

Endura AZ25 series probe

Combustion oxygen monitor



Measurement made easy

— Superior technology and quality from the world leader in oxygen measurement

Introduction

The Endura AZ25 Combustion Oxygen Analyzer is the latest in a long line of high-quality, combustion gas analyzers from ABB. The AZ25 is designed to measure oxygen concentration in high temperature furnace atmospheres.

The sensor, based on a zirconium oxide cell, is mounted at the tip of the probe that is inserted directly into the furnace. The resulting direct, in-situ measurement provides an accurate and rapid oxygen reading, for combustion control / optimization and process quality control purposes.

The in situ technique provides a true oxygen measurement inside the process. It eliminates 'equilibrium shift' that is common to systems in which gas samples are extracted and cooled before measurement.

For more information

Further publications for the Endura AZ25 probe are available for free download from:

www.abb.com/measurement

or by scanning this code:



Search for or click on

Data Sheet

Endura AZ25 oxygen analyzer
Combustion gas analysis

[DS/AZ25-EN](#)

Addendum

RoHS Directive 2011/65/EU (RoHS II)

[ADD/MEASUREMENT/001-EN](#)

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1 Safety

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.
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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 applies only to European customers.

	<p>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.</p> <p>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.</p>
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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 REACH directive

The candidate list according to Article 59 of the Regulation (EC) No 1907/2006 on the Registration, Evaluation, Authorisation and Restriction of chemicals (REACH) continues to expand. Article 33 places a legal obligation on an article producer to inform recipients of the information requirements when a candidate list substance is contained within an article at percentage of greater than 0.1% W/W.

The AZ25 probe, product number AZ25/ all variants, aluminosilicates (CAS, 142844-00-6) a class 2 carcinogen, is contained at a percentage marginally greater than 0.1% of the weight of the product. The material is totally enclosed within the product and should pose no risk to the user during installation, use and decommissioning providing the probe is handled in accordance with the instructions defined in the user manual. The probe should be disposed of as hazardous waste.

Further information on refractory ceramic fibers can be found at Fiberfrax, www.Fiberfrax.com and on the ECHA (European Chemicals Hazards Agency) websites.

1.8 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.

1.9 Safety conventions

Warning. In this manual, a warning is used to indicate 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. A caution is used to indicate 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. A note is used to indicate important information or instructions that should be considered before operating the equipment.

1.10 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.

Warning. The installation of the instrument should be performed exclusively by personnel specialized and authorized to work on electrical installations, in accordance with relevant local regulations.

1.11 Service and repairs

Other than the serviceable items listed in Section B, page 33, 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 correct working of the instrument and the electrical integrity or 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

1.12 Potential safety hazards

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

- Electrical (line voltage)
- Probe weight
- AutoCal unit and transmitter enclosure weights

2 Overview

This User Guide provides the following information:

- installation details for Endura AZ25 probes – see Section 3, page 7
- pneumatic schematics for systems fitted with or without restrictors (including test gas and reference air requirements) – see Section 3.5, page 9
- Endura AZ25 system electrical connection details:
 - for standard connection details (system without automatic calibration [AutoCal]) between an Endura AZ25 probe and an Endura AZ25 remote transmitter – see Section 4.2, page 21
 - for connection details (system with AutoCal) between an Endura AZ25 AutoCal unit and an Endura AZ25 remote transmitter – see Section A, page 32
- electrical connection details between Endura AZ25 probe / transmitter and ABB heritage products (see Appendix A, page 32):
 - ABB heritage ZMT transmitter and Endura AZ25 probe
 - ABB heritage ZDT transmitter and Endura AZ25 probe
 - ABB heritage ZGP2 probe and Endura AZ25 transmitter

The Endura AZ25 oxygen probe measures oxygen concentration in high temperature furnace atmospheres 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.

For customers with an existing (heritage) installed ZGP2 probe with a ZMT or ZDT transmitter – both the AZ25 probe and the AZ25 transmitter are fully backward-compatible.

System equipment comprises a (process-mounted) AZ25 probe controlled by a remote AZ25 transmitter and where required, an optional automatic calibration unit.

The AZ25 has a zirconia cell and a thermocouple assembly within the probe. The zirconia cell produces a signal proportional to the oxygen partial pressure of the sample. The thermocouple measures the temperature of the cell for automatic temperature compensation of the cell output.

An output generated at the zirconia cell is processed in the transmitter giving a locally displayed O₂ reading and a 4 to 20mA retransmission signal over any range between 0 % and 25 % O₂.

Optional automatic calibration (AutoCal) enables automatic, semi-automatic or manual calibration to be performed using a remote gas control manifold mounted within the standalone housing. Calibration sequencing is software-controlled from the AZ25 transmitter. Optional restrictors control the test gas and reference air flow without the need for flowmeters and flow control valves.

Restrictors are fitted in the autocal unit to control the test gas flow rates and in the probe to control the reference air flow rate. The system requires only preset test gas and reference air pressures of 1 bar (15 psi) to maintain a constant flow of 1.0 l/min (2.118 scfh) and 0.5 l/min (1.06 scfh).

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

3 Mechanical installation

3.1 General installation requirements

Warning.

- Before installing the probe, check the probe data label in the head of the probe – see Section 3.3.
- 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.

3.2 Unpacking

Caution.

- Unpack and handle with care do not subject it to hammer blows or other sharp shocks. The probe contains fragile ceramic components that can be damaged. Visually inspect equipment for damage before installing. Do not install damaged or faulty equipment.
- It is recommended to retain the protective probe packing materials to allow for re shipping in the unlikely event of a return.

3.3 Identifying the probe

The unique probe serial number and probe code (configuration) is printed on a data label attached to the inside the probe cover – see Fig. 3.1.

Caution. The details on each probe label are unique to the cell / probe combination they are attached to and **cannot** be used to identify any other probe or system.

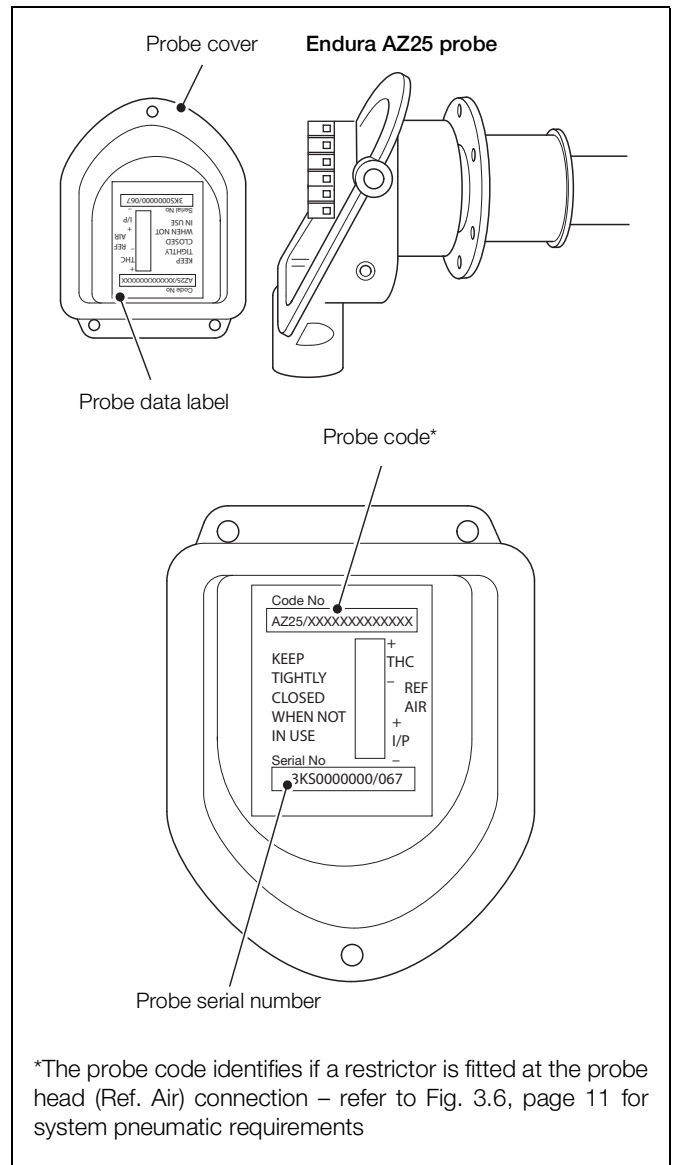


Fig. 3.1 Probe identification label location (probe head cover shown removed)

3.4 System location requirements

3.4.1 Endura AZ25 system without AutoCal

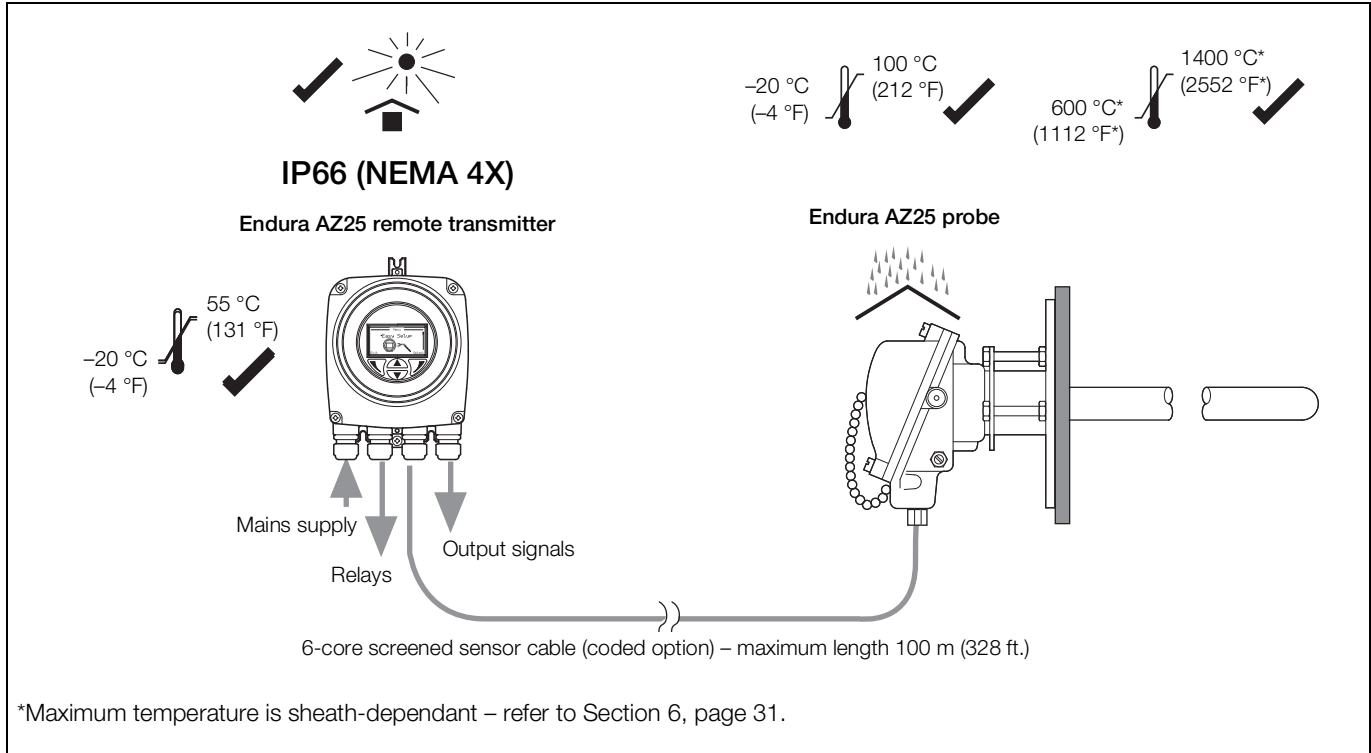


Fig. 3.2 Endura AZ25 system without AutoCal

3.4.2 Endura AZ25 system with AutoCal

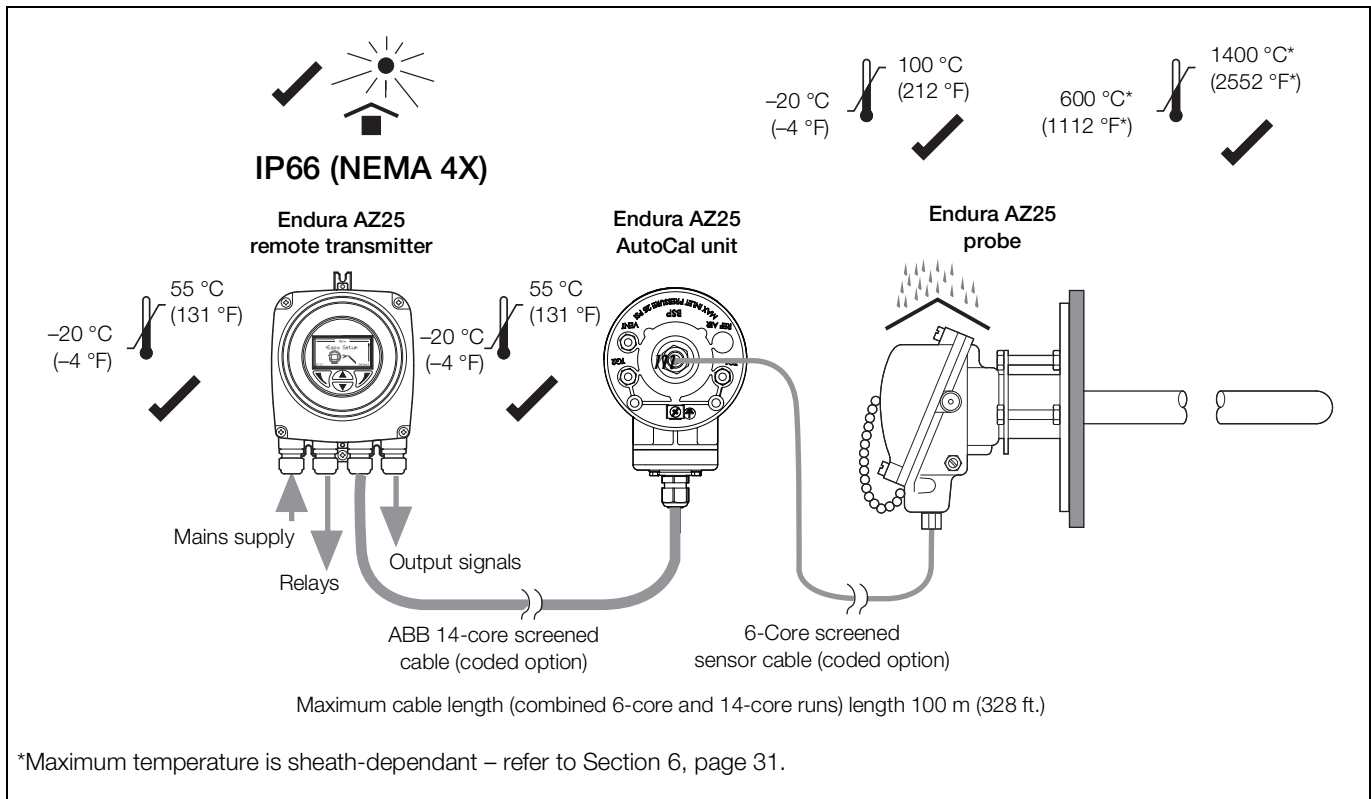


Fig. 3.3 Endura AZ25 system with AutoCal

3.5 Pneumatic connections

Note.

- The configuration option of having flow restrictors fitted to the probe determines the way the reference air and test gas flow is controlled. 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 high delivery pressures required to the probe(s).
- **Probes with restrictor** – the reference air flow is regulated by a restrictor installed in the probe which requires a set pressure of 1 bar (15 psi) to deliver the correct flow. Because the gases are delivered as a pressure at the probe it is permissible to use parallel pipework for multiple-probe installations.
- **Probes without restrictors** – the reference air and test gas flow is regulated by flowmeters (with integral needle valves) fitted in the delivery lines to the sensor – one flowmeter is required in **each** delivery line.

3.5.1 Pneumatic entry types

Endura AZ25 AutoCal unit / test gas 1, 2 and vent	
Metric	Imperial
1/4 in. BSP female threaded entry supplied with 6 mm OD compression fitting	1/4 in. NPT female threaded entry supplied with 1/4 in. OD compression fitting

Table 3.1 Pneumatic entry types at Endura AZ25 AutoCal unit

Endura AZ25 probe	
Metric	Imperial
Ref. Air: 1/8 in. BSP	Ref. Air: 1/8 in. NPT
Test gas: 6 mm dia. stud	

Table 3.2 Pneumatic entry types at Endura AZ25 probe

3.5.2 Schematic – Endura AZ25 system without AutoCal

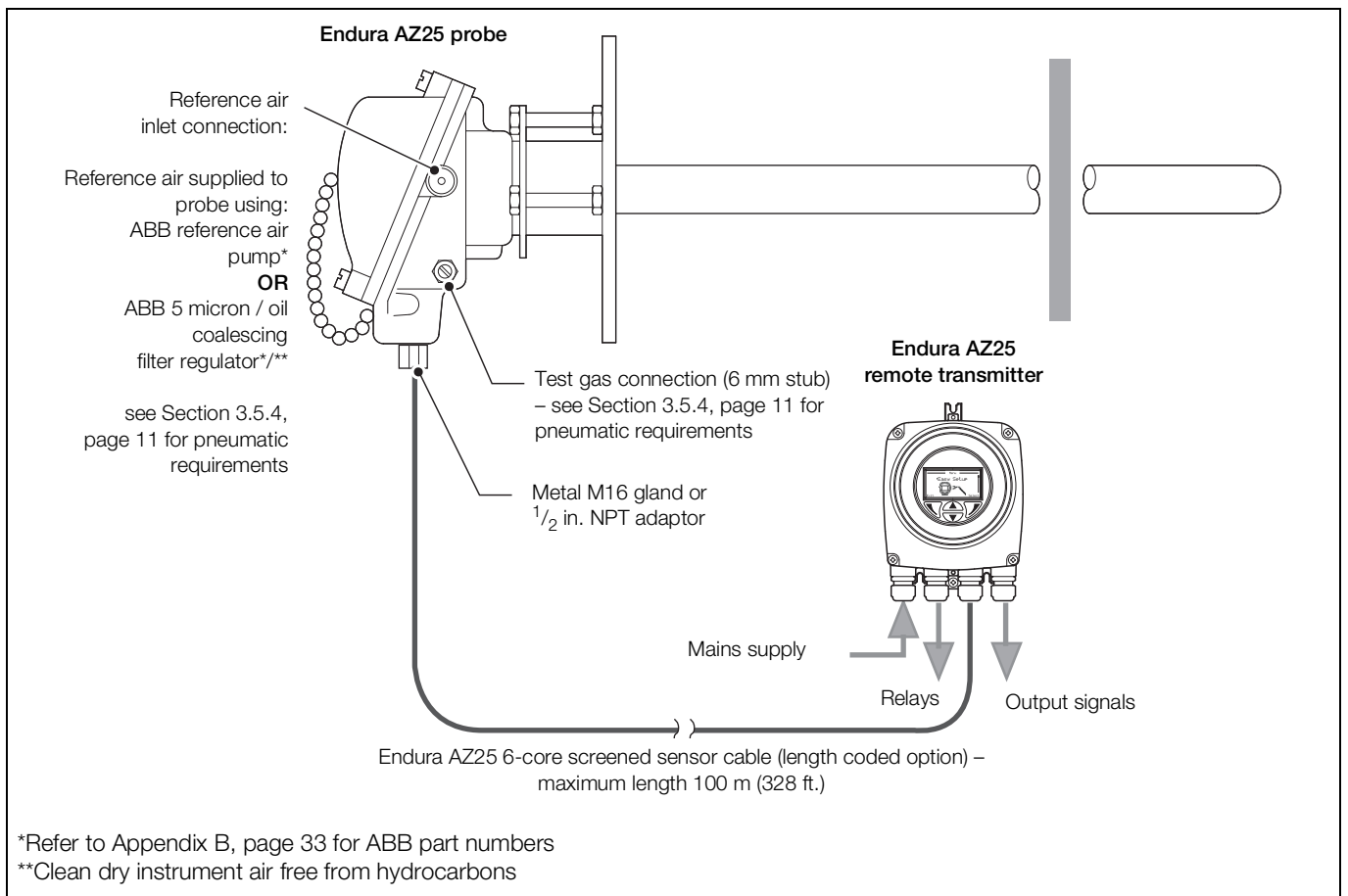


Fig. 3.4 Schematic – Endura AZ25 system without AutoCal

3.5.3 Schematic – Endura AZ25 system with AutoCal

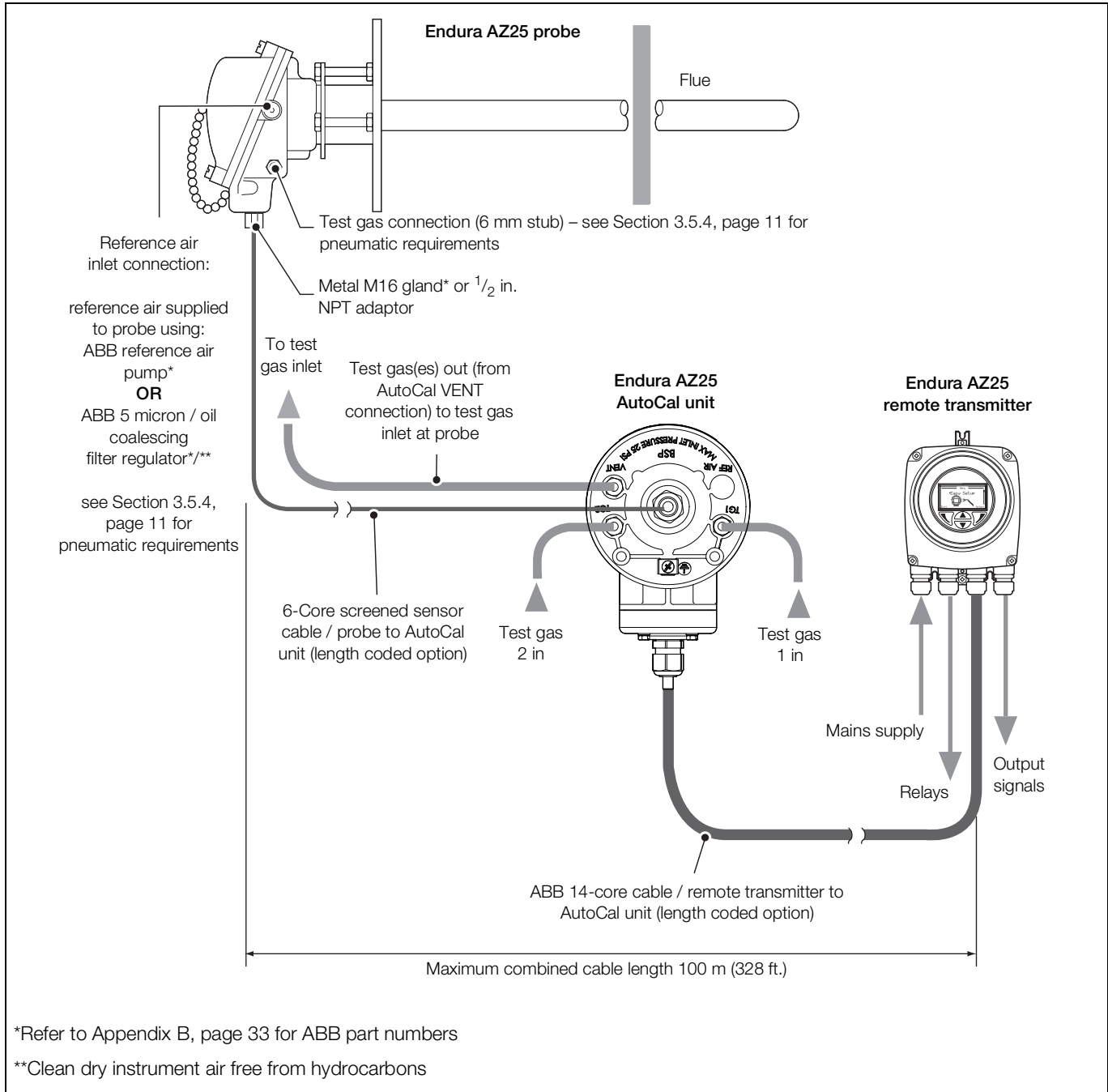


Fig. 3.5 Schematic – Endura AZ25 system with AutoCal

3.5.4 Pneumatic connection configurations

The pneumatic configuration of each probe is detailed on the probe identification label – see Section 3.3, page 7.

To identify the pneumatic configuration/requirements of your probe, refer to the flowchart below (Fig. 3.6) to identify which configuration is the closest match for your system and refer to the relevant figure in Sections 3.5.5 (page 12) to 3.5.7 (page 13) for flow rates.

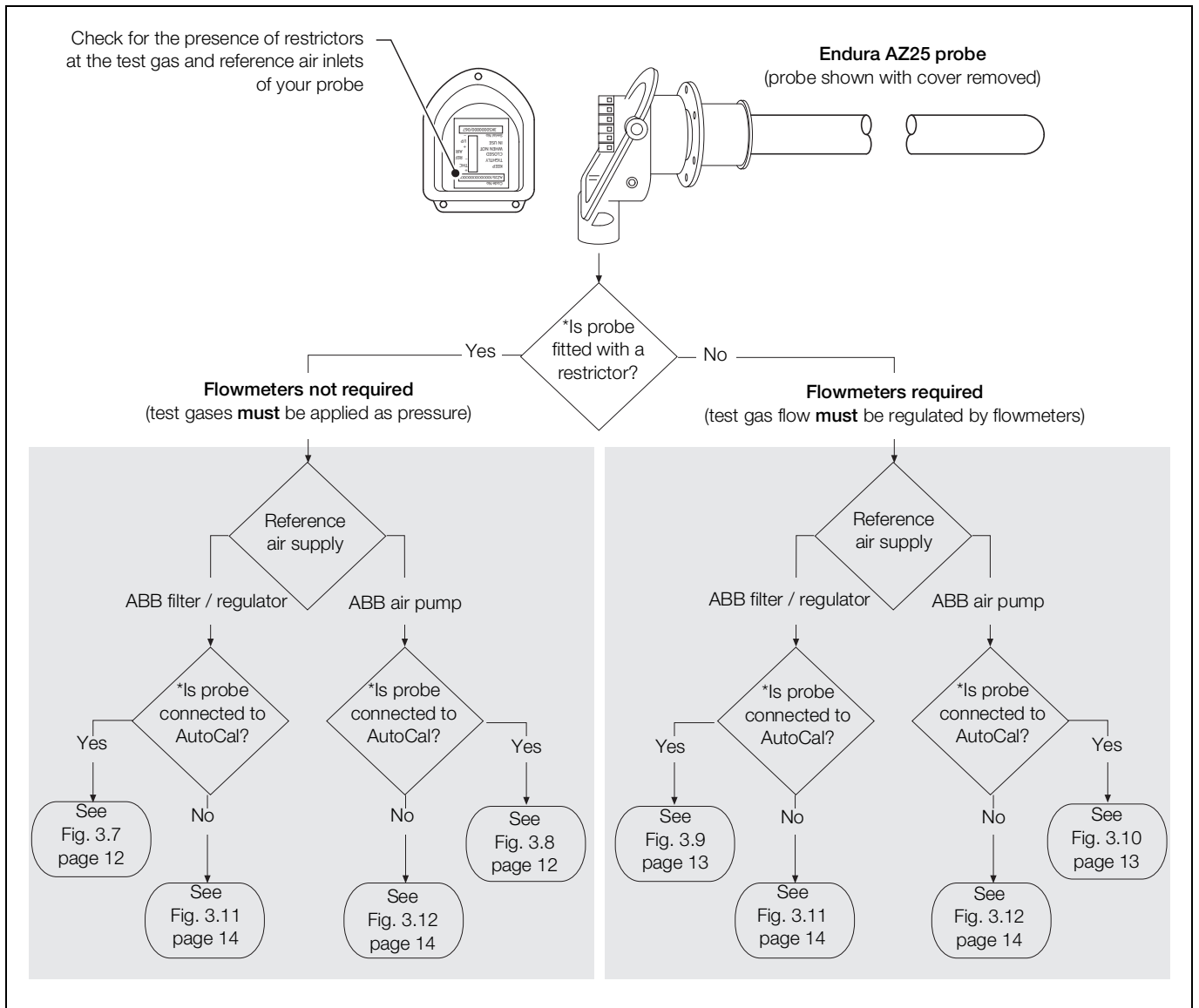


Fig. 3.6 Pneumatic connection configurations (schematic)

3.5.5 Test gas and reference air supply configurations – AutoCal systems with test gas restrictors

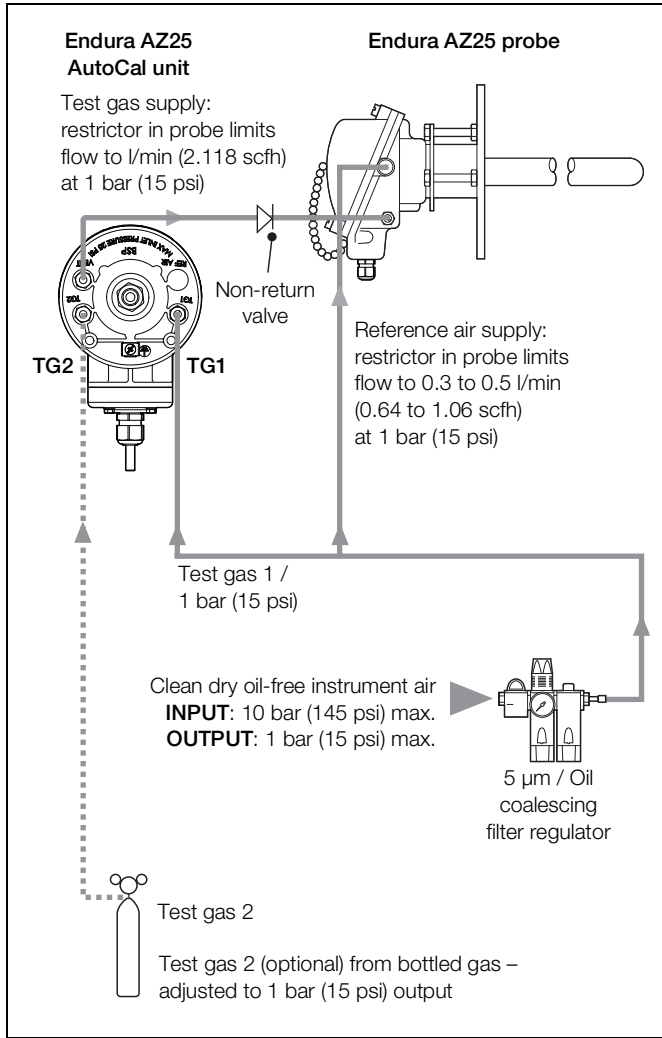


Fig. 3.7 System using air as test gas 1 and bottled gas as (optional) test gas 2

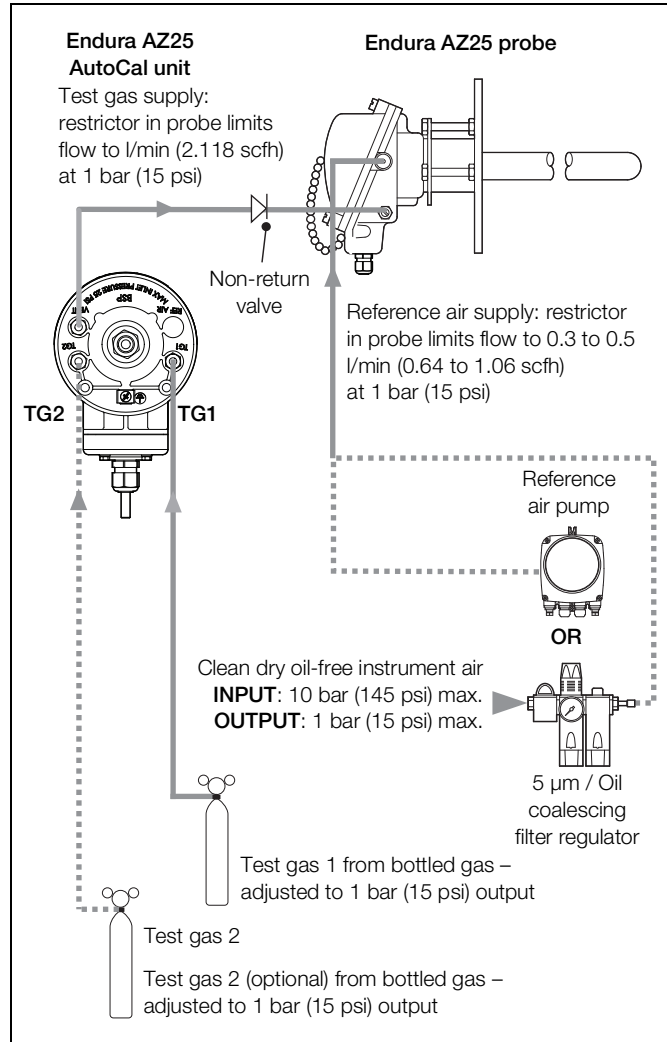


Fig. 3.8 System using 2 bottled test gases

3.5.6 Test gas and reference air supply configurations – AutoCal systems without test gas restrictors

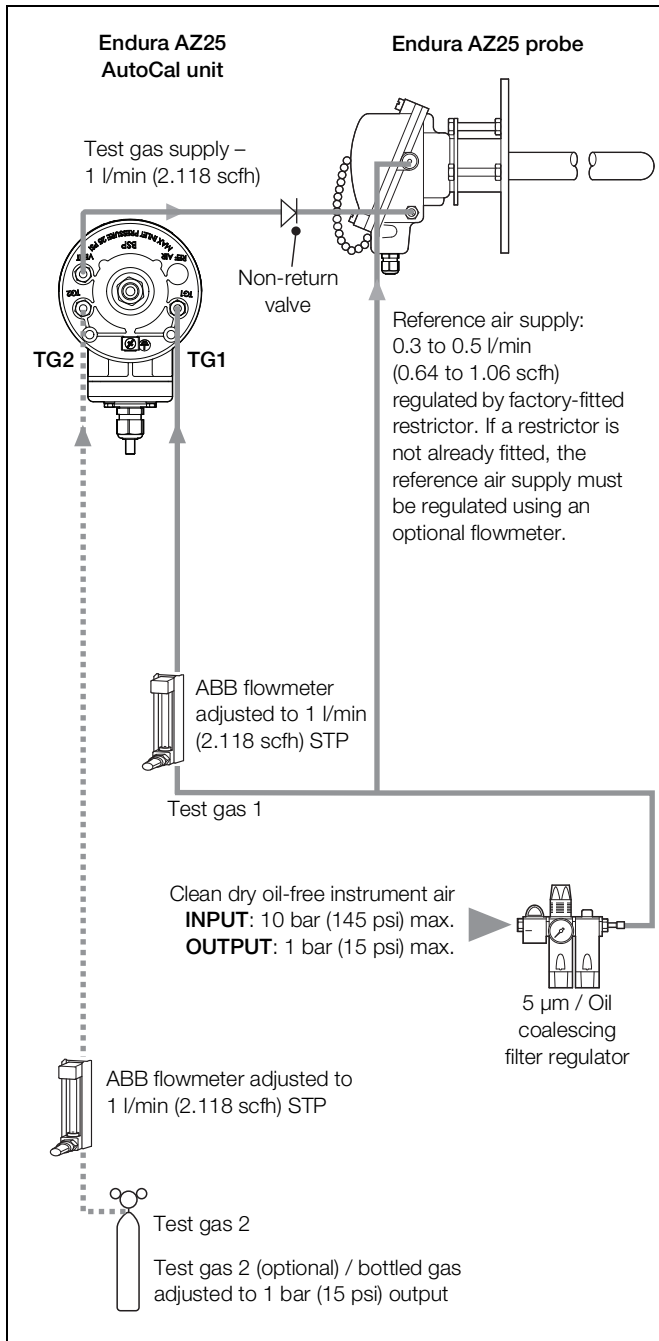


Fig. 3.9 System using air as test gas 1 and bottled gas as (optional) test gas 2

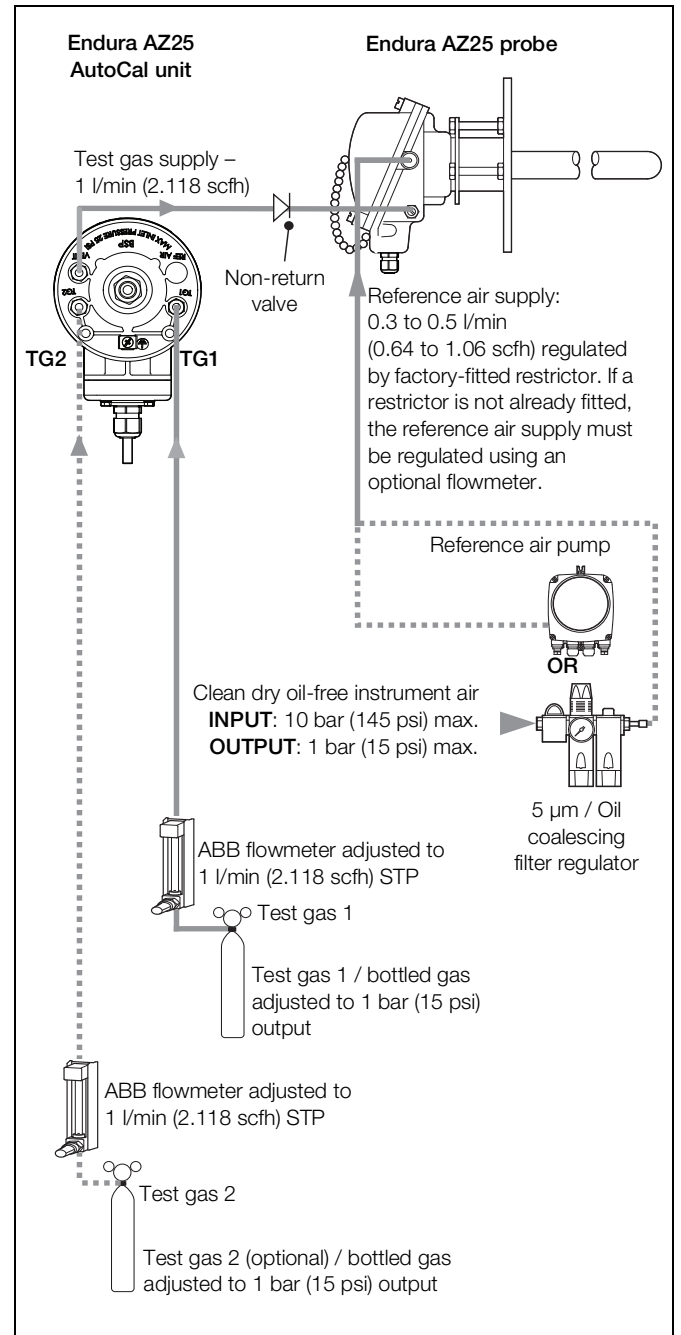


Fig. 3.10 System using 2 bottled test gases

3.5.7 Test gas and reference air supply configurations – non-AutoCal systems without test gas restrictors

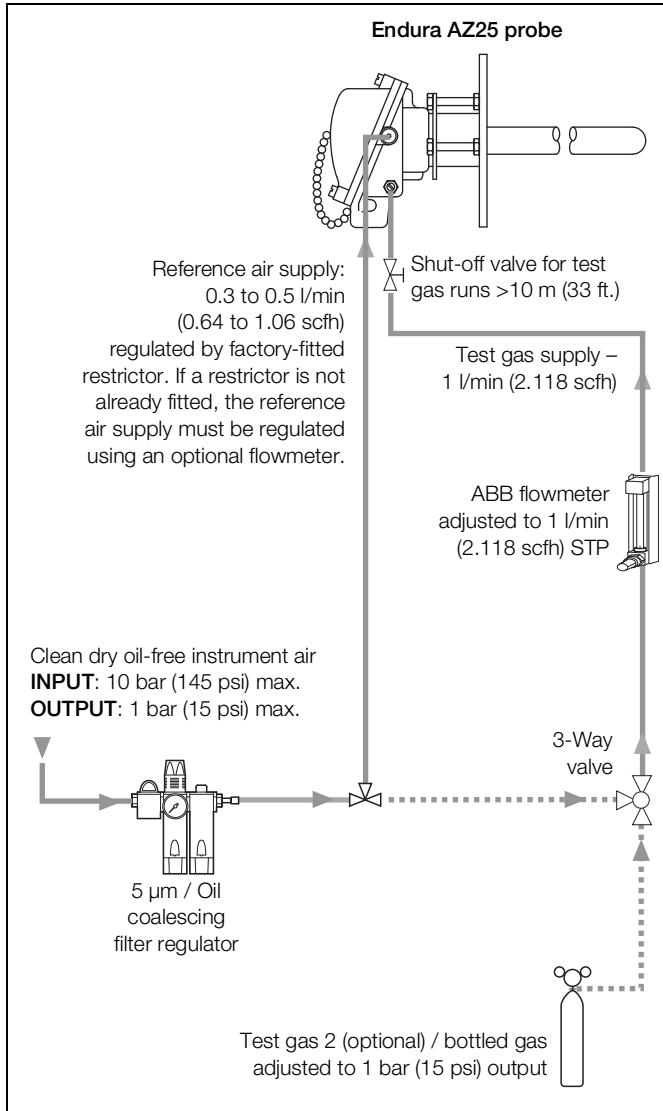


Fig. 3.11 System using air as test gas 1 and bottled gas as (optional) test gas 2

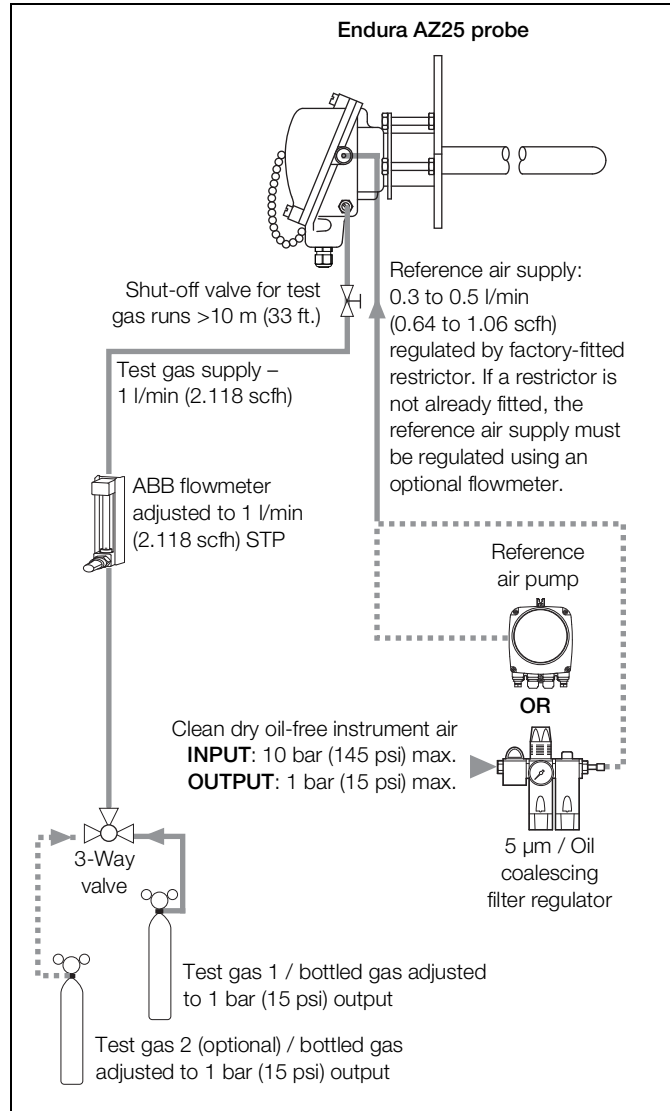


Fig. 3.12 System using 2 bottled test gases

3.6 Overall dimensions

3.6.1 Endura AZ25 probe

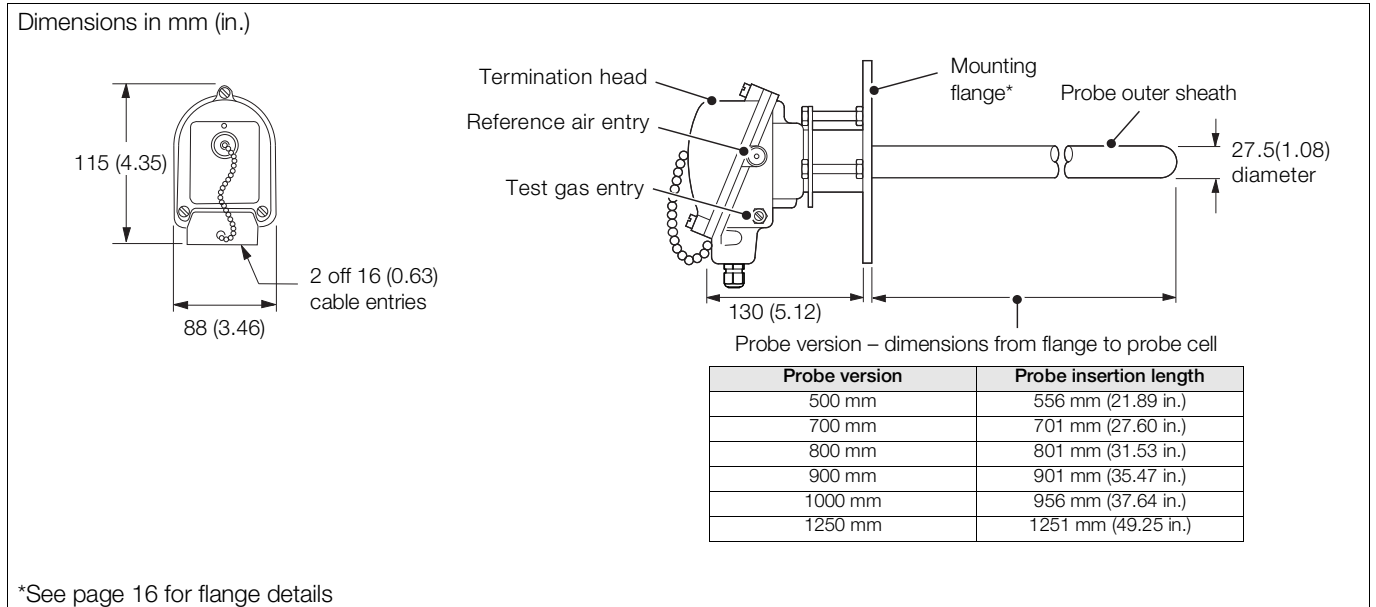


Fig. 3.13 Overall dimensions – Endura AZ25 AZ25 probe

3.6.2 Endura AZ25 AutoCal unit (with wall / pipe-mounting bracket)

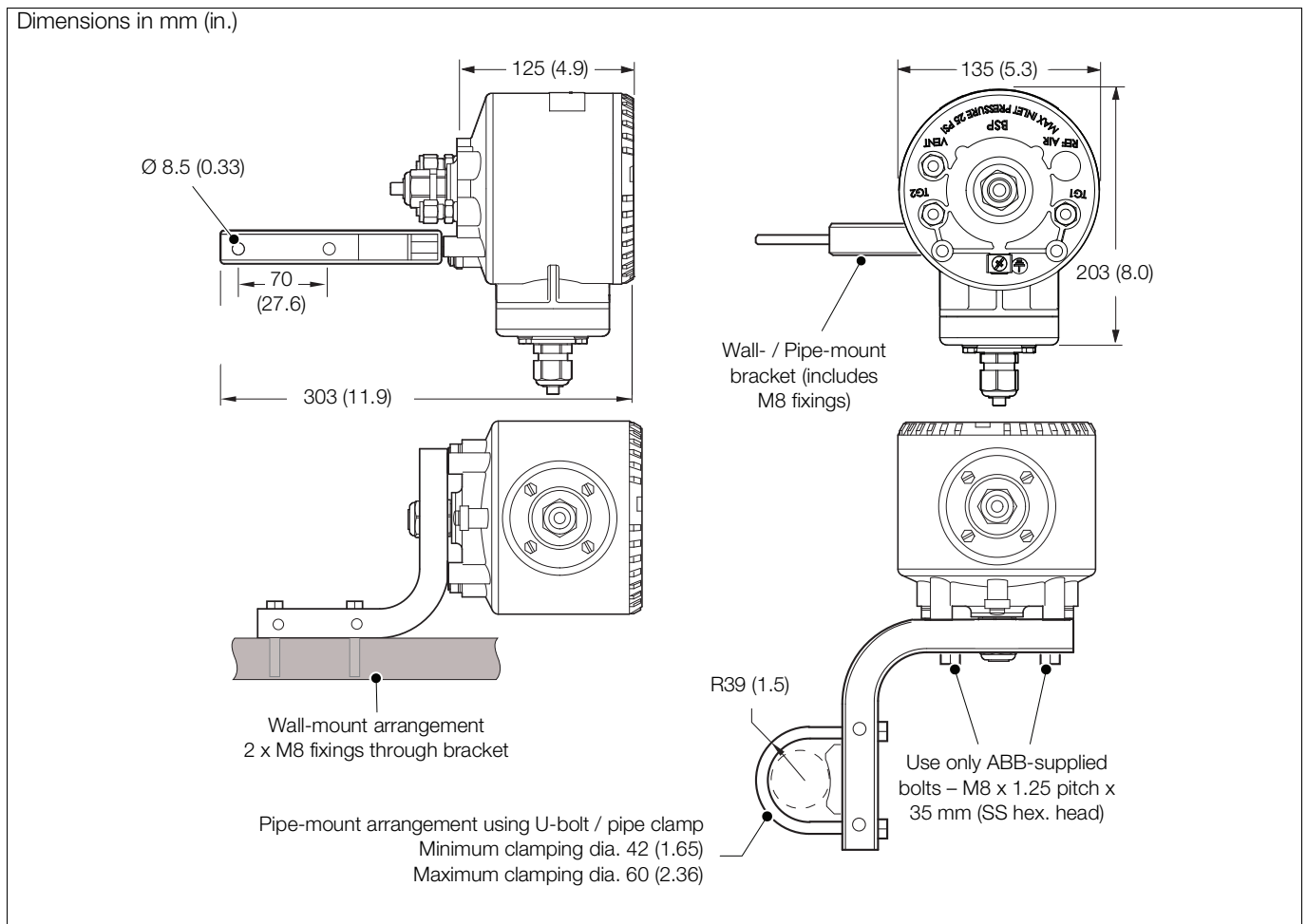


Fig. 3.14 Overall dimensions – Endura AZ25 AutoCal unit (with wall / pipe-mounting bracket)

3.7 Endura AZ25 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 3.3 4-Hole probe flange types and dimensions

Flange type	A	B	C (Ø)	D (PCD)	6-Hole flanges
ABB standard	101 (3.97)	6 (0.24)	7.3 (0.29)	80 (3.15)	

Table 3.4 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 3.5 8-Hole probe flange types and dimensions

Mounting plate	A	B	C	D	
ABB standard flange mounting plate – part No. AZ200 796 comprising: mounting plate, gasket, 6 each: M6/M10 shakeproof washers, plain washers and nuts.	160 (6.3)	160 (6.3)	7 (0.27)	16 (0.63)	<p>6 M6 Studs equispaced on 80 (3.15) PCD</p>

Table 3.6 ABB flange mounting plate dimensions

Flange type	A	B	C	Holes drilled by customer
ZGP2 heritage	125 (4.92)	5 (0.2)	Fixing holes (location / quantity) to be drilled by customer	

Table 3.7 ABB blank (heritage) flange dimensions

Flange type	A	B	C	1 in. male thread
1 in. NPT / BSP	69.8 (2.74)	15 (0.59)	45 (1.77)	

Table 3.8 1 in. NPT / 1 in. BSP mounting flange dimensions

3.8 Mounting – Endura AZ25 AutoCal unit

The AutoCal unit can be pipe- or wall-mounted. Refer to Section 3.6.2, page 15 for mounting requirements.

3.9 Mounting – Endura AZ25 probe

The probe can be fitted horizontally or, preferably, vertically for prolonged high temperature operation.

Mount the probe through the furnace wall using the preferred method shown in Fig. 3.15. Ensure that a sufficiently large hole is provided through the mounting (min. bore 42 mm diameter) to avoid damage to the probe during insertion or use.

In applications such as high temperature incinerators, fluid bed boilers, and ore roasters, where the level of water vapor in the waste gases to be measured can be extremely high, it is important that the mounting flange of the probe, including any stand-off which may be used, is thermally insulated to minimize condensation within the probe – see Fig. 3.15.

Condensation within the probe sheath, particularly in outdoor installations, can be sufficient to allow water to come into contact with the hot ceramic (zirconia) tube leading to thermal shock and failure of the sensor. This problem is most likely to occur on such installations where the plant is shut-down regularly over the week-end. Additionally, take care to protect the head of the probe from the elements in out-door installations.

Raising the temperature of the probe as rapidly as possible will assist in reducing the level of condensation. This is not possible on some processes where the plant temperature is gradually raised to the normal operating level. The temperature rise at the head of the probe can be assisted by having a large clearance hole in the refractory allowing hot gases to get up to the mounting flange/stand-off – see Fig. 3.16.

The problems described above are more likely to occur on horizontal installations. Where it is not possible to mount the probe in the vertical position, install the probe with a slope of at least 10 to 15° downwards from the head of the probe – see Fig. 3.17.

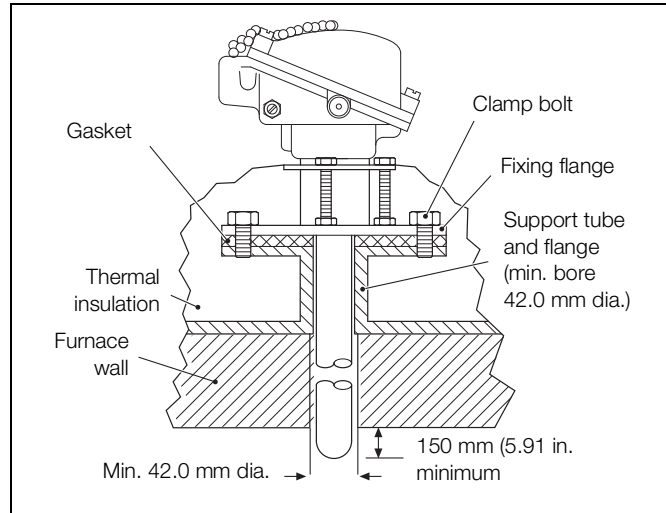


Fig. 3.15 Probe mounting – standard configuration

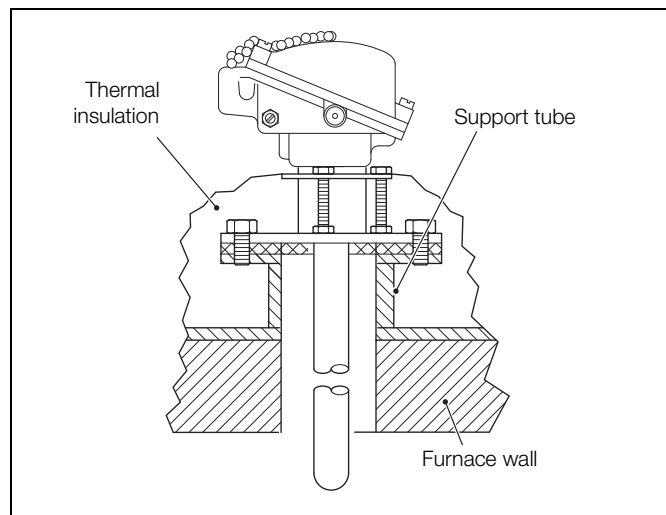


Fig. 3.16 Probe mounting – for improved probe heating

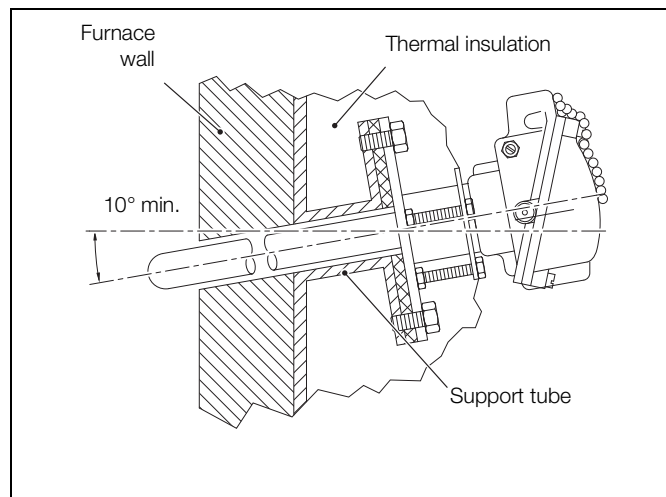


Fig. 3.17 Probe mounting – inclined configuration

3.10 End-of-life disposal

The 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.

3.10.1 Endura AZ25 system weights (probe, cable, transmitter, AutoCal unit)

Note. Weights listed exclude flanges.

Transmitter / AutoCal unit

Transmitter-only – unpacked	AutoCal unit only – packed / unpacked	AutoCal unit with bracket – unpacked
4.4 kg (8.8 lb)	8.5 kg (18.7 lb) / 3.0 kg (6.6 lb)	11.0 kg (24.5 lb)

Table 3.9 Endura AZ25 transmitter and AutoCal unit weights

Probe with aluminous porcelain sheath

Probe version	Total probe length	Probe-only – packed / unpacked	Probe + Tx – packed / unpacked
500 mm (23.62 in.)	686 mm (27.01 in.)	3.9 kg (8.5 lb) / 1.4 kg (3.0 lb)	6.4 kg (14.0 lb) / 3.9 kg (8.5 lb)
700 mm (27.56 in.)	831 mm (32.72 in.)	4.1 kg (9.0 lb) / 1.6 kg (3.5 lb)	6.6 kg (14.5 lb) / 4.1 kg (9.0 lb)
800 mm (31.50 in.)	931 mm (36.56 in.)	4.2 kg (9.2 lb) / 1.7 kg (3.7 lb)	6.7 kg (14.7 lb) / 4.2 kg (9.2 lb)
900 mm (35.43 in.)	1031 mm (40.59 in.)	4.3 kg (9.4 lb) / 1.8kg (3.9 lb)	6.8 kg (14.9 lb) / 4.3 kg (9.4 lb)
1000 mm (39.37 in.)	1086 mm (42.76 in.)	4.4 kg (9.6 lb) / 1.9 kg (4.1 lb)	6.9 kg (15.1 lb) / 4.4 kg (9.6 lb)
1250 mm (49.21 in.)	1381 mm (54.37 in.)	5.8 kg (12.8 lb) / 2.1 kg (4.5 lb)	8.3 kg (18.3 lb) / 4.6 kg (10.0 lb)

Table 3.10 Endura AZ25 probe with aluminous porcelain sheath

Probe with Incoloy 800 (1.4876) sheath

Probe version	Total probe length	Probe-only – packed / unpacked	Probe + Tx – packed / unpacked
500 mm (23.62 in.)	686 mm (27.01 in.)	4.7 kg (10.2 lb) / 2.2 kg (4.7 lb)	7.2 kg (15.7 lb) / 4.7 kg (10.2 lb)
700 mm (27.56 in.)	831 mm (32.72 in.)	5.0 kg (10.9 lb) / 2.5 kg (5.4 lb)	7.5 kg (16.4 lb) / 5.0 kg (10.9 lb)
800 mm (31.50 in.)	931 mm (36.56 in.)	5.2 kg (11.3 lb) / 2.7 kg (5.8 lb)	7.7 kg (16.8 lb) / 5.2 kg (11.3 lb)
900 mm (35.43 in.)	1031 mm (40.59 in.)	5.4 kg (11.8 lb) / 2.9 kg (6.3 lb)	7.9 kg (17.3 lb) / 5.4 kg (11.8 lb)
1000 mm (39.37 in.)	1086 mm (42.76 in.)	5.6 kg (12.2 lb) / 3.1 kg (6.7 lb)	8.1 kg (17.7 lb) / 5.6 kg (12.2 lb)
1250 mm (49.21 in.)	1381 mm (54.37 in.)	7.2 kg (15.8 lb) / 3.5 kg (7.6 lb)	9.7 kg (21.3 lb) / 6.0 kg (13.1 lb)

Table 3.11 Endura AZ25 probe with Incoloy 800 (1.4876) sheath

Probe with recrystallized alumina sheath

Probe version	Total probe length	Probe-only – packed / unpacked	Probe + Tx – packed / unpacked
500 mm (23.62 in.)	686 mm (27.01 in.)	4.1 kg (9.0 lb) / 1.6 kg (3.5 lb)	6.6 kg (14.5 lb) / 4.1 kg (9.0 lb)
700 mm (27.56 in.)	831 mm (32.72 in.)	4.3 kg (9.4 lb) / 1.8kg (3.9 lb)	6.8 kg (14.9 lb) / 4.3 kg (9.4 lb)
800 mm (31.50 in.)	931 mm (36.56 in.)	4.4 kg (9.6 lb) / 1.9 kg (4.1 lb)	6.9 kg (15.1 lb) / 4.4 kg (9.6 lb)
900 mm (35.43 in.)	1031 mm (40.59 in.)	4.5 kg (10.0 lb) / 1.9 kg (4.1 lb)	6.9 kg (15.1 lb) / 4.4 kg (9.6 lb)
1000 mm (39.37 in.)	1086 mm (42.76 in.)	4.7 kg (10.2 lb) / 2.2 kg (4.7 lb)	7.2 kg (15.7 lb) / 4.7 kg (10.2 lb)
1250 mm (49.21 in.)	1381 mm (54.37 in.)	6.2 kg (13.6 lb) / 2.4 kg (5.3 lb)	8.7 kg (19.1 lb) / 4.9 kg (10.8 lb)

Table 3.12 Endura AZ25 probe with recrystallized alumina sheath

Cable – AutoCal cable / probe (sensor) cable

Cable length	AutoCal cable (14-core) – unpacked	Probe (sensor) cable (6-core) – unpacked
5 m (16 ft.)	1 kg (2.2 lb)	0.2 kg (0.44 lb)
10 m (33 ft.)	3 kg (6.6 lb)	0.4 kg (0.88 lb)
25 m (82 ft.)	7 kg (15.4 lb)	0.9 kg (1.98 lb)
50 m (164 ft.)	15 kg (33 lb)	1.8 kg (2.2 lb)
75 m (246 ft.)	22 kg (48.4 lb)	2.7 kg (7.92 lb)
100 m (328 ft.)	N/A	3.6 kg (7.92 lb)

Table 3.13 Endura AZ25 cable weights – AutoCal cable and probe (sensor) cable

4 Electrical connections

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 IM/ AZ20E-EN.
- 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 AZ25 cable carries the screened signal wires Do not use alternative wires.
- 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).

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 the plastic 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.

4.1 Electrical entry types

Endura AZ25 transmitter	
Metric	Imperial
M20 (plastic glad)	$1/2$ in. NPT (plastic glad)

Table 4.1 Electrical entry types at Endura AZ25 transmitter

Endura AZ25 AutoCal unit	
Metric	Imperial
M20 (plastic gland)	$1/2$ in. NPT (plastic gland)

Table 4.2 Electrical entry types at Endura AZ25 AutoCal unit

Endura AZ25 probe	
Metric	Imperial
M16 (metal gland)	$1/2$ in. NPT (metal gland)

Table 4.3 Electrical entry types at Endura AZ25 probe

4.2 Endura AZ25 system without AutoCal

4.2.1 Cable preparation – 6-core sensor cable / Endura AZ25 remote transmitter to Endura AZ25 probe

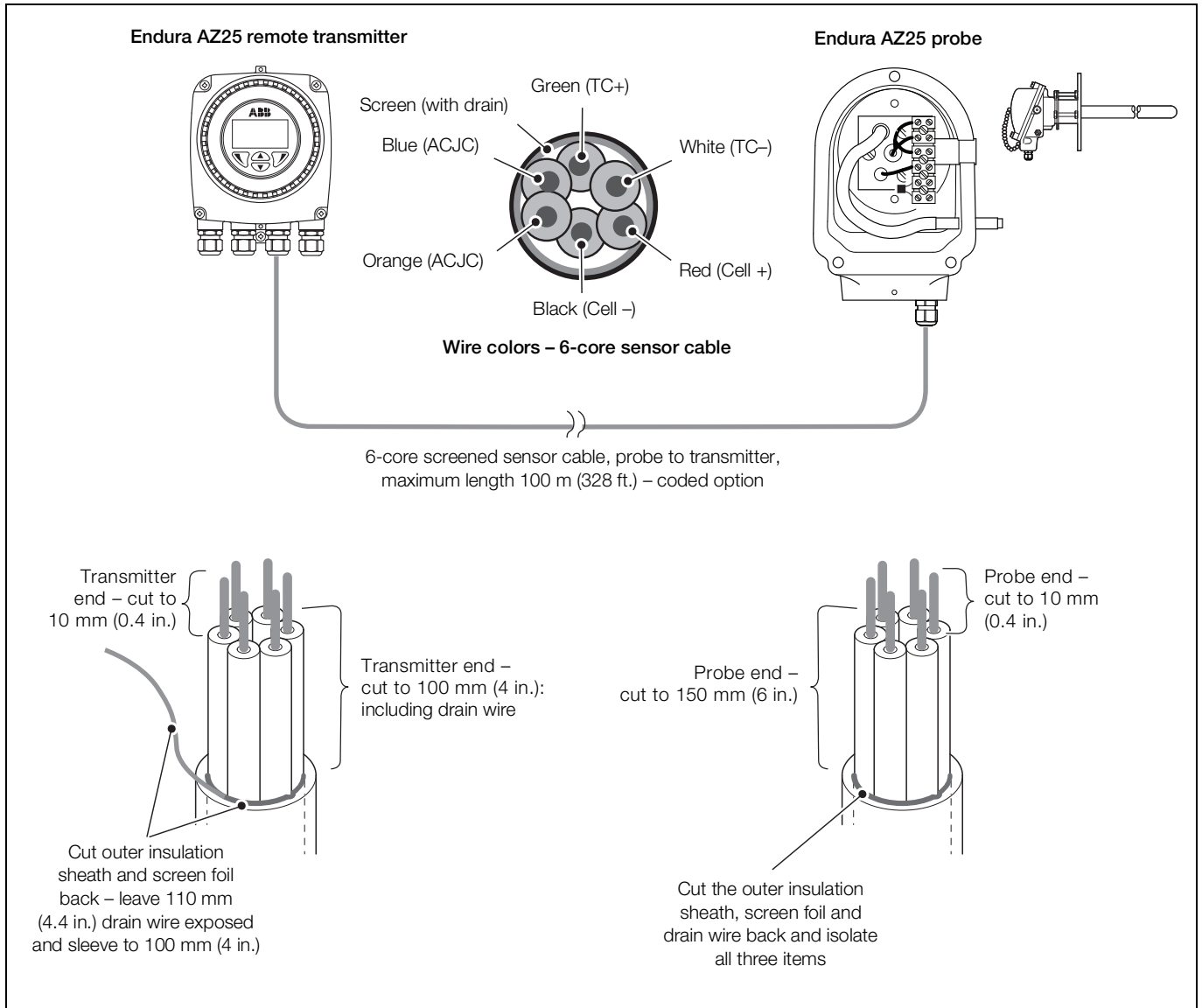


Fig. 4.1 Cable preparation – 6-core sensor cable / Endura AZ25 remote transmitter to Endura AZ25 probe

4.2.2 Cable connections – 6-core sensor cable / Endura AZ25 remote transmitter to Endura AZ25 probe

Transmitter terminal block color	6-core screened remote transmitter to probe cable – wire colors	Probe / remote transmitter connection
Green	Green	TC +
White	White	TC –
Red	Red	Cell +
Black	Black	Cell –
Orange	Orange	ACJC
Blue	Blue	ACJC
SCN (not used) – see Fig. 4.2 sensor cable screen (drain) is connected at internal earth stud only	Screen (drain) – see Fig. 4.2 for sensor cable screen connection requirements	Screen / drain – see Fig. 4.2 for sensor cable screen connection requirements at transmitter (no screen connection made at probe head)

Table 4.4 Cable connections – 6-core sensor cable / Endura AZ25 remote transmitter to Endura AZ25 probe

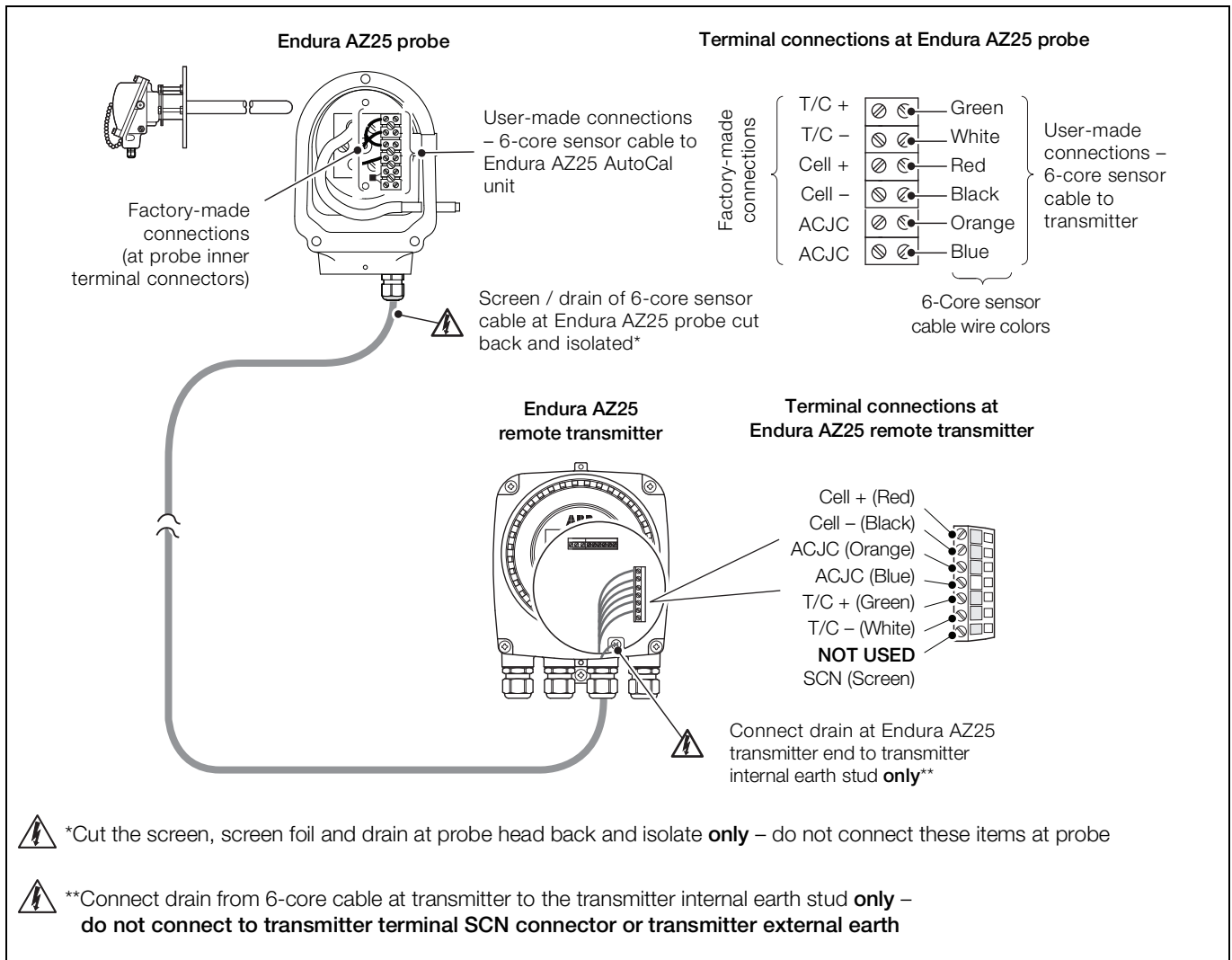


Fig. 4.2 Cable connections – 6-core sensor cable / Endura AZ25 remote transmitter to Endura AZ25 probe

4.3 Endura AZ25 system with AutoCal

Note.

- Endura AZ25 systems with AutoCal require 2 cable types (ABB-only supply):
 - 6-core cable: Endura AZ25 probe to Endura AZ25 AutoCal unit only – see Fig. 4.3
 - 14-core cable: Endura AZ25 AutoCal unit to Endura AZ25 transmitter only – see Fig. 4.5, page 25
- Mandatory earthing requirements:
 - 6-core cable at Endura AZ25 probe: outer insulation sheath, screen foil and drain wire cut back and isolated – see Fig. 4.3
 - 6-core cable at Endura AZ25 AutoCal unit: outer insulation sheath and screen foil cut back and isolated, drain wire connected to AutoCal unit inner terminal block SCN connector – see Fig. 4.3
 - 14-core cable: at Endura AZ25 AutoCal unit: outer insulation sheath and screen foil cut back and isolated, drain wire connected to AutoCal unit outer terminal block SCN connector – see Fig. 4.5, page 25
 - 14-core cable: at Endura AZ25 transmitter: outer insulation sheath and screen foil cut back and isolated, drain wire connected to transmitter internal terminal earth stud – see Fig. 4.5, page 25
- The maximum **combined** (6-core plus 14-core) cable run is 100 m (328 ft.), coded option.

4.3.1 Cable preparation – 6-core sensor cable / Endura AZ25 AutoCal unit to Endura AZ25 probe

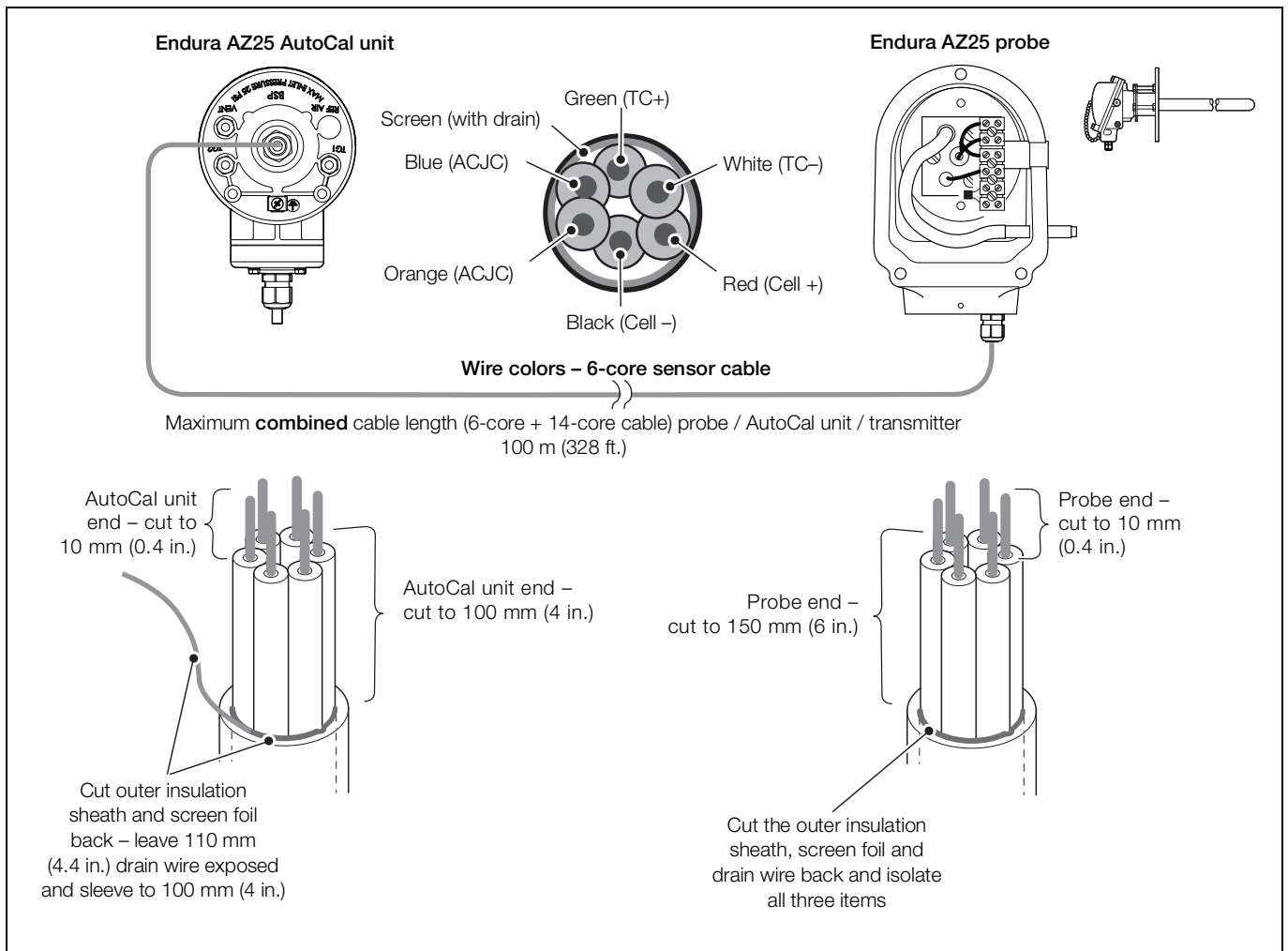


Fig. 4.3 Cable preparation – 6-core sensor cable / Endura AZ25 AutoCal unit to Endura AZ25 probe

4.3.2 Cable connections – 6-core sensor cable / Endura AZ25 AutoCal unit to Endura AZ25 probe

AutoCal unit inner terminal block connection	6-core screened AutoCal unit to probe cable – wire colors	Probe / AutoCal unit connection
Green (TC +)	Green	TC +
White (TC -)	White	TC -
Red (Cell +)	Red	Cell +
Black (Cell -)	Black	Cell -
Orange (ACJC)	Orange	ACJC
Blue (ACJC)	Blue	ACJC
Connect sensor cable drain wire at AutoCal unit to SCN terminal connector – see Fig. 4.4	Screen (drain) – see Fig. 4.4 for sensor cable screen connection requirements	Screen / drain – see Fig. 4.4 for sensor cable screen connection requirements at AutoCal unit (no screen connection made at probe head)

Table 4.5 Cable connections – 6-core sensor cable / Endura AZ25 AutoCal unit to Endura AZ25 probe

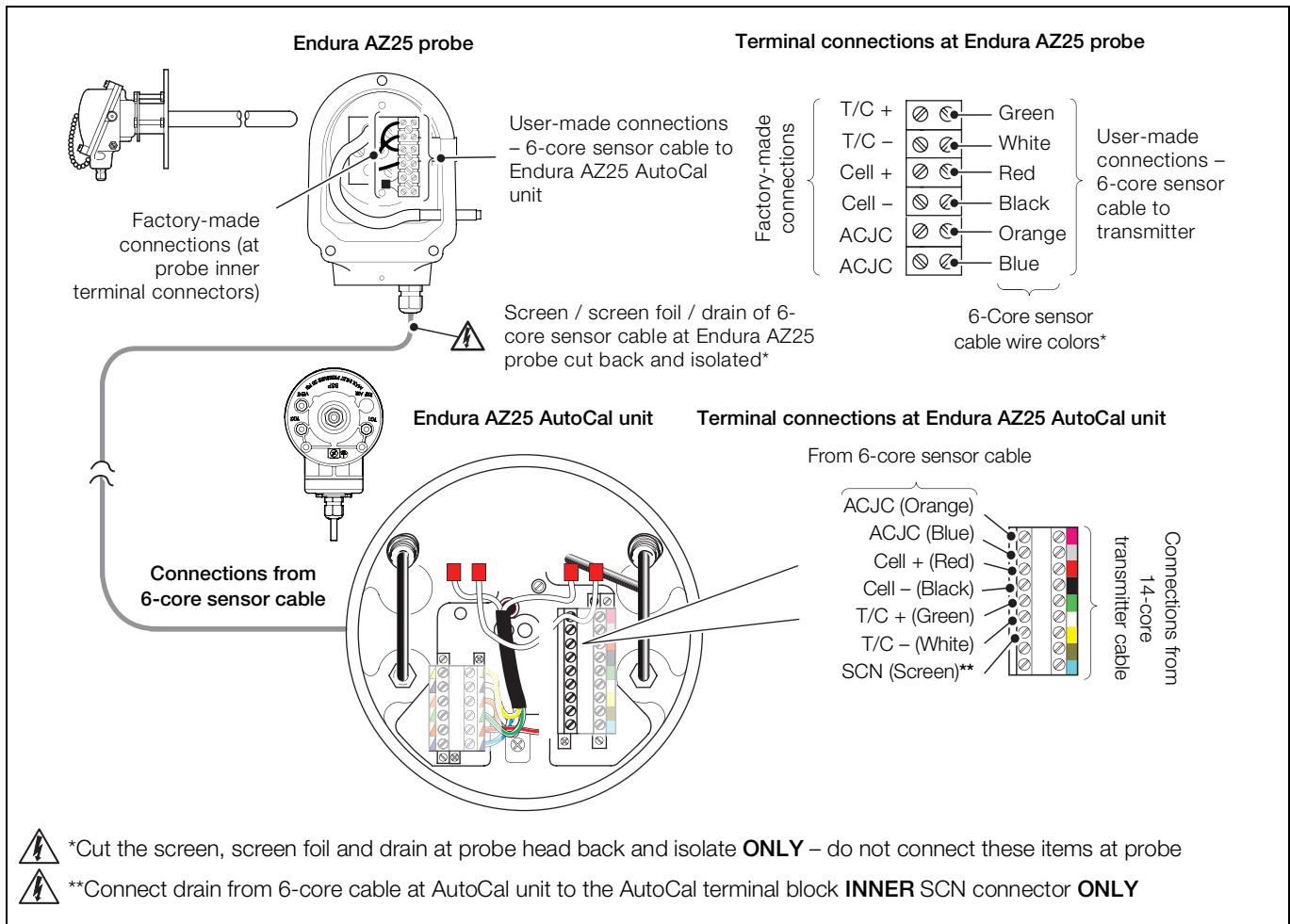


Fig. 4.4 Cable connections – 6-core sensor cable / Endura AZ25 AutoCal unit to Endura AZ25 probe

4.3.3 Cable preparation – 14-core cable / Endura AZ25 AutoCal unit to Endura AZ25 remote transmitter

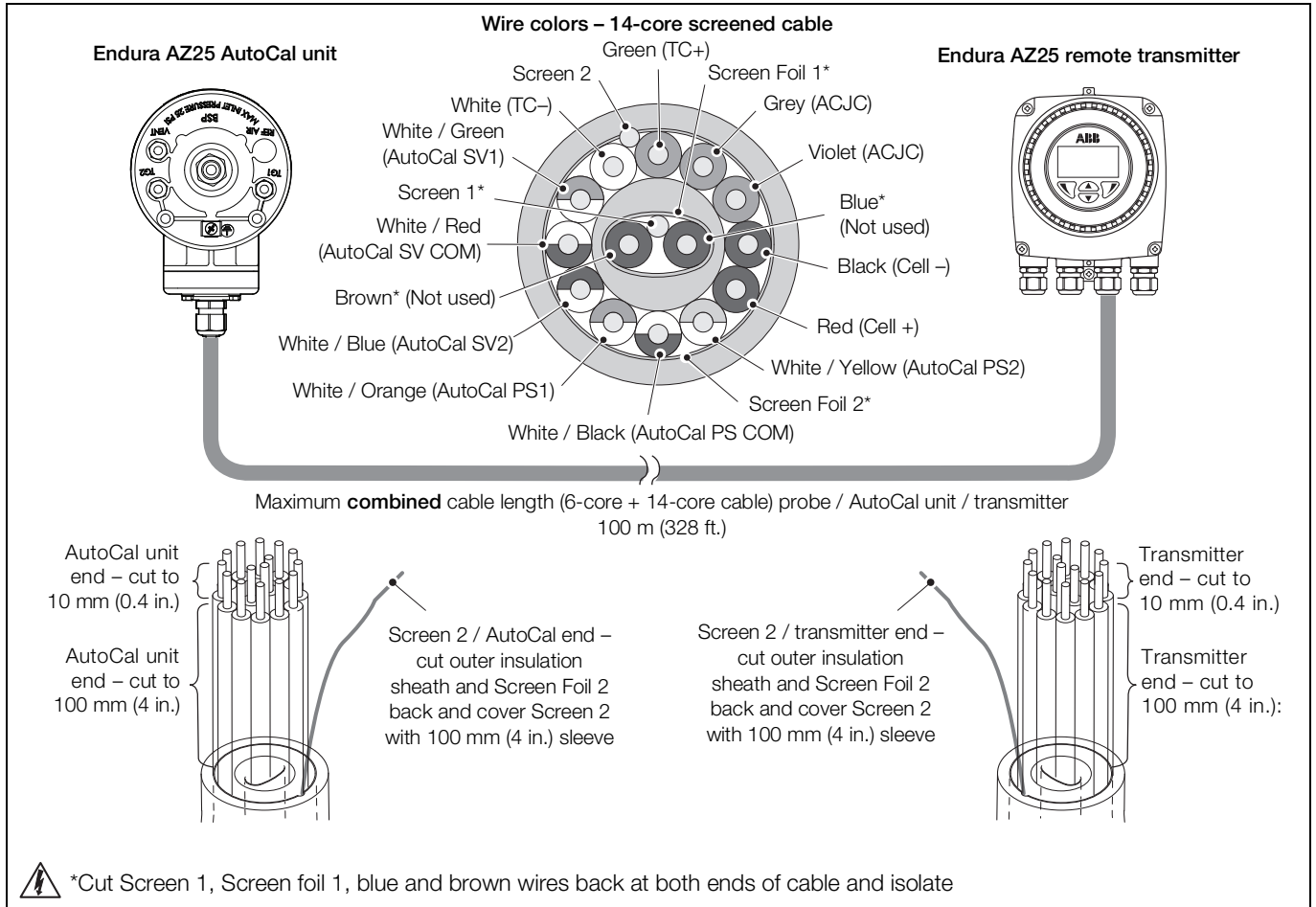


Fig. 4.5 Cable preparation – 14-core cable / Endura AZ25 AutoCal unit to Endura AZ25 remote transmitter

4.3.4 Cable connections – 14-core cable / Endura AZ25 AutoCal unit to Endura AZ25 remote transmitter

Connection at AutoCal unit (outer) removable terminal blocks	Connection at remote transmitter terminal blocks	Cable color	Connection
White / Yellow	White / Yellow	White / Yellow	PS2 (test gas 2)
White / Black	White / Black	White / Black	P COM
White / Orange	White / Orange	White / Orange	PS1 (test gas 1)
White / Green	White / Green	White / Green	SV2
White / Red	White / Red	White / Red	SV COM
White / Blue	White / Blue	White / Blue	SV1
Red	Red	Red	Cell + (oxygen input)
Black	Black	Black	Cell - (oxygen input)
Violet	Violet	Violet	ACJC
Grey	Grey	Grey	ACJC
Green	Green	Green	T/C +
White	White	White	T/C -
SCN Screen 2	SCN (not used – drain connected to Tx internal earth stud)	Screen 2 (Screen 1 cut back)	N/A
Brown (not used)	Brown (not used)	Brown (cut back)	Not used
Blue (not used)	Blue (not used)	Blue (cut back)	Not used

Table 4.6 Cable connections – 14-core cable / Endura AZ25 AutoCal unit to Endura AZ25 remote transmitter

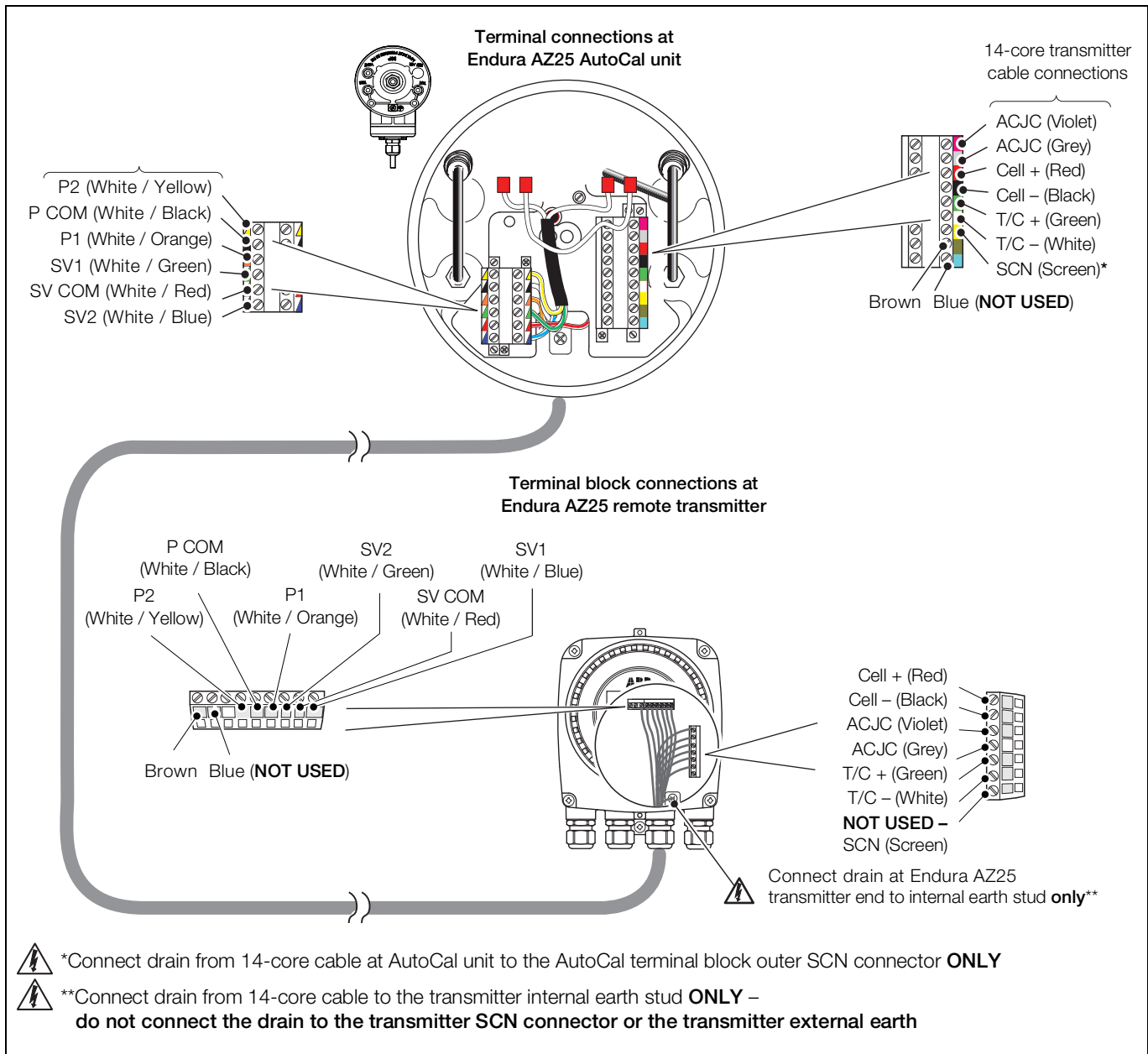


Fig. 4.6 Cable connections – 14-core cable / Endura AZ25 AutoCal unit to Endura AZ25 remote transmitter

4.4 Test gas and reference air connections

The probe has one test gas inlet and one reference air inlet (continuous supplies required). The AutoCal unit has two test gas inlets and one test gas outlet marked VENT (the Ref. Air connection at the AutoCal unit is not used with the AZ25 probe).

Caution. Only use clean dry instrument air free from hydrocarbons,* or traceable certified bottled test gas mixtures of O₂ / N₂.

4.4.1 Restrictors

Systems can be ordered with or without restrictors – refer to Section 3.5, page 9 for schematics of all configuration options.

Where restrictors are not fitted, flowmeters must be fitted to the test gas and reference air lines to restrict / regulate the flow:

- on systems **with** restrictors:
the reference air supply is set to 1 bar (15 psi) which gives 0.3 to 0.5 l / min (0.6 to 1.0 scfh) preset flow
the test gas supply is set to 1 bar (15 psi) which gives 1 l / min (2.118 scfh) preset flow
- on systems **without** restrictors:
pressure is still set to 1 bar (15 psi) then flow is restricted by valves on flowmeters

4.4.2 Connection types

Note. Refer to Section 3.5.1, page 9 for pneumatic entry types.

4.4.3 Test gas and reference air connections

Fig. 4.7 shows the test gas and reference air inlets at the probe.

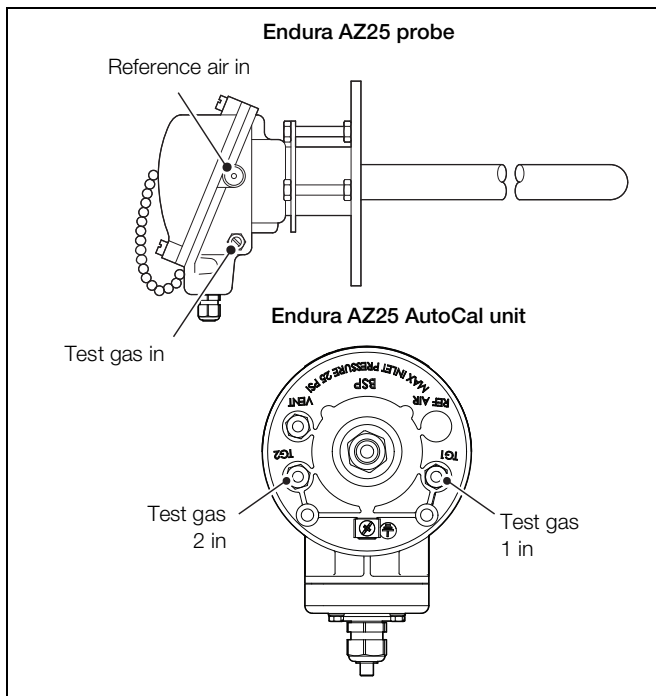


Fig. 4.7 Endura AZ25 probe – test gas and reference air connections

*ABB recommend our 5 µm / Oil Coalescing Filter Regulator – see Appendix A, page 32.

4.4.4 Test gas inlet

The probe test gas (calibration) inlet is provided for in situ 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.

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

- fit a high quality, corrosion-resistant (stainless steel), solenoid valve, manually operated valve or non-return valve (that is leak-tight 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

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 O₂ reading errors.

Note. It is preferable to use air (20.95 % O₂) 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 % O₂.

Refer to Section 3.5, page 9 for schematics of all configuration options

4.4.5 Vent (AutoCal unit)

The vent is used to route the test gas(es) from the AutoCal unit to the Test Gas inlet at the probe.

Ensure the vent and the tube from the vent do not become blocked during probe use.

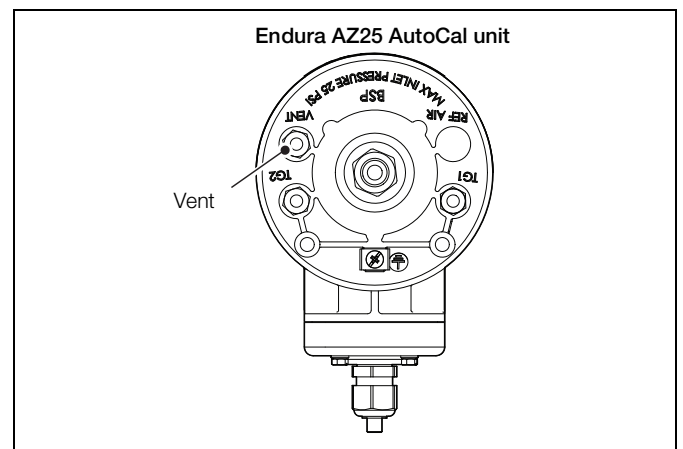


Fig. 4.8 Vent connection at AutoCal unit

4.4.6 Reference air inlet (probe)

A clean, dry, continuous instrument air supply, free from hydrocarbons is required, (supplied for example, from an ABB pump or filter-regulator – see Appendix B, page 33.

Connect the reference air tubing to the external reference air inlet at the probe – see Fig. 4.8, page 27.

Note.

- The reference air supply must be to instrument air standards – clean, dry and free of oil vapor and particle contamination; see schematics in Section 3.5, page 9.
- ABB recommend using the ABB 5µm / Oil Coalescing Filter Regulator to supply reference air – Appendix B, page 33.
- If oil vapor is suspected, use an ABB Reference Air Pump to supply reference air to the probe – Appendix B, page 33.

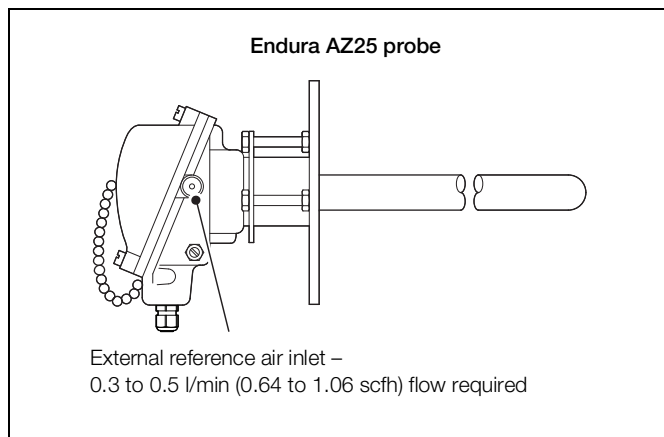


Fig. 4.9 Reference air inlet at probe

4.4.7 Inline shut-off valves

On non-AutoCal systems, if the test gas line is connected permanently and is >10 m (33 ft.) from the supply, fit non-return valves at the probe head to prevent breathing of flue gas in and out of test gas lines– refer to Section 3.5, page 9 for schematics of all configuration options.

4.4.8 Internal test gas and reference air tubes (AutoCal unit)

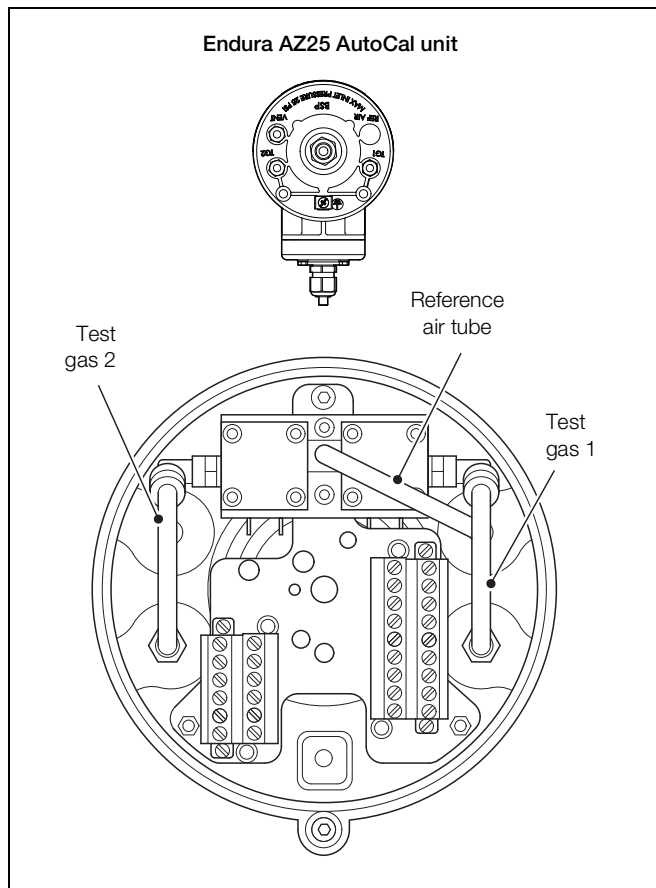


Fig. 4.10 Internal test gas and reference air tubes – AutoCal unit

5 Start-up and operation

5.1 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 O₂ reading errors.

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

Test gas connections must be checked for leak-tight 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 flow to a stable flow rate between 0.3 and 0.5 l / min (0.64 and 1.06 scfh) for probes without restrictors or 1 bar (15 psi) for probes with restrictors.
 - refer to Section 3.5.5 and 3.5.6, page 13 for probes fitted with AutoCal.
 - refer to Section 3.5.7, page 14 for probes without AutoCal.

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

5.2 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:

- the required test gas flow is 1 l/min (2.118 scfh) for all configurations
- refer to Section 3.5, page 9 for test gas and reference air supply configurations

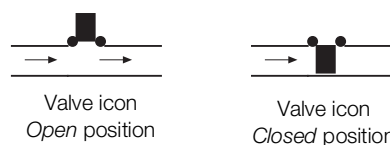
Note. The following sections assume the transmitter is energized and the probe at working temperature (above 600 °C), the reference air supply is on and test gases are available.


5.2.1 AutoCal System with restrictors

To set up an AutoCal system with restrictors:

1. Make test gas and reference air connections as detailed in Section 3.5.5, page 12.
2. Turn on Test Gas 1 and set the pressure to a nominal 1 bar (15 psi).
3. At the transmitter, check the *Calibrate / AutoCal Hardware / Hardware Type* parameter is set to *Internal*.
4. 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:



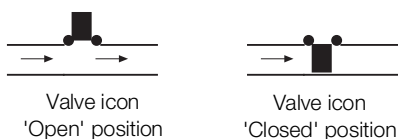
5. Fine tune Test Gas 1 pressure to 1 bar (15 psi) – this ensures the correct flow through the restrictors.
6. Turn gas off at the transmitter by pressing , then turn Test Gas 1 off at the supply.
7. Repeat steps 2 to 6 for Test Gas 2 (if present).
8. Refer to IM/AZ20E-EN to perform a calibration when required.


5.2.2 AutoCal System without restrictors

To set up an AutoCal system without restrictors:

1. Make test gas and reference air connections as detailed in Section 3.5.5, page 12 (remote transmitter).
2. Turn on Test Gas 1 and set the pressure to a nominal 1 bar (15 psi).
3. At the transmitter, check the *Calibrate / AutoCal Hardware / Hardware Type* parameter is *Internal*.
4. 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:



5. Fine tune Test Gas 1 pressure to 1 bar (15 psi) and set the flow on the flowmeter to 1 l/min (2.118 scfh).
6. Turn gas off at the transmitter by pressing , then turn Test Gas 1 off at the supply.
7. Repeat steps 2 to 6 for Test Gas 2 (if present).
8. Refer to IM/AZ20E-EN to perform a calibration when required.

5.2.3 Non-AutoCal System with restrictors

To set up an Non-AutoCal system with restrictors:

1. Make test gas and reference air connections as detailed in Section 3.5.7, page 14 (remote transmitter).

Note. Test Gas 1 and 2 connections are made to the probe's external Test Gas 1 (TG1) connection manually – see Section 3.5.7, page 14.

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 IM/AZ20E-EN to perform a calibration when required.

6 Specification

Physical

Probe insertion lengths

556 mm (21.89 in.)
701 mm (27.60 in.)
801 mm (31.53 in.)
901 mm (35.47 in.)
956 mm (37.64 in.)
1251 mm (49.25 in.)

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
65, 80, 100 mm
1 in. NPT
1 in. BSP
(flange pressure ratings do not apply)
ABB pattern heritage flange

Probe body material

Aluminous Porcelain
Incoloy 800
Recrystallized alumina

Mounting angle

Horizontal to vertically down

Process conditions

Process temperature

Aluminous Porcelain: 600 to 1250 °C (1112 to 2282 °F)

Incoloy 800: 600 to 850 °C (1112 to 1562 °F)

Probe mounted horizontally – Incoloy 800:
600 to 1000 °C (1112 to 1832 °F)

Probe mounted vertically down – recrystallized alumina:
600 to 1400 °C (1112 to 2552 °F)

Process pressure

5 kPa (0.7 psi) positive or negative

Operating requirements

Reference air

Regulated supply:

- probes with restrictors:
reference air supply set to 1 bar (15 psi), gives flow of
0.3 to 0.5 l / min (0.64 to 1.06 scfh) – flowmeters not required
- probes without restrictors:
1 bar (15 psi) flowmeters required with flow set to
0.3 to 0.5 l / min (0.64 to 1.06 scfh)

Pumped supply:

- probes with / without restrictors:
required preset flow: 0.3 to 0.5 l / min (0.64 to 1.06 scfh)

Test gas

User-selectable, 25 to 0.1 % O₂ balance N₂ and / or air (air 20.95 % is recommended as one of the test gases)

- AutoCal system with restrictors:
1 bar (15 psi) – flowmeters not required as restrictors preset flow
to 1 l/min (2.118 scfh)
- systems without restrictors:
1 bar (15 psi) flowmeters required, set to 1 l/min (2.118 scfh)

Calibration

Manual, semi-automatic or automatic (controlled by Endura AZ25 transmitter)

Automatic calibration

AutoCal hardware

Optional standalone unit with built-in solenoid valves for control of test gas flow

Built-in pressure switches to detect presence of test gases

DS/AZ25-EN Rev. E

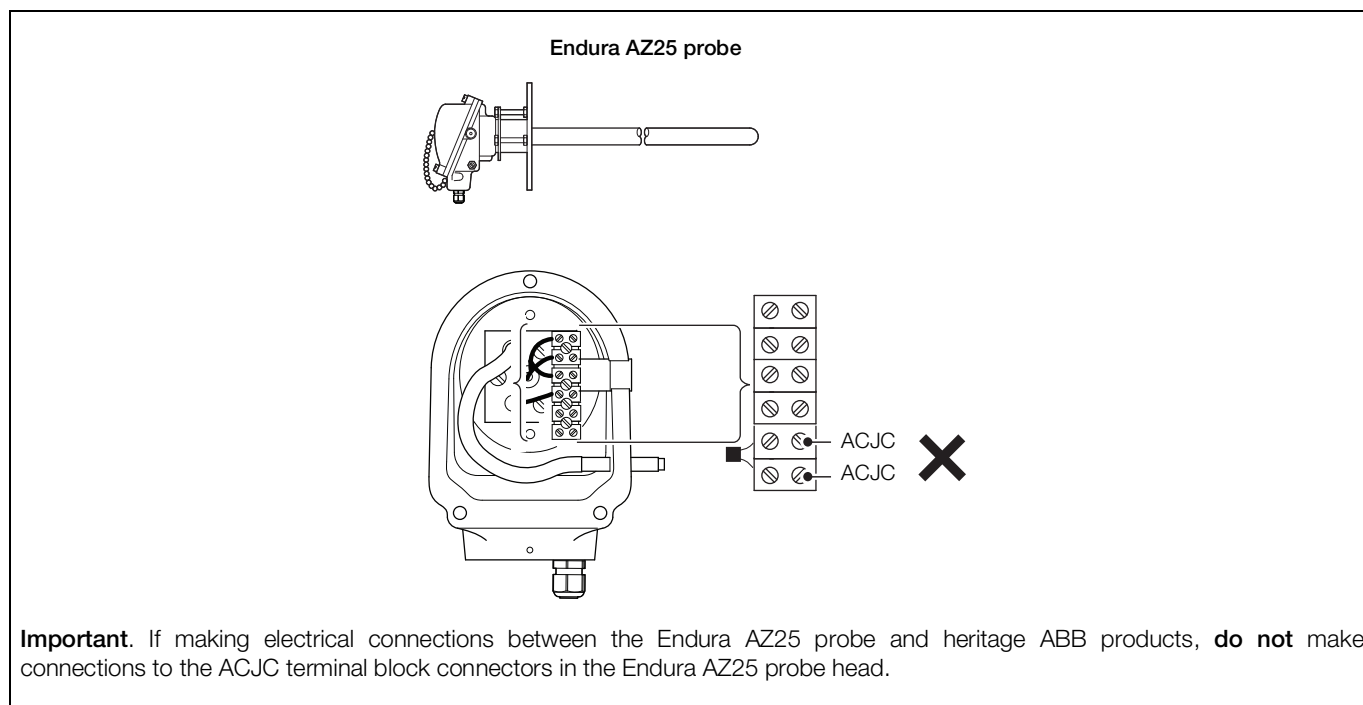
Appendix A – Electrical connections, Endura AZ25 to heritage ABB products

Refer to the following user Manuals and Fig. A.1 before making for electrical connections between Endura AZ25 products and heritage ABB products:

- Endura AZ25 probe to ZDT transmitter: [IM/ZDT/GP](#)
- Endura AZ25 probe to ZMT transmitter: [IM/ZDT](#)
- Endura AZ25 transmitter to ZGP2 probe: [IM/ZGP2](#)

These manuals can also be downloaded from:

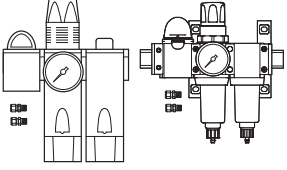

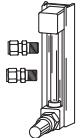
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Important. If making electrical connections between the Endura AZ25 probe and heritage ABB products, **do not** make connections to the ACJC terminal block connectors in the Endura AZ25 probe head.

Fig. A.1 ACJC terminals at AZ25 probe head – not used when connecting to heritage ABB products

Appendix B – Accessories and spares

Part No.	Description
AZ200 731 AZ200 732	Oil-coalescing filter-regulator: 1/4 NPT 5 µm 1/4 BSP 5 µm  Pre-June 2013 regulator Post-June 2013 regulator
AZ200 740 AZ200 741	Filter elements for pre-June 2013 regulator: 5 µm filter element Oil coalescing filter element
AZ200 742 AZ200 743	Filter elements for post-June 2013 regulator: 5 µm filter cartridge Oil coalescing filter cartridge
AZ200 770 AZ200 771 AZ200 772 AZ200 773	ABB reference air pump: 1/4 BSP (Metric) 230 V AC 50 / 60 Hz 1/4 BSP (Metric) 115 V AC 50 / 60 Hz 1/4 NPT (Imperial) 230 V AC 50 / 60 Hz 1/4 NPT (Imperial) 115 V AC 50 / 60 Hz 
Application dependant – see Table B.1	ABB Flowmeter 

Flowmeter Type	Part Number
1/4 NPT Flowmeter (Reference Air): 0.1 to 0.85 l / min (0.21 to 1.8 scfh) STP	AZ200 786
1/4 BSP Flowmeter (Reference Air): 0.1 to 0.85 l / min (0.21 to 1.8 scfh) STP	AZ200 787
1/4 NPT Flowmeter (Test Gas): 0.6 to 4.4 l / min (1.27 to 9.32 scfh) STP	AZ200 788
1/4 BSP Flowmeter (Test Gas): 0.6 to 4.4 l / min (1.27 to 9.32 scfh) STP	AZ200 789

Table B.1 ABB NPT/BSP Flowmeters

Notes

Sales



Service



Software



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