

# Endura AZ30 series probe

## Combustion oxygen monitor

Proven technology for use in hazardous area gases and dusts



### Introduction

This User Guide provides the following information:

- system schematics showing pneumatic requirements (for test gas and reference air) – see section 5.5, page 30 for product identification
- installation details for integral and remote Endura AZ30 probes – see section 4, page 8
- electrical connection details for remote and integral AutoCal / non-AutoCal probes (refer to COI/AZ30E-EN for electrical connections to remote terminal housings)

This User Guide should be used in conjunction with the following publications:

- Programming Guide (COI/AZ30E-EN)
- Maintenance Guide (MI/AZ30M-EN)

### Warning

The AZ30 combustion oxygen monitor is a certified product suitable for use in hazardous area locations. Before using this product refer to the product labeling for details of hazardous area certification.

## The Company

We are an established world force in the design and manufacture of measurement products 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.

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# 1 Safety

## Warning.

- System configuration must be carried out only by users or personnel with approved access rights (user privileges).
- Read all relevant sections of this guide before configuring the system or modifying system parameters.
- Install and use this equipment as detailed in this guide. Install and use associated equipment in accordance with the relevant national and local standards. Installation and repair must only be carried out by the manufacturer, authorized agents or persons conversant with the construction and installation standards for hazardous area certified equipment.

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.

## 1.1 Health & Safety

### Health and Safety

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

- The relevant sections of these instructions must be read carefully before proceeding.
- Warning labels on containers and packages must be observed.
- Installation, operation, maintenance and servicing must only be carried out by suitably trained personnel and in accordance with the information given.
- Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and / or temperature.

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

## 1.2 Electrical Safety – CEI / IEC 61010-1:2001-2

This equipment complies with the requirements of CEI / IEC 61010-1:2001-2 'Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use' and complies with US NEC 500, NIST and OSHA.

If the equipment is used in a manner NOT specified by the Company, the protection provided by the equipment may be impaired.

### 1.3 Symbols – CEI / IEC 61010-1:2001-2

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

	Protective earth (ground) terminal.
	Functional earth (ground) terminal.
	Direct current supply only.
	Alternating current supply only.
	Both direct and alternating current supply.
	The equipment is protected through double insulation.
	This symbol, when noted on a product, indicates a potential hazard which could cause serious personal injury and / or death. The user should reference this instruction manual for operation and / or safety information.
	This symbol, when noted on a product enclosure or barrier, indicates that a risk of electrical shock and / or electrocution exists and indicates that only individuals qualified to work with hazardous voltages should open the enclosure or remove the barrier.
	This symbol indicates that the marked item can be hot and should not be touched without care.
	This symbol indicates the presence of devices sensitive to electrostatic discharge and indicates that care must be taken to prevent damage to them.
	This symbol identifies a risk of chemical harm and indicates that only individuals qualified and trained to work with chemicals should handle chemicals or perform maintenance on chemical delivery systems associated with the equipment.
	This symbol indicates the need for protective eye wear.
	This symbol indicates the need for protective hand wear.
	Electrical equipment marked with this symbol may not be disposed of in European public disposal systems. In conformity with European local and national regulations, European electrical equipment users must now return old or end-of-life equipment to the manufacturer for disposal at no charge to the user.
	Products marked with this symbol indicates that the product contains toxic or hazardous substances or elements. The number inside the symbol indicates the environmental protection use period in years.

## 1.4 Product Recycling Information



Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August 2005. In conformity with European local and national regulations (EU Directive 2002 / 96 / EC), European electrical equipment users must now return old or end-of-life equipment to the manufacturer for disposal at no charge to the user.

**Note.** For return for recycling, please contact the equipment manufacturer or supplier for instructions on how to return end-of-life equipment for proper disposal.

## 1.5 Product Disposal

**Note.** The following only applies to European customers.



ABB is committed to ensuring that the risk of any environmental damage or pollution caused by any of its products is minimized as far as possible. The European Waste Electrical and Electronic Equipment (WEEE) Directive (2002 / 96 / EC) that came into force on August 13 2005 aims to reduce the waste arising from electrical and electronic equipment; and improve the environmental performance of all those involved in the life cycle of electrical and electronic equipment.

In conformity with European local and national regulations (EU Directive 2002 / 96 / EC stated above), electrical equipment marked with the above symbol may not be disposed of in European public disposal systems after 12 August 2005.

## 1.6 Restriction of Hazardous Substances (RoHS)



The European Union RoHS Directive and subsequent regulations introduced in member states and other countries limits the use of six hazardous substances used in the manufacturing of electrical and electronic equipment. Currently, monitoring and control instruments do not fall within the scope of the RoHS Directive, however ABB has taken the decision to adopt the recommendations in the Directive as the target for all future product design and component purchasing. .

## 1.7 Safety Precautions

Please read the entire manual before unpacking, setting up, or operating this instrument.

Pay particular attention to all warning and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

To ensure the protection provided by this equipment is not impaired, do not use or install this equipment in any manner other than that which is specified in this manual.

## 1.8 Safety Conventions

**Warning.** Indicates a condition which, if not met, could cause serious personal injury and / or death. Do not move beyond a warning until all conditions have been met.

If a warning sign appears on the instrument itself, refer to Precautionary Labels – UL Certification and Electrical Safety – CEI / IEC 61010-1:2001-2 for an explanation.

**Caution.** Indicates a condition which, if not met, could cause minor or moderate personal injury and / or damage to the equipment. Do not move beyond a caution until all conditions have been met.

**Note.** Indicates important information or instructions that should be considered before operating the equipment.

## 1.9 Safety Recommendations

For safe operation, it is imperative that these service instructions be read before use and that the safety recommendations mentioned herein be scrupulously respected. If danger warnings are not heeded to, serious material or bodily injury could occur.

## 1.10 Service and Repairs

Other than the serviceable items listed in Appendix C, page 39, none of the instrument's components can be serviced by the user. Only personnel from ABB or its approved representative(s) is (are) authorized to attempt repairs to the system and only components formally approved by the manufacturer should be used. Any attempt at repairing the instrument in contravention of these principles could cause damage to the instrument and corporal injury to the person carrying out the repair. It renders the warranty null and void and could compromise the hazardous area certification, correct working of the instrument, electrical integrity and the CE compliance of the instrument.

If you have any problems with installation, starting, or using the instrument please contact the company that sold it to you. If this is not possible, or if the results of this approach are not satisfactory, please contact the manufacturer's Customer Service

## 1.11 Potential Safety Hazards

The following potential safety hazards are associated with operating the system:

- Electrical (line voltage) – see page 7
- Hot surfaces – see page 7
- Probe weight
- Battery backup

This product employs an IEC 60086-1 Type C battery Varta type CR 2025 Li-Manganese-dioxide / Organic Electrolyte cell, 3V 165mAh or equivalent.

The battery cell is used as backup for a real-time clock with a minimum life expectancy of 10 years in normal use.

The battery is one of the components covered by the hazardous area certification of this product and must be replaced **only** with the same specification cell (or direct equivalent) and must be fitted correctly.

If the battery needs replacing please contact ABB.

- Use in oxygen-enriched atmospheres

The Endura AZ30 oxygen systems must be used **only** for measuring non-oxygen enriched gasses (not more than 21 % oxygen [air]) at pressure no greater than 1.1 bar absolute (44 in. WG).

## 2 System Overview

The Endura AZ30 oxygen probe measures oxygen concentration in flue gas using an in situ 'wet analysis' method. The 'wet analysis' method avoids measurement error (typically 20% of reading higher than the actual value) that is introduced by a sampling system using the 'dry analysis' method.

The sensor, based on a zirconium oxide cell, is mounted at the tip of the probe that is inserted in the flue duct. The resulting direct, in situ measurement provides accurate and rapid oxygen reading for combustion control / optimization and emissions monitoring purposes.

System equipment comprises a (flue-mounted) Endura AZ30 probe controlled by an integral- or remote-transmitter. During operation, a zirconia cell within the probe is maintained at a constant temperature of 700°C (1292°F) by a probe heater and control thermocouple assembly. An analog trip circuit, included in the AZ30 transmitter, trips if the thermocouple temperature exceeds 850 °C ( $\pm 20$  °C) or 1562 °F ( $\pm 68$  °F). If this happens, the AZ30 probe's heater power supply trip relay is activated, cutting power to the heater to prevent over-heating; ensuring the surface temperature of the probe never exceeds T4\* (135 °C [275 °F]). If the heater power supply has been tripped it must be re-set at the AZ30's transmitter in the *Device Setup / Reset Temp Trip* parameter – refer to Programming Guide COI/AZ30E-EN.

An output generated at the zirconia cell is processed in the transmitter providing a locally-displayed O<sub>2</sub> reading and a 4 to 20 mA retransmission signal over any range between 0 % and 100 % O<sub>2</sub>.

Optional automatic calibration (AutoCal\*) enables automatic, semi-automatic or manual calibration to be performed using a probe-mounted gas control manifold mounted within the probe head. Calibration sequencing is software-controlled from the transmitter.

The probe requires only preset test gas and reference air pressures of 1 bar (15 psi)  $\pm 12$  % to maintain a constant flow of 2.2 l / min (4.662 scfh). This flow is not affected by changes in the measured test gas pressure of  $\pm 0.35$  bar (5 psi).

**Note.** Operating the system in oxygen-enriched atmospheres will invalidate / compromise certification.

## 3 Key Product Safety Areas

**Warning.** Before installation and / or maintenance refer to Table 3.1 and Fig. 3.1 (page 7) to familiarize yourself with:

- Flamepath dimensional requirements.
- Mains power and hot surface locations.
- Flamepath types and locations (surface finishes, thread lengths, threadforms and fits on all flamepaths must remain undamaged to maintain system integrity and Hazardous Area certification).
- Locking screw locations (locking screws must be in the **locked** position at all times the system is operational. Use the 3 mm A/F hexagon wrench [supplied]).

### 3.1 Flamepath Dimensional Requirements

For dimensional checking purposes, Table 3.1 provides the values and tolerance of the spigot-type joints in the probe's construction – refer to Fig. 3.1, page 7 for flamepath FP<sup>2</sup>A and FP<sup>2</sup>B locations.

Flamepath ID	Spigot OD mm (in.)	Bore ID mm (in.)
FP <sup>2</sup> A	+0.03 44.0 (+0.00118) (1.732) -0.015 (-0.00059)	+0.05 44.0 (+0.00196) (1.732) -0.35 (-0.01377)
FP <sup>2</sup> B	+0.03 31.96 (+0.00118) (1.258) -0.015 (-0.00059)	+0.04 32.0 (+0.00157) (1.259) -0.00 (-0.0)

Table 3.1 Flamepath Dimensions Outside of the Requirements of IEC60079-1 for Inspection and Maintenance

\*To ensure correct heater control is maintained with an integrated oven temperature trip, the AZ30 probe must only be connected to an AZ30 or safe-area AZ20 electronics unit.

### 3.2 Flamepath Locations

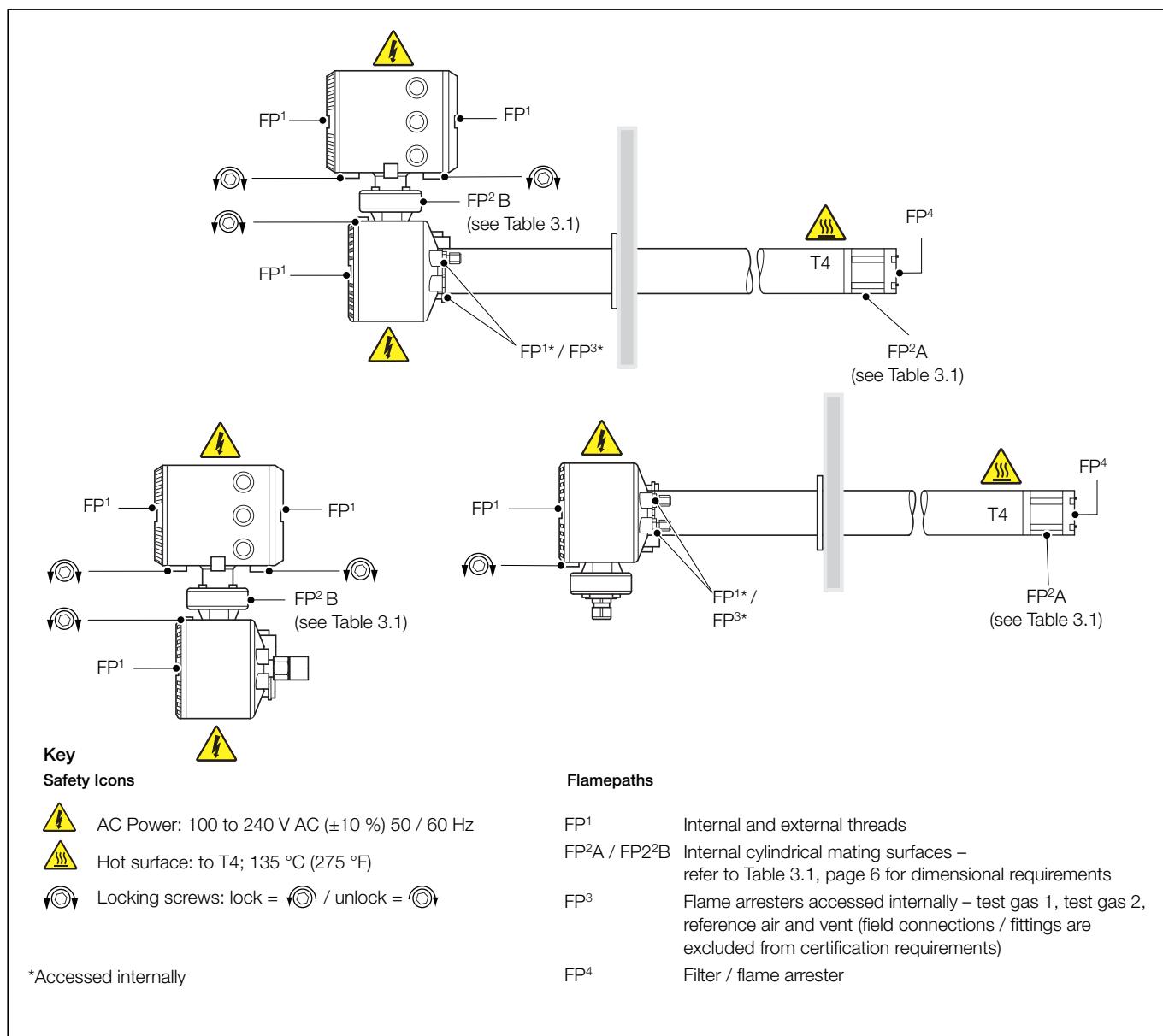


Fig. 3.1 Flamepath Locations and Key Product Safety Areas

## 4 Mechanical Installation

### 4.1 General Installation Requirements

#### Warning.

- The 'flameproof' construction of the AZ30 probe relies on the strength of the enclosure for its safe use in hazardous areas. Any erosion or corrosion should be avoided by means of proper installation and where doubt exists, regular inspection of the probe must be made.
- Maximum process pressure 1.1 bar absolute (44 in. WG). Certification is invalid if this pressure is exceeded.
- Before installing the probe, check the probe data and the alteration labels on the head of the probe – see Section 4.4, page 9.
- Select a location away from strong electrical and magnetic fields. If this is not possible, particularly in applications where mobile communications equipment is expected to be used, screened cables within flexible, earthed metal conduit must be used.
- Before installing the probe, read the Safety notes in Section 1, page 2.
- Ensure suitable lifting equipment and qualified personnel are available to suit the probe length and weights being installed – see page 21 for probe weights.

### 4.3 Probe Maintenance

Endura AZ30 has been designed for extended periods of maintenance-free operation. The modular design with reduced component count improves the reliability and robustness of the system and simplifies breakdown repair if it occurs.

Kits containing all the parts needed to complete on-site repairs are available from ABB, ensuring that hazardous area-trained service personnel can effect repairs quickly and efficiently at minimum cost. The Endura AZ30 probe has retained an easy-access cell arrangement, similar to the proven AZ20 probe, ensuring cell replacement can be carried out on-site using readily-available, basic hand tools, even after long periods of high temperature operation.

### 4.2 Unpacking

**Caution.** Visually inspect equipment for damage before installing. Do not install damaged or faulty equipment.

#### Warning.

- Handle the probe with care and do not subject it to hammer blows or other sharp shocks. The probe innards have fragile ceramic components that can be damaged.
- It is recommended to retain the protective probe packing materials for re-shipping in the unlikely event of a return.

#### 4.4 System Identification and Commissioning Labels

Each system is identified by probe- and transmitter-specific labels. A separate Commissioning Label attached to the probe contains commissioning and cell data specific to the system / probe.

Refer to Programming Guide COI/AZ30-EN for transmitter and remote terminal housing label locations.

Probe and commissioning label locations are identified in Fig. 4.1:

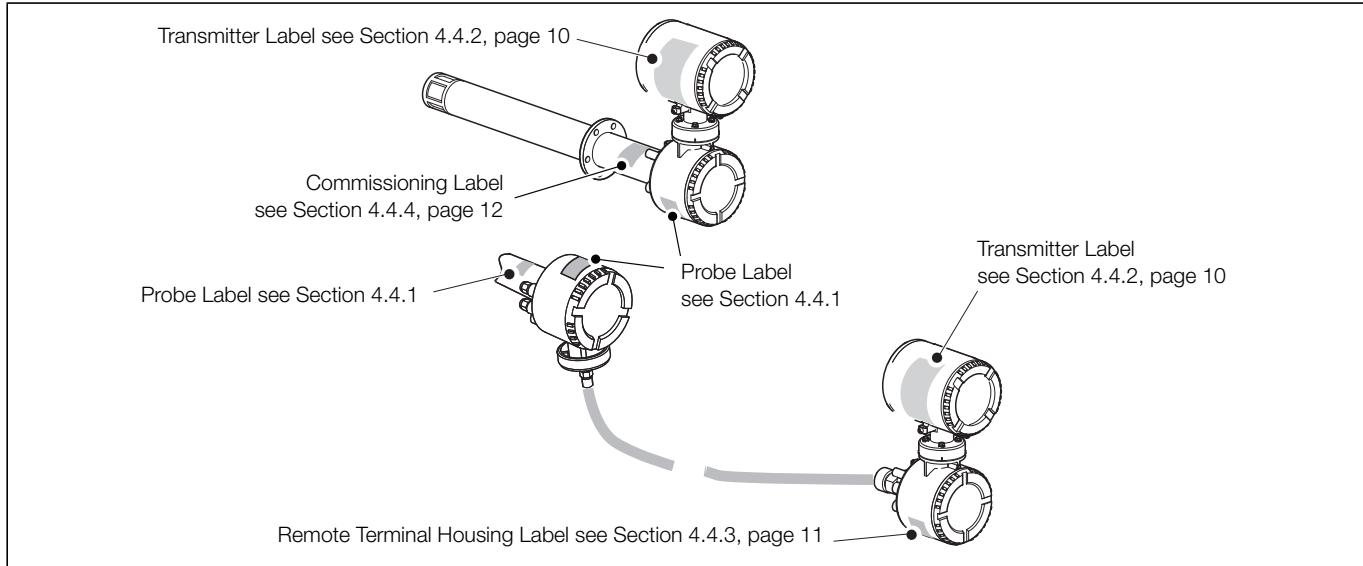


Fig. 4.1 Location of Probe and Commissioning Labels

##### 4.4.1 Probe Label

Referring to Fig. 4.2, the probe label identifies:

(A)	Probe approvals and classifications	(E)	Date of manufacture
(B)	Probe type number	(F)	Power supply requirements
(C)	Probe serial number	(G)	Approval symbols / icons
(D)	Probe tag number		

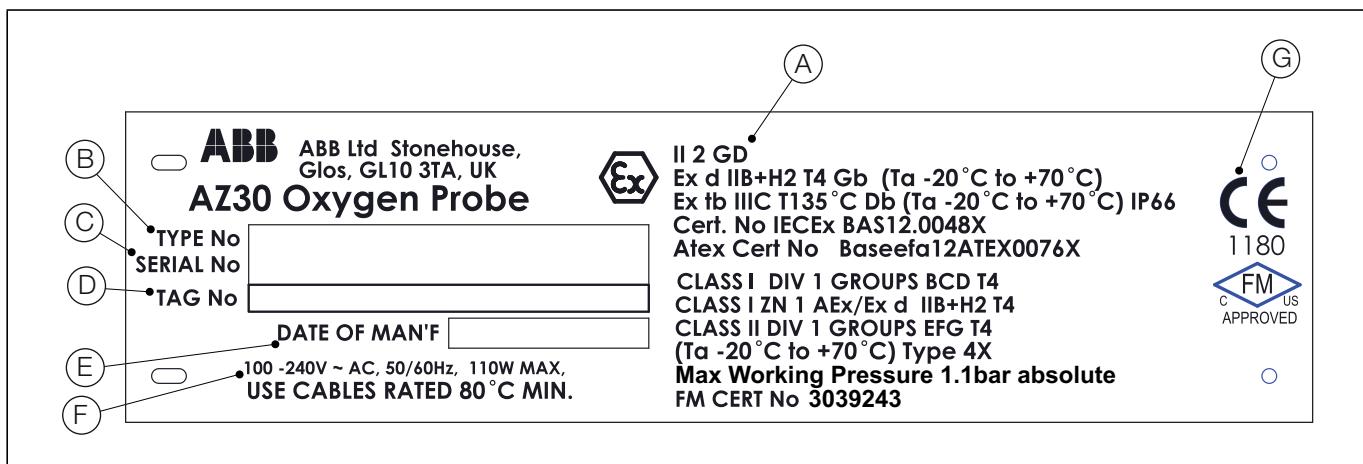


Fig. 4.2 Probe Label

#### 4.4.2 Transmitter Label

Referring to Fig. 4.3, the transmitter label identifies:

(A)	Transmitter approvals and classifications	(E)	Date of manufacture
(B)	Transmitter type number	(F)	Power supply requirements
(C)	Transmitter serial number	(G)	Approval symbols / icons
(D)	Transmitter tag number		

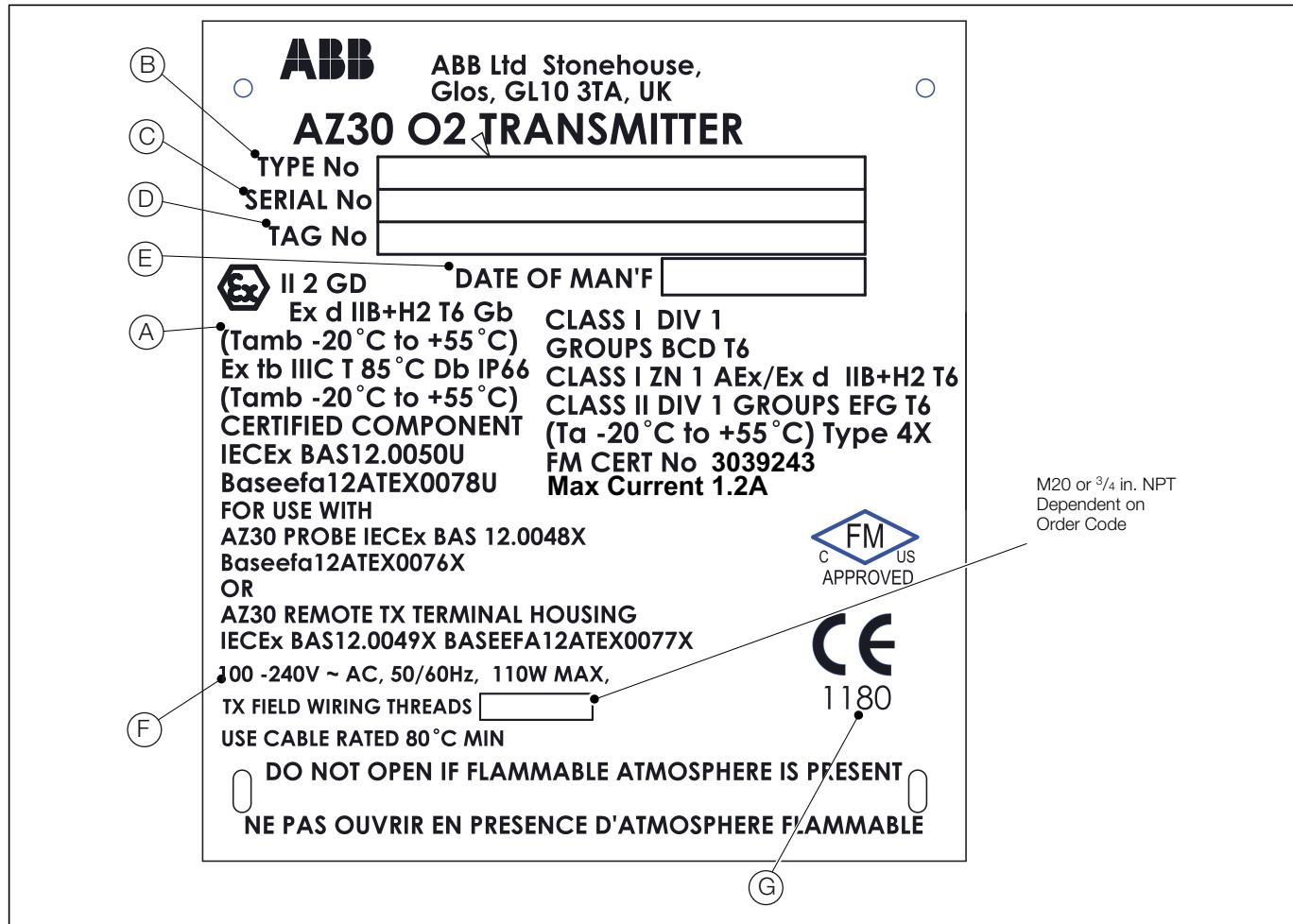


Fig. 4.3 Transmitter Label

#### 4.4.3 Remote Terminal Housing Label

Referring to Fig. 4.4, the transmitter label identifies:

(A)	Remote terminal housing approvals and classifications	(E)	Date of manufacture
(B)	Remote terminal housing type number	(F)	Power supply requirements
(C)	Remote terminal housing serial number	(G)	Approval symbols / icons
(D)	Remote terminal housing tag number		

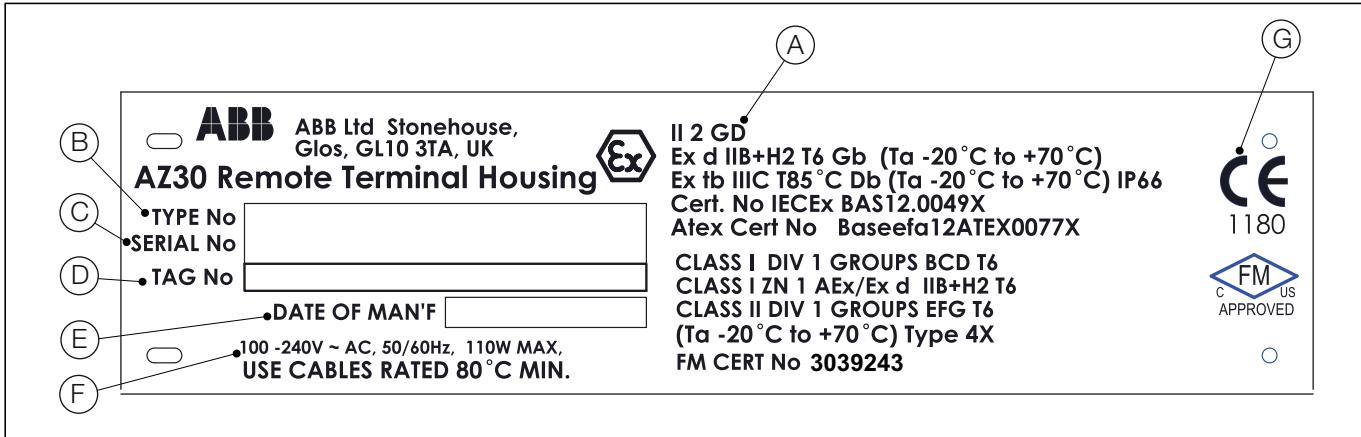


Fig. 4.4 Remote Terminal Housing Label

#### 4.4.4 Commissioning Label

Commissioning Label (see Fig. 4.5) contains the cell number (A), date (B), cell zero (C) and the calibration factor value (D) required to calibrate the probe for the zirconia cell fitted – refer to Programming Guide COI/AZ30E-EN, section 7 for calibration procedures.

The factory-supplied Commissioning Label also indicates that restrictors are fitted (mandatory for hazardous area certification) and if automatic calibration has been fitted.

**Caution.** To comply with certification, probes must be fitted and operated with flow restrictors. Do not use the probe unless the Commissioning Label shows that restrictors are fitted.

If a new cell is fitted a new Commissioning Label is supplied with the new cell. This new label must be placed over the old Commissioning Label and the 'Restrictors Fitted' / 'Yes' box must then be ticked by the customer.

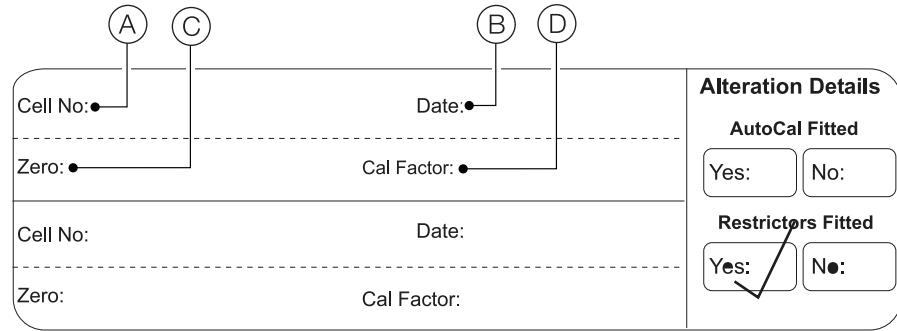


Fig. 4.5 Commissioning Label

**Note.** If AutoCal is fitted retrospectively the 'AutoCal Fitted' / 'Yes' box must be ticked. Some information on the new label may override some of the product code on the Probe / Transmitter Labels.

## 4.5 Pneumatic Connections

**Warning.** Certification may be invalidated and damage to the solenoids may occur if the applied pressure on any probe input exceeds 1.72 bar (25 psi) during operational service.

### Caution.

- Do not use the probe in hazardous areas unless restrictors are fitted. Use of probes without restrictors in these areas invalidates / compromises certification.
- Ensure the instructions for the pneumatic connections are followed accurately – an incorrect configuration at the probe can cause errors and / or permanent damage.
- **All configurations** – do not use gas mixers online to supply test gases to the probe(s) unless it can be confirmed that errors are not introduced by the 1 bar (15 psi)  $\pm 12\%$  delivery pressures required to operate the probe(s).
- **Probes with restrictors** – the reference air and test gas flow is regulated by the restrictors installed in the probe. The restrictors require a set pressure of 1 bar (15 psi)  $\pm 12\%$  to deliver the correct flows. Because the gases are delivered as a pressure at the probe it is permissible to use parallel pipework for multiple-probe installations.
- Where instrument air is supplied to the probe it must be clean, oil-free and filtered through the recommended ABB oil-coalescing filter-regulator – part number AZ200 731 (1/4 NPT 5  $\mu\text{m}$ ) or AZ200 732 (1/4 BSP 5  $\mu\text{m}$ ).

### 4.5.1 Pneumatic Connection Configurations

Refer to the pneumatic configuration flowchart (Fig. 4.6) below to identify which system configuration is the closest match for your components and then refer to the relevant figure in Section 4.5.2 or 4.5.3, page 14 for pneumatic settings.

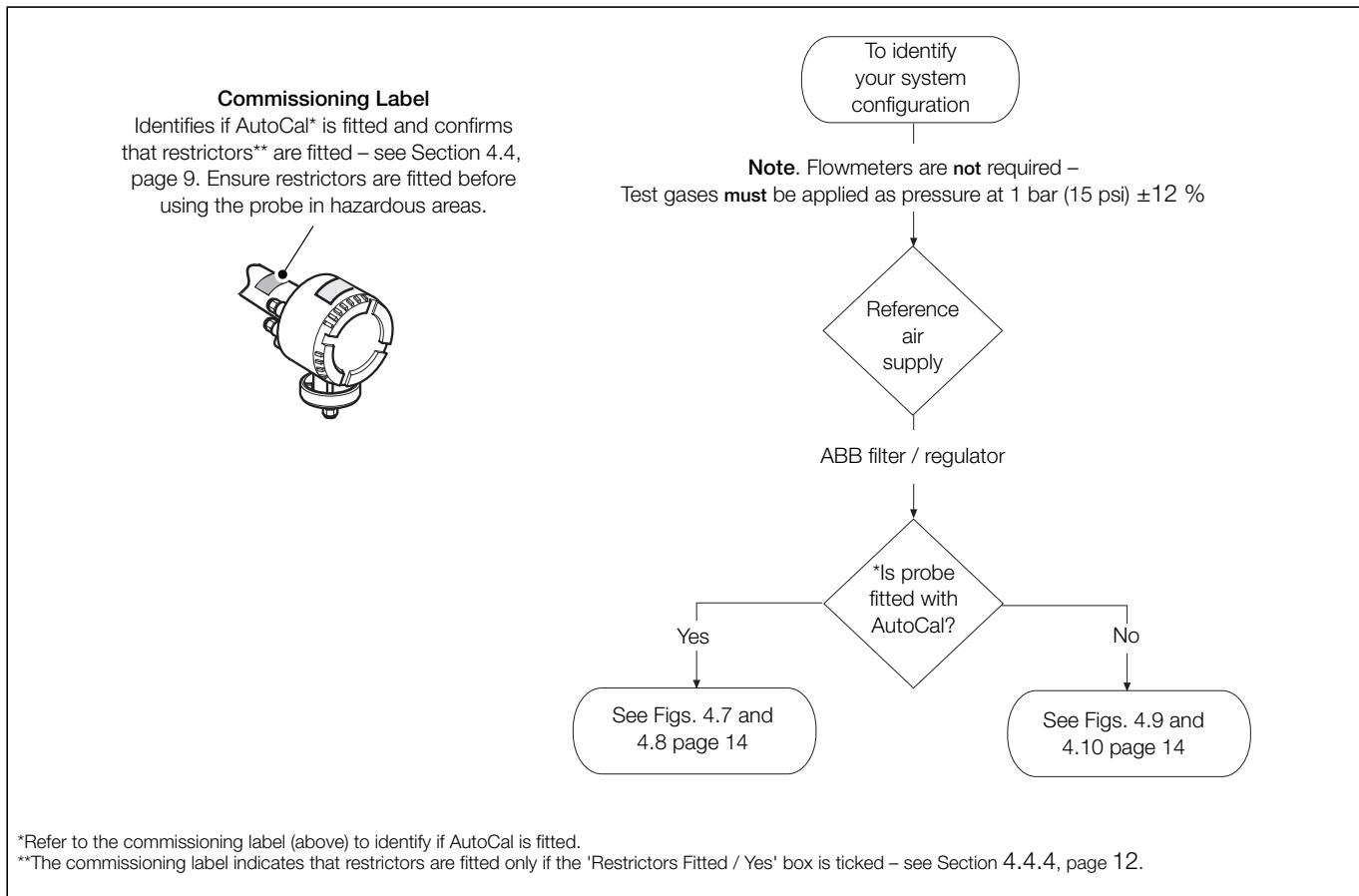


Fig. 4.6 Pneumatic Connection Configurations

**4.5.2 Test Gas and Reference Air Supply Configurations – Automatic Calibration (AutoCal) Systems**

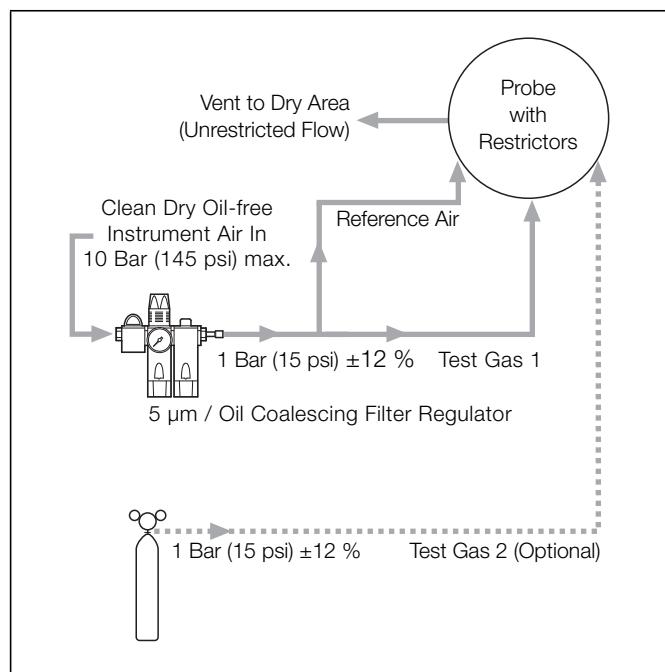


Fig. 4.7 AutoCal with Air as Test Gas 1

**4.5.3 Test Gas and Reference Air Supply Configurations – Non-automatic Calibration (Non-AutoCal) Systems**

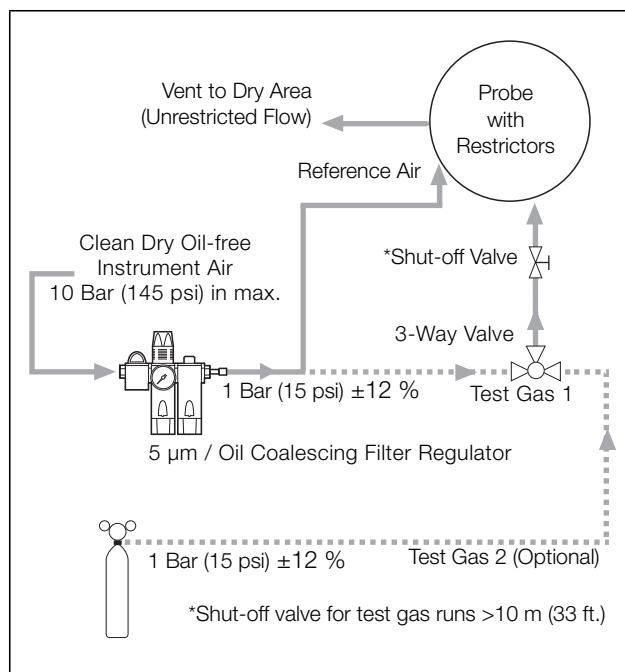


Fig. 4.9 Non-AutoCal with Air as Test Gas 1

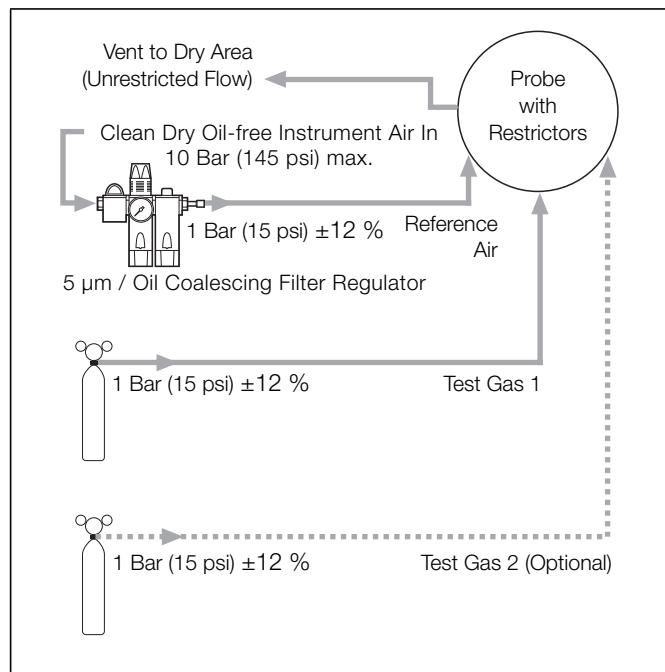


Fig. 4.8 AutoCal with 2 Test Gases

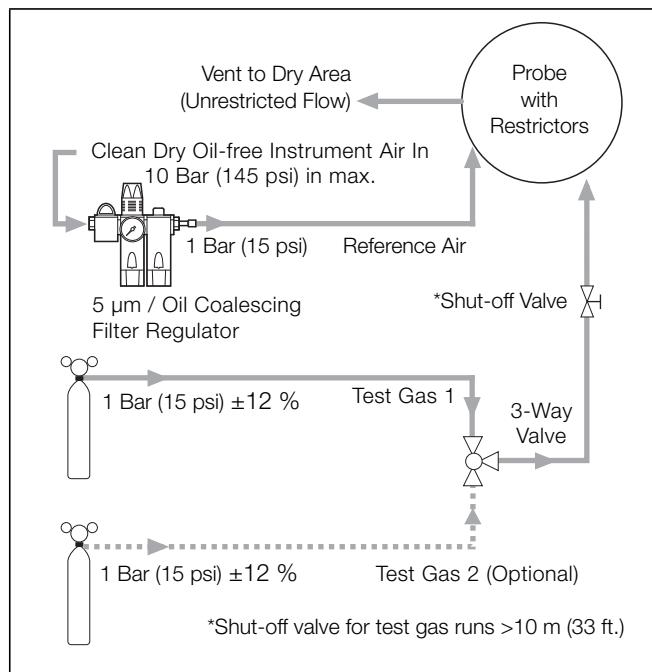


Fig. 4.10 Non-AutoCal with 2 Test Gases

## 4.6 Siting

Avoid locations where:

- obstructions or bends create turbulence in the gas flow and / or hinder probe insertion and removal
- excessive vibration induced by other plant or vortex shedding is present
- the probe may be subject to shock loading, for example, close to ash hammers
- there are dusty atmospheres – clean periodically to prevent build-up (for dust certification)

If excessive abrasive dust is present, fit a protective shield along the whole length of the inserted probe section.

If liquid condensation is present or could be created (for example a cold start on a gas boiler), mount the probe at a downward angle to prevent water entering the cell.

If necessary, thermally lag the probe mounting flange to prevent acid dew-point corrosion and to maintain the probe head temperature within the range of -20 to 70 °C (4 to 176 °F).

### 4.6.1 Probe with Integral Transmitter

**Caution.** Refer to Section 5.2, page 23 for barrier gland requirements.

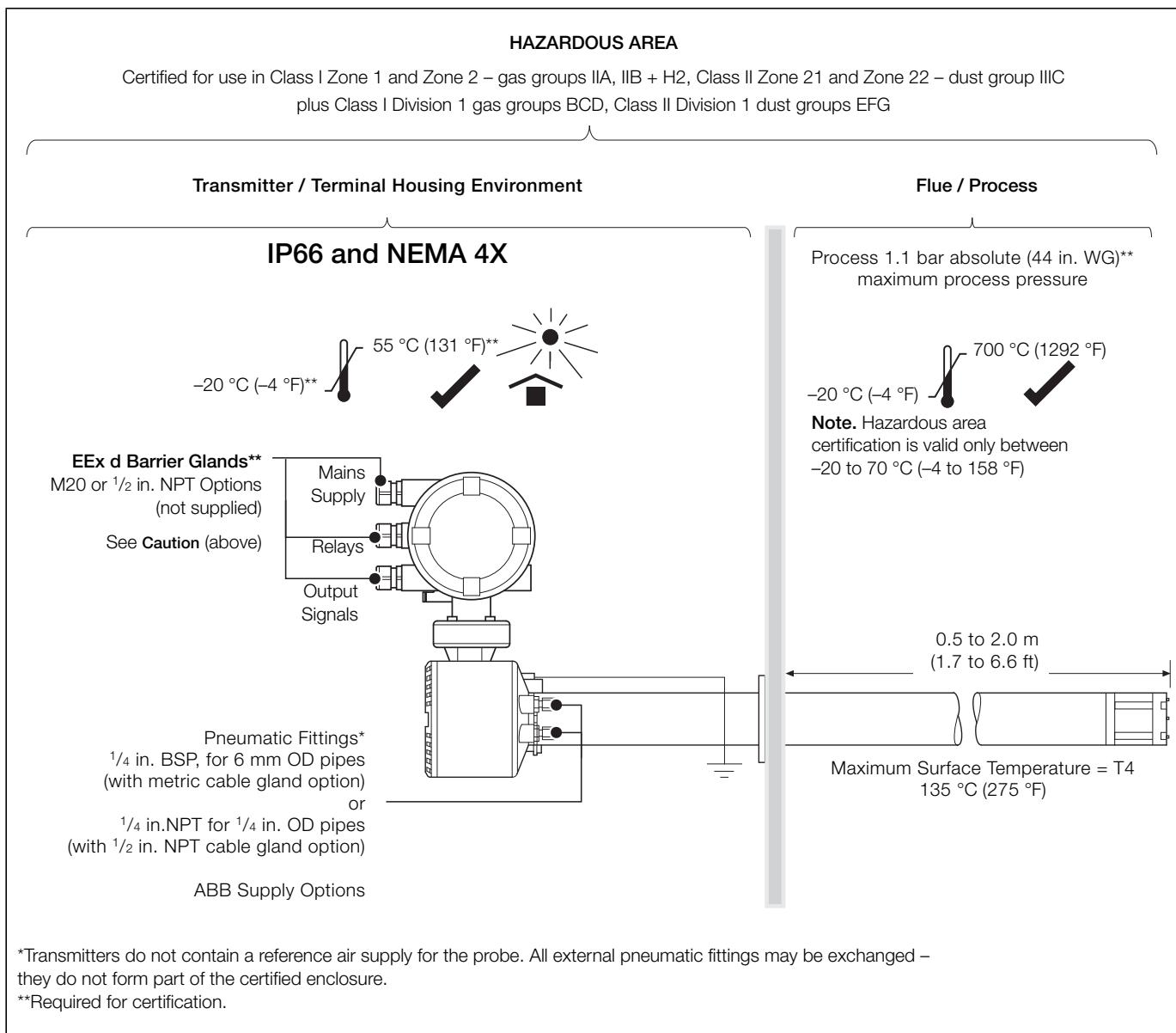


Fig. 4.11 Schematic – Probe with Integral Transmitter In Situ

#### 4.6.2 Probe with Remote Transmitter

**Caution.** Refer to Section 5.2, page 23 for cable entry and barrier gland requirements.

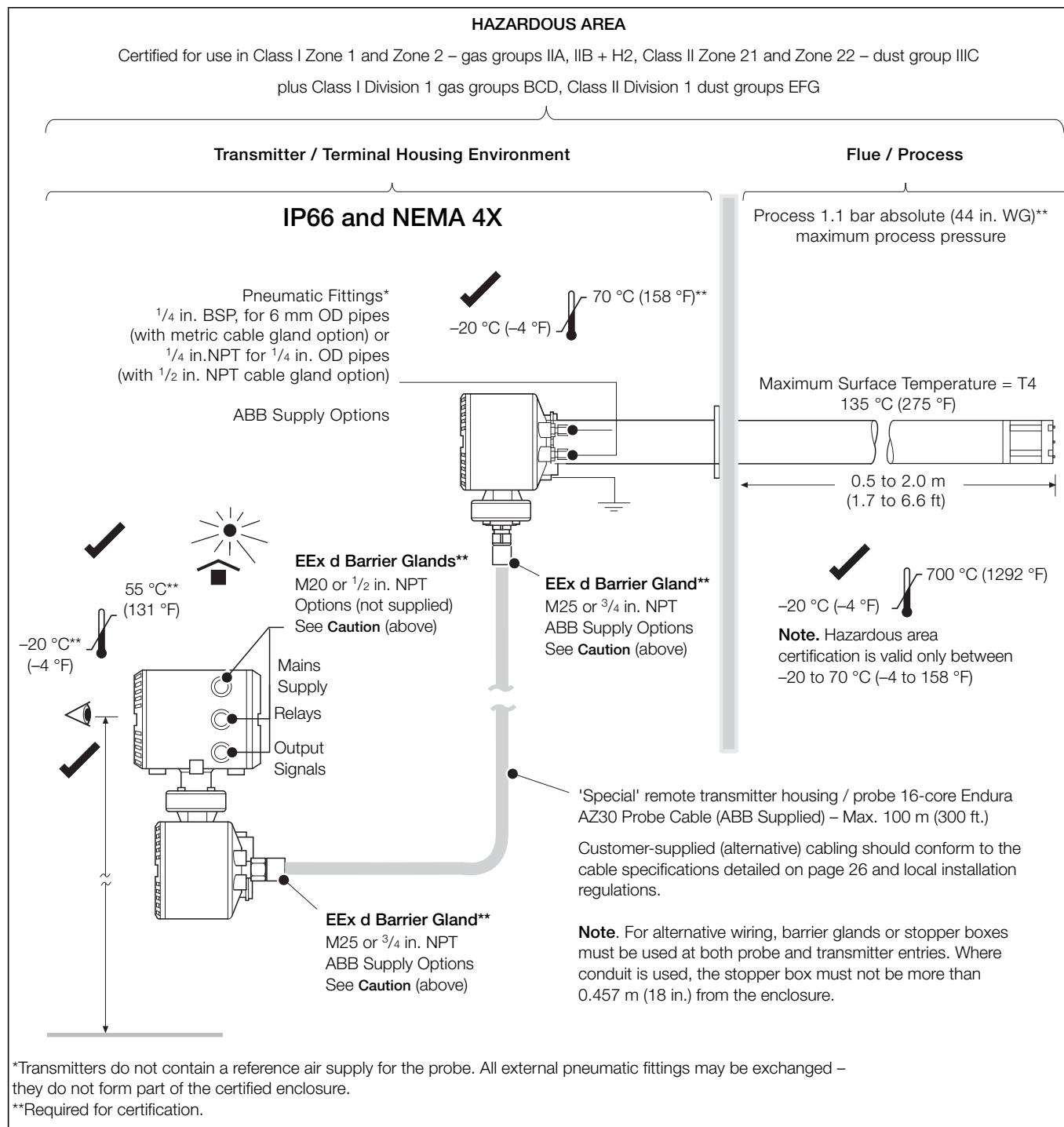


Fig. 4.12 Schematic – Probe with Remote Transmitter / Terminal Housing In Situ

## 4.7 Overall Dimensions

### 4.7.1 Remote Endura AZ30 Probe

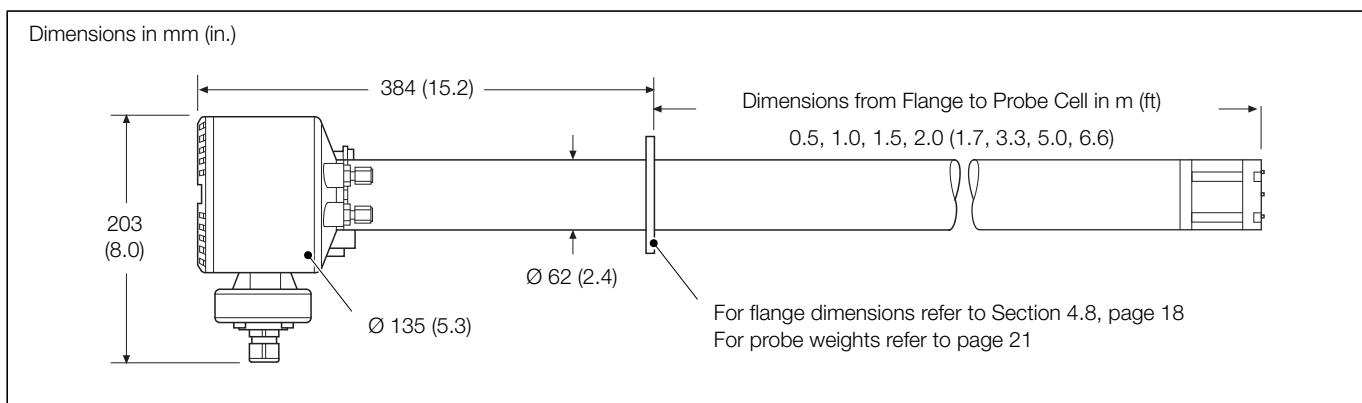


Fig. 4.13 Overall Dimensions – Remote Endura AZ30 Probe

### 4.7.2 Integral Endura AZ30 Probe

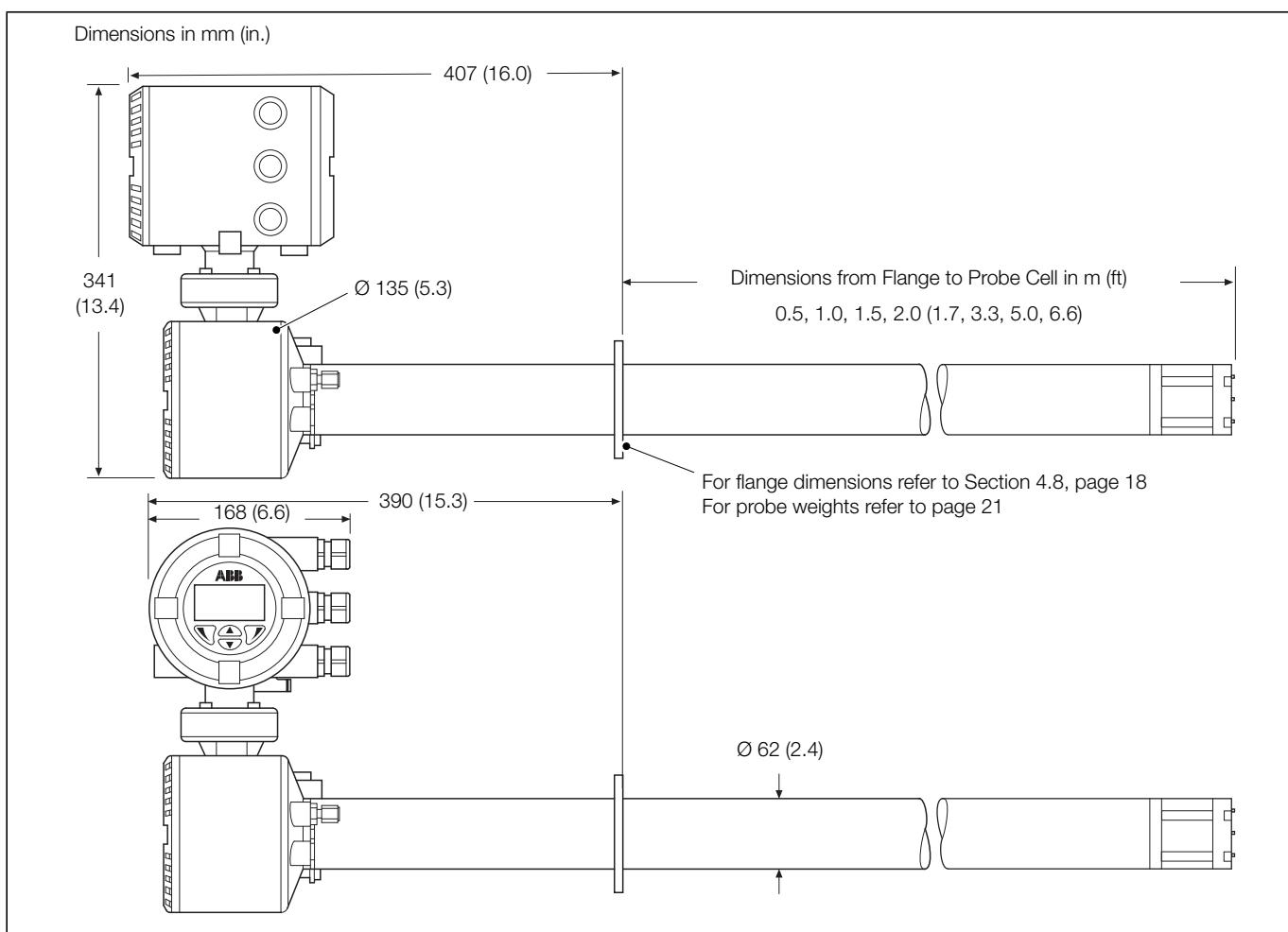


Fig. 4.14 Overall Dimensions – Integral Endura AZ30 Probe

## 4.8 Endura AZ30 Probe Flanges – All Probe Lengths

**Note.** These flanges are not pressure rated.

Dimensions in mm (in).

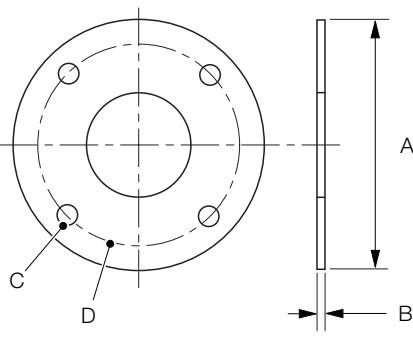
Flange Type	A	B	C (Ø)	D (PCD)	4-Hole Flanges
ANSI 2 in 150	152.4 (6.00)	12 (0.47)	19 (0.75)	120.6 (4.75)	
ANSI 2.5 in 150	177.8 (7.00)	12 (0.47)	19 (0.75)	139.7 (5.50)	
ANSI 3 in 150	190.5 (7.50)	12 (0.47)	19 (0.75)	152.4 (6.00)	
DIN 65 PN16	185 (7.28)	12 (0.47)	18 (0.70)	145 (5.70)	
JIS 65 5K	155 (6.10)	12 (0.47)	15 (0.59)	130 (5.12)	
JIS 80 5K	180 (7.08)	12 (0.47)	19 (0.75)	145 (5.71)	

Table 4.1 4-Hole Probe Flange Types and Dimensions

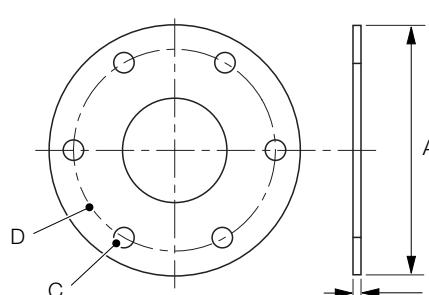
Flange Type	A	B	C (Ø)	D (PCD)	6-Hole Flanges
ABB Standard (0.5 m [1.64 ft.] probes only)	101 (3.97)	6 (0.24)	7.3 (0.29)	80 (3.15)	
ABB Standard	165 (6.50)	12 (0.47)	12.5 (0.50)	140 (5.51)	

Table 4.2 6-Hole Probe Flange Types and Dimensions

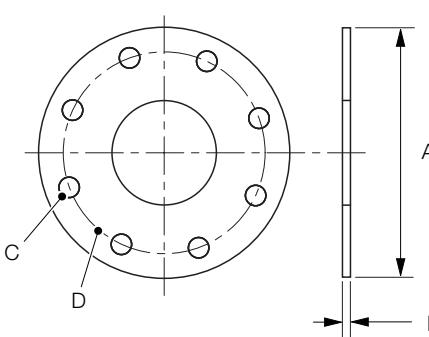
Flange Type	A	B	C (Ø)	D (PCD)	8-Hole Flanges
ANSI 4 in 150	228.6 (9.0)	12 (0.47)	19 (0.75)	190.5 (7.50)	
DIN 80 PN16	200 (7.87)	12 (0.47)	18 (0.70)	160 (6.30)	
DIN 100 PN16	220 (8.66)	12 (0.47)	18 (0.70)	180 (7.08)	
JIS 100 5K	200 (7.87)	12 (0.47)	19 (0.75)	165 (6.50)	

Table 4.3 8-Hole Probe Flange Types and Dimensions

#### 4.9 Mounting Plates for ABB Standard Flanges

In addition to the probe flange, the probe can be supplied with a mounting plate assembly for use with ABB Standard flanges (see Table 4.2, page 18) if specified.

**Note.** A mounting plate is required if there is no existing mounting on the flue or boiler.

##### 4.9.1 0.5 m (1.7 ft) Probe – Part No. AZ200 796

The 0.5 m (1.7 ft) probe mounting plate comprises the following items:

- probe mounting plate
- probe mounting gasket
- 6 x M6 shakeproof washers
- 6 x M6 plain washers
- 6 x M6 nuts

Dimensions in mm (in.)

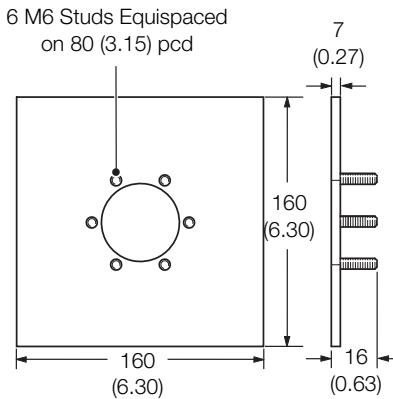


Fig. 4.15 Standard Mounting Plate – 0.5 m (1.7 ft) Probe

##### 4.9.2 1.0 to 2.0 m (3.3 to 6.6 ft) Probes – Part No. AZ200 795

The 1.0 to 2.0 m (3.3 to 6.6 ft) probe mounting plates comprise the following items:

- probe mounting plate
- probe mounting gasket
- 6 x M10 shakeproof washers
- 6 x M10 plain washers
- 6 x M10 nuts

Dimensions in mm (in.)

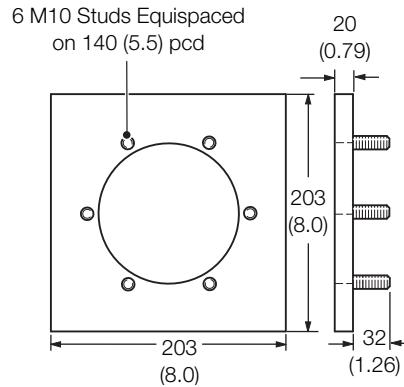


Fig. 4.16 Standard Mounting Plate –  
1.0 to 2.0 m (3.3 to 6.6 ft) Probes

##### 4.9.3 Long Probe to 0.5 m (1.7 ft) Probe Adaptor Plate – Part No. AZ200 794

The Long Probe to 0.5 m (1.7 ft) Probe Adaptor Plate comprises the following items:

- probe mounting plate
- probe adaptor gasket
- probe mounting gasket
- 6 x M6x16 hexagon-head steel screws
- 6 x M6 shakeproof washers

Dimensions in mm (in.)

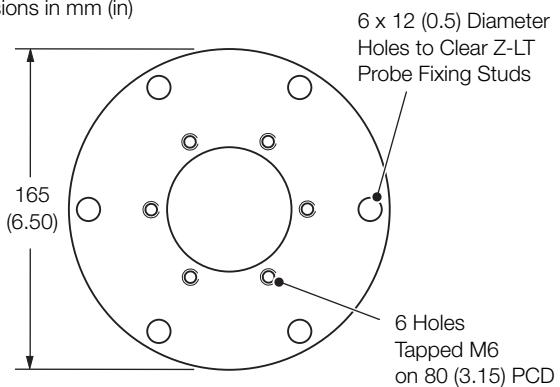


Fig. 4.17 Long Probe to 0.5 m (1.7 ft) Probes Adaptor Plate

## 4.10 Mounting

**Note.** Mount integral probes with the transmitter at the top of the probe head. Mount remote probes with the conduit at the bottom of the probe head.

### 4.10.1 Probe

To mount the probe (all sizes):

1. Cut a 120 mm (4.72 in) diameter hole in the flue wall (A).
2. Either:
  - a. weld the mounting plate (B) into place, concentric with the hole in the flue  
**or**
  - b. drill and bolt the plate to the flue
3. Fit the probe gasket (C) and insert the probe into the flue.
4. Secure the probe and gasket using nuts and washers (D) as follows:
  - a. 0.5 m (1.7 ft) probe – 6 x M6 nuts and washers
  - b. 1.0 to 2.0 m (3.3 to 6.6 ft) probe – 6 x M10 nuts and washers

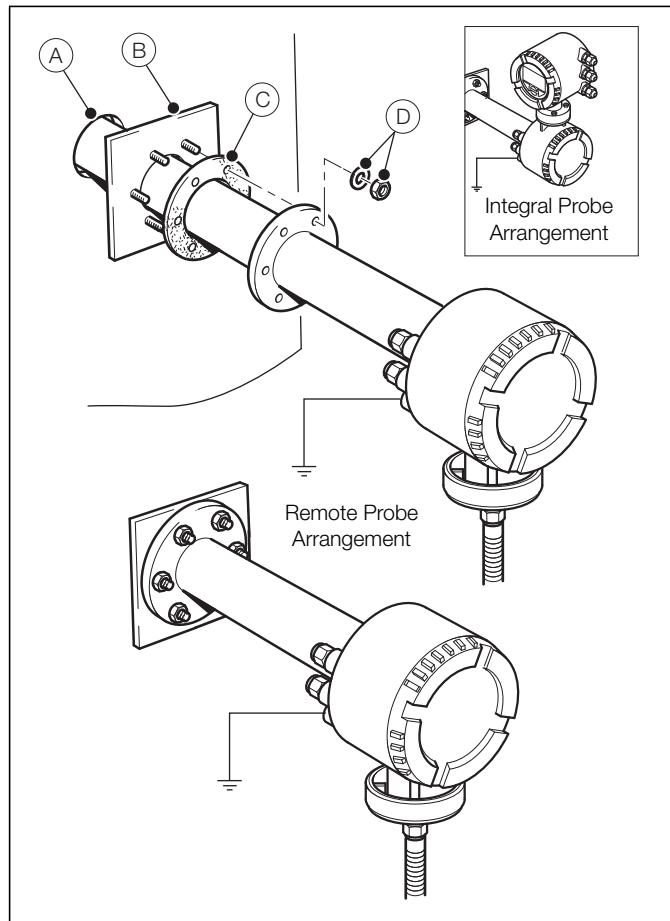


Fig. 4.18 Mounting the Probe

### 4.10.2 0.5 m (1.64 ft) Probe to Large Probe Adapter Plate Mounting

**Note.** The following procedure enables a 0.5 m (1.7 ft) probe to be fitted into a large probe (1.0 to 2.0 m [3.3 to 6.6 ft]) ABB Standard flange hole.

1. Locate the adapter gasket (A) on the existing mounting plate.
2. Locate the adapter plate (B) on the gasket.
3. Secure the gasket and plate with 6 x M10 nuts and washers (C).
4. Fit the probe gasket (D) over the probe end. Insert the probe into the flue.
5. Secure the probe and gasket using 6 x M6 screws and washers (E).

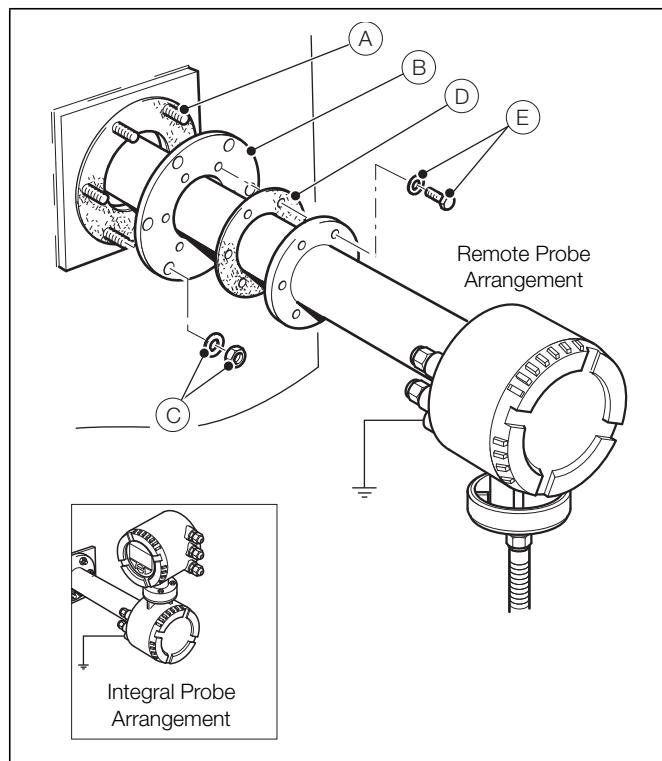


Fig. 4.19 Adaptor Plate Mounting –  
0.5 m (1.7 ft) Probe to Large Probe

#### 4.11 End of Life Disposal

Both the integral and remote transmitters contain a small lithium battery that must be disposed of responsibly in accordance with local environmental regulations.

The remainder of the equipment does not contain any substance that causes undue harm to the environment and must be disposed of in accordance with the Directive on Waste Electrical and Electronic Equipment (WEEE). It **must not** be disposed of in Municipal Waste Collection.

#### 4.12 Endura AZ30 Probe and Transmitter Weights (Unpacked and Packed)

Length m (ft.)	Unpacked – kg (lb)	Packed – kg (lb)
0.5 (1.7)	9.82 (21.65)	15.02 (33.11)
1.0 (3.3)	12.94 (28.53)	19.54 (43.08)
1.5 (5.0)	15.96 (35.18)	24.16 (53.26)
2.0 (6.6)	19.18 (42.28)	28.68 (63.23)

Table 4.4 Endura AZ30 Probe Only (Excludes Transmitter)

Length m (ft.)	Unpacked – kg (lb)	Packed – kg (lb)
0.5 (1.7)	13.32 (29.36)	18.54 (40.87)
1.0 (3.3)	16.44 (36.24)	23.07 (50.86)
1.5 (5.0)	17.0 (42.90)	27.86 (61.42)
2.0 (6.6)	19.3 (49.78)	31.63 (69.73)

Table 4.5 Integral Endura AZ30 Probe

Unpacked – kg (lb)	Packed – kg (lb)
9.5 (20.94)	12.5 (27.55)

Table 4.6 Endura AZ30 Remote Transmitter / Terminal Housing

## 5 Connections

### 5.1 Electrical Safety

#### Warning.

- The transmitter is not fitted with a switch therefore a disconnecting device such as a switch or circuit breaker conforming to local safety standards must be fitted to the final installation. It must be fitted in close proximity to the instrument within easy reach of the operator and must be marked clearly as the disconnection device for the transmitter – see Programming Guide COI/AZ30E-EN.
- The probe **must** be bonded to local earth via the external earth connection – see Fig. 5.1.
- Electrical installation and earthing (grounding) must be in accordance with relevant national and local standards.
- Remove all power from supply, relay and any powered control circuits and high common mode voltages before accessing or making any connections.
- The Endura AZ30 (ABB) cable carries the screened signal wires and the separately screened 90 to 264 V AC heater control wires safely.
- The equipment conforms to Installation Category II of IEC 61010.
- All connections to secondary circuits must have basic insulation.
- After installation, there must be no access to live parts, for example, terminals.
- Terminals for external circuits are for use only with equipment with no accessible live parts.
- If the equipment is used in a manner not specified by the Company, the protection provided by the equipment may be impaired.
- All equipment connected to the transmitter's terminals must comply with local safety standards (IEC 60950, EN601010-1).
- The probe is supplied with voltages up to full mains supply levels from the transmitter. The power supply to the transmitter must be isolated from the mains before the probe lid is removed.

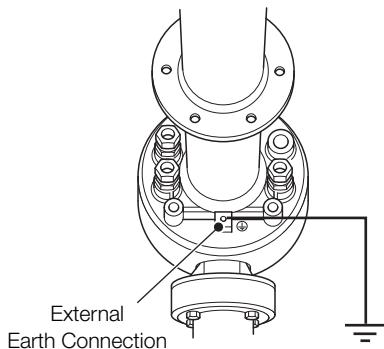


Fig. 5.1 External Earth Connection from Probe

#### Caution.

- Make connections only as shown.
- Maintain Environmental Protection at all times.
- Ensure the seal and mating surfaces are clean to maintain environmental rating.
- Ensure cable glands are tightened after wiring. Do not overtighten cable glands to avoid destroying their sealing properties. Initially, tighten finger-tight, then a further  $1/2$  to  $3/4$  turn using a suitable spanner or wrench.
- Fit blanking plugs where required.
- Inductive loads must be suppressed or clamped to limit voltage swings.
- Operation of outputs is programmable.

## 5.2 Cable Entry and Barrier Gland Requirements

### Note. Glands

Glands – when fitting glands, follow the gland manufacturer's instructions. If conduit and stopper boxes are used, the stopper boxes must not be more than 0.457 m (18 in.) from the enclosures.

### 5.2.1 Cable Entry Selection

Refer to the cable entry selection flowchart (Fig. 5.2) and Table 5.1 below to ensure the correct cable entry devices are used.

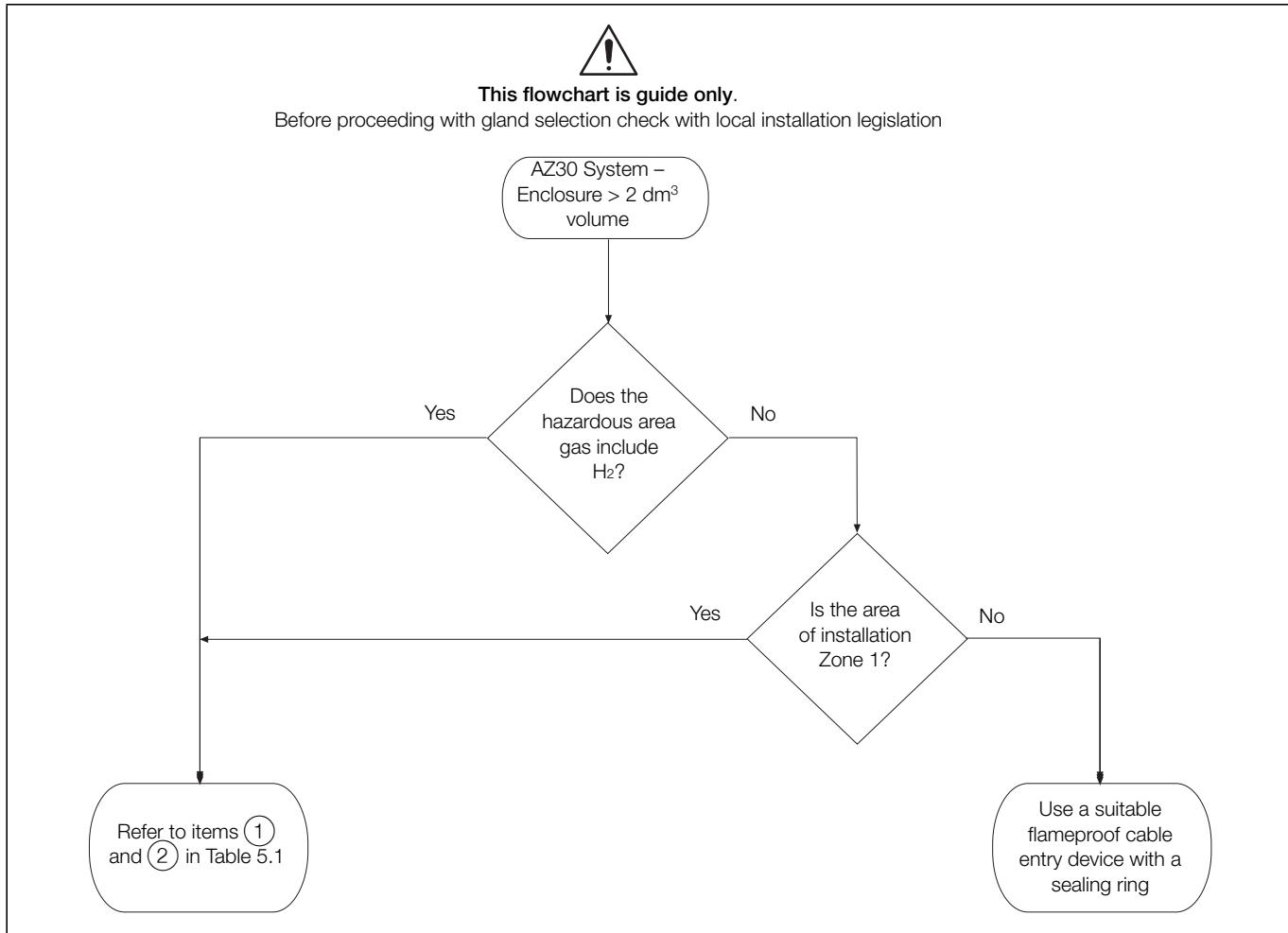


Fig. 5.2 Cable Entry Selection Flowchart

Item	Requirements for Cable Entry Devices
①	A flameproof sealing device (for example, a stopping box or sealing chamber) specified in the appropriate documentation, or having component approval and employing cable entry devices appropriate to the cables used. The sealing devices such as stopping boxes or sealing chambers shall incorporate compound or other appropriate seals that permit stopping around individual cores. Sealing devices shall be fitted at the point of entry of cables to the apparatus.
②	Flameproof cable entry devices incorporating compound filled seals around the individual cores or other equivalent sealing arrangements – refer to Section 5.2.2, page 24 for barrier gland requirements.

Table 5.1 Cable Entry Selection Requirements for Hazardous Areas

### 5.2.2 M25 (or 3/4 in. NPT) Probe Gland Options

If the optional ABB-supplied barrier glands are not used, any M25 or 3/4 in. NPT cable glands selected must be of the barrier type, approved for use in hazardous areas and certified suitable for use in Zone 1 and Zone 2 Gas groups IIA, IIB + H2, Zone 21, Zone 22 Dust groups IIIC and / or Class I Division 1 Gas groups BCD, Class II Division 1 Dust groups EFG.

- The M25 (or 3/4 in. NPT) barrier cable gland must be suitable for use with the ABB 'special' 16-core cable if ordered with the AZ30 system or for any alternative cable to our specifications – see Fig. 5.3, page 25.
- The M25 (or 3/4 in. NPT) barrier cable gland must provide a standard seal for non-armored cable – refer to cable specifications in Section 5.4, page 26.
- An alternative to barrier glands is the use of stopper boxes where local regulations permit.

### 5.2.3 Mains, Relay and Output Signals Glands – M20 (or 1/2 in. NPT)

The M20 (or 1/2 in. NPT) cable glands used on the transmitter must be of the EEx d barrier type, approved for use in hazardous areas and certified suitable for use in Zone 1 and Zone 2 Gas groups IIA, IIB + H2, Zone 21, Zone 22 Dust groups IIIC and / or Class I Division 1 Gas groups BCD, Class II Division 1 Dust groups EFG.

## 5.3 Probe Cable Preparation

### 5.3.1 Preparing the Standard ABB Probe Cable

**Warning.** The Endura AZ30 probe cable carries the screened signal wires and separately-screened 90 to 264 V AC heater control wires safely.

- If alternative cables are used, the cable sizes and insulation specifications must be adhered to and the 90 to 264 V AC heater wires must be screened separately to prevent interference to the signal cables – see Section 5.4, page 26 for cable requirements.
- If non-standard ABB signal cables are not contained in a suitable metallic conduit, they must be screened separately to prevent external interference.

**Caution.** The following instructions are applicable **only** to probe cable fitted with barrier-type cable glands at both ends of the probe cable – see Section 5.2, page 23 for probe cable barrier gland requirements. Prepare the probe cable before fitting the barrier glands.

Referring to Fig. 5.3, page 25:

1. Expose both the signal and screen wires by cutting the outer insulation sheath and screen foil. Splay the 12 signal cables, then cut the inner (heater) insulation sheath and screen foil back to leave all 14 cables stripped back to leave 300 mm (12 in.) tails:
2. At both ends of the probe cable, twist the 2 screen wires (◎) together to form one twisted pair at each end and fit an earth sleeve (not supplied) over each twisted pair.  
In all terminals, leave 7 mm (0.25 in.) of each twisted pair exposed for connection at the terminal plugs.
3. Prepare the signal and heater wire ends for connection at the terminal plug(s) by cutting sleeves back to expose 7 mm (0.25 in.) of bare wire.
4. **Important** – on non-AutoCal probes, do not cut the AutoCal wires back to the outer insulation sheath. Instead, bundle them together at both the transmitter and probe end to allow an (optional) AutoCal upgrade to be performed using the existing cable.

AutoCal wires comprise:

- White / Yellow – PS2
- White / Black – PS Common
- White / Orange – PS1
- White / Green – SV1
- White / Red – SV Common
- White / Blue – SV2

5. Proceed to Section 5.4, page 26 to make probe cable connections between the remote transmitter terminal housing and the probe.

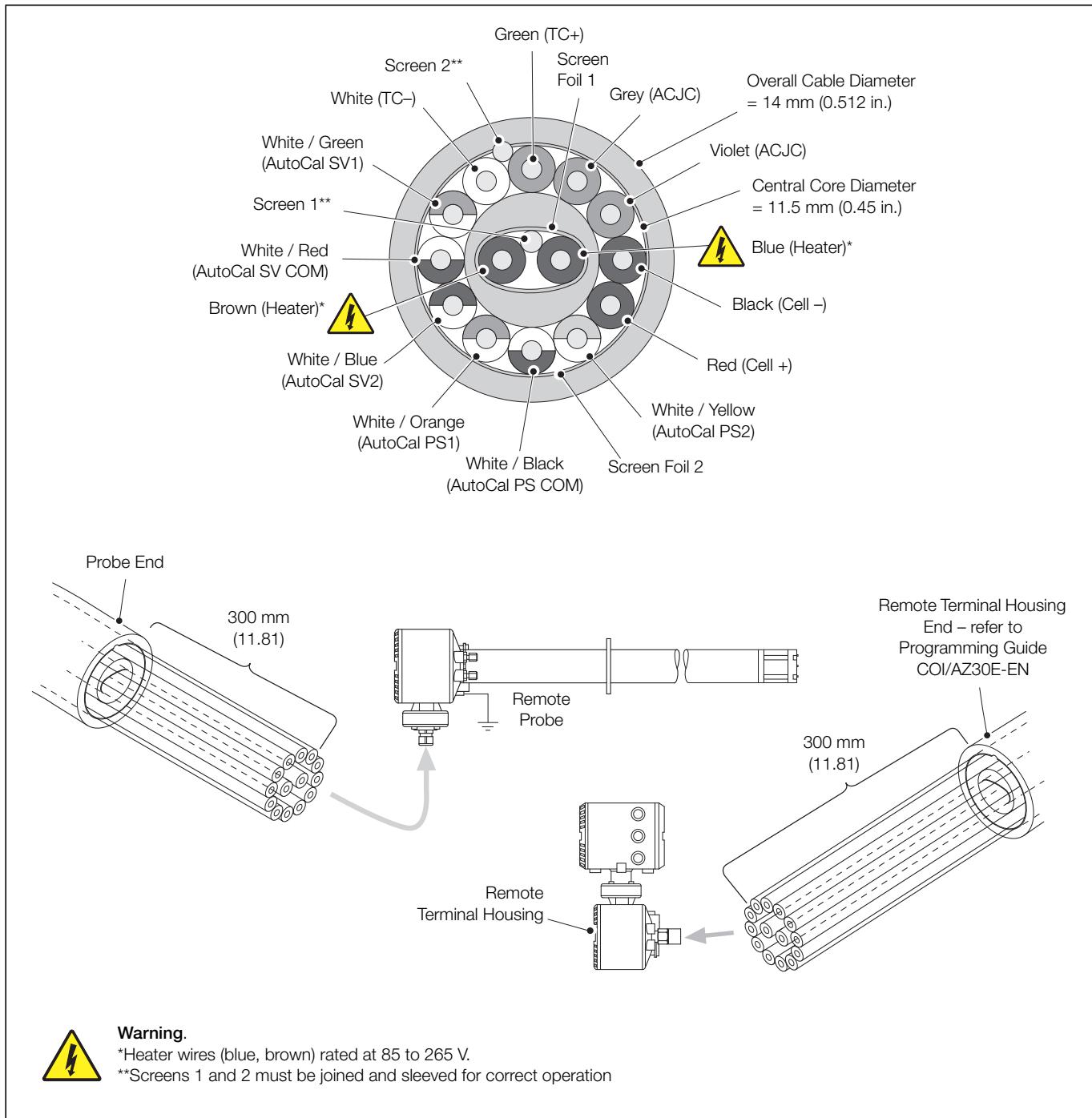


Fig. 5.3 Preparing the (ABB) Probe Cable

## 5.4 Probe Cable Connections / Remote Transmitter Terminal Housing to Probe

### 5.4.1 Standard ABB Cable Specifications

Tx wire ident number	Terminal label color	(Position) Terminal block connection	Cable color	Cable requirements*
Separately screened heater supply				
1	Blue	(1) Heater	Blue	0.75 mm <sup>2</sup>
2	Brown	(2) Heater	Brown	0.75 mm <sup>2</sup>
Heater screen / drain				
0.5 mm <sup>2</sup>				
Separately screened signal cables				
Chassis earth	Green / Yellow (SCN)	(3) Screen (twisted pair / sleeved)	Screens (Yellow / Green)	0.5 mm <sup>2</sup>
4	White	(4) Thermocouple (negative)	White	0.5 mm <sup>2</sup>
5	Green	(5) Thermocouple (positive)	Green	0.5 mm <sup>2</sup>
6	Green / Yellow	(6) Oxygen input (negative)	Black	0.5 mm <sup>2</sup>
7	Red	(7) Oxygen input (positive)	Red	0.5 mm <sup>2</sup>
8	Grey	(8) PT1000 Cold Junction Compensation	Grey	0.5 mm <sup>2</sup>
9	Violet	(9) PT1000 Cold Junction Compensation	Violet	0.5 mm <sup>2</sup>
10	White / Yellow	(10) Pressure Switch / Gas 2	White / Yellow	0.5 mm <sup>2</sup>
11	White / Black	(11) Pressure Switch / Common	White / Black	0.5 mm <sup>2</sup>
12	White / Orange	(12) Pressure Switch / Gas 1	White / Orange	0.5 mm <sup>2</sup>
13	White / Green	(13) Solenoid Valve / Gas 1	White / Green	0.5 mm <sup>2</sup>
14	White / Red	(14) Solenoid Valve / Common	White / Red	0.5 mm <sup>2</sup>
15	White / Blue	(15) Solenoid Valve / Gas 2	White / Blue	0.5 mm <sup>2</sup>
Signal cables screen				
0.5 mm <sup>2</sup>				

#### \*Requirements for non-ABB supplied cable / conduit

- **Screens and drains:**  
Heater wires must be sleeved separately from the screened signal cables.
- **Heater cores (items 1 and 2) and heater drain**  
Heater cores: 0.75 mm<sup>2</sup>, 24/0.2 CU wire, resistance (20C) 26 Ω/km max.  
Heater drain: 0.5 mm<sup>2</sup>, 16/0.2 CU wire, resistance (20C) 39 Ω/km max.
- **Signal cores (items 3, 15) and signal drain**  
Signal cores / signal drain: 0.5 mm<sup>2</sup>, 16/0.2 CU wire, resistance (20C) 39 Ω/km max.
- **Voltage rating**  
300 V to earth  
500 V between cores
- **Cable (non-ABB supply) operating temperature requirements**  
-20 °C (-4 °F) min.; 80 °C (176 °F) max.
- **Cable conduit (non-ABB supply)**  
Stainless-steel (for alternative wiring, barrier glands or stopper boxes must be used at both probe and transmitter entries).  
Where conduit is used, the stopper box must not be more than 0.457 m (18 in.) from the enclosure.

#### 5.4.2 Standard ABB Probe Cable Connections

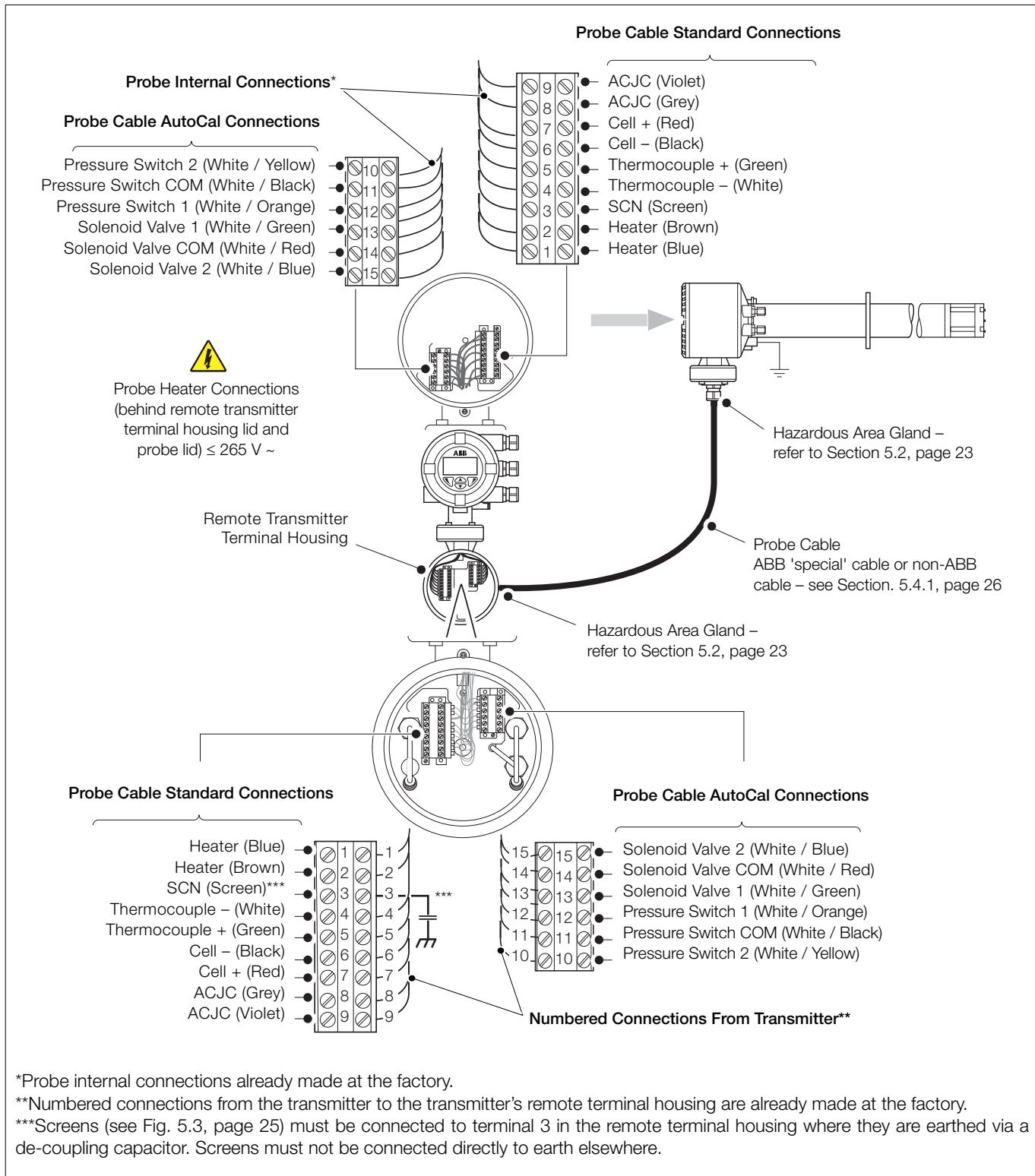


Fig. 5.4 Probe Cable Connections – Remote Transmitter Terminal Housing to Probe

#### 5.4.3 Making Standard ABB Probe Cable Connections at the Remote Probe

##### Notes.

- When fitting **glands**, follow the gland manufacturers' instructions. If conduit and stopper boxes are used, the stopper boxes must not be more than 0.457 m (18 in.) from the enclosures.
- Non-AutoCal probes are not fitted with the 6-way AutoCal terminal block or pressure switch / solenoid valve block.
- For probes fitted with AutoCal, make standard connections (steps 1 to 5), then AutoCal connections as detailed in Section 5.4.4, page 29.
- For non-AutoCal probes, retain the unused AutoCal wires to allow for a future upgrade – see Table 5.3 for AutoCal wire colors.

Referring to Fig. 5.5:

- Unscrew and remove the probe lid (A).
- Trim cable to length according to requirements.
- Pass probe cable and gland (B) through probe entry at (C) taking care not to disturb the existing wiring (D).
- Remove terminal plug (E) from probe terminal block (F).
- Make terminal plug connections as shown in Table 5.2:

Terminal / Cable Color	No.	Tag ID	Tx Connection
Violet	9	ACJC	Pt1000 Cold Junction Compensation
Grey	8	ACJC	Pt1000 Cold Junction Compensation
Red	7	Cell +	Oxygen Input (+ve)
Black	6	Cell -	Oxygen Input (-ve)
Green	5	TC+	Thermocouple (+ve)
White	4	TC -	Thermocouple (-ve)
Light Yellow (Sleeved Screens)	3	SCN	Screens 1 and 2 (Screens 1 and 2 must be connected for correct operation)
Brown	2	H	Heater
Blue	1	H	Heater

Table 5.2 Probe Cable Connections

- Carefully connect terminal plug (E) into probe terminal block (F) taking care not to disturb the existing wiring (D).
- For probes fitted with AutoCal, proceed to Section 5.4.4, page 29.
- For probes without AutoCal, tighten cable gland (C).
- Refit the probe lid (A) and tighten hand-tight.
- Refer to Programming Guide COI/AZ30E-EN for connections at the remote transmitter terminal housing.

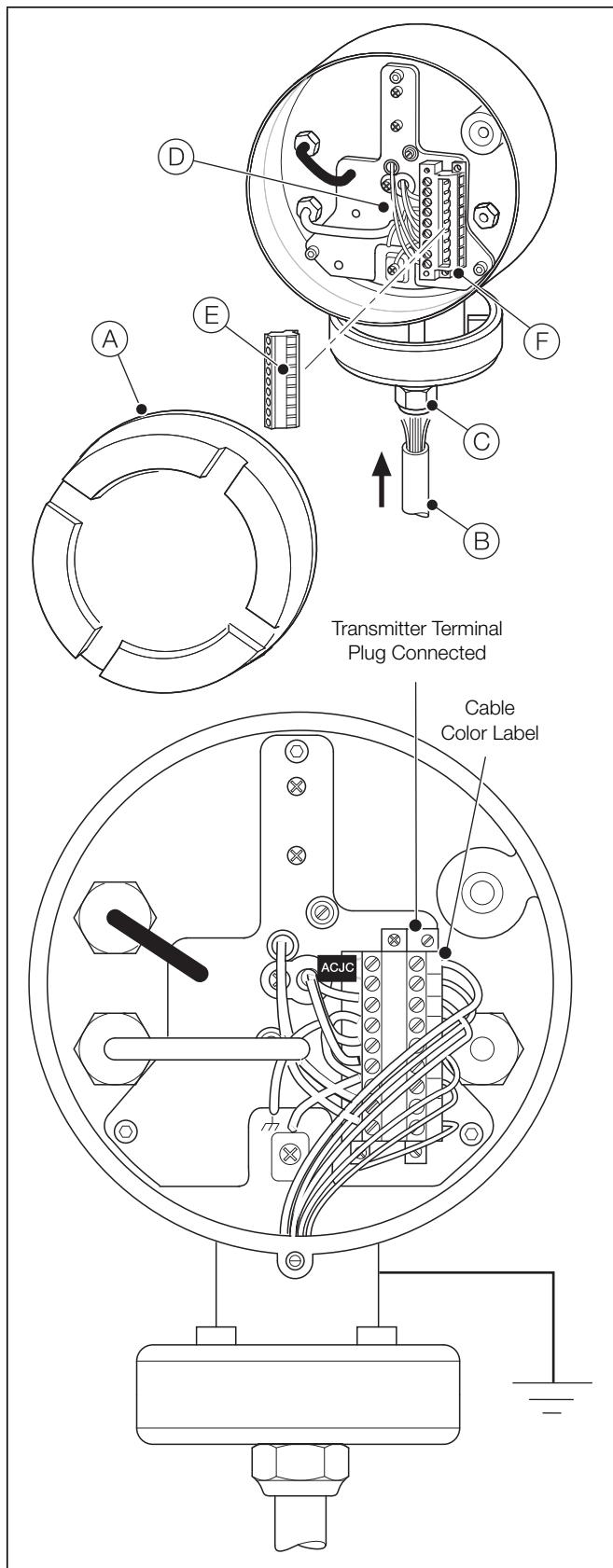


Fig. 5.5 Endura AZ30 Probe Cable Connections

#### 5.4.4 Making AutoCal Connections at the Remote Probe

1. Make standard connections – see section 5.4.3, page 28, steps 1 to 6.

Referring to Fig. 5.6:

2. Remove terminal plug (A) from probe terminal block (B) taking care not to disturb the existing wiring (C).
3. Trim cables to length according to requirements.
4. Make AutoCal terminal plug connections as shown in Table 5.3:

Terminal / Cable Color	No.	Tag ID	AutoCal Connection
White / Yellow	10	PS2	Pressure Switch Gas 2
White / Black	11	PS COM	Pressure Switch Common
White / Orange	12	PS1	Pressure Switch Gas 1
White / Green	13	SV1	Solenoid Valve Gas 1
White / Red	14	SV COM	Solenoid Valve Common
White / Blue	15	SV2	Solenoid Valve Gas 2

Table 5.3 AutoCal Connections at Probe

5. Carefully plug the terminal plug (A) into probe terminal block (B) taking care not to disturb the existing wiring (C).
6. Tighten cable gland (D).
7. Refit the probe lid (E) and tighten hand-tight.
8. Refer to Programming Guide COI/AZ30E-EN for connections at the remote transmitter terminal housing.

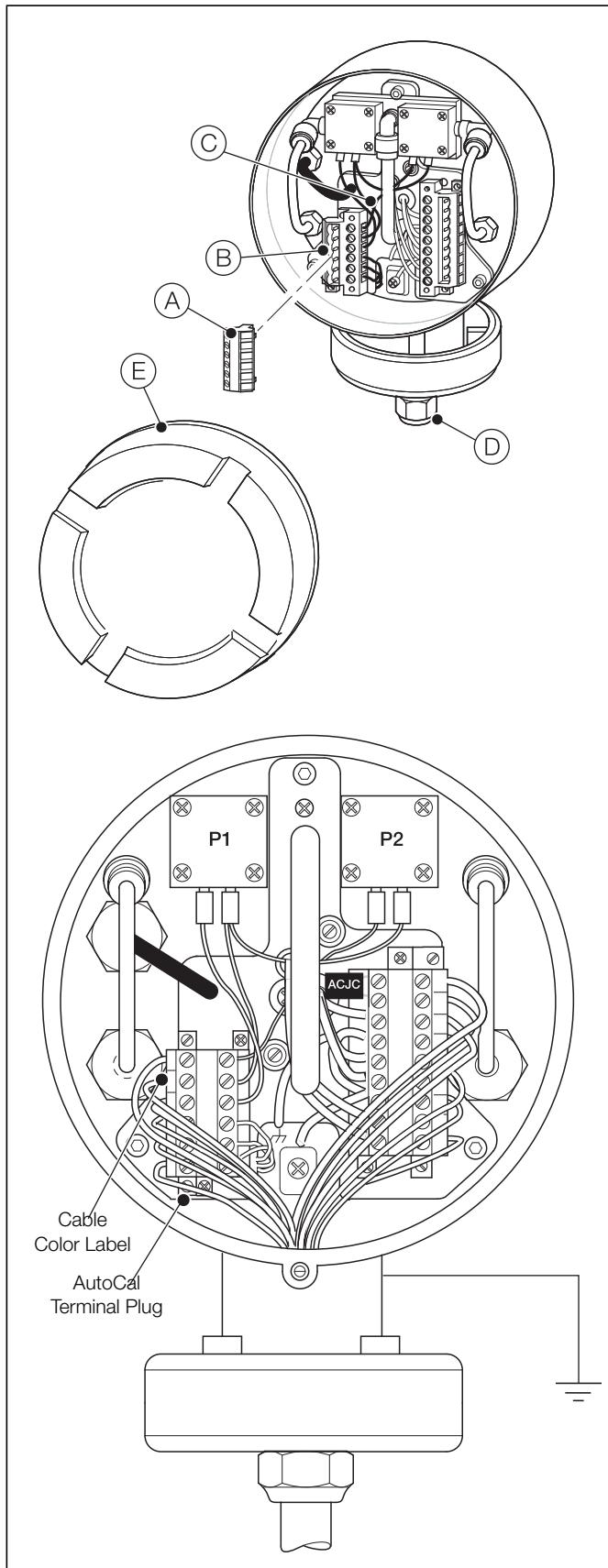


Fig. 5.6 AutoCal Connections at Endura AZ30 Probe

## 5.5 Gas and Air Connections

Two test gas inlets, one reference air inlet and one vent inlet are located on the probe head. An external earth (bonding) point is also provided.

**Caution.** Only use clean dry oil-free instrument air,\* or traceable certified bottled test gas mixtures of O<sub>2</sub> / N<sub>2</sub>.

### 5.5.1 Restrictors

AZ30 systems are factory fitted with restrictors – refer to Section 4.5, page 14 for schematics of all configuration options.

- on all systems, set pressures to 1 bar (15 psi)  $\pm 12\% = 2.2$  l / min (0.58 US gal / min)

**Caution.** Ensure pressures never exceed 1.72 bar (25 psi). Certification may be invalidated and damage to the solenoids may occur if the applied pressure on any probe input exceeds 25 psi (1.72 bar) during operational service.

### 5.5.2 Connection Types

**Note.** Connection types comprise:

- 1/4 NPT female threaded entry supplied with 1/4 in OD compression fitting  
or
- 1/4 BSP female threaded entry supplied with 6 mm OD compression fitting

### 5.5.3 Orientation of External Connections

Fig. 5.7 shows the 2 orientations for test gas, reference air and the vent.

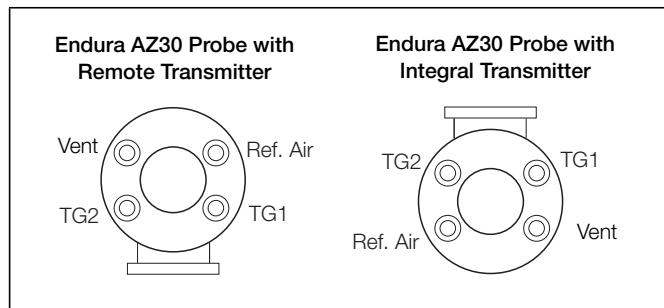


Fig. 5.7 Integral and Remote Endura AZ30 Probe Gas and Air Connections

\*ABB recommend our 5 µm / Oil Coalescing Filter Regulator – see Appendix C, page 39.

### 5.5.4 Test Gas Inlets

Two test (calibration) gas inlets are provided for in situ AutoCal probe testing using a test gas.

If AutoCal is not fitted, Test Gas 1 connection is used for Test Gases 1 and 2. The gas connections are switched manually, as requested by the calibration sequencing in the transmitter.

**Note.** Test gas connection to non-AutoCal transmitters is made to the external TG1 connection only. TG2 connection is blanked-off permanently.

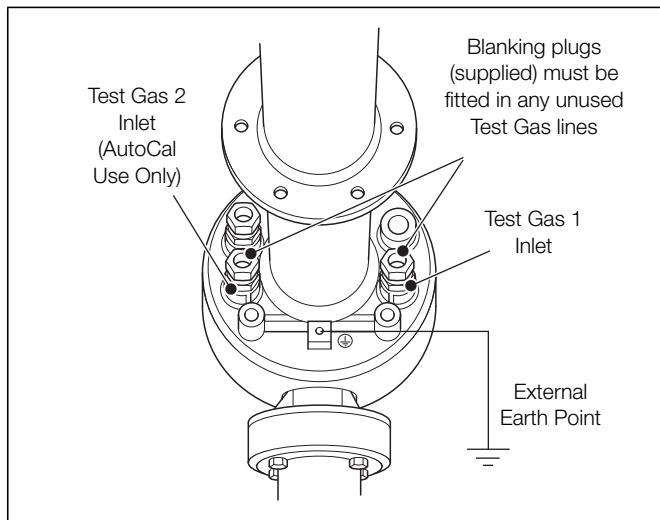


Fig. 5.8 Test Gas Connections –  
Endura AZ30 Probe with Remote Transmitter Shown

If the probe is connected permanently to the test gas supply pipework:

- on non-AutoCal systems, the test gas connection should not be sealed when not in use (air leaking into the probe via the connection causes measurement errors; in a pressurized flue, gases venting to atmosphere through the connection causes corrosion of, and / or blocks, the test gas tube; in a negative pressure flue, air leakage causes high O<sub>2</sub> reading errors).
- fit a high quality, corrosion-resistant (stainless steel), solenoid valve, manually operated valve or non-return valve (that is leaktight even at zero back-pressure) in the pipework, as close to the test gas inlet valve as possible.
- keep the valve closed when the calibration system is not in use.

**Note.** It is preferable to use air (20.95 % O<sub>2</sub>) as one of the test gases as this is the sensor's zero point. Alternative representative gases can be used according to local environmental conditions.

To ensure better accuracy, use 2 test gases that represent the top and bottom limits of the known operating range.

Due to resolution accuracies, do not calibrate the system with gases of less than 1 % O<sub>2</sub>.

### 5.5.5 Vent

The vent allows the reference air to escape to atmosphere. If the vent is likely to be exposed to moisture, connect a large-bore tube to the vent and route to a dry area.

Ensure that the vent, or the vent tube, does not become blocked during probe use as this may cause pressurization to greater than 1.1 bar absolute (44 in. WG) that would invalidate certification.

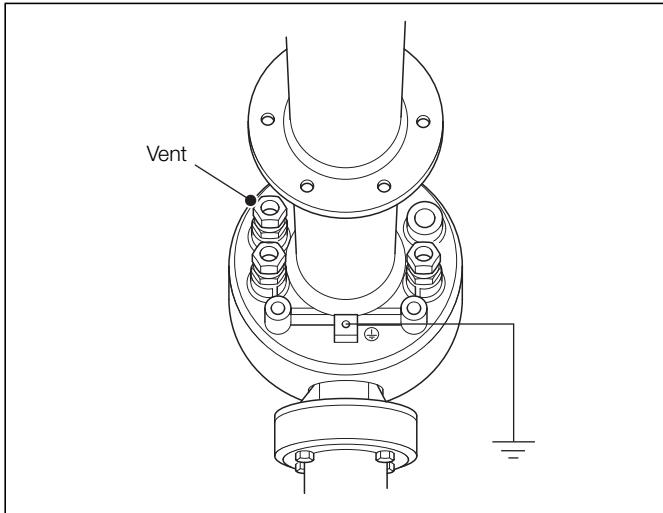


Fig. 5.9 Vent

### 5.5.6 Reference Air Inlet

A clean, dry, oil-free air supply at 1 bar (15 psi)  $\pm 12\%$  is required, from (for example) a filter-regulator – see Appendix C, page 39.

Connect the reference air tubing to the external reference air inlet – see Fig. 5.10.

#### Note.

- The reference air supply must be to instrument air standards – clean, dry and free of oil vapor and particle contamination; see schematics on page 14.
- ABB recommend using the ABB 5  $\mu\text{m}$  / oil-coalescing filter-regulator to supply reference air – see Appendix C, page 39.

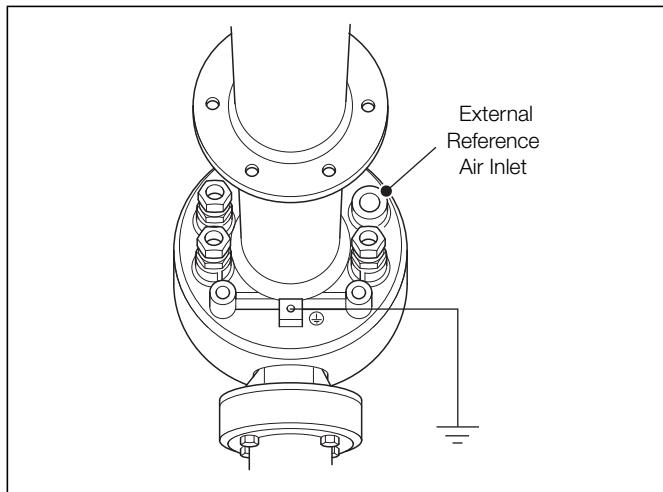


Fig. 5.10 Reference Air Inlet

### 5.5.7 Internal Test Gas and Reference Air Tubes

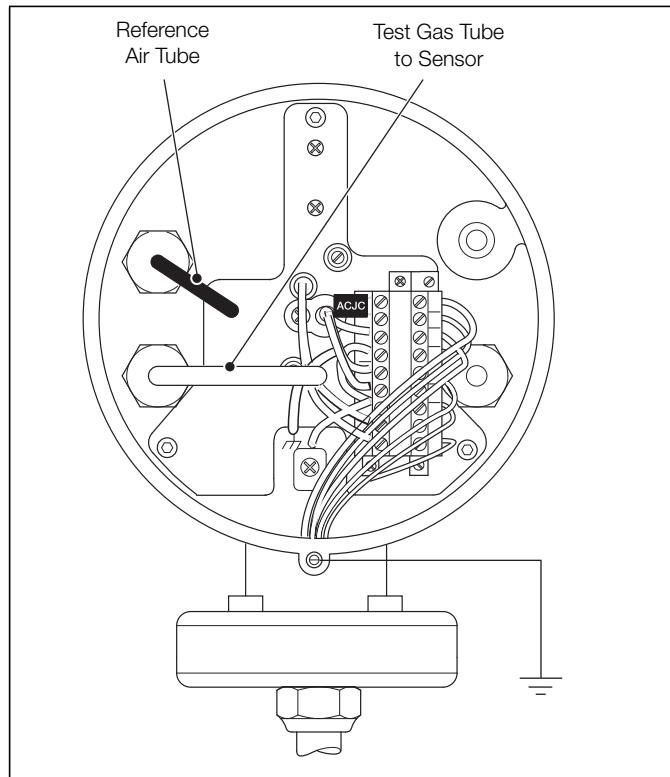


Fig. 5.11 Internal Test Gas and Reference Air Tubes –  
Non-AutoCal

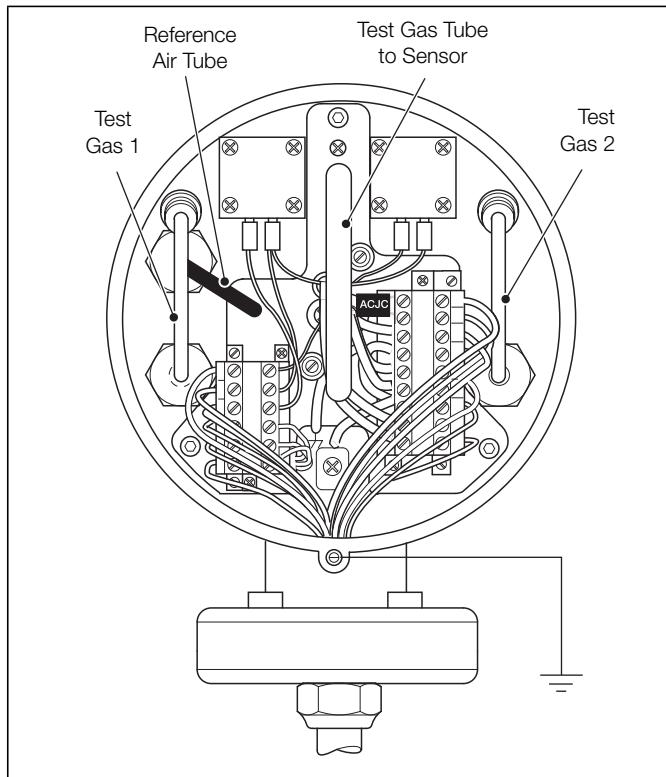


Fig. 5.12 Internal Test Gas and Reference Air Tubes –  
AutoCal Fitted

## 6 Start-up and Operation

### 6.1 Preparation

1. If the probe is not connected permanently to test gas pipework for automatic calibration purposes, ensure blanking plugs are securely fitted to the test gas inlet connections on the probe.
2. If the probe is connected permanently to test gas pipework for automatic calibration purposes, ensure that the valve installed in the pipework adjacent to the test gas connection is closed.

**Caution.** If the test gas connection is not sealed when not in use, air leaking into the probe via the connection causes measurement errors. In a pressurized flue, gases venting to atmosphere through the connection cause corrosion of, and / or block, the test gas tube. In a negative pressure flue, air leakage causes high O<sub>2</sub> reading errors.

3. Check the connections on both the probe and the transmitter.

Test gas connections must be checked for leaktight joints. Leaks, especially on permanently pressurized AutoCal-fitted probes, can cause errors and drain away expensive bottles of test gas.

4. Adjust the reference air pressure to 1 bar (15 psi)  $\pm 12\%$ .
  - for Test Gas connection arrangements refer to Section 4.5.2, page 14.
5. Set the test gas pressure to 1 bar (15 psi)  $\pm 12\%$  – see Section 6.2.

### 6.2 Setting Up Test Gases

This section prepares the system for manual and automatic calibration routines by setting up the test gas flows and pressures to suit different AutoCal / restrictor configurations:

- refer to Section 4.5, page 13 for test gas and reference air supply configurations.
- connections at the probe are the same for remote and integral transmitters.

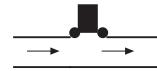
**Note.** The following sections assume the transmitter and probe are energized, the reference air supply is on and test gases are available.

#### 6.2.1 AutoCal System

To set up an AutoCal system:

1. Turn on Test Gas 1 and set the pressure to a nominal 1 bar (15 psi).
2. At the transmitter, check the *Calibrate / AutoCal Hardware / Hardware Type* parameter is set to *Internal*.
3. At the transmitter, open the *Test Gas 1* valve by selecting: *Calibrate / AutoCal Hardware / Valve Manual Control / Test Gas 1* and pressing  to open the valve.

A small icon is displayed to indicate the valve is in the *Open* position:



Valve icon  
Open position



Valve icon  
Closed position

4. Fine tune Test Gas 1 pressure to 1 bar (15 psi)  $\pm 12\%$ .
5. Turn gas off at the transmitter by pressing , then turn Test Gas 1 off at the supply.
6. Repeat steps 2 to 6 for Test Gas 2 (if present).
7. Refer to Programming Guide COI/AZ30E-EN to perform a calibration when required.

**Note.** Only perform a final system calibration after the probe has been thermally stable for 2 hours.

#### 6.2.2 Non-AutoCal System

To set up a Non-AutoCal system:

1. Make test gas and reference air connections as detailed in Section 4.5.1, page 13 (remote or integral transmitter).
2. Turn on Test Gas 1 and adjust the pressure to 1 bar (15 psi).
3. Turn Test Gas 1 off at the supply.
4. Repeat steps 2 to 4 for Test Gas 2 (if present), connect the Test Gas 2 line to the probe's external TG1 connection.
5. Refer to Programming Guide COI/AZ30E-EN to perform a calibration when required.

**Note.** Test Gas 1 and 2 connections are made to the probe's external Test Gas 1 (TG1) connection and must be switched manually – see section 4.5, page 13.

## 7 Endura AZ30 Probe Specification

### Hazardous area certifications

#### Probe

Ex II 2 GD

Ex d IIB +H<sub>2</sub> T4 Gb Ta -20°C to 70°C

Ex tb IIIC T135°C Db Ta -20°C to +70°C IP66

Cert. No IECEx BAS12.0048X

Atex Cert No. Baseefa12ATEX0076X

Class I Division 1 Groups BCD T4

Class I Zone 1 AEx/Ex d IIB+H<sub>2</sub> T4

Class II Division 1 Groups EFG T4

(Ta -20 °C to +70 °C) Type 4X

Max Working Pressure 1.1bar absolute

FM Certificate No. 3039243

### General Safety

Conforms to EN61010-1: 2001

### Approvals

CE mark

cFMus

ATEX

### Physical

#### Probe insertion lengths

0.5 m (1.7 ft.)

1.0 m (3.3 ft.)

1.5 m (5.0 ft.)

2.0 m (6.6 ft.)

#### Process connection

All probe lengths:

ANSI B16.5 150 lb

2, 2.5, 3, 4 in

DIN2501 Part 1

65, 80, 100 mm

JIS B2238 5K

(flange pressure ratings do not apply)

0.5 m (1.7 ft.) probes ABB standard small flange

1.0 m (3.3 ft.) and longer ABB standard large flange

#### Probe body material

316 Stainless steel

#### Mounting angle

Horizontal to vertically down

#### Threaded entries

Gland entry (certified):

probe cable gland entry: 1 x M25 or 3/4 in. NPT  
(remote probe only)

Pneumatic entries (not certified):

4 fittings supplied with AutoCal options or 3 fittings and 1  
blanking plug supplied with non-AutoCal options.

Size options: 1/4 in BSP for 6 mm OD pipe (with M20 cable gland  
option) or 1/4 NPT for 1/4 in OD pipe (with 1/2 NPT option)

### Process Conditions

#### Standard process temperature

All probe lengths

-20 to 700 °C (-4 to 1292 °F)

#### Process

This probe is certified for use in non oxygen-enriched atmospheres, 0 to 20.95 % air only and a maximum pressure of 1.1 bar absolute (44 in. WG).

### Operating requirements

#### Reference air (clean dry instrument air free from oil)

Regulated supply 1 bar (15 psi) ±12 %\*  
(flowmeters not required as probes are fitted with restrictors)

#### Test gases (regulated to 1 bar (15 psi) ±12 %\*)

User-selectable, 20.95 to 0.1 % O<sub>2</sub> balance N<sub>2</sub> and / or air  
(air is recommended as one of the test gases)

#### Calibration

Manual, semi-automatic or automatic  
(controlled by Endura AZ30 transmitter)

### Automatic calibration

#### AutoCal hardware

Optional built-in solenoid valves for control of test gas flow  
Built-in pressure switches to detect presence of test gases

### Heater Operational Requirements

#### Endura AZ30 Probe Heater

Nominally 190 Ω, 70 W at 115 V AC – power is limited to 70 W max.  
by Endura AZ30 transmitter over a 100 to 240 V AC ±10 % (90 V min.  
264 V max.) 50 / 60 Hz range.

DS/AZ30-EN Rev. A

## Appendix A – Principle of Operation

The Endura AZ30 probe's zirconia cell is a thimble-shaped sensing element fitted with inner and outer electrodes at its closed end. The inner electrode is exposed to the flue gas entering the open end of the cell; the outer electrode is supplied with reference air from a pump or regulator and is therefore exposed to a constant partial pressure of oxygen (20.95 % O<sub>2</sub>). The cell is held at a constant 700°C (1292 °F) by a heater and control thermocouple.

Because zirconia is an electrolyte that conducts only oxygen ions at temperatures in excess of 600 °C (1112 °F), the voltage generated between the electrodes (the cell output) is a function of the ratio of the oxygen partial pressure difference between the reference electrode and the measuring electrode and its temperature. Therefore, any change in the oxygen partial pressure of the flue gas at the exposed electrode produces a change in the cell output voltage as dictated by the Nernst equation.

Cell output voltage increases logarithmically with decreasing oxygen, thus providing high sensitivity at low oxygen levels.

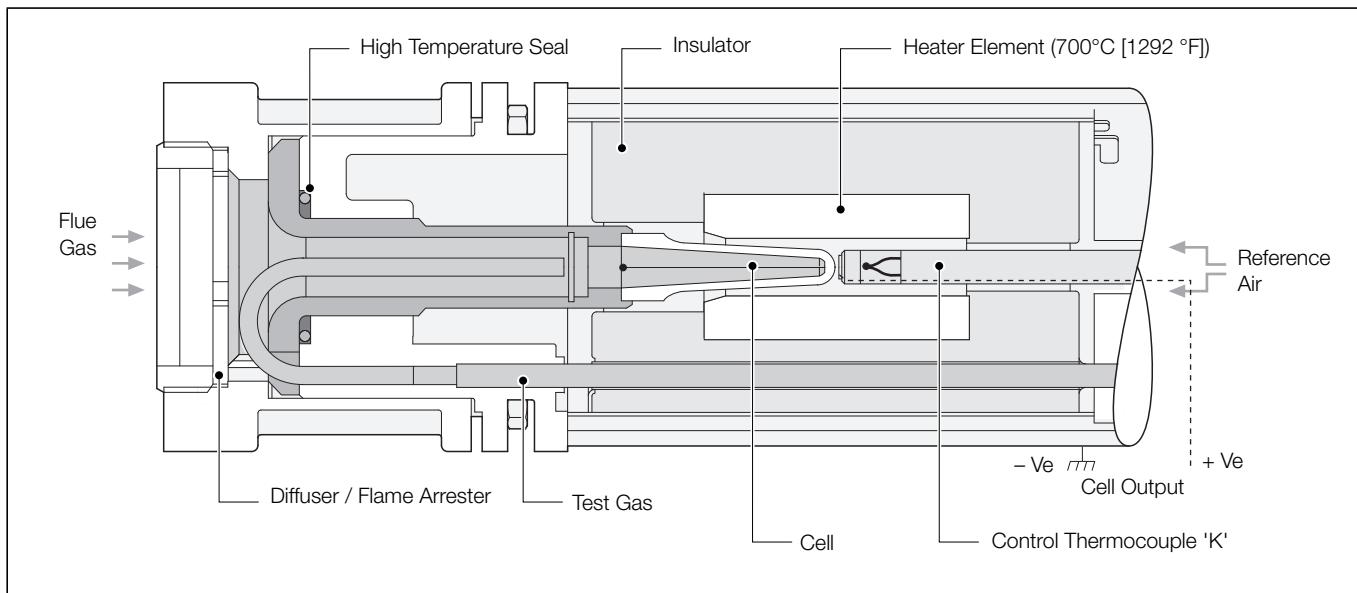


Fig. A.1 Endura AZ30 Probe Construction

## Appendix B – EC Declaration of Conformity



### EC Declaration of Conformity

We, **ABB Limited**

Of, **Oldends Lane  
Stonehouse  
Gloucestershire  
England  
GL10 3TA**

Declare under our own responsibility that the product:

Description of the Equipment:- **AZ30 Oxygen Probe**

to which this declaration relates is in conformity with the following standards:

**Directive 2006/95/EC (LVD)**

Harmonised Standard used:  
EN61010-1:2001

**Directive 2004/108/EC (EMC)**

Harmonised Standard used:  
EN 61326:2006

**Directive 94/9/EC (ATEX) and IECEx**

Harmonised Standards used:  
IEC 60079-0 2011 Ed 6, EN60079-1 2007-04 Ed 6, EN60079-31 2009, EN60079-31 2008 Ed 1

Provisions of the Directive fulfilled by the Equipment.

Equipment Group:-

② II 2GD

Ex d IIB+H<sub>2</sub> T4 Gb (Ta -20°C to +70°C)

Ex tb IIIC T135C Db (Ta -20°C to +70°C) IP66

Name, notified body number and address of the Notified Body:-

Baseefa Ltd, Number 1180, of:- Rockhead Business Park, Staden Lane, Buxton, Derbyshire SK17 9RZ.

Number of the type examination certificates:-

**Baseefa12ATEX0076X** - last supplement ..... issued **16 APRIL 2012**

**IECEx BAS 12.048X** - last supplement ..... issued **23 APRIL 2012**

When installed and operated according to the supplied instructions.

8 - JUN - 2012

Date of Issue

Signature Brian Hull - General Manager

Fig. B.1 AZ30 Oxygen Probe

Power and productivity  
for a better world™ 

## EC Declaration of Conformity

We, **ABB Limited**

Of, **Oldends Lane  
Stonehouse  
Gloucestershire  
England  
GL10 3TA**

Declare under our own responsibility that the product:

Description of the Equipment:- **AZ30 O<sub>2</sub> Transmitter**

to which this declaration relates is in conformity with the following standards:

### **Directive 2006/95/EC (LVD)**

Harmonised Standard used:  
EN61010-1:2001

### **Directive 2004/108/EC (EMC)**

Harmonised Standard used:  
EN 61326:2006

### **Directive 94/9/EC (ATEX) and IECEx**

Harmonised Standards used:  
IEC 60079-0 2011 Ed 6, EN60079-1 2007-04 Ed 6, EN60079-31 2009, EN60079-31 2008  
Ed 6

Provisions of the Directive fulfilled by the Equipment.

Equipment Group:-

Ex II 2GD  
Ex d IIB+H<sub>2</sub>T6 Gb (Ta -20°C to +55°C)  
Ex tb IIIC T85°C Db (Ta -20°C to +55°C) IP66

Name, notified body number and address of the Notified Body:-  
Baseefa Ltd, Number 1180, of:- Rockhead Business Park, Staden Lane, Buxton, Derbyshire  
SK17 9RZ.

Number of the type examination certificates:-

Baseefa12ATEX0078U - last supplement ..... issued 16 APRIL 2012  
IECEx BAS 12.0050U - last supplement ..... issued 09 May 2012

When installed and operated according to the supplied instructions.

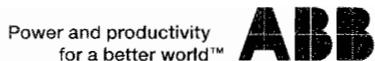
8-JV N - 2012

Date of Issue



Signature Brian Hull - General Manager

Fig. B.2 AZ30 O<sub>2</sub> Transmitter



## EC Declaration of Conformity

We, ABB Limited

Of, Oldends Lane  
Stonehouse  
Gloucestershire  
England  
GL10 3TA

Declare under our own responsibility that the product:

Description of the Equipment:- **AZ30 Remote Terminal Box**

to which this declaration relates is in conformity with the following standards:

### Directive 2006/95/EC (LVD)

Harmonised Standard used:  
EN61010-1:2001

### Directive 2004/108/EC (EMC)

Harmonised Standard used:  
EN 61326:2006

### Directive 94/9/EC (ATEX) and IECEx

Harmonised Standards used:  
IEC 60079-0 2011 Ed 6, EN60079-1 2007-04 Ed 6, EN60079-31 2009, EN60079-31 2008  
Ed 1

Provisions of the Directive fulfilled by the Equipment.

Equipment Group:-

④ II 2GD

Ex d IIB+H<sub>2</sub>T6 Gb (Ta -20°C to +70°C)

Ex tb IIIC T85°C Db (Ta -20°C to +70°C) IP66

Name, notified body number and address of the Notified Body:-

Baseefa Ltd, Number 1180, of:- Rockhead Business Park, Staden Lane, Buxton, Derbyshire  
SK17 9RZ.

Number of the type examination certificates:-

Baseefa12ATEX0077X - last supplement ..... issued **16 APRIL 2012**

IECEx BAS 12.0049X - last supplement ..... issued **23 APRIL 2012**

When installed and operated according to the supplied instructions.

8 - JUN - 2012

Date of Issue

Signature Brian Hull - General Manager

Fig. B.3 AZ30 Remote Terminal Box

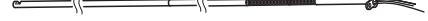
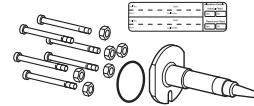
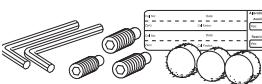
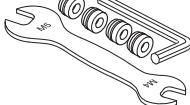
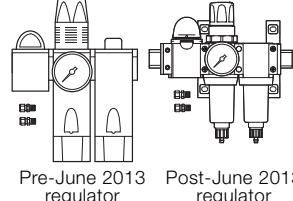
## Appendix C – Accessories and Spares

### C.1 Documentation

Part No.	Description
MI/AZ30M-EN	Maintenance Guide  Download* the Maintenance Guide from:  <a href="http://www.ABB.com/analytical-instruments">www.ABB.com/analytical-instruments</a>  *Enter this address in your browser and then type MI/AZ30M-EN in the search box. The Maintenance Guide is the top link.  

**Warning.** Do not attempt maintenance without referring to the Maintenance Guide (MI/AZ30-EN) for instructions.

### C.2 Probe Spares

Part No.	Description
Length dependant – see table below	Thermocouple / Electrode Assembly  
0.5 m (1.7 ft.)	AZ200 701
1.0 m (3.3 ft.)	AZ200 702
1.5 m (5.0 ft.)	AZ200 703
2.0 m (6.6 ft.)	AZ200 704
AZ300 745	Cell Assembly (includes Commissioning label and C-ring)  
AZ200 727	Restrictor spares kit  
AZ300 746	Diffuser Flame Arrestor Assembly (includes C-ring)  
AZ200 798 AZ200 799	Probe tool kit – NPT (AZ30) – BSP (AZ30) (included with probe as standard)  
AZ200 731 AZ200 732	Oil-coalescing Filter-Regulator*: 1/4 NPT 5 µm 1/4 BSP 5 µm  *Required for Reference air and Test Gas air   Pre-June 2013 regulator      Post-June 2013 regulator
AZ200 740 AZ200 741 AZ200 742 AZ200 743	Filter elements for pre-June 2013 regulator: 5µm filter element Oil coalescing filter element Filter elements for post-June 2013 regulator: 5µm filter cartridge Oil coalescing filter cartridge

## Notes

# Products and customer support

## 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.

### UK

ABB Limited  
Tel: +44 (0)1453 826661  
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:

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

# Contact us

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[www.abb.com](http://www.abb.com)

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