



Cenelec/ATEX

## 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. Q5907

EN 29001 (ISO 9001)



Lenno, Italy – Cert. No. 9/90A

Sonehouse, U.K.



## Electrical Safety

This instrument complies with the requirements of CEI/IEC 61010-1:2001-2 "Safety requirements for electrical equipment for measurement, control, and laboratory use". If the instrument is used in a manner NOT specified by the Company, the protection provided by the instrument may be impaired.

## Symbols

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

	<b>Warning</b> ⚠ Refer to the manual for instructions		Direct current supply only
	<b>Caution</b> ⚡ Risk of electric shock		Alternating current supply only
	Protective earth (ground) terminal		Both direct and alternating current supply
	Earth (ground) terminal		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 Communications 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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## 1 INTRODUCTION

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MagMaster™ is a range of high performance electromagnetic flowmeters for the measurement of electrically conductive fluids and slurries, and is normally supplied as a calibrated system, with the transmitter factory configured to a supplied full-bore or insertion probe sensor.

A wide range of options is available to suit most applications, including:

Integral or remote transmitter.

Insertion Probes.

Approved Versions, including:

Hazardous area operation.

HART™ communication protocol.

PROFIBUS DP communication protocol.

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**Warning.** For MagMaster Approved / Hazardous Versions read in conjunction with IM/MM-BK1.

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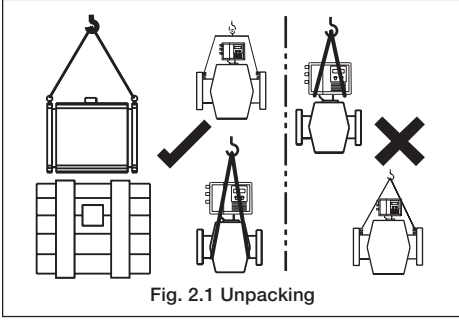
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### Warning.

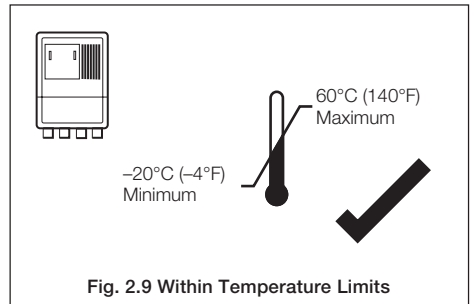
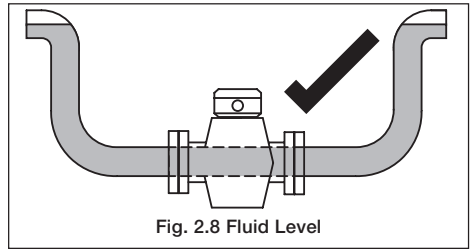
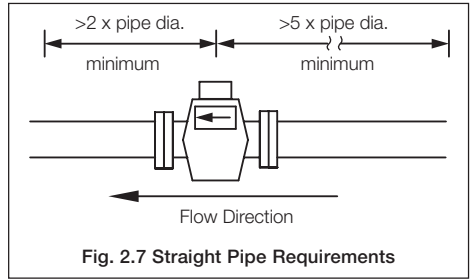
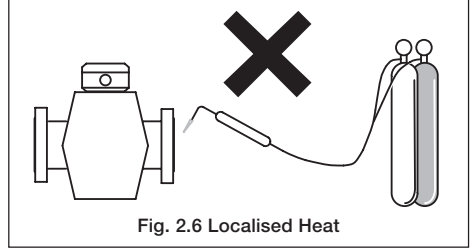
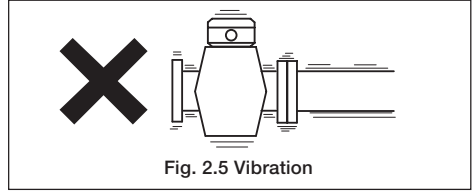
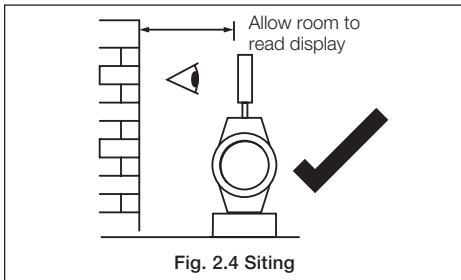
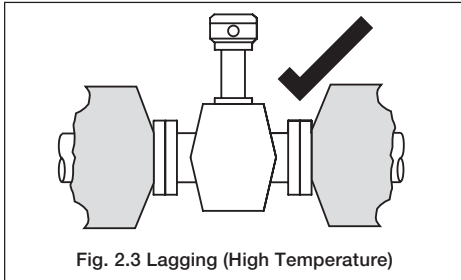
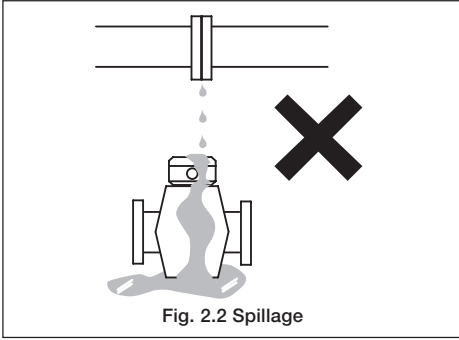
- Installation and maintenance must only be carried out by suitably trained personnel.
  - All relevant sections of this manual must be read before selecting a location.
  - Safety requirements of this equipment, any associated equipment and the local environment must be taken into consideration.
  - The installation and use of this equipment must be in accordance with relevant national and local standards.
-

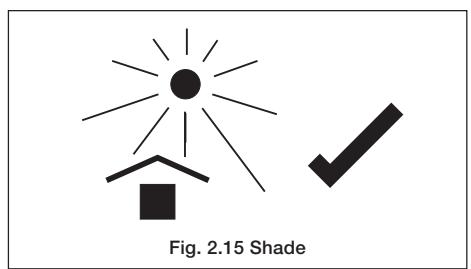
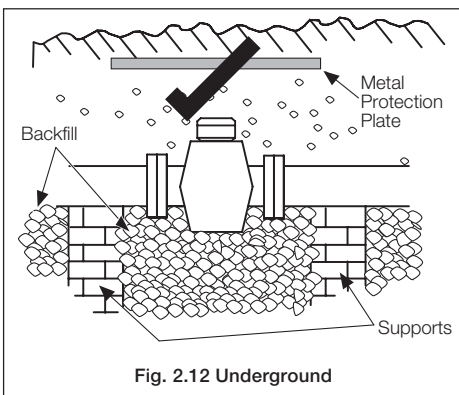
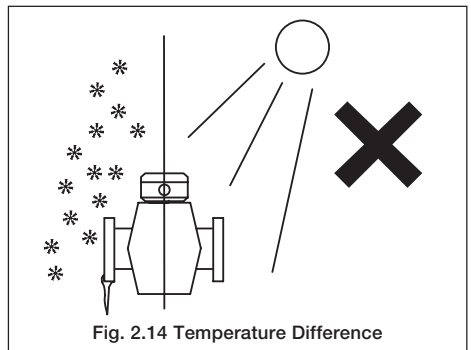
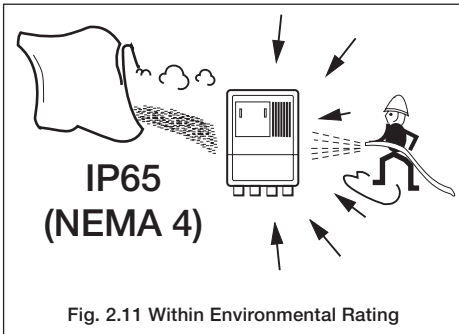
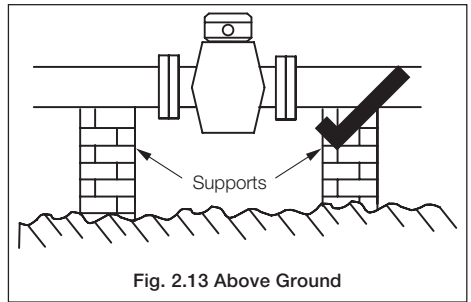
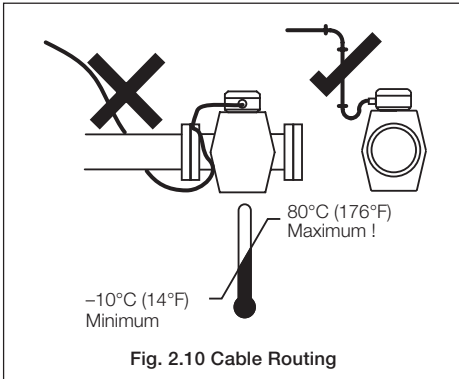
## 2 MECHANICAL INSTALLATION

### 2.1 Unpacking



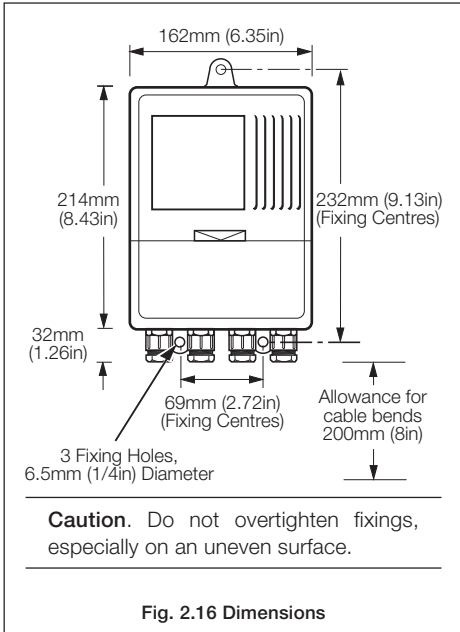
### 2.2 Installation Conditions





### 2.3 Mechanical Installation

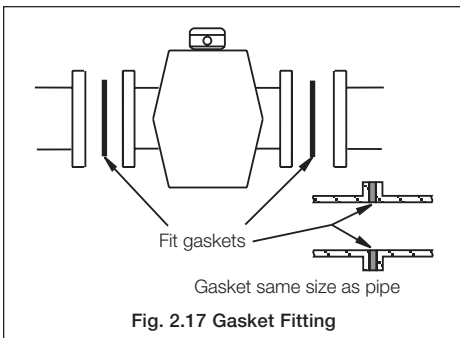
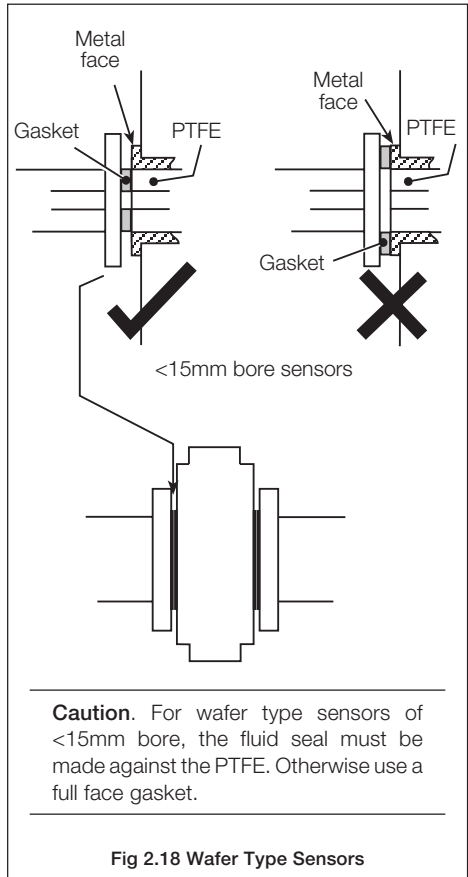
#### 2.3.1 Transmitters



#### 2.3.2 Sensors

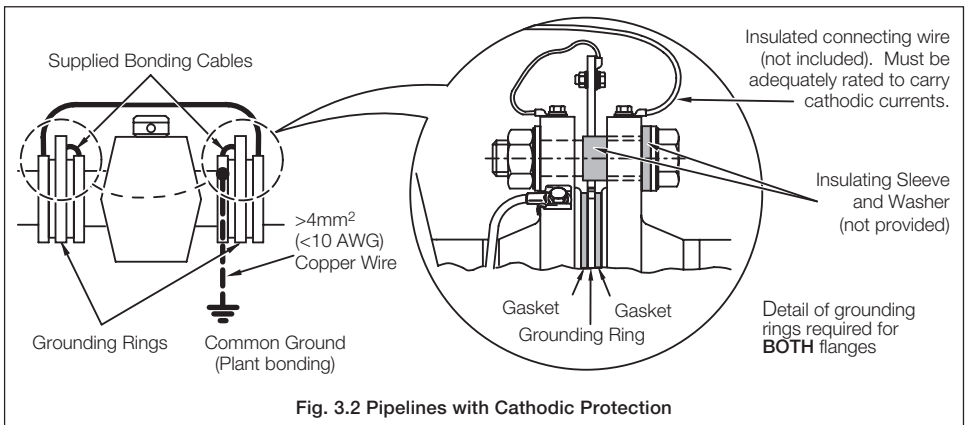
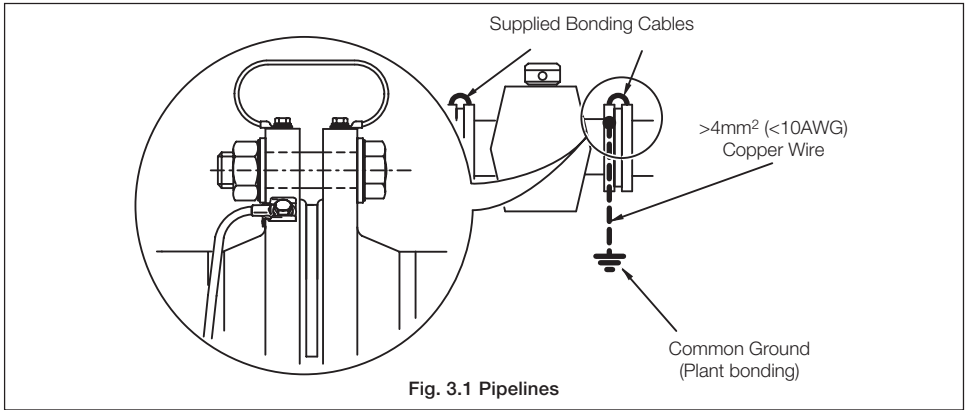
**Caution.**

- Do NOT exceed the maximum working pressure marked on the equipment.
- Use stainless steel (austenitic) bolts, studs and nuts for flanged sensors below 200mm.



### 3 ELECTRICAL INSTALLATION

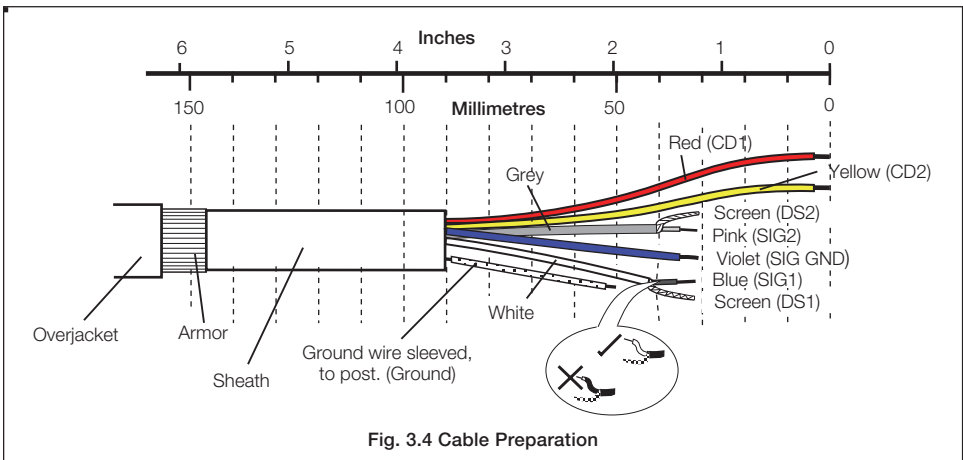
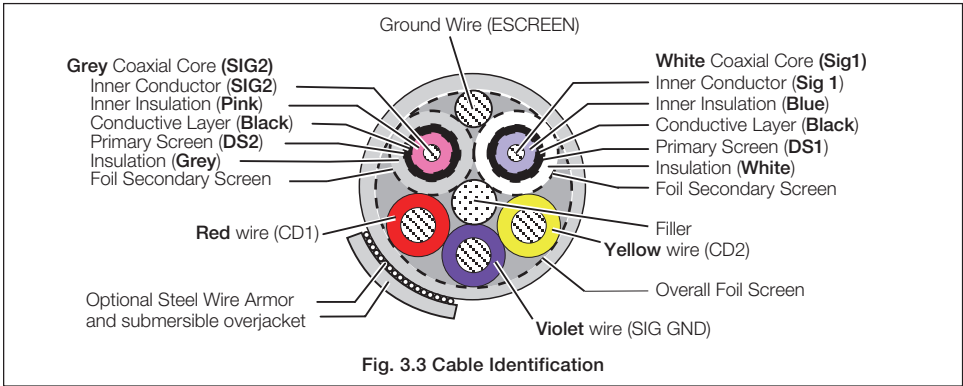
#### 3.1 Grounding (Fig. 3.1, 3.2)



## ...3 ELECTRICAL INSTALLATION

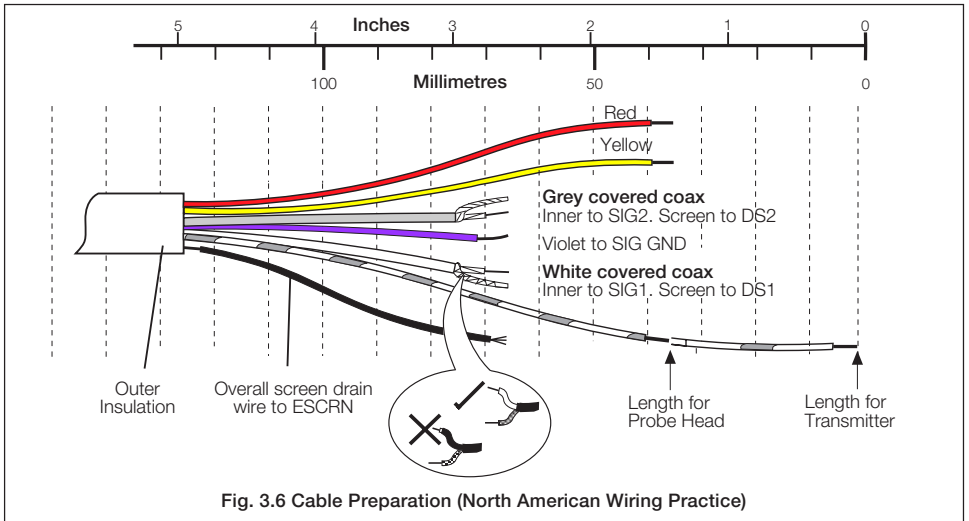
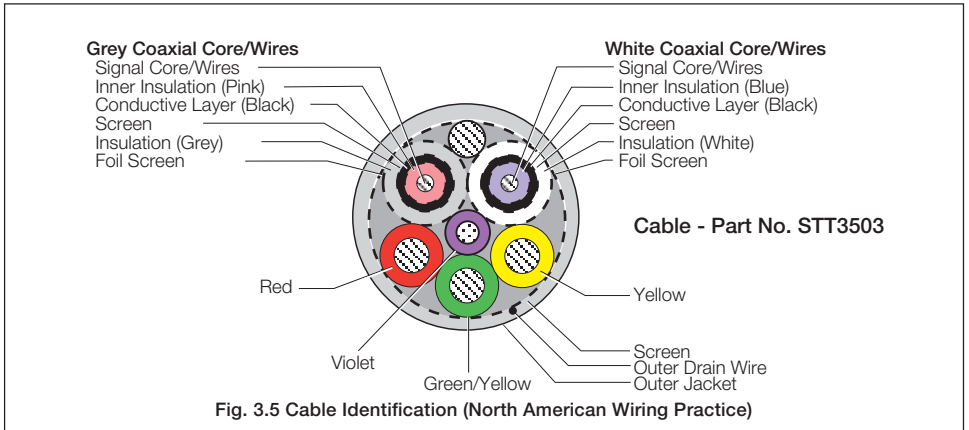
### 3.2 Cables

#### 3.2.1 Cable (Remote Versions only)

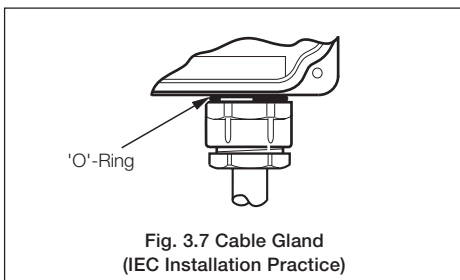




### 3.2.2 Cable (Alternative Type – North American Wiring Practice)



### 3.2.3 Cable Glands (IEC Installation Practice)



**Warning.**

- Rigid conduit must not be fitted to the transmitter.
- Transmitter conduit adaptors must incorporate a face seal.

### 3.2.4 Conduit Adapters and Cable Glands (North American – 0.5in)

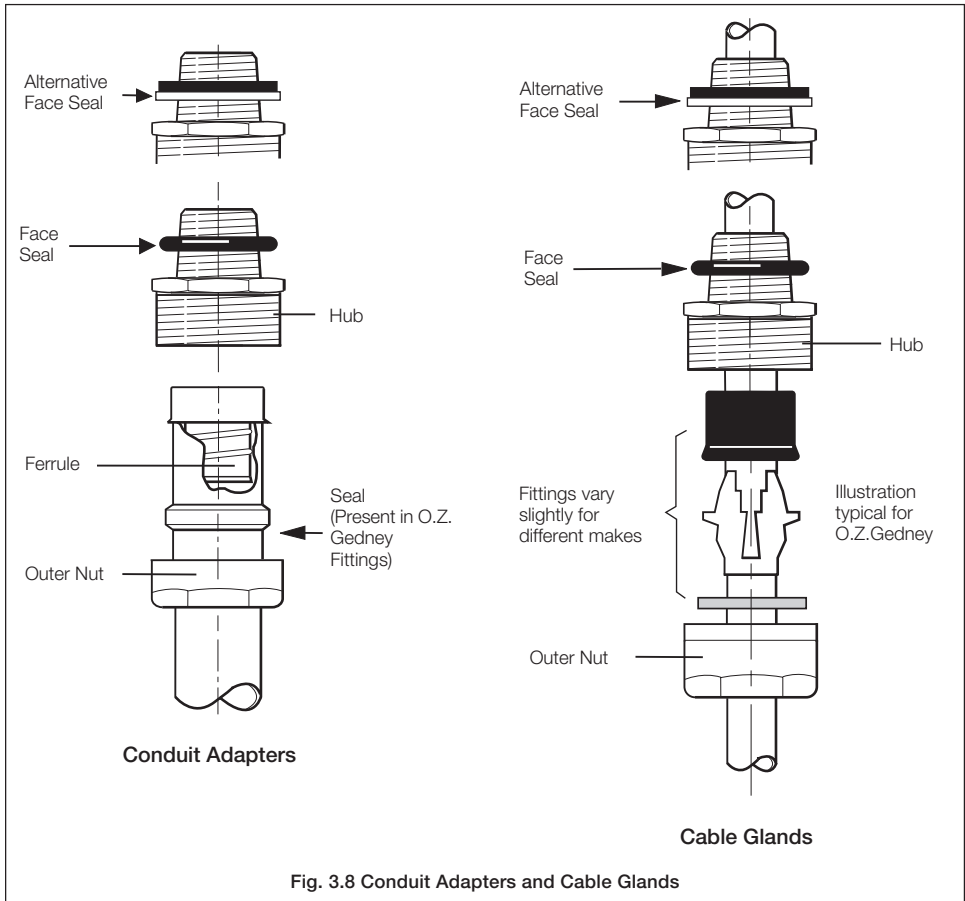


Fig. 3.8 Conduit Adapters and Cable Glands

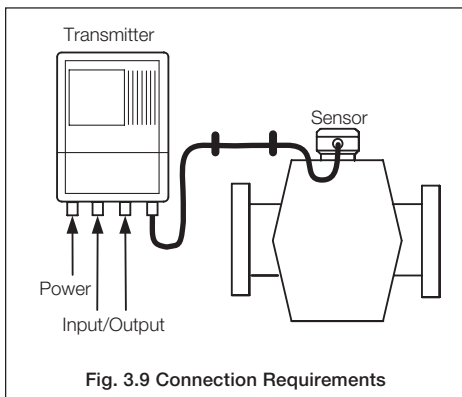


Fig. 3.9 Connection Requirements

### 3.3 Connection Requirements

The transmitter and sensor are supplied as a matched system. Check serial numbers to ensure they are matched.

#### 3.3.1 Sensors

Remote sensors are usually supplied with an integral cable and potted connections. If the sensor has been supplied unpotted, connections must also be made to the sensor terminal box and then potted on completion with the supplied potting material – See Appendix A.

**Caution.** (Remote versions)

- Remove any exposed black conductive layer from under coaxial screens.
- Make connections only as shown.
- Sleeve all bare wiring.
- Twist RED and YELLOW cores lightly together.
- Twist WHITE and GREY coaxial cables lightly together.
- Maintain Environmental Protection at all times.
- Conduit connections must provide cable entry sealing.

**Information.** (Remote versions)

- Refer to ENVIRONMENTAL PROTECTION (Appendix A).
- Internal appearance of Terminal Box may vary from that shown.

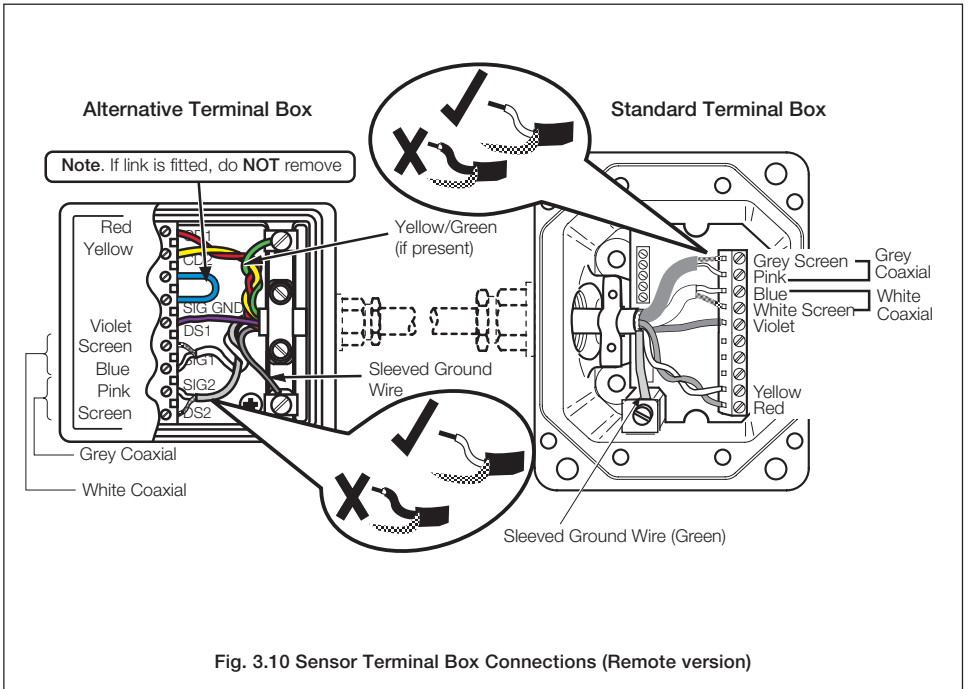


Fig. 3.10 Sensor Terminal Box Connections (Remote version)

### 3.3.2 Transmitters (All versions)

**Caution.** Unused cable entries must be blanked with the permanent blanking plugs supplied with the transmitters.

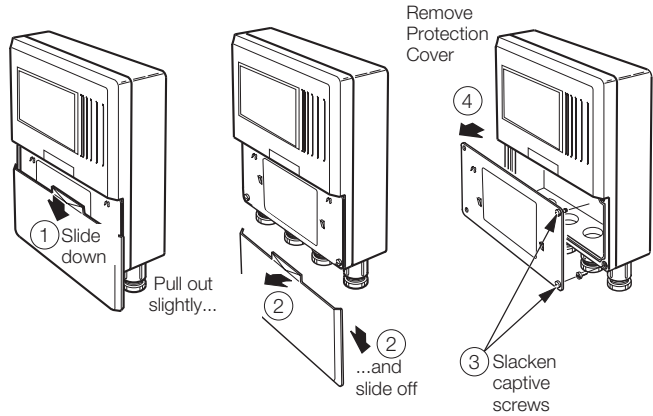


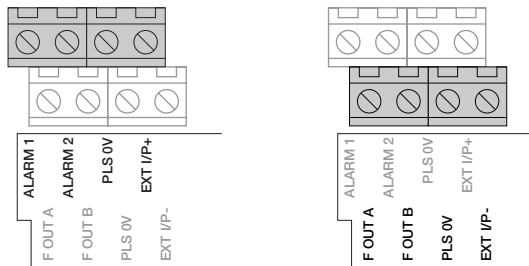
Fig. 3.11 Transmitter Connection Terminal

**Caution.**

- Remove any exposed black conductive layer from the inner insulation of both coaxial cables.
- Substitute sensor cable of any kind is not acceptable.
- Do not make connections except as shown.
- Twist cable pairs together as shown.
- Sleeve ALL bare wires.
- Sensor cable may only be joined using company supplied junction box - available separately.

### Terminal Identification

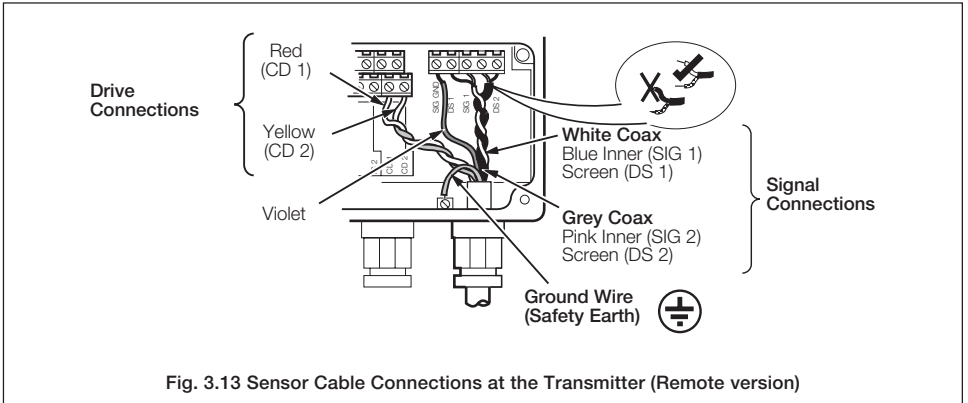
Each terminal block has two parallel rows of connectors. The corresponding label for each connector is printed on the board as shown in fig 3.12.



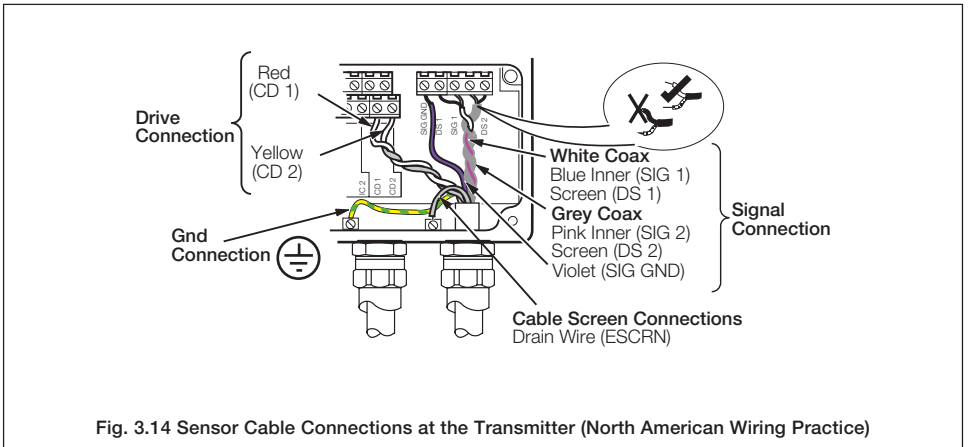
**Caution.** It is important that all wires are correctly connected to their corresponding terminal.

Fig 3.12 Terminal Identification

...3.3.2 Transmitters (All versions)



North American Wiring Practice



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## ...3 ELECTRICAL INSTALLATION

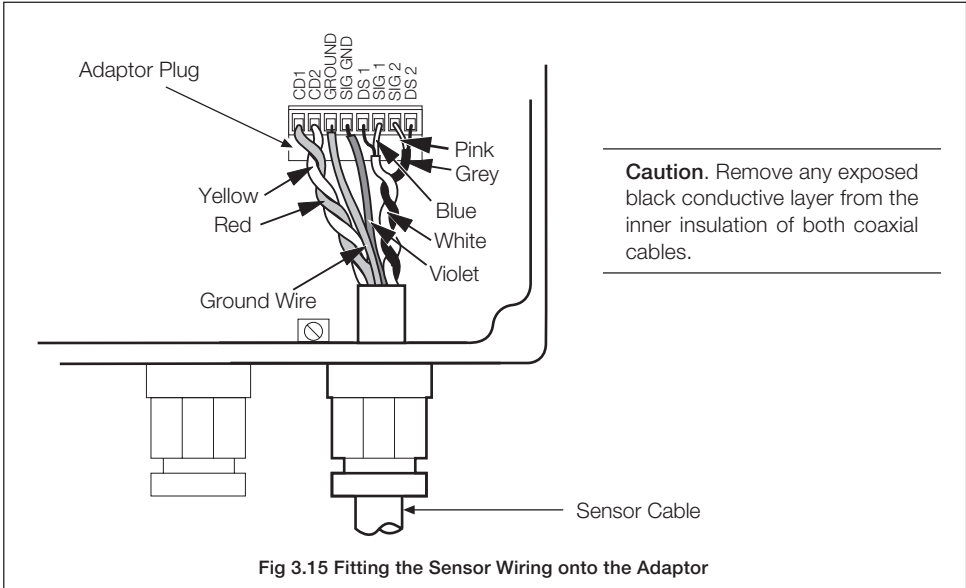
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### 3.3.3 Alternate Wiring Configuration

Some later transmitters have an alternative (plug-and-socket) sensor wiring configuration (see Fig. 3.15)

This connector may be either an integral part of the termination area or, alternatively, part of the CalMaster adapter board. The wiring of both these variants is the same.

To wire the adaptor plug, carefully pull off the plug from the adaptor board, connect the wires (using a screwdriver with a 2.5mm blade to tighten the terminal screws) and replace the plug.



## 3.4 Input/Output Connections

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### Caution.

- Refer to SPECIFICATION for Input/Output ratings.
  - Inductive loads must be suppressed or clamped to limit voltage swings
  - Capacitive loads must be inrush current limited.
  - Hazardous area requirements are not considered in the following pages.
-

3.4.1 Frequency Outputs – Fig. 3.16

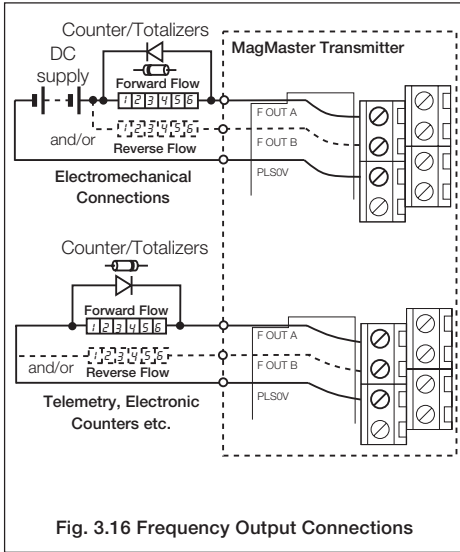


Fig. 3.16 Frequency Output Connections

3.4.3 PLC Interface – Fig. 3.18

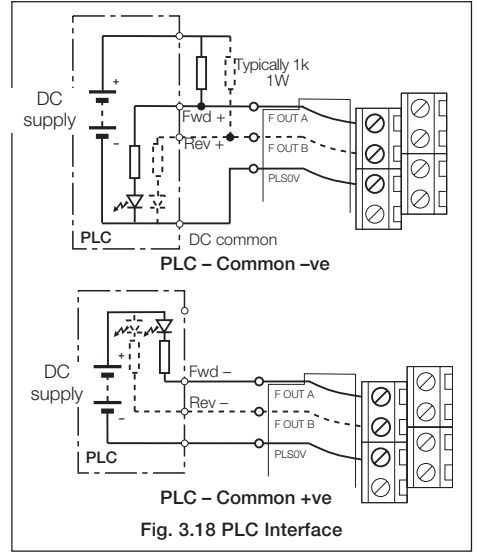
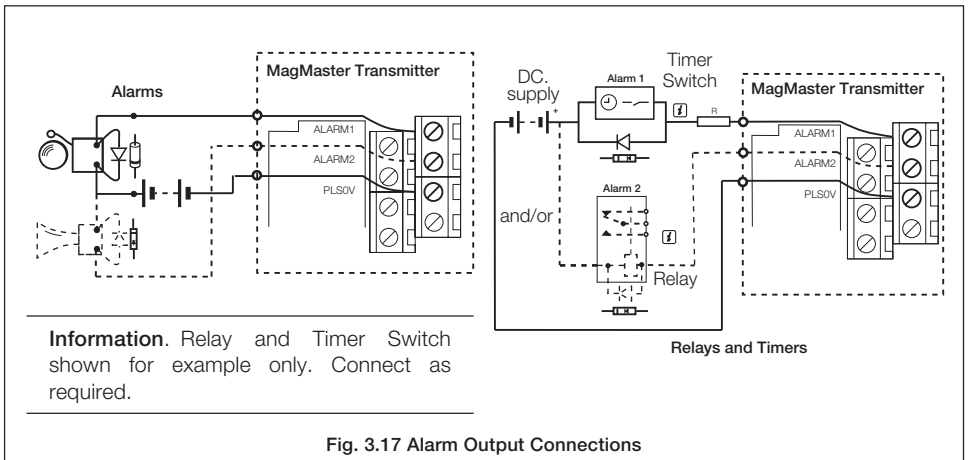


Fig. 3.18 PLC Interface

3.4.2 Alarm Outputs – Fig. 3.17

Information.

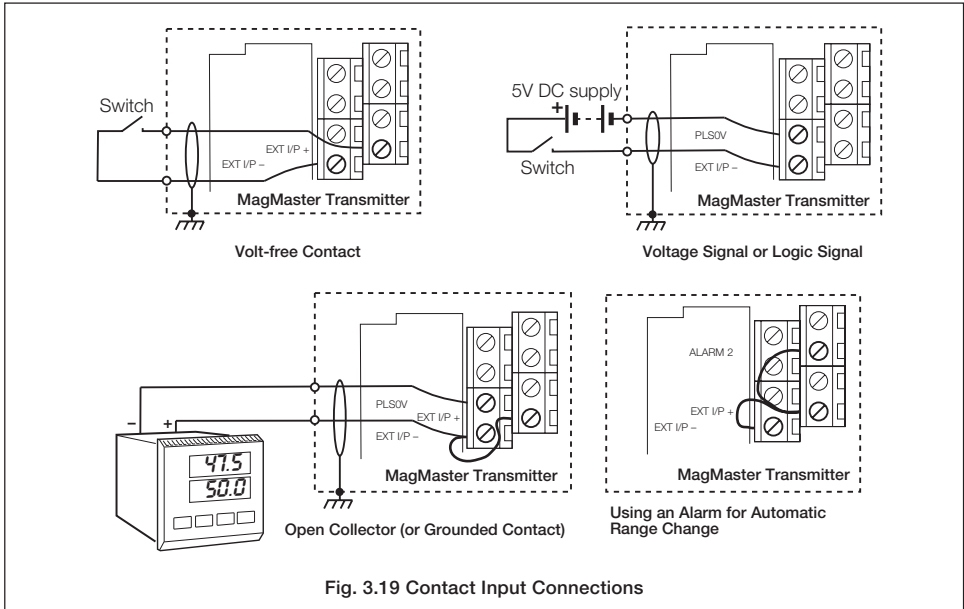
- Inductive loads may be suppressed by diodes (D) – 1N4004 or similar.
- Inrush currents are limited to 1 Amp by resistor R – e.g. 27Ω 1W for 24V systems.
- Operation of outputs is programmable – see Configuration Manual for details.
- Frequency and Alarm outputs share a common return with contact input.
- External isolators not normally required, as the pulse, alarm and contact circuits are electrically separated from all other Magmaster connections.



Information. Relay and Timer Switch shown for example only. Connect as required.

Fig. 3.17 Alarm Output Connections

3.4.4 Contact Input – Fig 3.19





3.4.5 Current Output – Fig. 3.20 and 3.21

**Information.**

- Output is fully programmable – see Programming Guide.
- Output is electrically separated from all other MagMaster connections.
- External isolators are not normally required and may significantly limit accuracy if used.

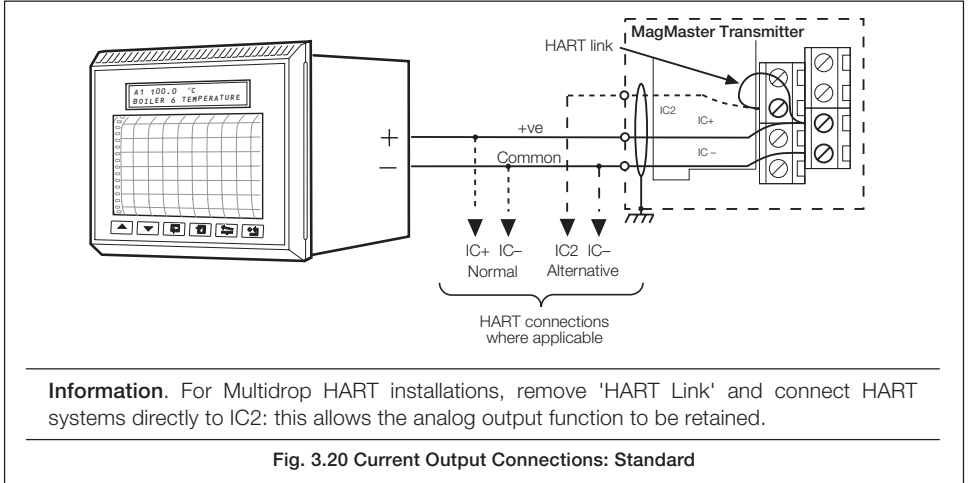


Fig. 3.20 Current Output Connections: Standard

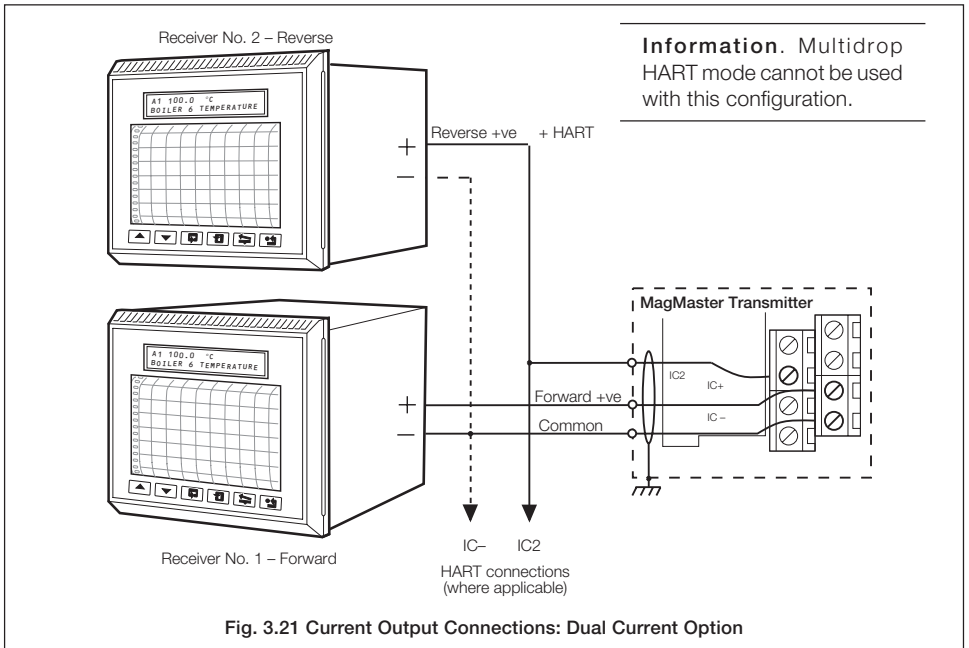
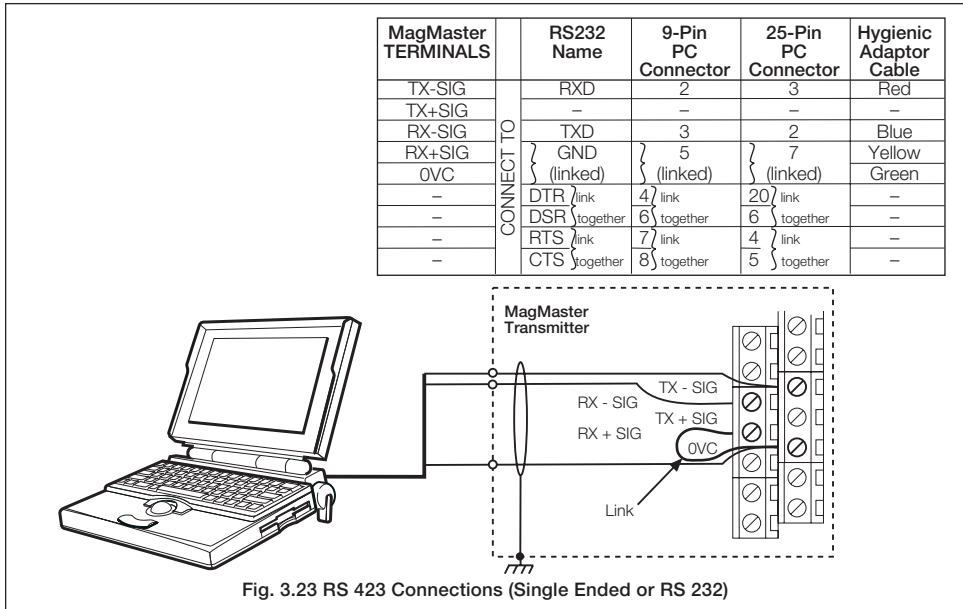
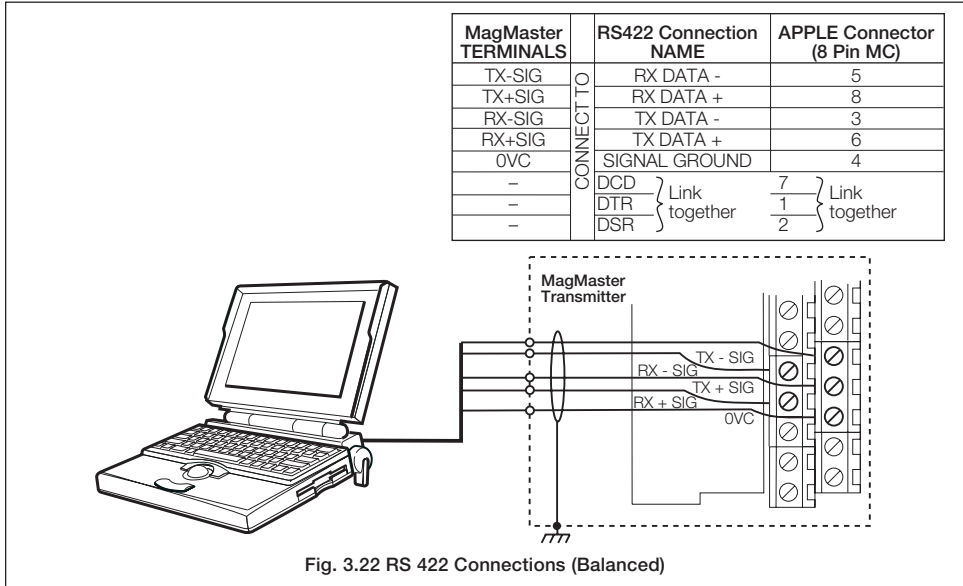


Fig. 3.21 Current Output Connections: Dual Current Option

### ...3 ELECTRICAL INSTALLATION

#### 3.4.6 Computer Connection – Fig. 3.22 and 3.23

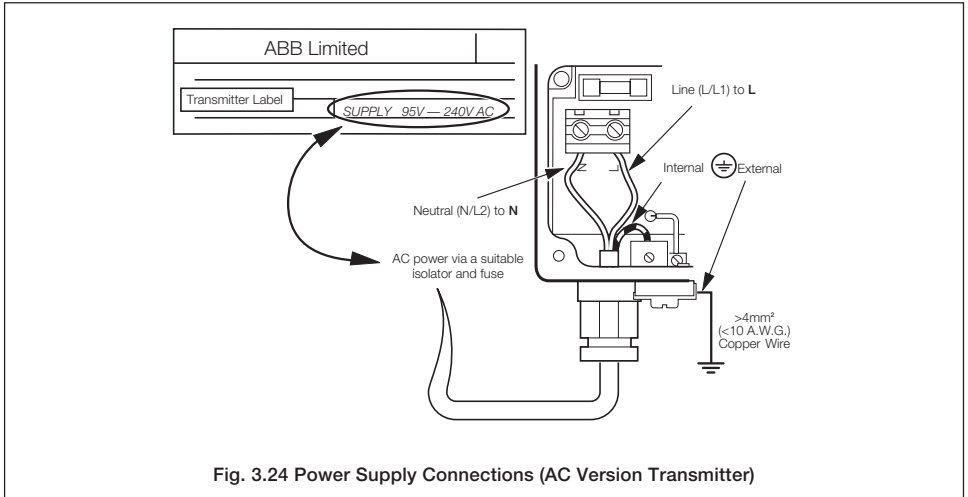
**Information.** RS422/423 option is electrically isolated from all other MagMaster connections.



## 3.4.7 Power Supply Connections – Fig. 3.24 and 3.25

**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.** On some AC-powered board variants the replaceable cartridge-type line fuse is omitted. A thermal solid-state fuse is fitted but may be located elsewhere on the board.

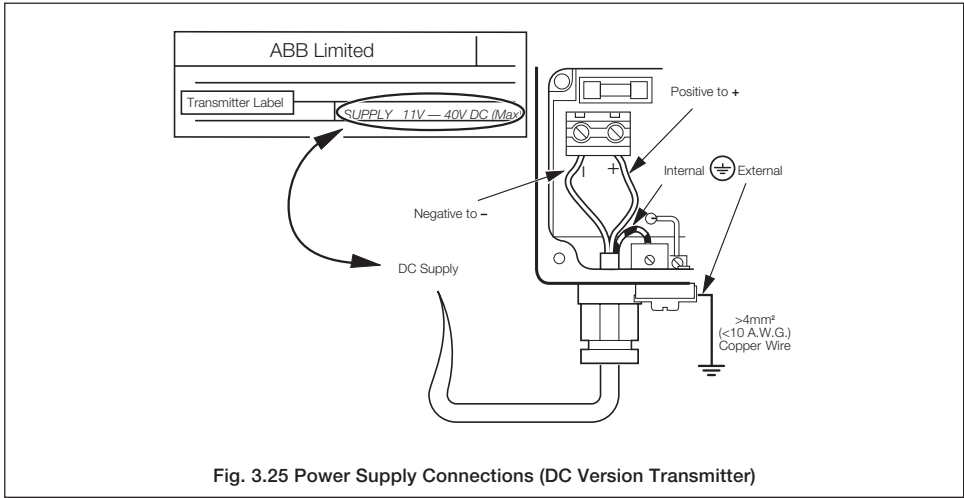


Fig. 3.25 Power Supply Connections (DC Version Transmitter)

### 3.4.8 Profibus Connections

Refer to the separate manual (IM/MM/PBS) for details.

## 4 STARTUP AND OPERATION

### Warning.

- Ensure Plant Safety while configuring, at all times.
- The 9-way D-Type Serial Link is not isolated. Ensure that it is NOT connected to power earth (ground), with cathodically protected systems.

### 4.1 Startup

Switch on the power supply to the flowmeter, and if a transmitter with display has been ordered, the flow rate will be shown on the display as shown in Fig. 4.1 or 4.2.

Sequential application of the provided magnetic wand to the left hand icon in the transmitter display area, or by pressing the button on the keypad versions or the remote display, steps the display through the following sequence:

- % (Flow Rate % of Range)
- > (Forward flow total value)
- < (Reverse flow total value)
- \* (Net flow total value)

Alm(Active alarms)

Vel (Flow Velocity in m/s or ft/s)

Any alarms are displayed sequentially if more than one alarm is present.

Application of the wand to the right hand icon, or pressing the keypad button, resets the totaliser display, if this facility is enabled.

### Information.

- For the use of local or remote serial communication, and configuration, see the Quick Reference Programming Guide or the main MagMaster manual.
- For all versions supporting HART™, see the main MagMaster manual.

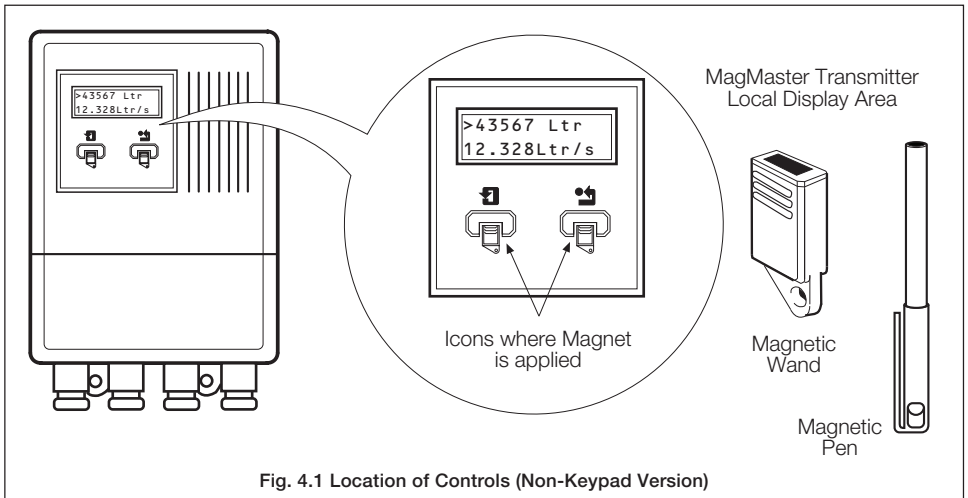


Fig. 4.1 Location of Controls (Non-Keypad Version)

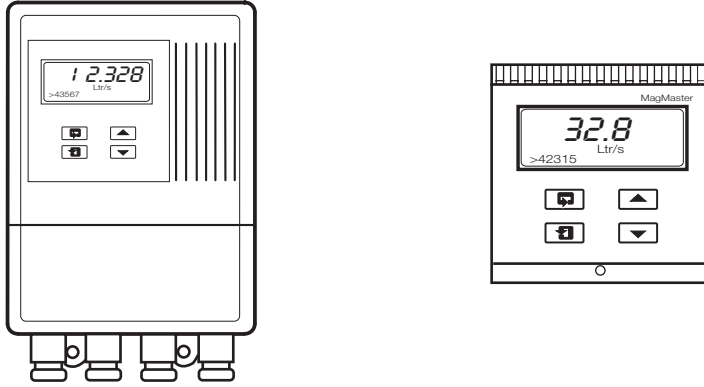


Fig. 4.2 Location of Controls (Keypad Versions)

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## APPENDIX A – ENVIRONMENTAL PROTECTION

---

### **Warning.**

- Potting materials are toxic – use suitable safety precautions.
  - Read the manufacturers instructions carefully before preparing the potting material.
  - The remote sensor terminal box connections must be potted immediately on completion to prevent the ingress of moisture.
  - Check all connections before potting – see ELECTRICAL INSTALLATION.
  - Do not overfill the terminal box or allow the potting material to come into contact with the 'O' ring or groove.
  - Do not let potting material enter conduit, if used.
-

# SPECIFICATION

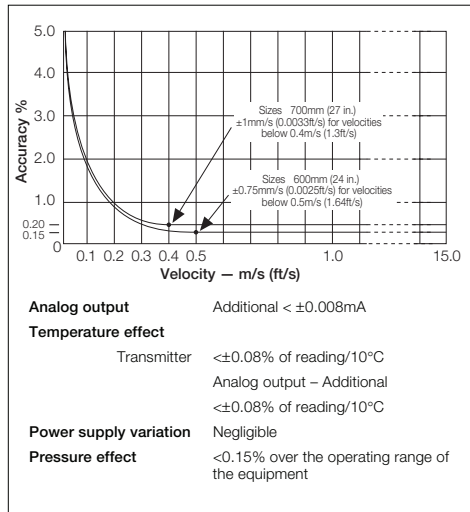
## Specification – Sensor

### Sizes

Sizes mm (in.)	Flow Range	
	Minimum	Maximum*
	m <sup>3</sup> /h (US g/min)	m <sup>3</sup> /h (US g/min)
15 (0.6)	0.005 (0.021)	6 (28)
20 (0.8)	0.009 (0.038)	11 (50)
25 (1)	0.014 (0.059)	17 (77)
40 (1.6)	0.035 (0.15)	45 (197)
50 (2)	0.053 (0.23)	71 (311)
65 (2.5)	0.089 (0.40)	119 (525)
80 (3)	0.136 (0.59)	181 (796)
100 (4)	0.21 (0.94)	283 (1243)
150 (6)	0.47 (2.10)	640 (2797)
200 (8)	0.84 (3.73)	1130 (4974)
250 (10)	1.32 (5.83)	1770 (7771)
300 (12)	1.91 (8.4)	2540 (11190)
350 (14)	2.60 (11)	3460 (15230)
400 (16)	3.39 (15)	4520 (19890)
450 (18)	4.29 (19)	5730 (25180)
500 (20)	5.3 (23)	7070 (31090)
600 (24)	7.6 (33)	10180 (44760)
700 (28)	14 (46)	13850 (60920)
760 (30)	16 (52)	15900 (69930)
800 (31)	18 (60)	18100 (79560)
900 (35)	23 (75)	22900 (100700)
1000 (39)	28 (93)	28300 (124300)
1050 (41)	31 (112)	34200 (150400)
1200 (47)	41 (134)	40700 (179000)
1400 (55)	55 (182)	55400 (243700)
1500 (59)	64 (208)	63600 (279700)
1600 (63)	72 (238)	72400 (318300)
1800 (71)	92 (302)	91600 (402800)
2000 (79)	113 (372)	113100 (497400)
2200 (87)	136 (451)	137000 (602000)

\* Based on 10ms<sup>-1</sup> (33fts<sup>-1</sup>), but instrument capability in excess of 15ms<sup>-1</sup> (50fts<sup>-1</sup>)

### Accuracy (under forward flow reference conditions)





**...Specification – Sensor**

**Wetted Material**

**Lining**

Suitable for potable water and waste water  
(all materials UKWFBS listed)  
Contact factory for non-standard materials

**Electrodes**

Stainless steel 316  
Contact factory for non-standard materials

**Flanges**

Carbon steel

**Pressure limitations**

≤600mm as flange rating  
≥700mm 6, 10 or 16 bar

**Environmental protection**

IP68 (NEMA6)  
Buriable to 5m (16 ft) depth

**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**

≥5µS/cm

**End connections**

PN6 ANSI B16-5 Class 150  
PN10 ANSI/AWWA C207 Class B & D  
PN16 AS2129 Table 'C'  
or BS10/AS2129 Table 'D' & 'E'

**Electronic Display Unit**

**Mounting**

Integral with sensor  
**OR**  
Remote up to 100m (325 ft)  
Longer lengths available on request

**Housing**

IP65 (NEMA4)  
Glass-loaded polypropylene, polycarbonate window ULVO rated

**Electrical connections**

20mm glands, or accepts  
½ in. NPT connections

**Sensor cable**

ABB cable supplied as standard  
Armored version available on request

**Power supply\***

Voltage Type	Voltage Range (V) Absolute rating	Frequency (Hz)	VA
AC	85 to 265	47 to 440	<20
DC	11 to 40	–	<20

\*Power supply fully isolated

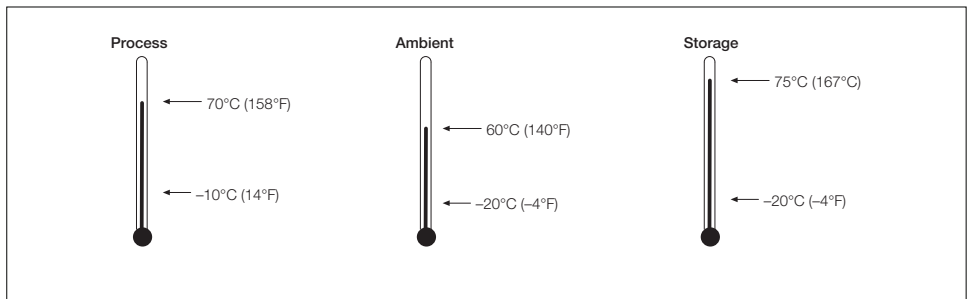
**Liquid Sensing**

Drives output to zero with an empty pipe

**Languages**

Operation in English, French, German, Spanish, Italian, Dutch plus others on application

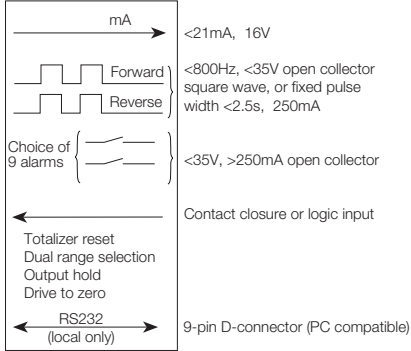
**Temperature Ranges**



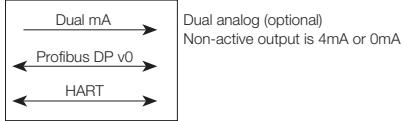
# ...SPECIFICATION

## Output/Inputs

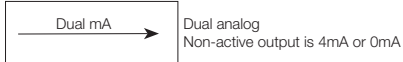
Common



Optional (For blind & 2-line display units)

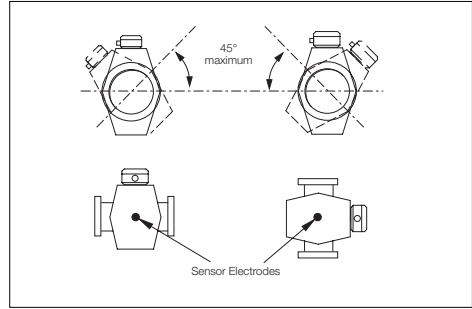


Optional (For keypad units)

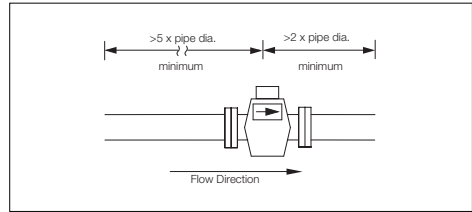


Galvanic isolation to 50V DC between analog pulse/alarm and earth/ground

## Mounting



## Pipe Connections



**Sensor Specification (nominal dimensions)**

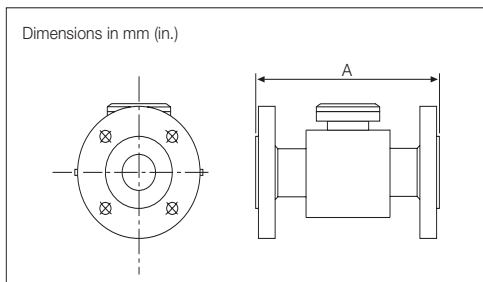
15 to 2200mm (0.5 to 84 in.)

Meter Size mm	Flange Size			Length A mm (in.)	Approximate Weight kg (lb)
	Metric Flanges (DN)	BS10 Flanges (in.)	AWWA C207 Flanges (NPS)		
15	15*	1/2	1/2	200 (7.9)*	7 (15)
20	20*	3/4	3/4		
25	25*	1	1		
40	40*	1 1/2	1 1/2		
50	50*	2	2		
65	65*	2 1/2	2 1/2		
80	80*	3	3	250 (9.8)*	18 (40)
100	100*	4	4		
150	150*	6	6	300 (11.8)*	38 (84)
200	200**	8	8	350 (13.8)**	37 (81)
250	250**	10	10	450 (17.7)**	60 (132)
300	300**	12	12	500 (19.7)**	70 (154)
350	350**	14	14	550 (21.7)**	100 (220)
400	400**	16	16	600 (23.6)**	115 (253)
450	450**	18	18	698 (27.5)**	160 (352)
500	500**	20	20	768 (30.2)**	217 (455)
600	600**	24	24	918 (36.1)**	315 (693)
700	700***	27	28	700 (27.6)***	430 (945)
760	760***	30	30	762 (30)**	
800	800***	-	-	800 (31.5)***	
900	900***	36	36	900 (35.4)***	540 (1190)
1000	1000***	39	39	1000 (39.4)***	720 (1585)
1050	1050***	42	42	1067 (42)**	880 (1930)
1200	1200***	48	48	1200 (47.2)***	1000 (2160)
1400	1400***	54	54	1400 (55.1)***	1450 (3190)
1500	1500***	60	60	1524 (59)**	1370 (3000)
1600	1600***	66	66	1600 (63)**	2000 (4400)
1800	1800***	72	72	2250 (88.6)***	2400 (5280)
2000	2000***	78	78	2500 (98.4)***	3200 (7040)
2200	2200***	84	84	2750 (110)***	4200 (9300)

\*Tolerance +0/-3mm

\*\*Tolerance +0/-5mm

\*\*\*Typical tolerance +0/-10mm









# 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 Flow Meters
- Turbine Flowmeters
- Flow Elements

### Marine Systems & Turbochargers

- Electrical Systems
- Marine Equipment
- Offshore Retrofit and Re-ferbishment

### 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.

### United Kingdom

ABB Limited  
Tel: +44 (0)1453 826661  
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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