Instruction Manual
IM/AM/E Issue 11

Electromagnetic Flowmeter

AquaMaster™ Explorer

ABB

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.

0255

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.

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.

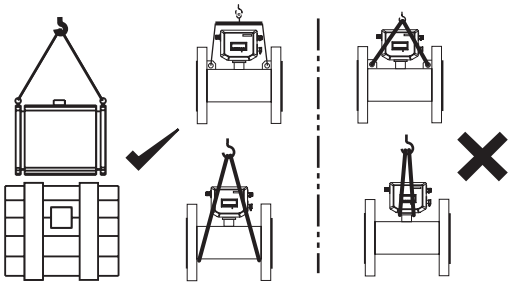
This manual provides end-user details for AquaMaster Explorer Integral and Remote transmitters. For details of the sensor used with the transmitter, please refer to the sensor manual supplied at time of ordering.

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 47 before selecting a location.

2 Mechanical Installation

2.1 Unpacking



Note. Metal case design shown.

Fig. 2.1 Unpacking

2.2 Installation Conditions

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

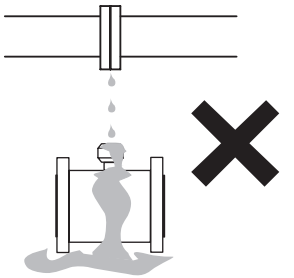


Fig. 2.2 Spillage

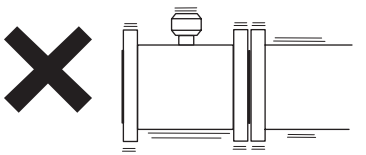


Fig. 2.3 Vibration

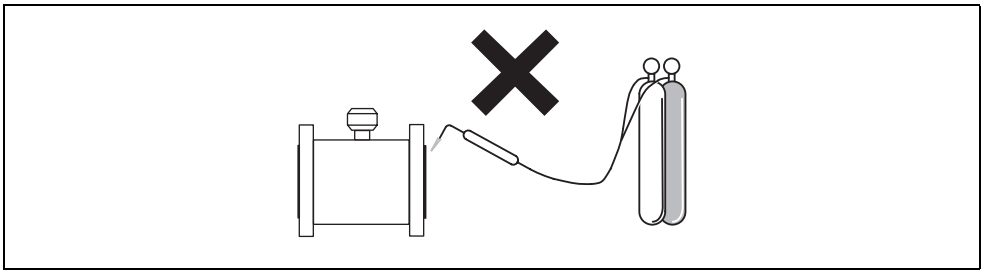


Fig. 2.4 Localized Heat

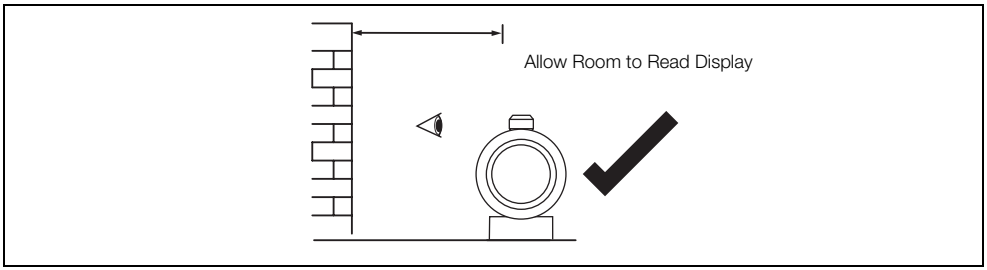


Fig. 2.5 Siting

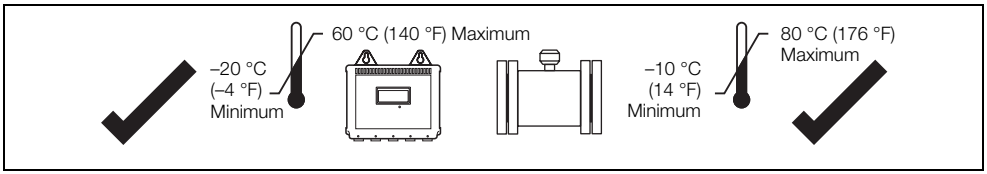


Fig. 2.6 Within Temperature Limits

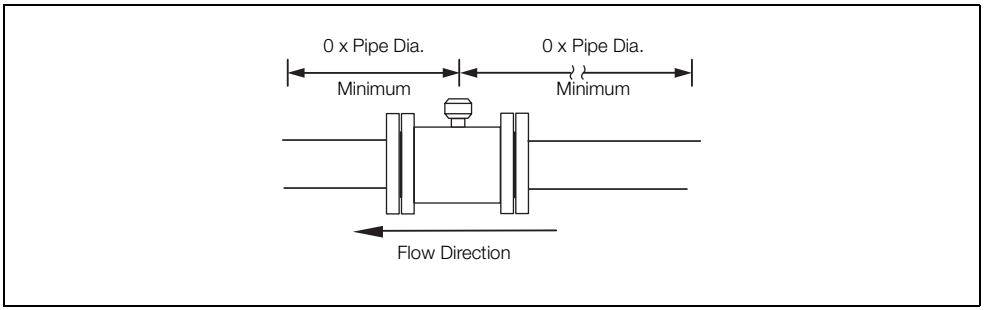


Fig. 2.7 Straight Pipe Requirements

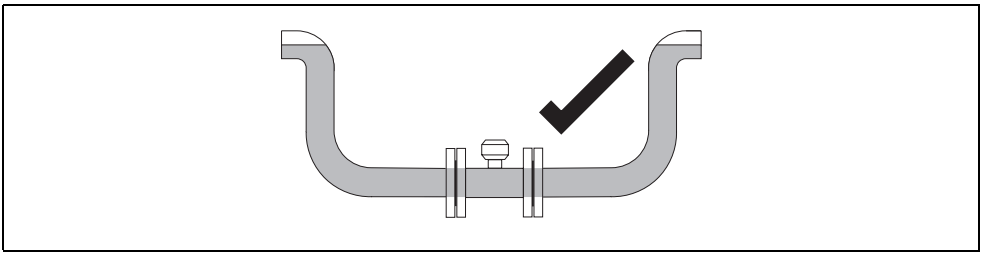


Fig. 2.8 Fluid Level

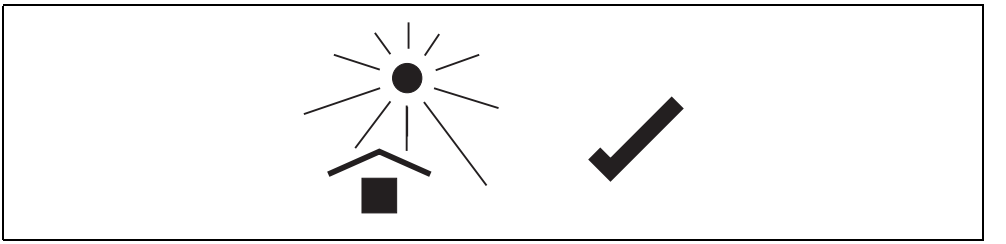


Fig. 2.9 Shade

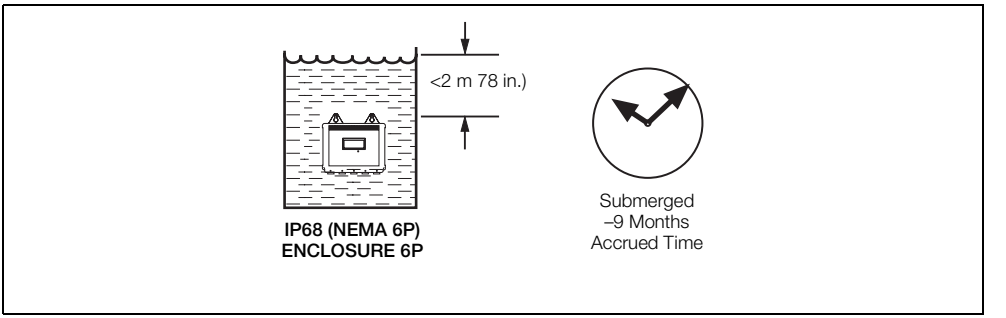


Fig. 2.10 Within Environmental Rating

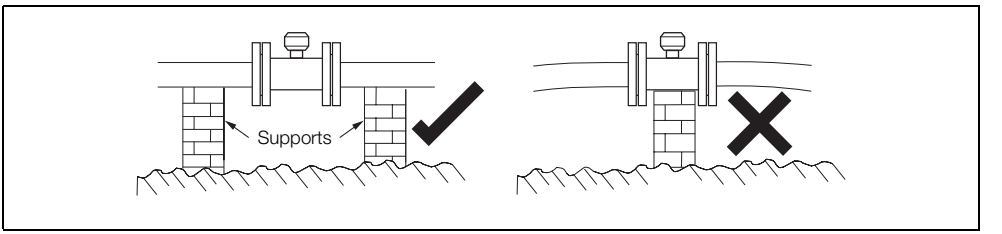


Fig. 2.11 Above Ground

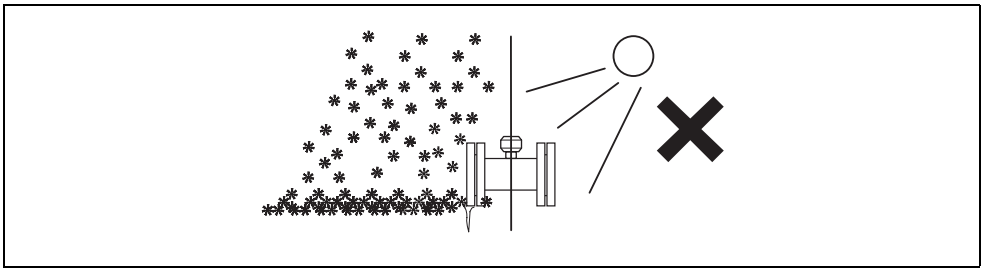


Fig. 2.12 Temperature Difference

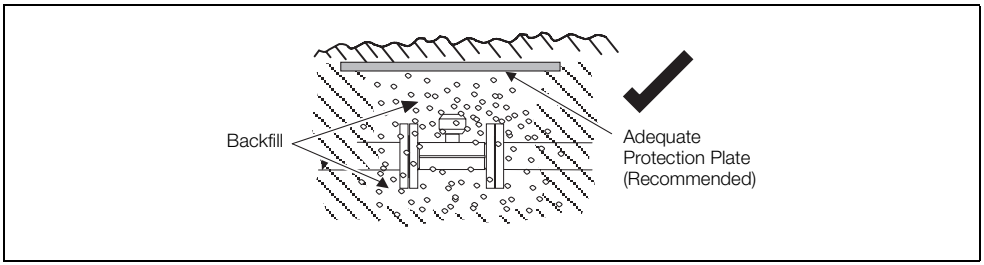


Fig. 2.13 Underground

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

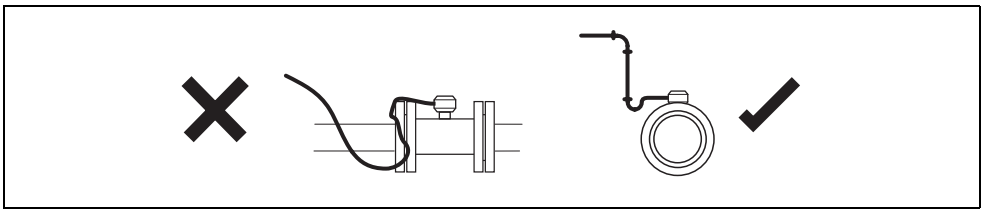


Fig. 2.14 Cable Routing

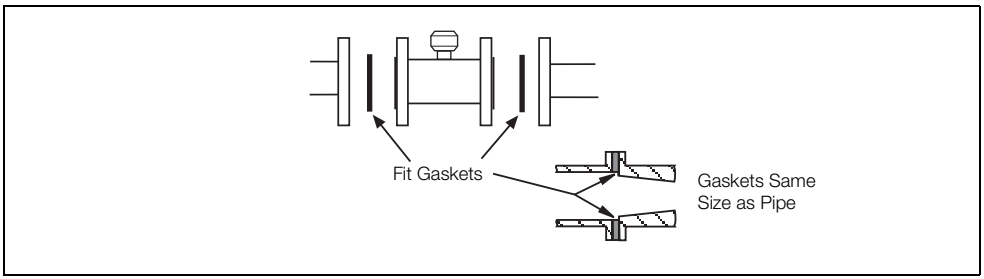


Fig. 2.15 Gasket Fitting

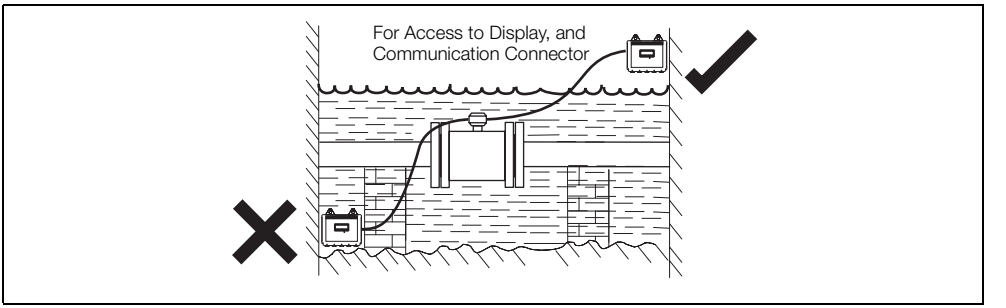


Fig. 2.16 Access to Transmitter

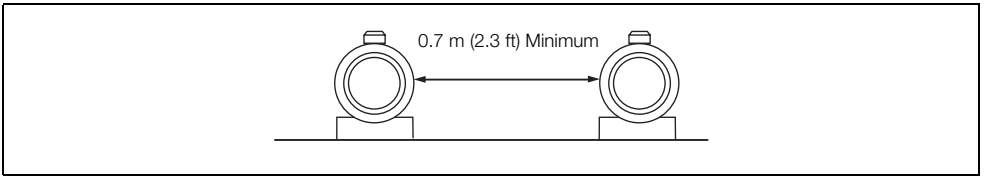


Fig. 2.17 Separation of Sensors

2.3 Transmitter Dimensions

2.3.1 Terminal Box – Sensor-mounted

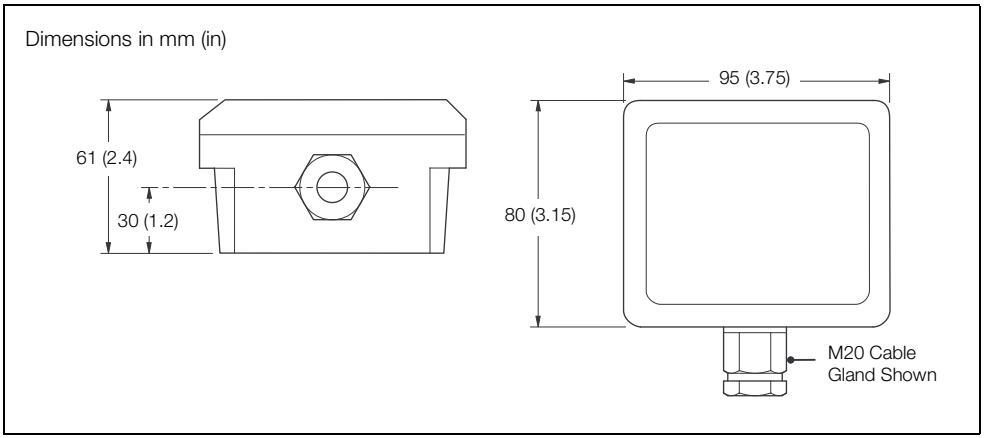


Fig. 2.18 Sensor-mounted Terminal Box

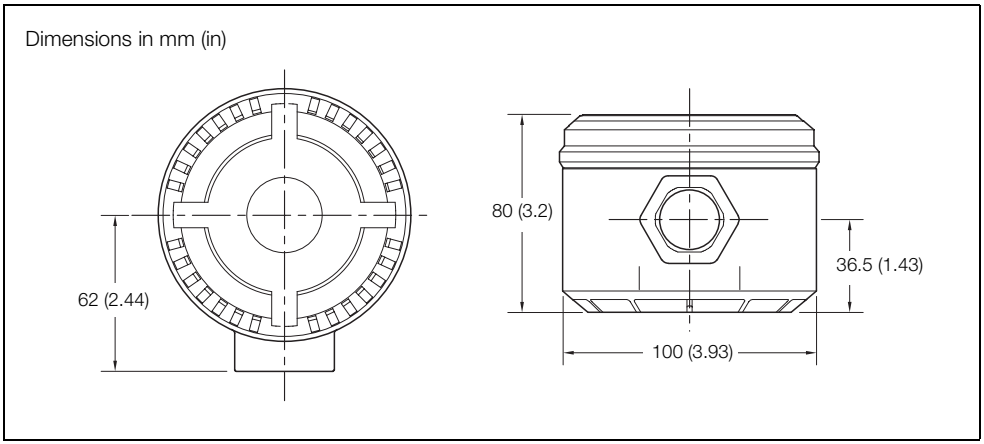


Fig. 2.19 Round Terminal Box

2.3.2 AquaMaster Explorer

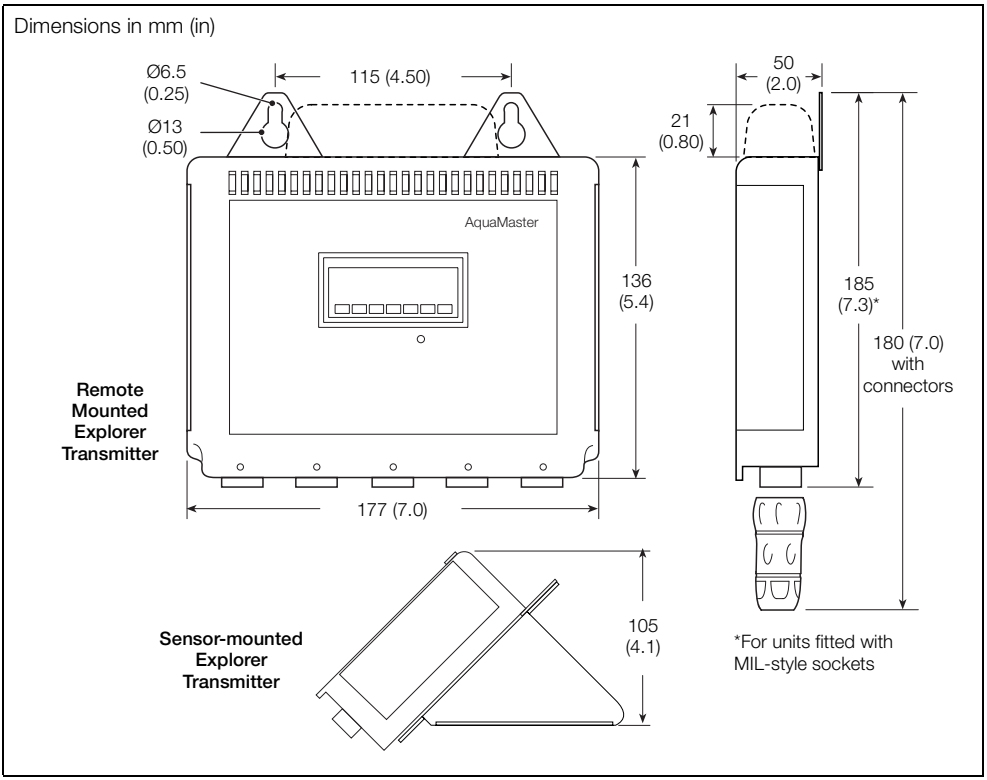


Fig. 2.20 AquaMaster Explorer – Dimensions

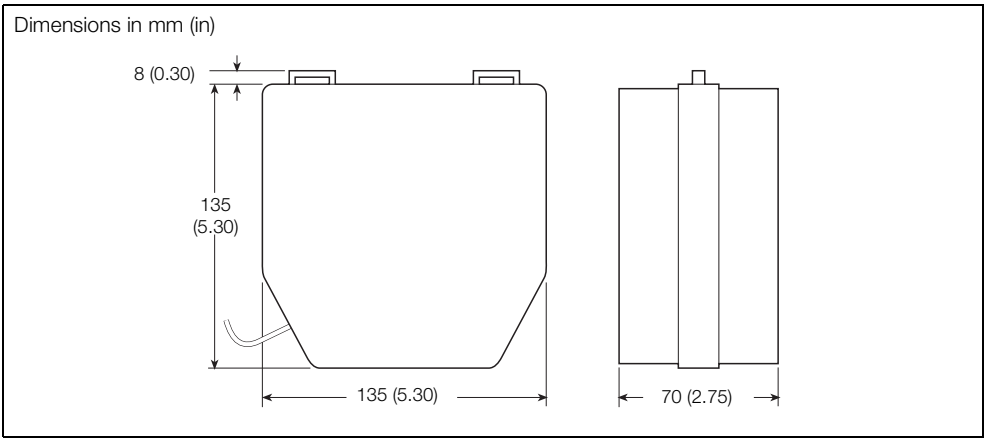


Fig. 2.21 AquaMaster Explorer Battery Pack Dimensions

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. 2.22
- Ensure the antenna will not become submerged under water – see Fig. 2.22.
- 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. 2.23.
- Do not mount the antenna beneath a solid surface (e.g. metal cover, floor/ceiling, etc).

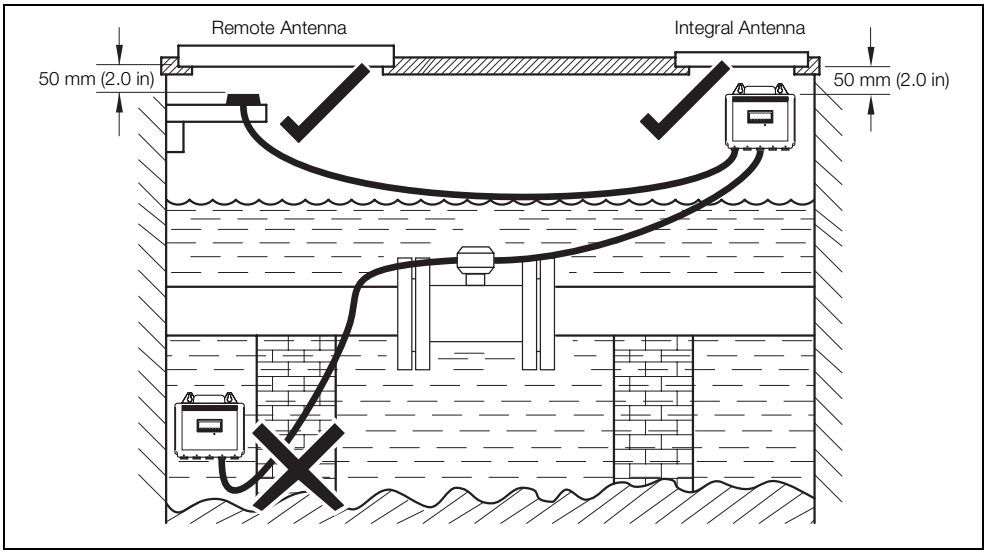


Fig. 2.22 GSM Antenna Installation

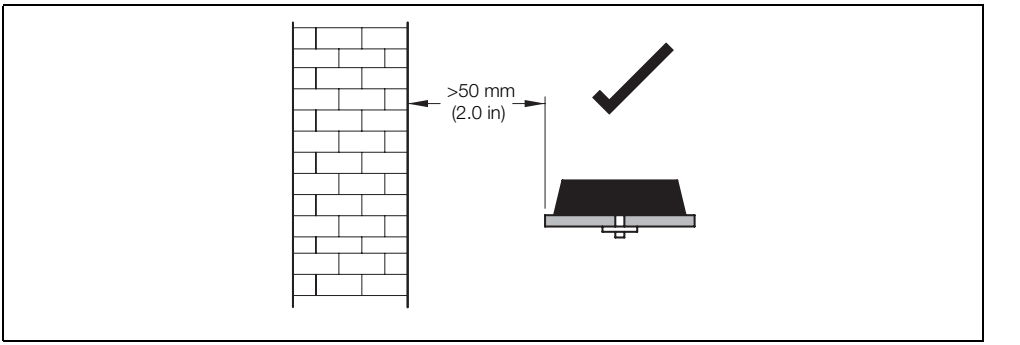


Fig. 2.23 GSM Antenna Installation

2.4.2 Connecting a Remote Antenna

Referring to Fig. 2.24:

1. Remove the cover (A) from the socket on top of the transmitter.
2. Gently push the antenna plug (B) into the socket, then twist the screw ring clockwise until locked.

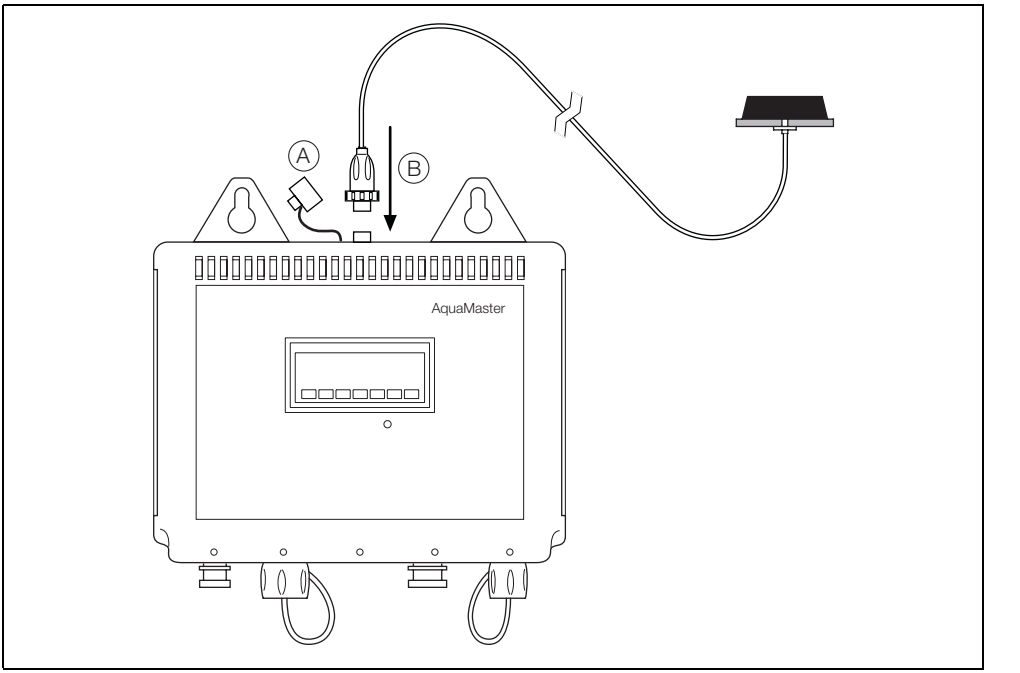


Fig. 2.24 Connecting a Remote Antenna – AquaMaster Explorer

2.4.3 Installing a SIM Card

Referring to Fig. 2.25:

1. Remove the transmitter from its mounting point.
2. Use water to wash off any loose dirt from the case.
3. On the back of the transmitter, unscrew and remove the cover (A) to the SIM card holder (B).
4. Carefully lift the right-hand edge of the holder (B) outwards.
5. Slide the SIM card (C) into the carrier, contact side down and bevelled edge to the top-right.
6. Close the holder (B) until it clicks into place and refit the cover.

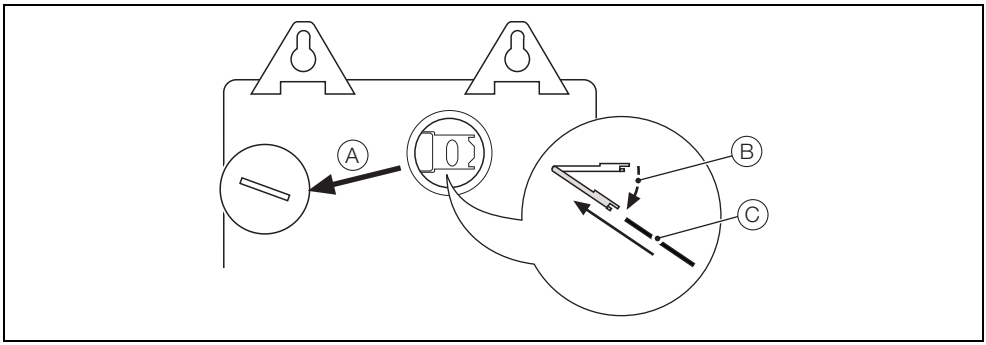


Fig. 2.25 Installing a SIM Card – AquaMaster Explorer

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 ≥4 mm2 (<10AWG) cable.
- Older sensors from DN40 to DN80, that are fitted with bare metal stainless steel flanges, do not require fluid contact rings.

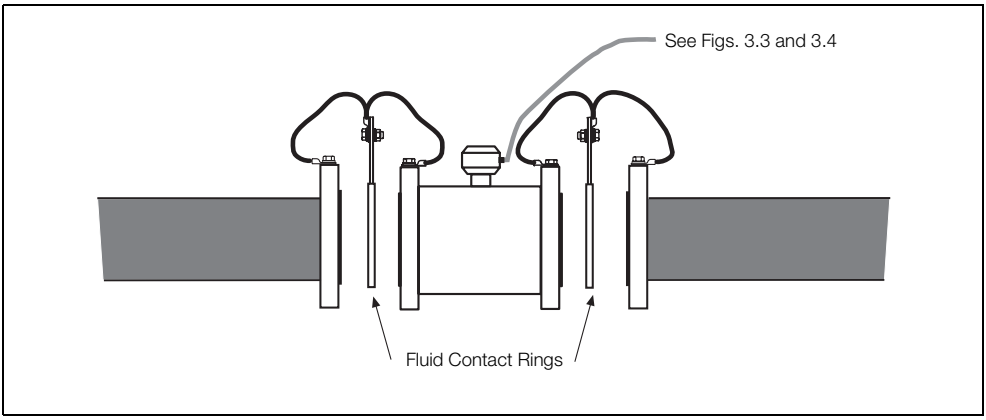


Fig. 3.1 All Metal Pipe, Including Lined Metal Pipe

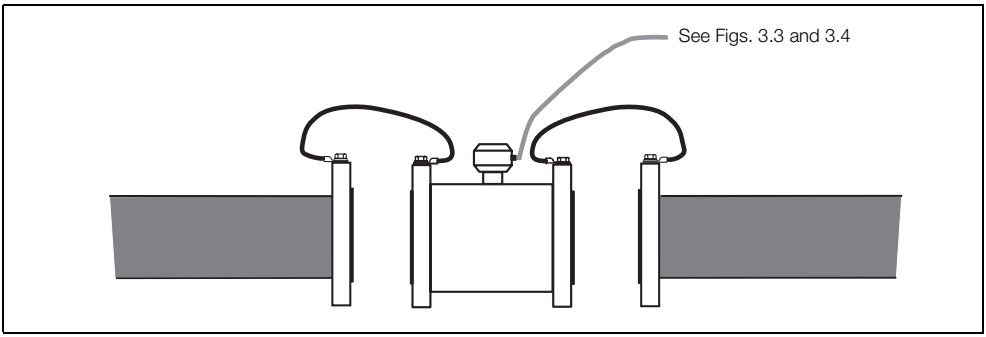


Fig. 3.2 All Metal pipe, including lined metal pipe

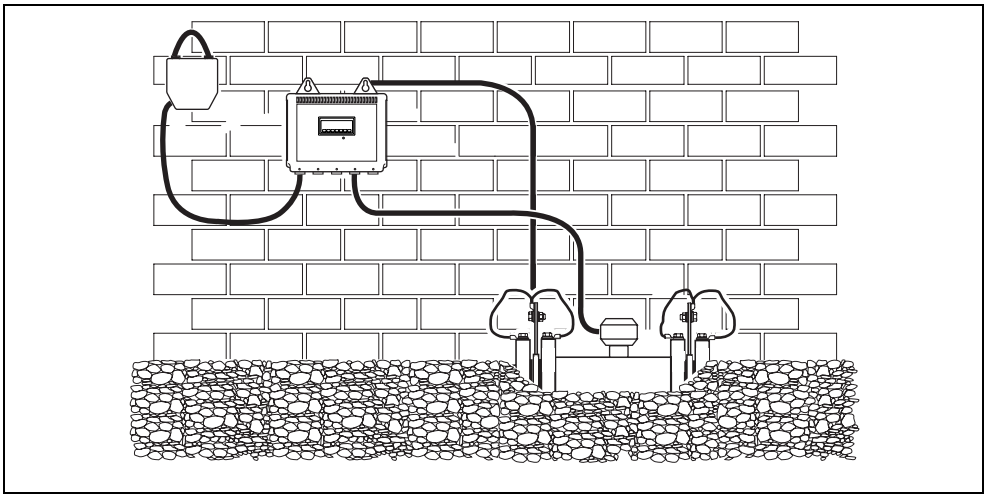


Fig. 3.3 Battery-powered AquaMaster Explorer Transmitter Mounted in a Chamber

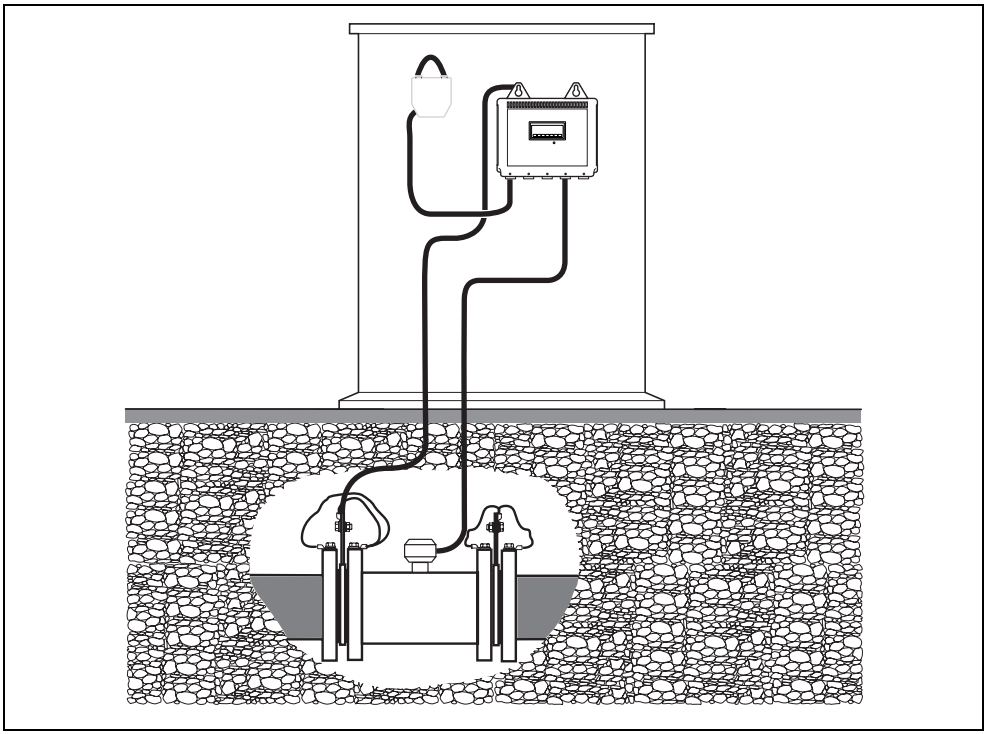


Fig. 3.4 Battery-powered AquaMaster Explorer Transmitter Mounted in a Cabinet

3.2 Connections

3.2.1 AquaMaster Explorer Connections – Bulgin Connectors

Referring to Fig. 3.5:

1. Remove the screwed cap (A) on the sensor connector.
2. Gently push the sensor plug (B) into the socket and rotate it until it engages, then tighten the locking ring.

Notes.

- If the sensor cable is fitted with the metal MIL-spec connector, connection is via the MIL-spec sensor cable adapter (part number WEBC2001, available separately).
- If the sensor cable is terminated with flying leads, connection is via a sensor cable adapter box (part number WABC2024/B, available separately).

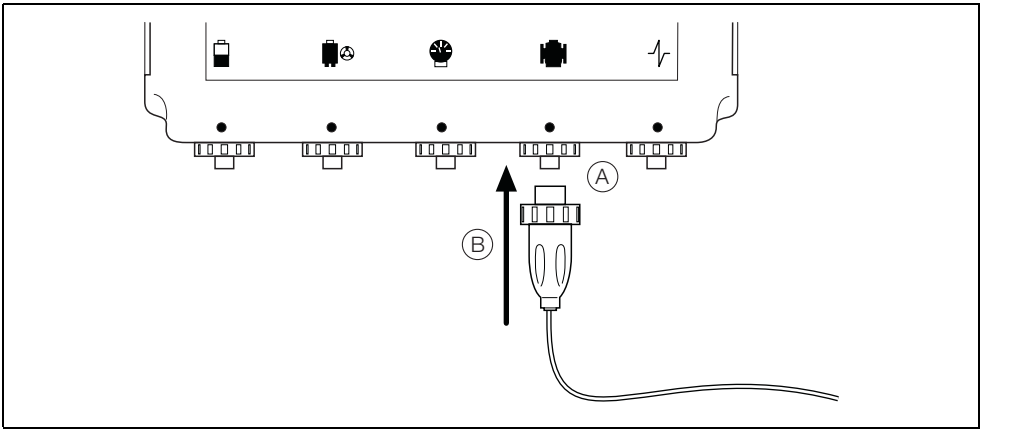


Fig. 3.5 AquaMaster Explorer – Sensor Connections (Bulgin)

Note. This arrangement is an option.

3.2.2 AquaMaster Explorer Connections – MIL-style Connectors

Referring to Fig. 3.6:

1. Remove the screwed cap (A) on the sensor connector.
2. Gently push the sensor plug (B) into the socket and rotate it until it engages, then tighten the locking ring.

Note. If the sensor cable is terminated with flying leads, connection is via a sensor cable adapter box (part number WABC2035, available separately).

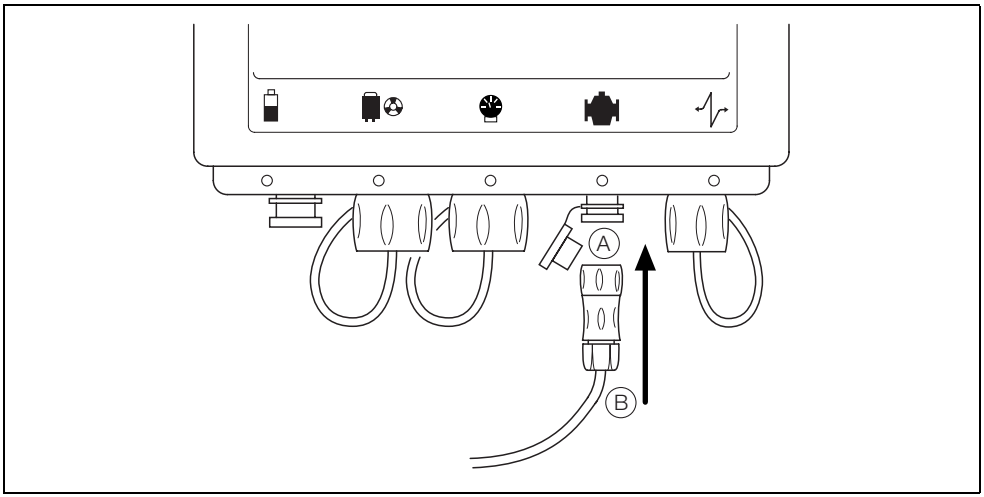


Fig. 3.6 AquaMaster Explorer – Sensor Connections (MIL-style)

3.2.3 AquaMaster Explorer Connections – Use of Tamper-Detection Seals

Referring to Fig. 3.7:

1. Slide the optional locking-ring (A) (from pack WEBC 2004) over the cable to be sealed.
2. Connect the cable (B) to the appropriate transmitter connector.
3. Slide the locking-ring (C) over the connector.
4. Pass the wire of the seal (D) through both the hole in the locking-ring and the matching hole in the front of the transmitter. Close the seal.

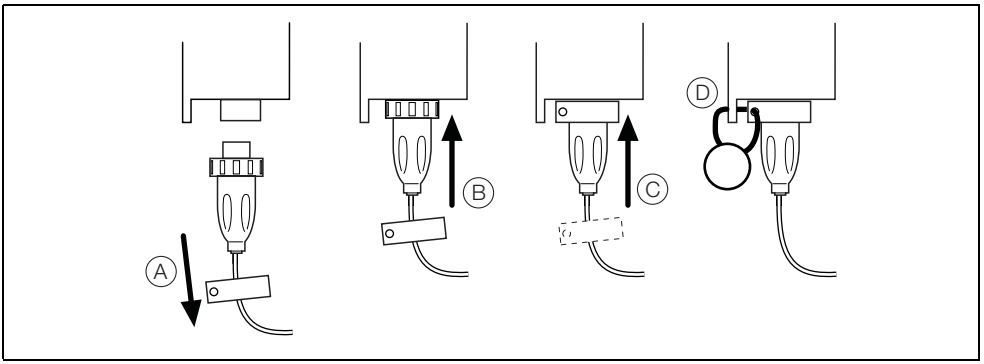


Fig. 3.7 AquaMaster Explorer – Use of Tamper-Detection Seals

Note. This arrangement is an option and applies to Bulgin connectors only.

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

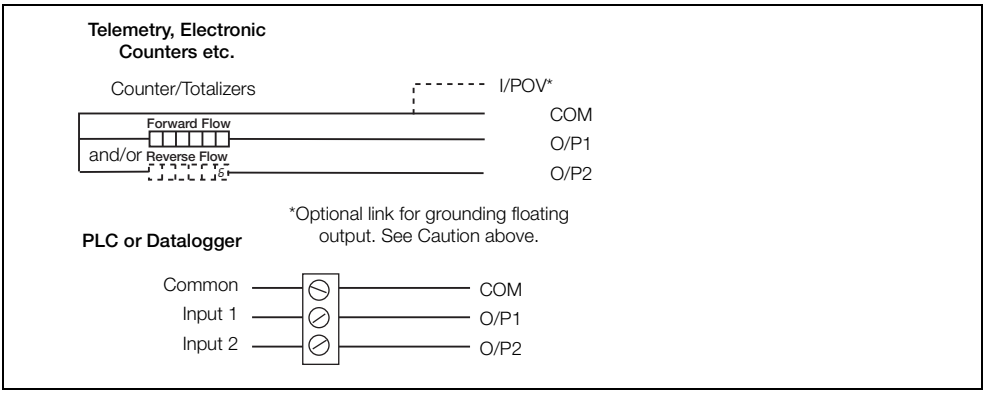


Fig. 3.8 Frequency Output Connections

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

3.3.2 Alarm Interface

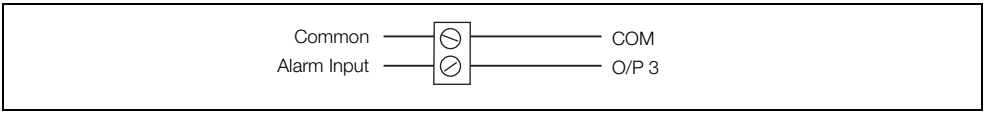


Fig. 3.9 Alarm Output Connections – AquaMaster

Note. Output 3 is not polarity sensitive. The common connection for these outputs is designated 'COM'.

3.3.3 AquaMaster Explorer Input/Output Connections

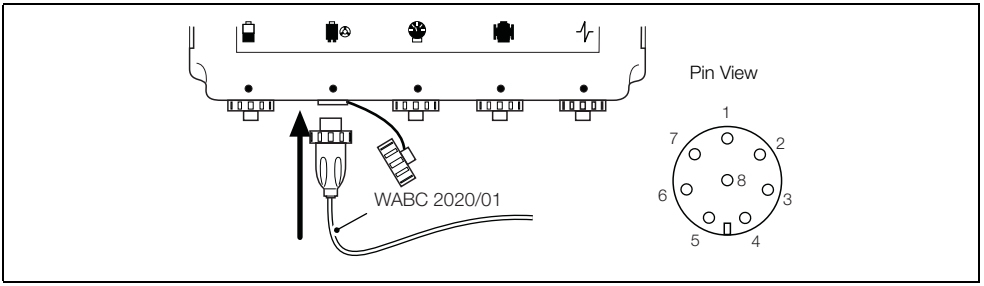


Fig. 3.10 AquaMaster Explorer – Bulgin Connectons (Connector, Remote version)

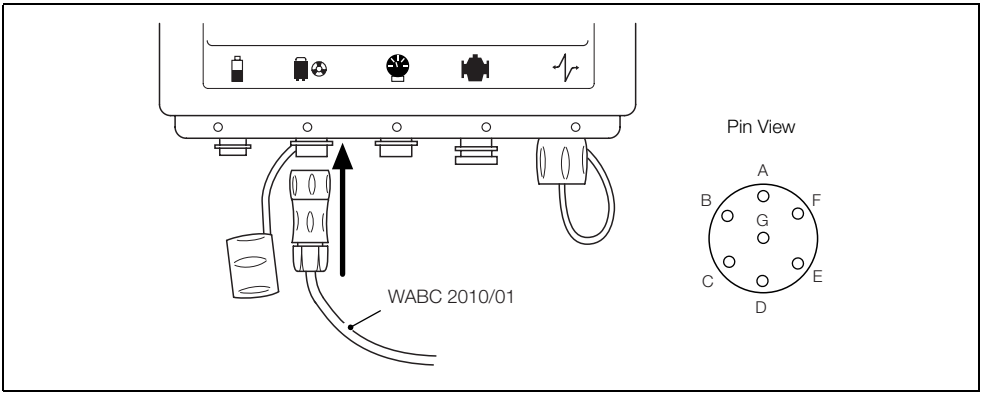


Fig. 3.11 AquaMaster Explorer – MIL Style Connectons (Connector, Remote version)

Pin (Bulgin)	Pin (MIL Style)	Signal	Function	Color (Output Cable)
1	A	+V	Scanreader +V	Violet
2	B	DATA	Scanreader Data	Blue
3	C	O/P COM	Output Common	Yellow
4	D	O/P2	Reverse Pulses or Direction Indicator	Red
5	E	O/P3	Alarm Output	Brown
6	F	O/P1	Forward Pulses or Forward & Reverse Pulses	Orange
7	G	0V	Scanreader 0V	Screen
8		NC	Not Used	

Table 3.1 AquaMaster Explorer – Connector Input/Output Connections

3.3.4 Third party and standard output cables

Most of the cables are designed to either plug or wire to the AquaMaster and the third party logger without requiring any AquaMaster configuration. However in the case of connecting an AquaMaster to a RADCOM multilog the configuration of the AquaMaster must be changed. This change is to set the function of output 1 to pulse forward (>70=3) and reverse, and function of output 2 to reverse (>71=4).

Part Number	Description
WEBC2011/M	AquaMaster Explorer with plastic MIL connectors O/p – Technolog Cello MIL3
WEBC2012/M	AquaMaster Explorer with plastic MIL connectors O/p – Technolog Cello BH4
WEBC2013/M	AquaMaster Explorer with plastic MIL connectors – RADCOM multilog
WEBC2014/M	AquaMaster Explorer with plastic MIL connectors – Primayer Xilog
WABC2010/01	Sensor cable Assembly 1m, remote (can be used for output cable with wired end)

Table 3.2 AquaMaster Explorer – Connector Input/Output Connections

3.3.5 Local Computer Connection

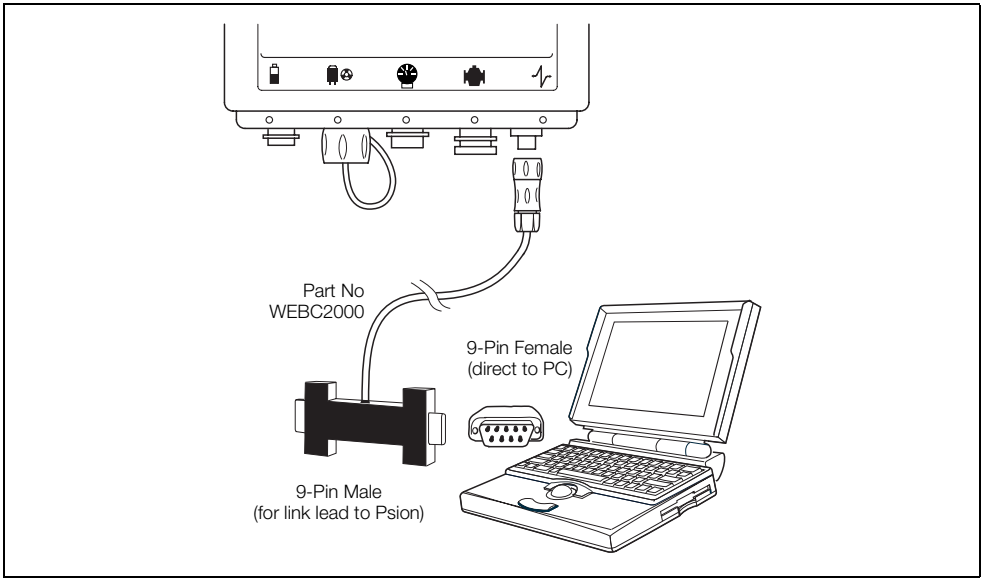


Fig. 3.12 Local Computer Connections – AquaMaster Explorer

3.3.6 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.
- The AquaMaster Explorer is battery powered, refer to Fig. 4.1 for connection details.

3.3.7 Pressure Transducer (Optional)

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

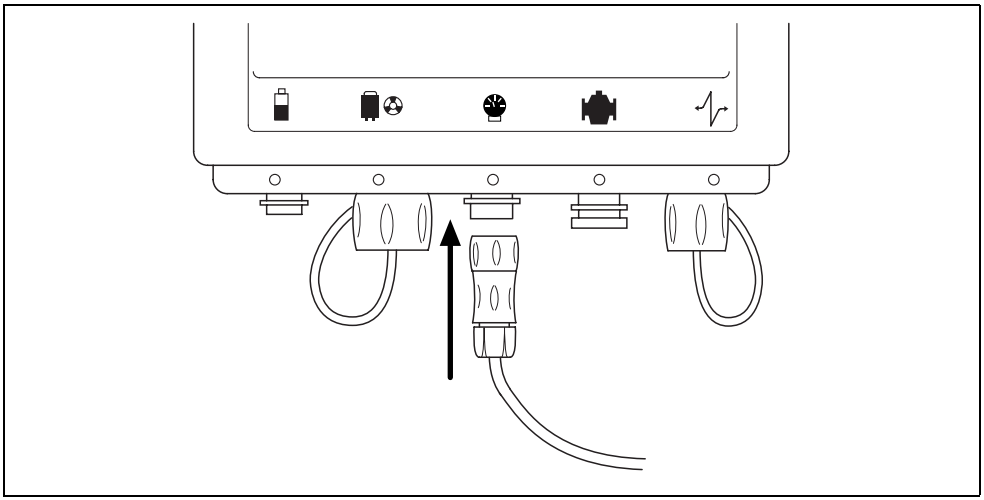
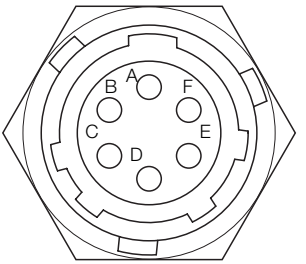


Fig. 3.13 AquaMaster Explorer fitted with Optional PressureTransducer Connector

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.

3.3.8 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/link is used (as detailed in Fig. 3.14) to prevent login through any communication means and modification of any parameters on the AquaMaster/Explorer.



A Pressure Sensor Bridge +
B Pressure Sensor Output +
C Pressure Sensor Bridge -
D Pressure Sensor Output -
E Read-Only Switch link
F Read-Only Switch link

To force the Explorer into read-only state, link connections E & F*

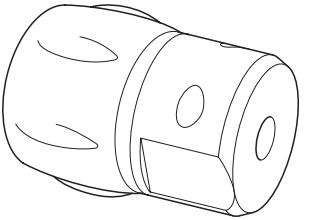
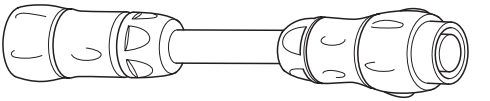


*ABB Supply a plug with this link fitted– part number WEBX0060



If a pressure transducer is required, an adapter cable (part number WEBC2025) can be used

Fig. 3.14 Read-only Switch Connections

Physical security tags/seals can be fitted to detect unauthorized physical access – see Fig. 3.15.

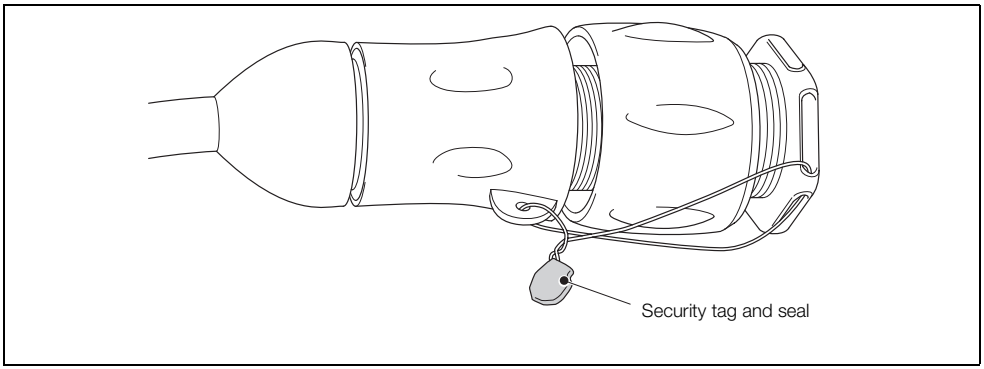


Fig. 3.15 Security Tagging

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.
- Operation at elevated temperatures (>45 °C) will significantly shorten the battery capacity and life.

4.1 Connecting Batteries

AquaMaster can be supplied with an optional battery pack. Make connections as shown in Fig. 4.1.

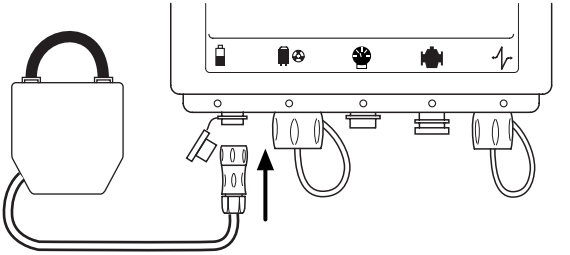


Fig. 4.1 Connecting Batteries – AquaMaster Explorer

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.

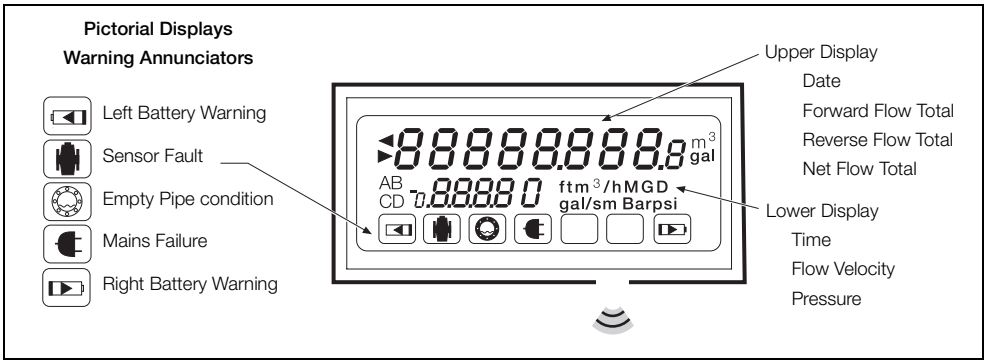


Fig. 4.2 Location of Controls

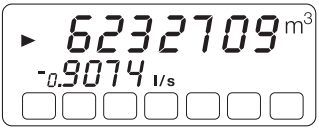
4.3 Display Activation

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.

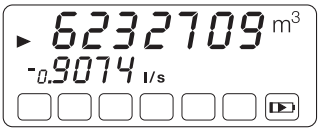
Note. For the use of local or remote serial communication and how to alter the displayed set of measurements, or instrument setup, see the Quick Reference Programming Guide.

4.4 Replacing a Battery



Normal Operation

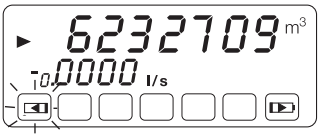
If both batteries are good, no battery icons are displayed.



Replace Battery

When a single battery icon is shown, this indicates the main battery pack is exhausted and the transmitter is now running on the battery pack reserve supply. The flowmeter is still working normally. The battery pack should now be changed.

Note. On transmitters fitted with built in data loggers, download any logger contents before changing the battery.



Battery Pack Exhausted

Important. Both the main and reserve battery packs are exhausted and the flowmeter is no longer working. Replace the battery pack.

4.5 Servicing Plugs and Sockets

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

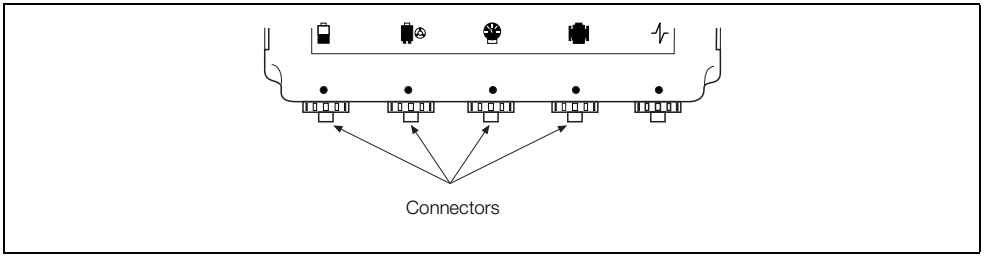


Fig. 4.3 Transmitter Sockets (Bulgin)

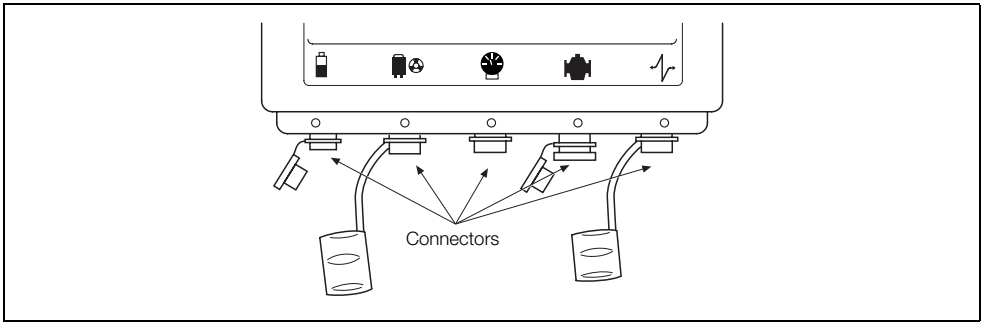


Fig. 4.4 Transmitter Sockets (MIL Style)

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 4.5.6, page 32.
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.

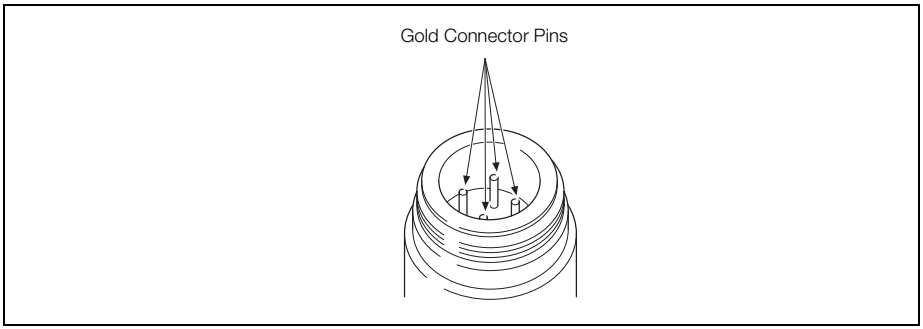


Fig. 4.5 Cleaning the Gold Connector Pins

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

Common

MRBX9969	Close Coupled Mounting Kit
WEBC2000	AquaMaster Local Comms Adaptor
WEBC2003/01	Remote GSM Aerial Kit 1m
WEBC2003/05	Remote GSM Aerial Kit 5m

Bulgin Connector

WABC2017	Remote Battery Pack
WABC2020	Sensor Cable Assy 0.5 m, for integral / close-coupled
WABC2020/01	Sensor Cable Assy 1 m, for remote
WABC2020/03	Sensor Cable Assy 3 m, for remote
WABC2020/10	Sensor Cable Assy 10 m, for remote
WABC2020/20	Sensor Cable Assy 20 m, for remote
WABC2020/30	Sensor Cable Assy 30 m, for remote
WABC2020/40	Sensor Cable Assy 40 m, for remote
WABC2020/50	Sensor Cable Assy 50 m, for remote
WABC2020/60	Sensor Cable Assy 60 m, for remote
WABC2020/70	Sensor Cable Assy 70 m, for remote
WABC2020/80	Sensor Cable Assy 80 m, for remote
WABC2020/01	Output Cable 1m wire-ended
WEBC2011	Output Cable for Technolog Cello (MIL)
WEBC2012	Output Cable for Technolog Cello (Brad Harrsion)
WEBC2013	Output Cable for RADCOM Multilog
WEBC2014	Output Cable for Primayer Xilog
WEBC2005	Output Cable to 19way MIL
WEBC2006	Output Cable to 2x19way MIL
WEBC2007	Output Cable to 7way MIL & Technolog Cello
WEBC2004	Connector Security Locking Ring – pack of 5
WABX2010/05	Pressure Cable Assy 16bar, 5m
WABX2010/10	Pressure Cable Assy 16bar, 10m
WEBC2010/05	Scanreader cable 5m
WEBC2010/10	Scanreader cable 10m
WEBC2010/20	Scanreader cable 20m
WEBC2010/30	Scanreader cable 30m

MIL Style Connector

WABC2033	Remote Battery Pack
WABC2010	Sensor Cable Assy 0.5 m, for integral / close-coupled
WABC2010/01	Sensor Cable Assy 1 m, for remote
WABC2010/03	Sensor Cable Assy 3 m, for remote
WABC2010/10	Sensor Cable Assy 10 m, for remote
WABC2010/20	Sensor Cable Assy 20 m, for remote
WABC2010/30	Sensor Cable Assy 30 m, for remote
WABC2010/40	Sensor Cable Assy 40 m, for remote
WABC2010/50	Sensor Cable Assy 50 m, for remote
WABC2010/60	Sensor Cable Assy 60 m, for remote
WABC2010/70	Sensor Cable Assy 70 m, for remote
WABC2010/80	Sensor Cable Assy 80 m, for remote
WABC2010/01	Output Cable 1m wire-ended
WEBC2011/M	Output Cable for Technolog Cello (MIL)
WEBC2012/M	Output Cable for Technolog Cello (Brad Harrsion)
WEBC2013/M	Output Cable for RADCOM Multilog
WEBC2014/M	Output Cable for Primayer Xilog
WEBC2006/M	Output Cable 2x19way MIL
WEBC2024	Connector Security Plug – pack of 5
WABX2000/05	Pressure Cable Assy 16bar, 5m
WABX2000/10	Pressure Cable Assy 16bar, 10m

Adapter Cable/Upgrade Kits – Bulgin Connector

WABC2029	Sensor Adapter Kit (Compact M20 Plastic to Bulgin)
WEBC2001	Sensor MIL Cable adapter (MIL to Bulgin)
WEBC2002	Pressure MIL Cable adapter (MIL to Bulgin)
WABC2022/B	Sensor Upgrade Kit (M20 Plastic to Bulgin)
WABC2023/B	Sensor Upgrade Kit (M20 Armoured to Bulgin)
WABC2024/B	Sensor Adaptor Kit (M20 Plastic to Bulgin)
WABC2025/B	Sensor Adaptor Kit (M20 Armoured to Bulgin)
WABC2026/B	Sensor Adaptor Kit (½NPT blanked to Bulgin)

Adapter Cable/Upgrade Kits – MIL Style Connector

WABC2035	Sensor Adapter Kit (M16 Plastic to MIL)
WABC2036	Pressure Adapter Kit (M16 Plastic to MIL)
WABC2022/M	Sensor Upgrade Kit (M20 Plastic to MIL)
WABC2023/M	Sensor Upgrade Kit (M20 Armoured to MIL)
WABC2024/M	Sensor Adaptor Kit (M20 Plastic to MIL)
WABC2025/M	Sensor Adaptor Kit (M20 Armoured to MIL)
WABC2026/M	Sensor Adaptor Kit (½NPT blanked to Bulgin)

5 Specification

Battery-powered Meters – Flow Requirements to OIML R49

					AquaMaster OIMLClass 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)	250	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 $Q_3 \geq 100$ m^3/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

Explorer Transmitter

Mounting

Directly on sensor

or

Remote up to 200 m (650 ft)

Housing

IP68 (NEMA 6P)

Stainless steel housing in a Thermoplastic outer cover with window, encapsulated with polyurethane-based resin.

Electrical connections

IP68 plug & socket

Sensor cable

ABB cable supplied as standard

SWA cable available (via adaptor box) on application

External battery pack

IP68 (NEMA 6P)

Battery life @ 0 to 45 °C (32 to 113 °F) typically 5 years

Extended life is possible to give, say, 6 years with a small degradation in response time and slightly increased measurement uncertainty (contact ABB for details).

Battery life is shorter with GSM, depending on how frequently it is used and for what period. For example, used once per day for SMS automated reporting of data logged at 15 minute intervals, the life of a battery pack would be typically reduced to approximately 4 years.

Pulse and alarm outputs

Three bidirectional solid state switches with common isolation

±35 V DC 50mA

Output 1 Forward only, or forward plus reverse pulses

Output 2 Reverse pulses, or direction indicator

Output 3 Alarm indicates any problem with measurement or with power

Pulse output 50 Hz maximum, 50 % nominal duty cycle

Serial data communications

Local Port RS232 compatible via ABB lead (Option)

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 Abs.

Connection
Standard quick-fit male probe connector via an adapter cable

Operating temperature range
–20 (ambient) to 70 °C (–4 to 158 °F)

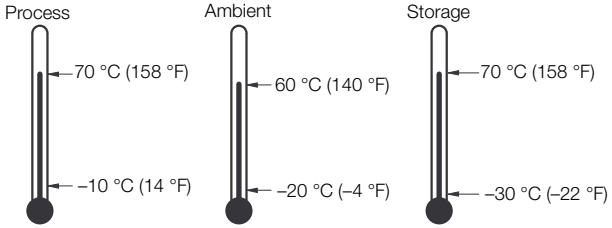
Caution. Protect the sample and transducer from freezing.

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

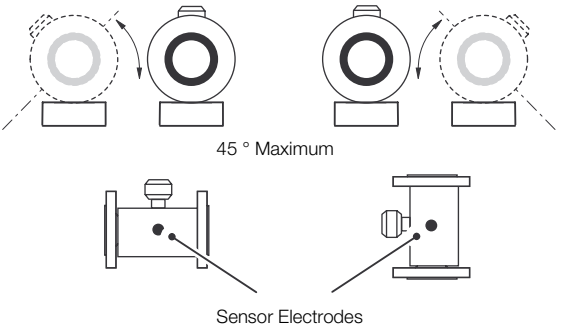
German

Spanish

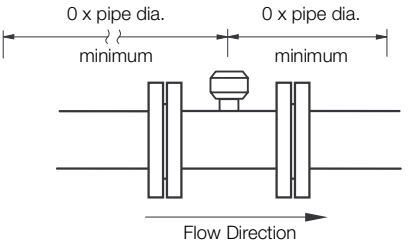
Italian

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

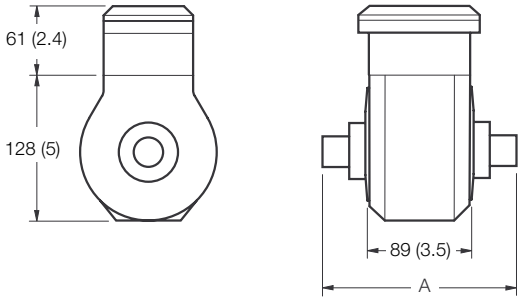
Configuration Parameter	Default European	Default North American
Pulse Factor	1	1
Pulse Units	m^3	Ugal
Totalizer Units	m^3	Ugal
Full Scale Flow	Q_3	Q_3
Flow Units	m^3 / h	MUGD
Velocity Units	m / s	ft / s
Date Format from Country Code	DDMMYY	MMDDYY
Flow Response Time (s)	3	3
Display Flow Rate	Yes	Yes
Display 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

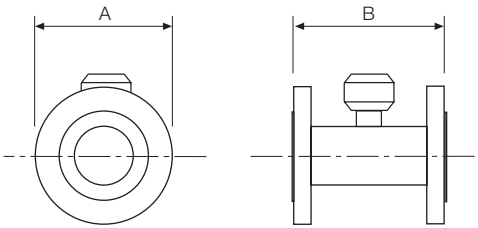
Meter Size		Dimensions mm (in.)		Approx. Weight	
mm	in.	A	Connection	kg	lb
15	1/2	119 (4.7)	G 3/4 in. B or 3/4 in. NPSM	2.5	5
20	3/4	127 (5)	G 1 in. B or 1 in. NPSM	2.5	5
25	1	127 (5)	G 1 1/4 in. B or 1 1/4 in. NPSM	2.5	5

Dimensions in. mm (in.)



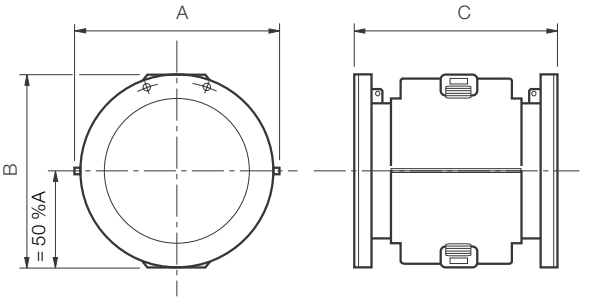
40 to 300 mm (1½ to 12 in.) – Flanged

Meter Size		Dimensions mm (in.)		Approx. Weight	
mm	**in.**	**A**	**B**	**kg**	**lb**
40	1½	176 (7)	200 (7.9)	11	24
50	2	176 (7)	200 (7.9)	12	27
65	2½	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



DS/AMAS Issue 6 (Explorer)

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.

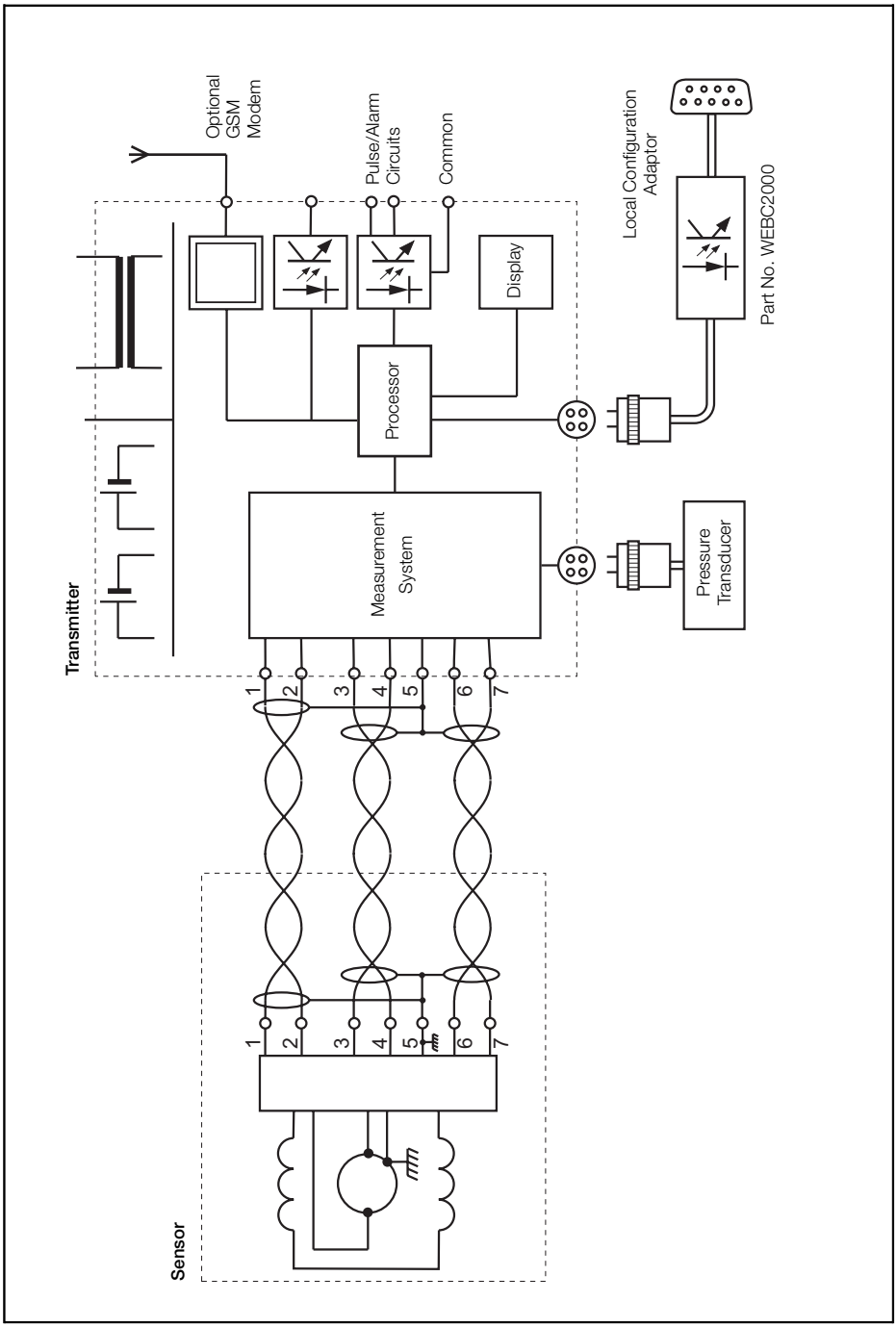


Fig. A.1 AquaMaster Block Diagram

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

USA
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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The Company's policy is one of continuous product improvement and the right is reserved to modify the information contained herein without notice.

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