady** battery icon is shown, replace the cell on the side indicated – in this example, the right-hand battery. Wait approximately three seconds after disconnecting the battery before connecting the new battery. **DO NOT** change a battery if its associated icon is flashing.



Battery Pack Exhausted

Important. If both batteries require replacement, first change the cell indicated by the steady icon – in this example, the left battery. The flashing icon indicates the battery currently in use.

4.4.1 Spares Kits

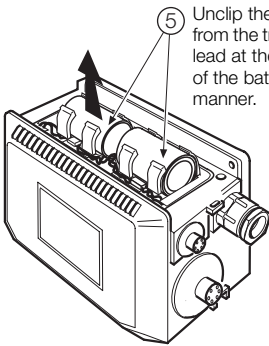
Previous Model (domed cover version)	Part Number
Battery Kit comprises 1 battery and one seal	MEFA 9949
Lid assembly	MEFA 9950

Table 4.1 AquaMaster Transmitter – Previous Model

4.4.2 Battery Changing Procedures

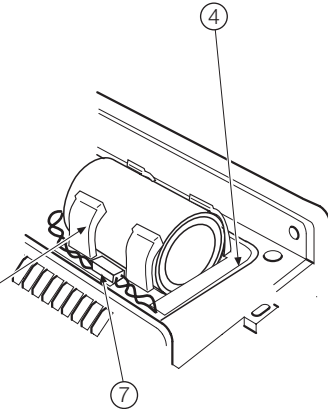
Note. Before changing batteries in a dirty environment it is recommended that, in order to minimize contamination, the new O-ring is fitted to the new lid assembly (or cleaned lid assembly from a previous installation) in a clean area, and the lid sealed in a polythene bag.

- ① If the transmitter is not fixed in any way, arrange or hold it with the top cover uppermost.
- ② Wash off any loose dirt from the case using plain water.
- ③ Remove the top cover of the transmitter (see Fig. 3.7) to expose the batteries.



⑤ Unclip the appropriate battery from the tray and disconnect the lead at the connector; dispose of the battery in the approved manner.

Clean the O-ring mating surface around the opening into the transmitter body using a wet tissue.



⑥ Fit a new battery from the battery kit into the clips.

⑦ Ensure the connector is tucked in the recess and that the wires are NOT lying on the O-ring mating surface.

- ⑧ Fit new silica gel bag; dispose of existing bag.
- ⑨ Fit the new O-ring (supplied with the battery) into a new or recycled lid assembly.
- ⑩ Fit the new cover and ensure the screws are tightened fully.

Finally – remove and discard the O-ring seal from the removed lid assembly, wash the lid under running water (using a brush if necessary), dry it and seal it in a polythene bag for later re-use.

Fig. 4.3 Battery Changing Procedures – AquaMaster

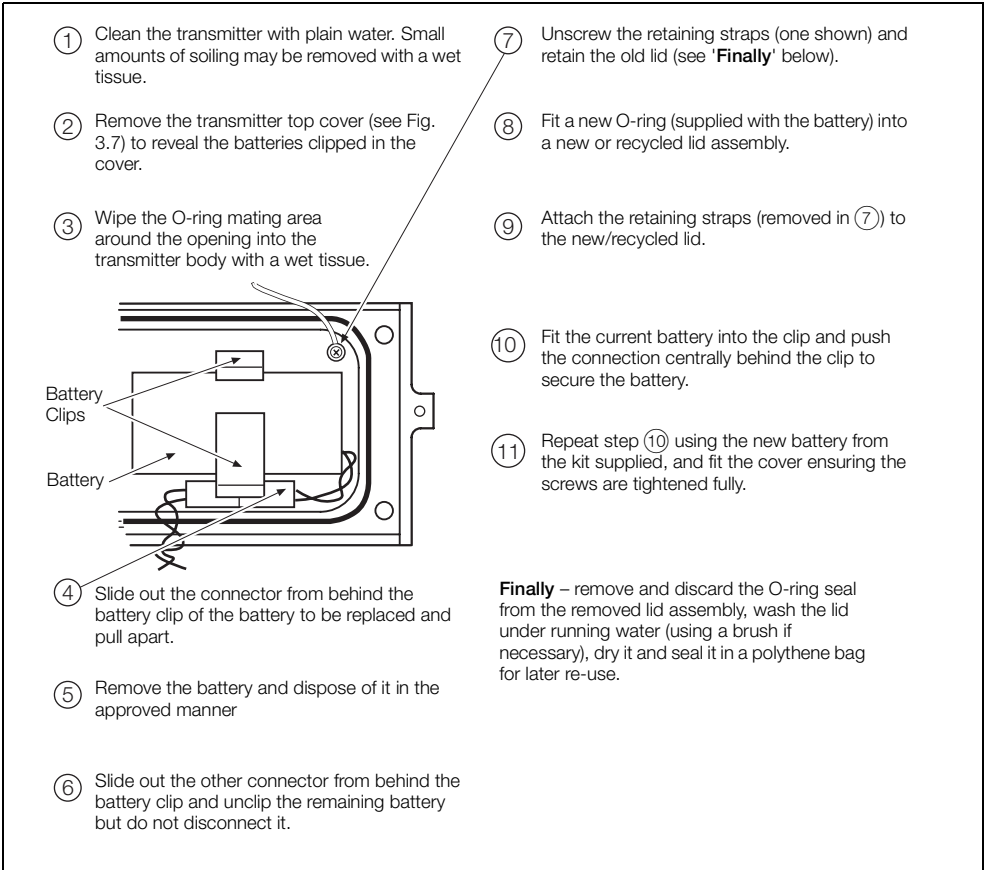


Fig. 4.4 Battery Changing Procedures – AquaMaster Early Version)

4.5 Servicing Plugs and Sockets

To ensure long and reliable service life for the plugs and sockets on AquaMaster Flow Transmitters, ABB recommend regular treatment of the gold connector pins:

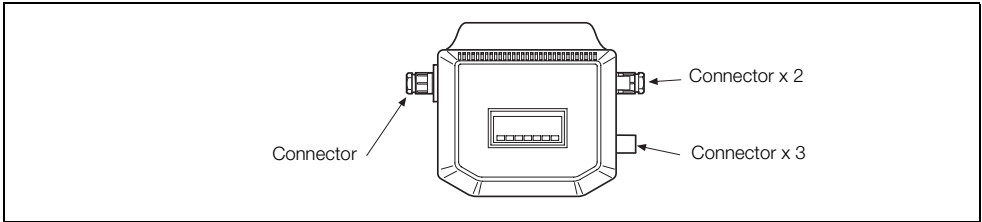


Fig. 4.5 Transmitter Sockets

4.5.1 Service Intervals

Treat all connectors:

- at 3-year intervals
- when the battery is changed
- when the installation is visited for other reasons (such as CalMaster 2 Verification)

4.5.2 Equipment Required

Cleaners are available from your local ABB representative. To purchase supplies directly or for local distributor details please go to the following website:

<http://store.caig.com/>

Material details are:

Description	Part No.
DeoxIT® – Contact Cleaner & Rejuvenator DeoxIT® – Mini-spray, 5 % solution, flushing action, 14g (Applications = 150 approx.)	D5MS-15
DeoxIT® GOLD – Contact Enhancer, conditioner & Protector DeoxIT® GOLD G5 Mini Spray 5 % solution, 14 g, flushing action and safe on plastics (Applications = 150 approx.)	G5MS-S

4.5.3 Preparation

Item	Precaution
Real-time Clock	This procedure may result in the loss of the real-time clock. Once the treatment is complete, check and if necessary, re-program the real-time clock and date – see section 4.5.8, page 36.
Transmitters with Data Loggers	This procedure may result in the loss of logger contents on transmitters fitted with data loggers. To prevent data loss, download logger data before treating the connector pins.

4.5.4 Disconnection

Before DeoxIT treatment disconnect ALL cables in the following order:

1. Battery
2. Sensor
3. Pressure transducer (if fitted)
4. Outputs
5. Communications cable (if connected)

Uncap unused connectors.

4.5.5 Order of Treatment

To minimise disruptive effects of repeatedly breaking and making connections the following order of treatment should be followed using the Stage1 and Stage2 processes for each plug and socket in turn:

1. Treat sensor connector & cable (ensure battery is disconnected at this point).
2. Disconnect sensor cable.
3. Treat battery connector & cable (ensure sensor is disconnected at this point).
4. Disconnect battery cable.
5. Treat all other peripheral connections and cables.
6. Ensure all cables are disconnected.

4.5.6 Stage 1 – Oxide Removal and Cleaning

To remove existing oxide and clean the pins:

1. Apply a short burst (around 0.5 s duration) of DeoxIT DN5 spray to the metal surfaces of the connectors and to the gold connector pins.

Avoid unnecessary spraying onto transmitter housing.

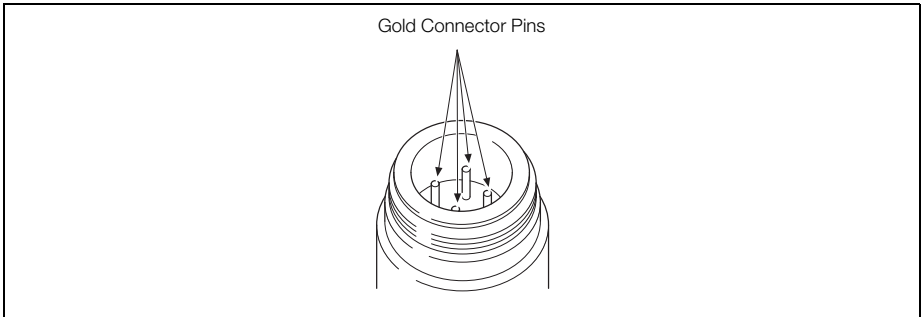


Fig. 4.6 Cleaning the Gold Connector Pins

2. Connect a corresponding male/female connector to the connector under test 5 times.
3. Wait 10 seconds.
4. Reapply one short burst (around 0.5s duration) of DeoxIT DN5 spray to the metal surfaces.
5. Allow any residue to run out of connector.
6. Wait 30 seconds for the application to dry.

Note. The surfaces may not appear completely dry after this time as a protective layer is left behind when the carrier evaporates.

4.5.7 Stage 2 – Oxide Prevention

To prevent oxide build-up:

1. Apply a very short burst (not more than 0.5s duration) of DeoxIT Gold GN5 spray to the metal surfaces.
Avoid unnecessary spraying onto transmitter housing.
2. Wait 10 seconds.
3. Reapply one very short burst (not more than 0.5s duration) of DeoxIT Gold GN5 spray to the metal surfaces.
4. Allow any residue to run out of connector.
5. Wait 30 seconds for the application to dry.

Note. The surfaces may not appear completely dry after this time as a protective layer is left behind when the carrier evaporates.

4.5.8 Completion Tasks

To complete servicing of the plugs and sockets:

1. Reconnect peripheral devices in this order.
 - a. Sensor
 - b. Pressure transducer (if fitted)
 - c. Outputs
 - d. Battery
2. Refit protective caps on unused connection sockets.
3. For transmitters with built-in loggers and no GSM, re-program the real-time clock and date – see Programming Manual IM/AMS/QRG).

4.6 Accessories/Spares Kits

Adapter Cables

WEBC2000	AquaMaster Local Comms Adaptor
WABC2035	Bulgin to Plastic MIL style upgrade kit (sensor)
WEBC2011/M	Explorer output cable for Technolog Cello MIL3 (MIL)
WEBC2012/M	Explorer output cable for Technolog Cello BH3 (MIL)
WEBC2013/M	Explorer output cable for RADCOM Multilog (MIL)
WEBC2014/M	Explorer output for Primayer Xilog (MIL)
WABC2010/01	Wire-ended o/p lead 1 m, Plastic MIL style connector
WABC2036	AquaMaster pressure upgrade kit

5 Specification – Sensor

AC-powered Meters – Flow Requirements to OIML R49

Size		Q ₄	Q ₃	Q _(0.25%)	AquaMaster OIML Class 2 Specification			AquaMaster OIML Class 1 Specification		
mm	in.	m ³ / h (Ugal / min)	m ³ / h (Ugal / min)	m ³ / h (Ugal / min)	Q ₂ m ³ / h (Ugal / min)	Q ₁ m ³ / h (Ugal / min)	R	Q ₂ m ³ / h (Ugal / min)	Q ₁ m ³ / h (Ugal / min)	R
15	1/2	5 (22)	4 (18)	0.11 (0.48)	0.010 (0.044)	0.006 (0.026)	630	0.016 (0.070)	0.010 (0.04)	400
20	3/4	7.9 (35)	6.3 (28)	0.18 (0.79)	0.016 (0.070)	0.010 (0.044)	630	0.025 (0.11)	0.016 (0.070)	400
25	1	12.5 (55)	10 (44)	0.29 (1.27)	0.025 (0.11)	0.016 (0.070)	630	0.04 (0.176)	0.025 (0.11)	400
40*	1 1/2	31 (138)	25 (110)	1.5 (6.6)	0.063 (0.28)	0.040 (0.176)	630	0.1 (0.44)	0.063 (0.28)	400
50*	2	50 (220)	40 (176)	1.5 (6.6)	0.1 (0.44)	0.063 (0.277)	630	0.16 (0.70)	0.1 (0.44)	400
65	2 1/2	79 (247)	63 (277)	1.8 (6.2)	0.16 (0.7)	0.1 (0.44)	630	0.25 (1.10)	0.16 (0.70)	400
80*	3	125 (550)	100 (440)	3 (13.2)	0.3 (1.32)	0.16 (0.70)	630	0.4 (1.76)	0.25 (1.10)	400
100*	4	200 (880)	160 (700)	4.6 (20.25)	0.41 (1.8)	0.25 (1.10)	630	0.64 (2.82)	0.4 (1.76)	400
125	5	313 (1378)	250 (1100)	7.1 (31.26)	0.63 (2.77)	0.40 (1.76)	630	1.0 (4.40)	0.63 (2.77)	400
150*	6	500 (2200)	400 (1760)	11.4 (50.19)	1 (4)	0.63 (12.77)	630	1.6 (7.04)	1.0 (4.40)	400
200*	8	788 (3470)	630 (2770)	18 (79.25)	1.6 (7)	1.0 (4.40)	630	2.5 (11)	1.6 (7.04)	400
250*	10	1250 (5500)	1000 (4400)	29 (127.7)	2.5 (11)	1.6 (7.04)	630	4 (17.6)	2.5 (11)	400
300*	12	2000 (8810)	1600 (7040)	46 (202)	4.1 (18)	2.5 (11)	630	6.4 (28.18)	4 (17.6)	400
350	14	2000 (8810)	1600 (7040)	80 (352)	6.4 (28.18)	4 (17.6)	400	12.8 (56.35)	8 (35.22)	200
400	16	3125 (13760)	2500 (11007)	125 (550)	10 (44)	6.3 (27.73)	400	20 (88.05)	12.5 (55.03)	200
450	18	3125 (13760)	2500 (11007)	125 (550)	10 (44)	6.3 (27.73)	400	20 (88.05)	12.5 (55.03)	200
500	20	5000 (22010)	4000 (17610)	200 (880)	16 (70.44)	10 (44)	400	32 (140.9)	20 (88.05)	200
600	24	7875 (34760)	6300 (27740)	315 (1387)	25.2 (110.9)	15.8 (69.56)	400	50.4 (221.9)	31.5 (138.7)	200

* OIML R49 version available to Class 1 and Class 2

Note. OIML R49–1 allow Class 1 only for meters with $Q_3 \geq 100$ m³/h. Meters outside this range have been tested and conform to Class 1 specification.

Battery-powered Meters – Flow Requirements to OIML R49

					AquaMaster OIML Class 2 Specification			AquaMaster OIML Class 1 Specification		
Size		Q ₄	Q ₃	Q _{0.5%}	Q ₂	Q ₁	R	Q ₂	Q ₁	R
mm	in.	m ³ / h (Ugal / min)	m ³ / h (Ugal / min)	m ³ / h (Ugal / min)	m ³ / h (Ugal / min)	m ³ / h (Ugal / min)		m ³ / h (Ugal / min)	m ³ / h (Ugal / min)	
15	1/2	5 (22)	4 (18)	0.24 (1.05)	0.026 (0.110)	0.016 (0.070)	250	0.04 (0.176)	0.025 (0.11)	160
20	3/4	7.9 (34.8)	6.3 (28)	0.37 (1.62)	0.04 (0.176)	0.025 (0.110)	250	0.063 (0.277)	0.04 (0.176)	160
25	1	12.5 (55)	10 (44)	0.6 (2.64)	0.064 (0.281)	0.04 (0.176)	250	0.1 (0.44)	0.063 (0.277)	160
40*	1 1/2	31 (138)	25 (110)	1.5 (6.6)	0.16 (0.704)	0.1 (0.44)	250	0.25 (1.10)	0.16 (0.704)	160
50*	2	50 (220)	40 (176)	2.4 (10.56)	0.26 (1.14)	0.16 (0.70)	250	0.4 (1.76)	0.25 (1.10)	160
65	2 1/2	79 (347)	63 (277)	3.7 (16.29)	0.40 (1.76)	0.25 (1.10)	250	0.63 (2.77)	0.4 (1.76)	160
80*	3	125 (550)	100 (440)	5.9 (25.97)	0.64 (2.81)	0.4 (1.76)	250	1 (4.40)	0.63 (2.77)	160
100*	4	200 (880)	160 (700)	9.4 (41.38)	1.0 (4.4)	0.64 (2.81)	250	1.6 (7.04)	1 (4.40)	160
125	5	313 (1378)	250 (1100)	14.7 (64.72)	1.6 (7.04)	1.0 (4.4)	25 0	2.5 (11)	1.6 (7.04)	160
150*	6	500 (2200)	400 (1760)	23.5 (103.46)	2.56 (11.27)	1.6 (7.04)	250	4 (17.61)	2.5 (11)	160
200*	8	788 (3470)	630 (2770)	37 (162.90)	4.0 (17.61)	2.5 (8.8)	250	6.3 (27.73)	3.9 (17.17)	160
250*	10	1250 (5500)	1000 (4400)	60 (260)	6.4 (28.18)	4 (17.6)	250	10 (44)	6.3 (27.73)	160
300*	12	2000 (8810)	1600 (7040)	90 (400)	10.2 (44.91)	6.4 (28.18)	250	16 (70.44)	10 (44)	160
350	14	2000 (8810)	1600 (7040)	110 (484.3)	16 (70.44)	10 (44.02)	160	41 (180.5)	25 (110)	63
400	16	3125 (13760)	2500 (11010)	170 (748.48)	25 (110)	15.6 (68.68)	160	63 (277.4)	40 (176)	63
450	18	3125 (13760)	2500 (11007)	170 (748.48)	25 (110)	15.6 (68.68)	160	63 (277.4)	40 (176)	63
500	20	5000 (22010)	4000 (17610)	270 (1188.72)	40 (176.11)	25 (110)	160	100 (440.3)	63.5 (279.6)	63
600	24	7875 (34670)	6300 (27740)	420 (1849.20)	63 (277.38)	39 (171.71)	160	160 (704.4)	100 (440.3)	63

* OIML R49 version available to Class 1 and Class 2

Note. OIML R49–1 allow Class 1 only for meters with Q₃ ≥ 100 m³/h. Meters outside this range have been tested and conform to Class 1 specification.

Wetted Materials

Screw-end meters

Brass

Flanged meters

Electrodes – stainless steel 316L

Lining

Suitable for potable water (WRAS listed), ACS (except DN65)

Pressure limitations

As flange rating

PN25 Max Process Temp 50 °C

PN40 Max Process Temp 40 °C

OIML / MID Approved Meters 16 bar

Pressure equipment directive 97/23/EC

This product is applicable in networks for the supply, distribution and discharge of water and associated equipment and is therefore exempt.

Conductivity

>50 µS / cm

End Connections

Thread-end connections

15 mm – G 3/4 in. B 3/4 in. NPSM

20 mm – G 1 in. B 1 in. NPSM

25 mm – G 1 1/4 in. B 1 1/4 in. NPSM

40 to 300 mm (1.5 to 12 in.) flanged

EN1092-1 / ISO 7005 – PN10, PN16, PN25

ANSI B16.5 Class 150

AS 2129 Tables C, D, E and F

AS 4087 PN14, PN16, PN21

JIS to BS2210, 10k

350 to 600 mm (14 to 24 in.) flanged

EN1092-1 / ISO 7005 – PN10, PN16, PN25

AS 4087 PN14, PN16, PN21

AS 2129 Tables C, D, E and F

ANSI B16.5 Class 150

JIS to B2210 5k and 10k

OIML R49 Approval

Size range and flow specification

See specification table

Accuracy class

1 and 2

Environmental class

T50 0.1 °C to 50 °C (32.18 °F to 122 °F)

Pressure loss class

< 0.63 bar

Minimum upstream pipe

0 D

Minimum downstream pipe

0 D

Orientation

Any

MID Approval

Approved to directive 2004/22/EC

Specification – Transmitter

AquaMaster Transmitter

Mounting

Remote or integral

Cable Length

Remote 200 m (650 ft)

Housing

IP67 (NEMA 6P) Aluminum Alloy with Glass Window

Electrical connections

20 mm glands (plastic or armored), or accepts 1/2 in. NPT threaded or military-style plug & socket

Sensor cable

ABB cable supplied as standard

Special cable available on application

SWA cable available on application

Power supply

Battery life @ 0 to 50 °C (32 to 122 °F)

1 battery – typically 1.2 years

2 batteries – typically 3 years

Type	Voltage range (V) Absolute Rating	Frequency (Hz)	VA
AC	85 to 265	47 to 440	<10
Battery	3.6 (Lithium)	–	–

Pulse and alarm outputs

Three bidirectional solid state switches with common isolation ±35V DC 50mA

Output 1 Forward only, or forward plus reverse pulses

Output 2 Reverse pulses or direction indicator

Pulse output 50 Hz maximum, 50 % nominal duty cycle

Output 3 Alarm indicates any problem with the measurement or unit power

Serial data communications

Local Port RS232 compatible via ABB lead (Option)

Remote Port (Option) RS232 with RI, RTS and CTS handshaking

Encoder Interface (non-logging versions only)

Function

Remote reading of totalizer and serial no.

Protocol

ABB encoder

Connections

2-wire for inductive pads (max. cable length 80 m [260 ft])

3-wire for AMR

Compatible readers

Severn Trent Services Smart reader

ABB or Elster SR100 and SR50

Logicon Versaprobe

Itron ERT

Compatible inductive pads

Starpad

ABB

Telemetry applications using remote serial data communications

Internal GSM modem Dual Band GSM; fully programmable schedule for battery operation and Automated Meter Reading

Pressure System – External Transducer

Pressure range

16 bar g or 16 bar Abs.

Connection

Standard quick-fit male probe connector via an adapter cable

Operating temperature range

-20 (ambient) to 70 °C (-4 to 158 °F)

Caution. Protect the sample and transducer from freezing.

Accuracy (typical)

±0.4 % of range

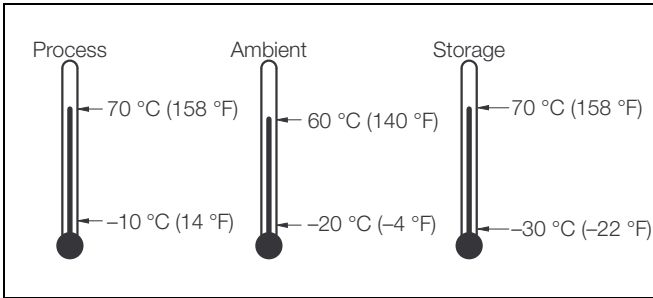
Thermal error band (typically 100 °C [212 °F])

±1.5 % span

Cable length

5 or 10 m (16 or 33 ft)

Temperature Ranges



Note. Operation outside ambient temperature limits of 0 to 45 °C (32 to 113 °F) reduces battery capacity and shortens battery life.

Response Time (Programmable)

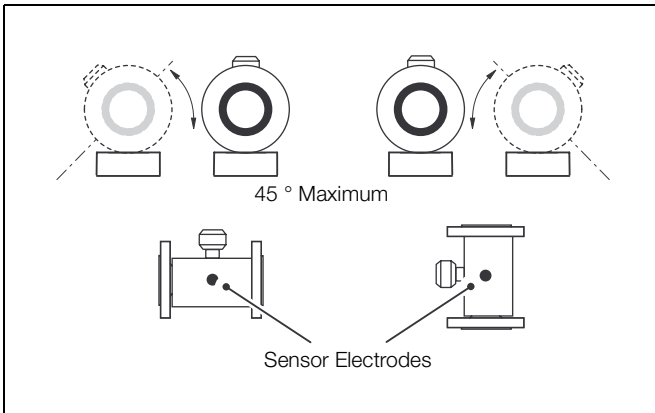
Minimum

- 1 s (mains-powered)
- 15 s (battery-powered)

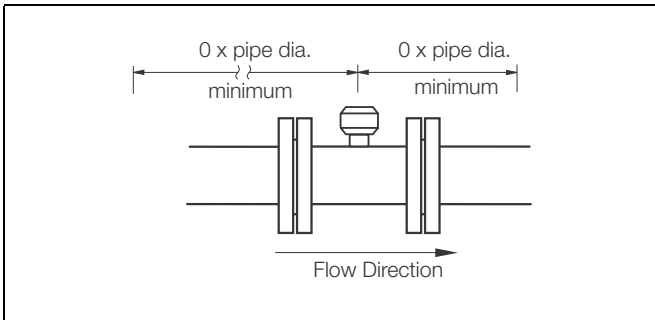
Languages

- English
- French
- German
- Spanish
- Italian
- Dutch

Mounting



Pipe Conditions



Pressure Loss

Flow Rate	Pressure Loss in bar (psi)
Q_3	<0.63 (9.1)
$Q_{3/2}$	<0.16 (2.3)

Logger details (option)

	Logger		
	1	2	3
Logger Function	Flow & Pressure	Flow & Pressure	Forward, Reverse, Tariffs & Net Flow Totals
No. of Records	8831	11361	366
Logging Interval	15 to 65500 s (adjustable)		24 hr (fixed)
Typical Capacity	3 months @ 15 min	~7 days @ 1 min	1 year
Mode	Cyclic	Cyclic	Cyclic
Use ABB LogMaster	✓	✓	✓
Use Technolog (PMAC)	✓	✓	✗
Use Primayer Primeware	✓	✓	✗
Use OSI PI Database / CBV (WADIS) System	✓	✓	✗

GSM Antenna (option)

Mounting

Integral with transmitter or remote.

Antenna environmental

IP66 (NEMA4) waterproof for accidental submersion

(Note. The GSM does not operate with integral antenna under water).

General advice is to mount the antenna as high as possible, always outside of any metal enclosure and not under the surface of the ground.

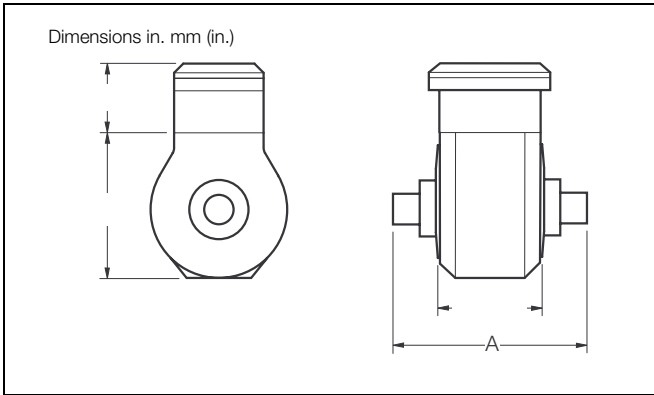
Default Settings Table

Configuration Parameter	Default European	Default North American
Pulse Factor	1	1
Pulse Units	m ³	Ugal
Totalizer Units	m ³	Ugal
Full Scale Flow	Q ₃	Q ₃
Flow Units	m ³ / h	MUGD
Velocity Units	m / s	ft / s
Date Format from Country Code	DDMMYY	MMDDYY
Flow Response Time (s)	3	3
Display Flow Rate	Yes	Yes
Display Forward Total	Yes	Yes
Display Reverse Total	Yes	Yes
Display Net Total	No	No
Display Date	No	No
Display Velocity	No	No
Output Option Pulse Forward	Pulses Forward	Pulses Forward
Output Option Pulse Reverse	Pulses Reverse	Pulses Reverse
Profile Factor	1	1
Probe Insertion Factor	1	1

Sensor Specification (Nominal Dimensions)

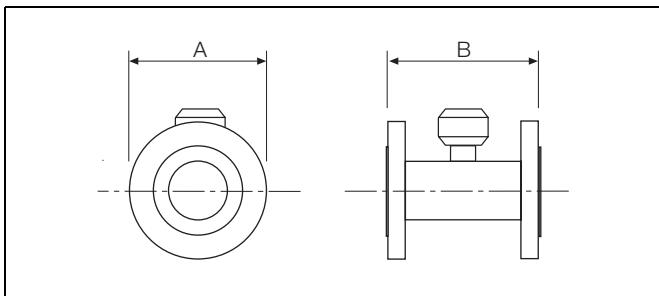
15 to 25 mm (1/2 to 1 in.) – Screw Ends

Meter Size		Dimensions mm (in.)	Connection	Approx. Weight	
mm	in.	A		kg	lb
15	1/2	119 (4.7)	G 3/4 in. B or 3/4 in. NPSM	2.5	5
20	3/4	127 (5)	G 1 in. B or 1 in. NPSM	2.5	5
25	1	127 (5)	G 1 1/4 in. B or 1 1/4 in. NPSM	2.5	5



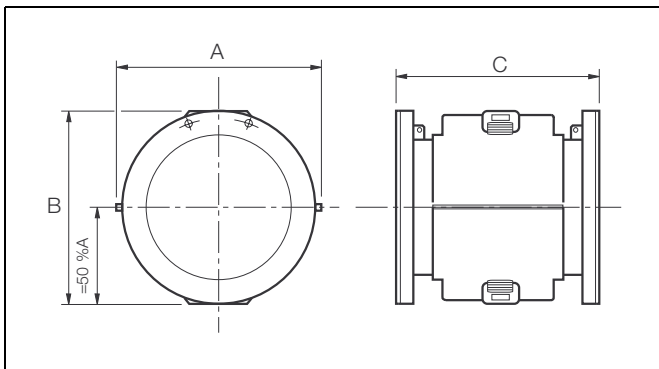
40 to 300 mm (1 1/2 to 12 in.) – Flanged

Meter Size		Dimensions mm (in.)		Approx. Weight	
mm	in.	A	B	kg	lb
40	1 1/2	176 (7)	200 (7.9)	11	24
50	2	176 (7)	200 (7.9)	12	27
65	2 1/2	219 (8.6)	200 (7.9)	13	29
80	3	219 (8.6)	200 (7.9)	18	40
100	4	230.5 (9.8)	250 (9.8)	25	55
150	6	281 (11.8)	300 (11.8)	31	68
200	8	402 (15.8)	350 (13.8)	48	106
250	10	440 (17.3)	450 (17.7)	75	165
300	12	480 (18.9)	500 (19.7)	112	247



350 to 600 mm (14 to 24 in.) – Flanged

Meter Size		Dimensions mm (in.)			Approx. Weight	
mm	in..	A	B	C	kg	lb
350	14	513 (20.2)	520 (20.5)	550 (21.7)	100	220
400	16	570 (22.4)	576 (22.7)	600 (23.6)	115	253
450	18	632 (24.9)	627 (24.7)	698 (27.5)	160	352
500	20	686 (27.0)	679 (26.7)	768 (30.2)	217	455
600	24	772 (30.4)	770 (30.3)	918 (36.1)	315	693



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Appendix A Hazardous Area Protection

A.1 GSM-Equipped Units – Safety Precautions

The following safety precautions must be observed during all phases of the operation, usage, service or repair of this GSM cellular terminal. Failure to comply with these precautions violates safety standards of design, manufacture and intended use of the product. The Company assumes no liability for customer failure to comply with these precautions.

1. When in a hospital or other health care facility, observe the restrictions on the use of mobiles. Switch the cellular terminal or mobile off, if instructed to do so by the guidelines posted in sensitive areas. Medical equipment may be sensitive to RF energy. The operation of cardiac pacemakers, other implanted medical equipment and hearing aids can be affected by interference from cellular terminals or mobiles placed close to the device. If in doubt about potential danger, contact the physician or the manufacturer of the device to verify that the equipment is properly shielded. Pacemaker patients are advised to keep their hand-held mobile away from the pacemaker, while it is on.
2. Switch off the cellular terminal or mobile before boarding an aircraft. Make sure it cannot be switched on inadvertently. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communications systems. Failure to observe these instructions may lead to the suspension or denial of cellular services to the offender, legal action, or both.
3. Do not operate the cellular terminal or mobile in the presence of flammable gases or fumes. Switch off the cellular terminal when you are near petrol stations, fuel depots, chemical plants or where blasting operations are in progress. Operation of any electrical equipment in potentially explosive atmospheres can constitute a safety hazard.
4. Your cellular terminal or mobile receives and transmits radio frequency energy while switched on. Remember that interference can occur if it is used close to TV sets, radios, computers or inadequately shielded equipment. Follow any special regulations and always switch off the cellular terminal or mobile wherever forbidden, or when you suspect that it may cause interference or danger.

Note. Cellular terminals or mobiles operate using radio signals and cellular networks cannot be guaranteed to connect in all conditions. Therefore, you should never rely solely upon any wireless device for essential communications, for example emergency calls.

Remember, in order to make or receive calls, the cellular terminal or mobile must be switched on and in a service area with adequate cellular signal strength.

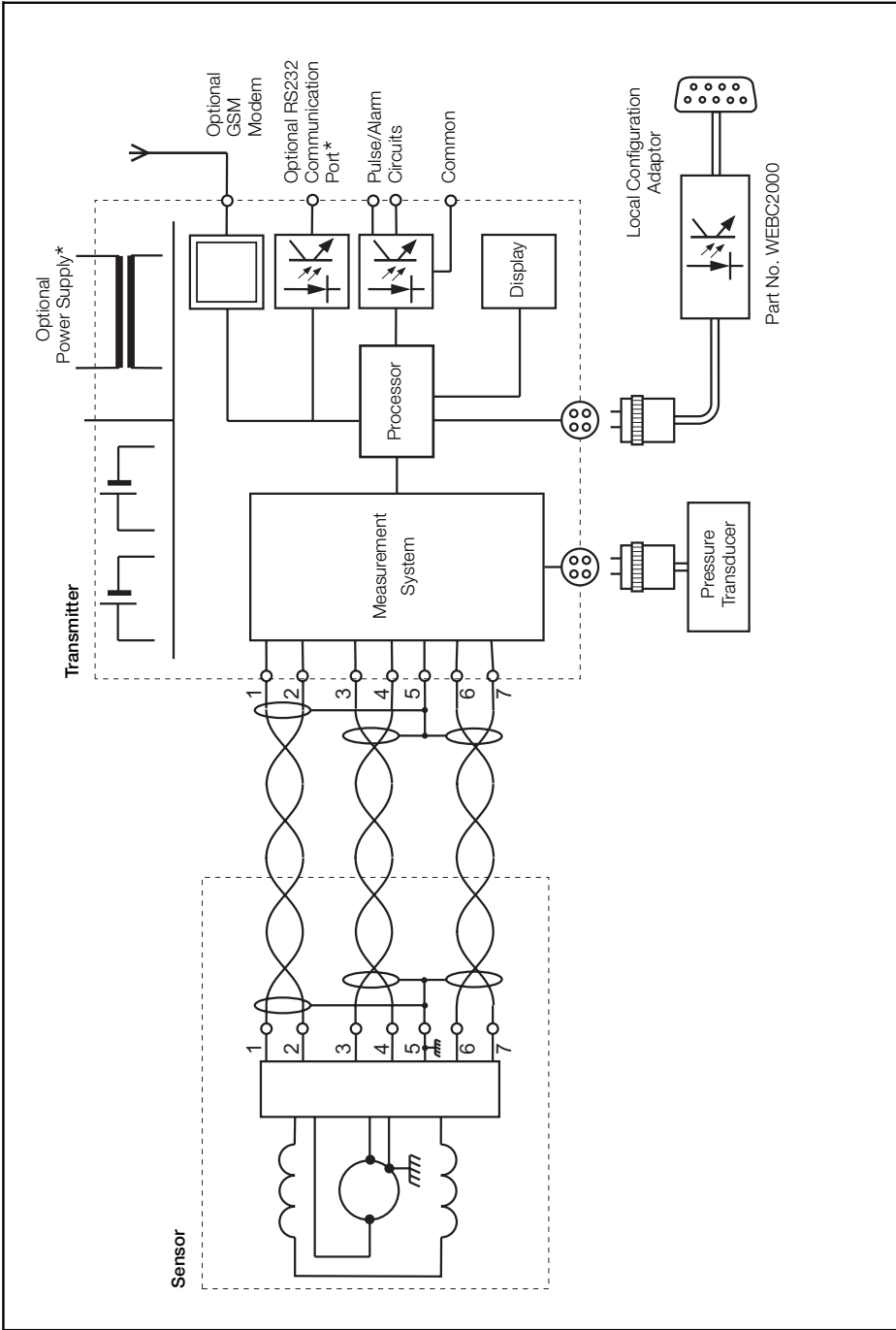


Fig. A.1 AquaMaster Block Diagram

Notes

PRODUCTS & CUSTOMER SUPPORT

Products

Automation Systems

- for the following industries:
 - Chemical & Pharmaceutical
 - Food & Beverage
 - Manufacturing
 - Metals and Minerals
 - Oil, Gas & Petrochemical
 - Pulp and Paper

Drives and Motors

- AC and DC Drives, AC and DC Machines, AC Motors to 1kV
- Drive Systems
- Force Measurement
- Servo Drives

Controllers & Recorders

- Single and Multi-loop Controllers
- Circular Chart and Strip Chart Recorders
- Paperless Recorders
- Process Indicators

Flexible Automation

- Industrial Robots and Robot Systems

Flow Measurement

- Electromagnetic Flowmeters
- Mass Flowmeters
- Turbine Flowmeters
- Wedge Flow Elements

Marine Systems & Turbochargers

- Electrical Systems
- Marine Equipment
- Offshore Retrofit and Refurbishment

Process Analytics

- Process Gas Analysis
- Systems Integration

Transmitters

- Pressure
- Temperature
- Level
- Interface Modules

Valves, Actuators and Positioners

- Control Valves
- Actuators
- Positioners

Water, Gas & Industrial Analytics

Instrumentation

- pH, Conductivity and Dissolved Oxygen Transmitters and Sensors
- Ammonia, Nitrate, Phosphate, Silica, Sodium, Chloride, Fluoride, Dissolved Oxygen and Hydrazine Analyzers
- Zirconia Oxygen Analyzers, Katharometers, Hydrogen Purity and Purge-gas Monitors, Thermal Conductivity

Customer Support

We provide a comprehensive after sales service via a Worldwide Service Organization. Contact one of the following offices for details on your nearest Service and Repair Centre.

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Fax: +44 (0)1453 829671

United States of America

ABB Inc.
Tel: +1 215 674 6000
Fax: +1 215 674 7183

Client Warranty

Prior to installation, the equipment referred to in this manual must be stored in a clean, dry environment, in accordance with the Company's published specification.

Periodic checks must be made on the equipment's condition. In the event of a failure under warranty, the following documentation must be provided as substantiation:

1. A listing evidencing process operation and alarm logs at time of failure.
2. Copies of all storage, installation, operating and maintenance records relating to the alleged faulty unit.

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