Data sheet DS/AZ40–EN Rev. B

Endura AZ40
Oxygen and carbon monoxide equivalent (COe) analyzer

Superior technology and quality from the world leader in combustion gas analysis

Measurement made easy

Oxygen only or oxygen plus combustibles
— increased combustion efficiency
— burner malfunction identification
— enhanced plant safety

Close-coupled sample system
— integral flame arrestors
— stable sample temperature and pressure
— heated sample path

Comprehensive diagnostics
— NAMUR-compliant diagnostic symbols
— supports predictive maintenance
— fully logged diagnostic events

Automatic sensor calibration
— fully programmable schedule
— locally triggered

Process logging and trending of all measured and calculated values
— oxygen and carbon monoxide equivalent (COe)
— process temperature measurement
— combustion efficiency calculation

Multiple sample filter and blowback options
— optional dual filtration system
— fully programmable blowback

Backward compatibility
— upgrade path for heritage SMA 90 analyzers

Endura AZ40
Oxygen and carbon monoxide equivalent (COe) analyzer

AZ40

The AZ40 oxygen and combustibles analyzer continuously samples and analyses combustion waste gases to determine the levels of excess oxygen and un-burned fuel (also known as combustibles and determined by measuring the carbon monoxide equivalent (COe)). Accurate measurement of both oxygen and COe is important for the safe, reliable and efficient operation of industrial combustion plant.

Close-coupled sample system

The sensor assembly is mounted on the process wall with the probe and filter assembly extending into the process gas stream. The sample is extracted from the process and fed through the sensor head using an air powered ejector. Oxygen analysis is made by an industry-standard zirconium oxide cell.

Carefully metered dilution air is added before un-burned combustibles are measured by a high-sensitivity catalytic sensor calibrated for COe. The dilution air ensures a sufficient supply of oxygen to enable the COe sensor to function during abnormal process conditions when very low combustion oxygen levels can occur.

The close-coupled extractive system enables careful temperature- and pressure-control of the sensors and sample gas. This provides a stable background for target gas measurement to enhance its accuracy.

Operational safety is ensured by the inclusion of a flame arrester in the sample path to prevent flash-back if the process gas combustible level exceeds the lower explosive limit (LEL) during start-up, shut down or process disturbance.

The sample path is maintained at high temperature to prevent acid gas condensation and corrosion.

Fig. 1: AZ40 system

Sample filter and blowback options

To enable long, maintenance-free operation, the sensor sample probe is fitted with a primary and (optional) secondary filter (recommended). The primary filter is designed to oscillate in the process gas stream to reduce the build-up of particulates. The optional blowback feature is fully programmable.

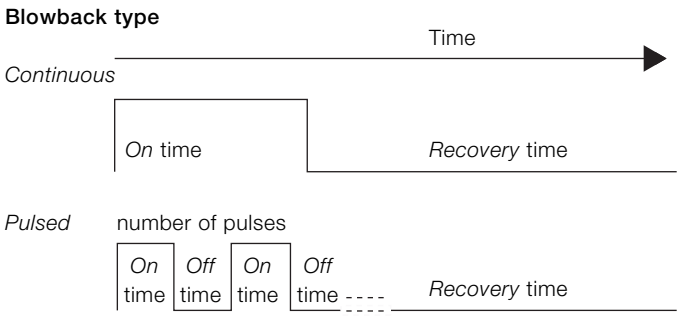

Fig. 2: Blowback programming

Fig. 4: Primary and secondary filters

Fig. 3: Sensor fitted with blowback

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Automatic sensor calibration

The AZ40 includes as standard, an automatic sensor calibration system that uses test gases of known concentrations to calibrate both sensors and ensure continual accuracy.

Solenoids controlling the calibration gases are incorporated into the AZ40 transmitter. Calibration can be triggered automatically on a timed schedule, or on demand using either the transmitter interface or a transmitter digital input.

Fig. 5: Autocal unit

Comprehensive diagnostics

Advanced diagnostics, in accordance with NAMUR NE107, classify alarms and warnings as 'Maintenance Required', 'Check Function', 'Failure' and 'Out-of-Specification'.

NAMUR icons

	Diagnostic icon – *Out of Specification*.
	Diagnostic icon – *Maintenance Required*.
	Diagnostic icon – *Failure*.
	Diagnostic icon – *Check Function*.

A 'Performance Log' containing details of measurements and coefficients for all calibrations and cycles holds up to 100 time-stamped events. When the log is full, the oldest data is overwritten by new entries.

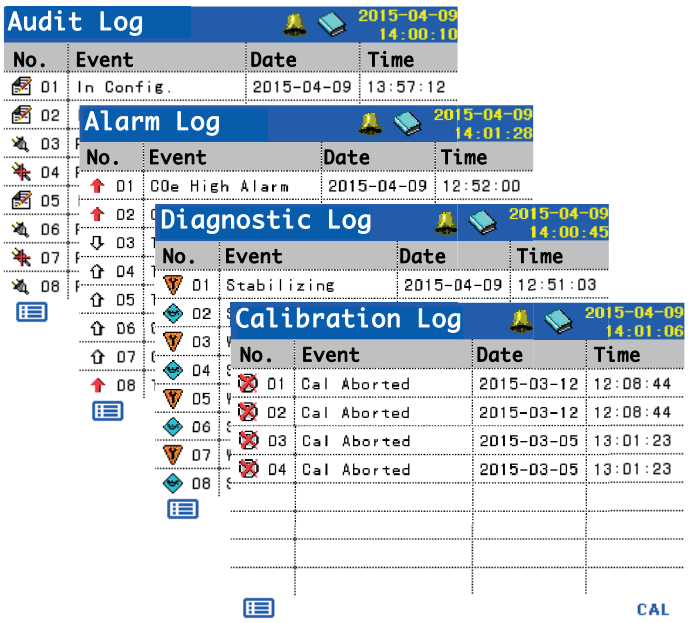

Fig. 6: Performance log

Logging and trending

All measured and calculated values are saved to an SD card and can be trended on screen (when selected). This feature benefits process disturbance analysis by providing a clear record of when and how a disturbance affected the O2, COe and temperature readings.

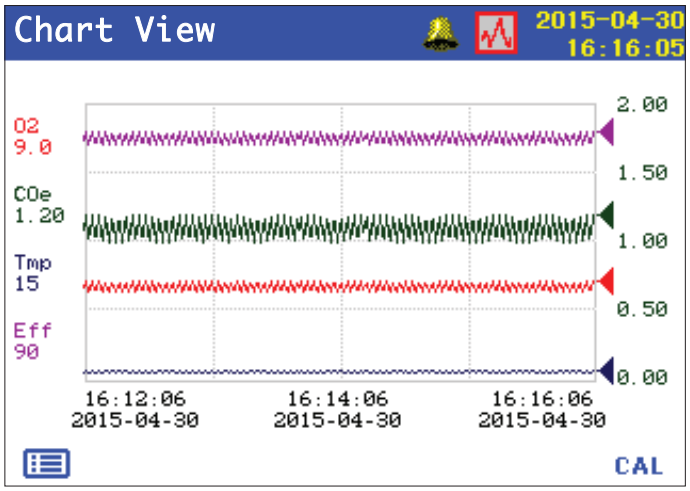

Fig. 7: Trending analysis

SD card functionality

The SD card is also used to upload and download system configuration files. This provides a permanent record of configuration changes and enables analyzers to be cloned, saving valuable time when commissioning multiple systems. It also enables firmware upgrades in the field when additional functionality is required.

Fig. 8: Inserting SD card

Endura AZ40
Oxygen and carbon monoxide equivalent (COe) analyzer

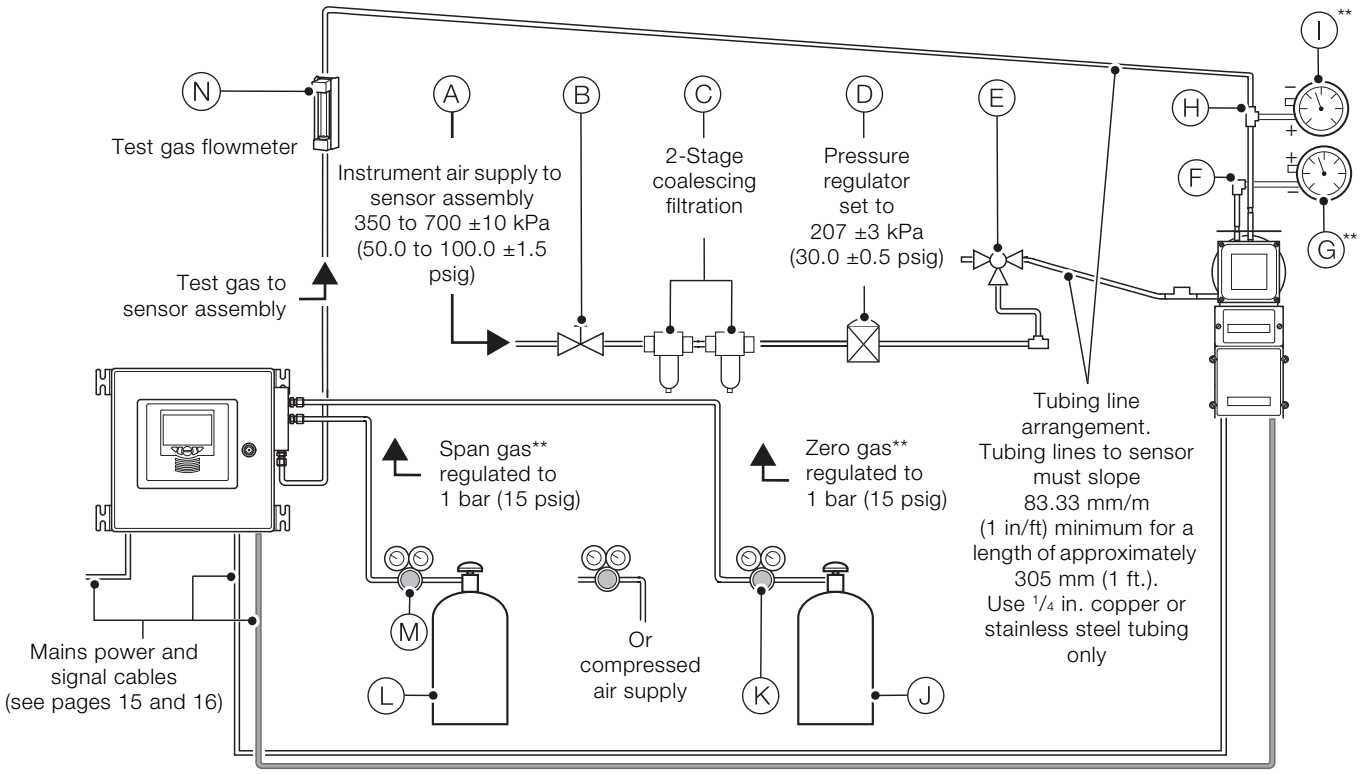

Fig. 9: AZ40 pneumatic installation schematic

Item	Description
Ⓐ	Instrument air supply to sensor assembly: — supply required: 350 to 700 ±10 kPa (50.0 to 100.0 ±1.5 psig) — the dew point at line pressure must be at least 10 °C (18 °F) below the minimum local ambient temperature at the plant site — maximum particle size in the air stream at the instrument must not exceed 3 microns — maximum total oil or hydrocarbon content, exclusive of non-condensables, must be as close as possible to 0 w/w % or v/v %. – it must not exceed 1 ppm w/w or v/v under normal operating conditions
Ⓑ	Shut-off valve
Ⓒ	2-Stage coalescing filtration (self-draining)*
Ⓓ	Instrument air pressure regulator
Ⓔ	3-Way valve (optional for maintenance purposes only, not necessary for operation)
Ⓕ	Aspirator suction pressure port: — pressure required at port: –51.7 to –65.5 kPa (–7.5 to –9.5 psig)
Ⓖ	Aspirator suction pressure gauge (Magnahelic)*: — pressure range: 0 to –69 kPa (0 to –10 psig)
Ⓗ	Test gas port (sensor test gas inlet)
Ⓘ	Probe filter / pressure gauge*: — pressure range: 0 to 20 in H_2O (inch WC)
Ⓙ	Zero test gas (cylinder)***: — mixed gas of O_2/CO/N_2 balance — nominal 1 % O_2 / CO to be 80 to 100 % of the CO range used — must be certified for both O_2 and CO content
Ⓚ	2-Stage cylinder regulator for zero test gas — set to 1 bar (15 psig)

Table 1: Key to pneumatic installation schematic

Item	Description
Ⓛ	Span test gas (compressed air supply or cylinder)***: — concentration of O_2 to be 80 to 100 % of the O_2 range used — compressed air supply may be used for a 0 to 25 % O_2 range (recommended) — cylinder gas must be certified for O_2 content — compressed air line may be defined as 20.95 % O_2
Ⓜ	2-Stage cylinder regulator for span test gas — set to 1 bar (15 psig)
Ⓝ	Flowmeter, test gas line

* Use 2-stage filtration only – required efficiency for 0.01 micron (particles and droplets, installed in order) 93 and 99.99 %.

** If gauges are fitted permanently, a shut-off valve must be used to prevent leakage from the gauge.

*** Avoid locations near sources of heat – ambient temperature must not exceed 49 °C (120 °F).

Zero test gas must be the test gas of lowest oxygen content.

Span test gas must be the test gas of highest oxygen content.

For maximum accuracy, the highest CO test gas (CO span) must be combined with the lowest (1 % nominal) oxygen test gas.

The oxygen span gas must have zero CO content (CO zero).

The oxygen span gas may be air (20.95 % O_2) – recommended.

Table 1: Key to pneumatic installation schematic (continued)

Endura AZ40
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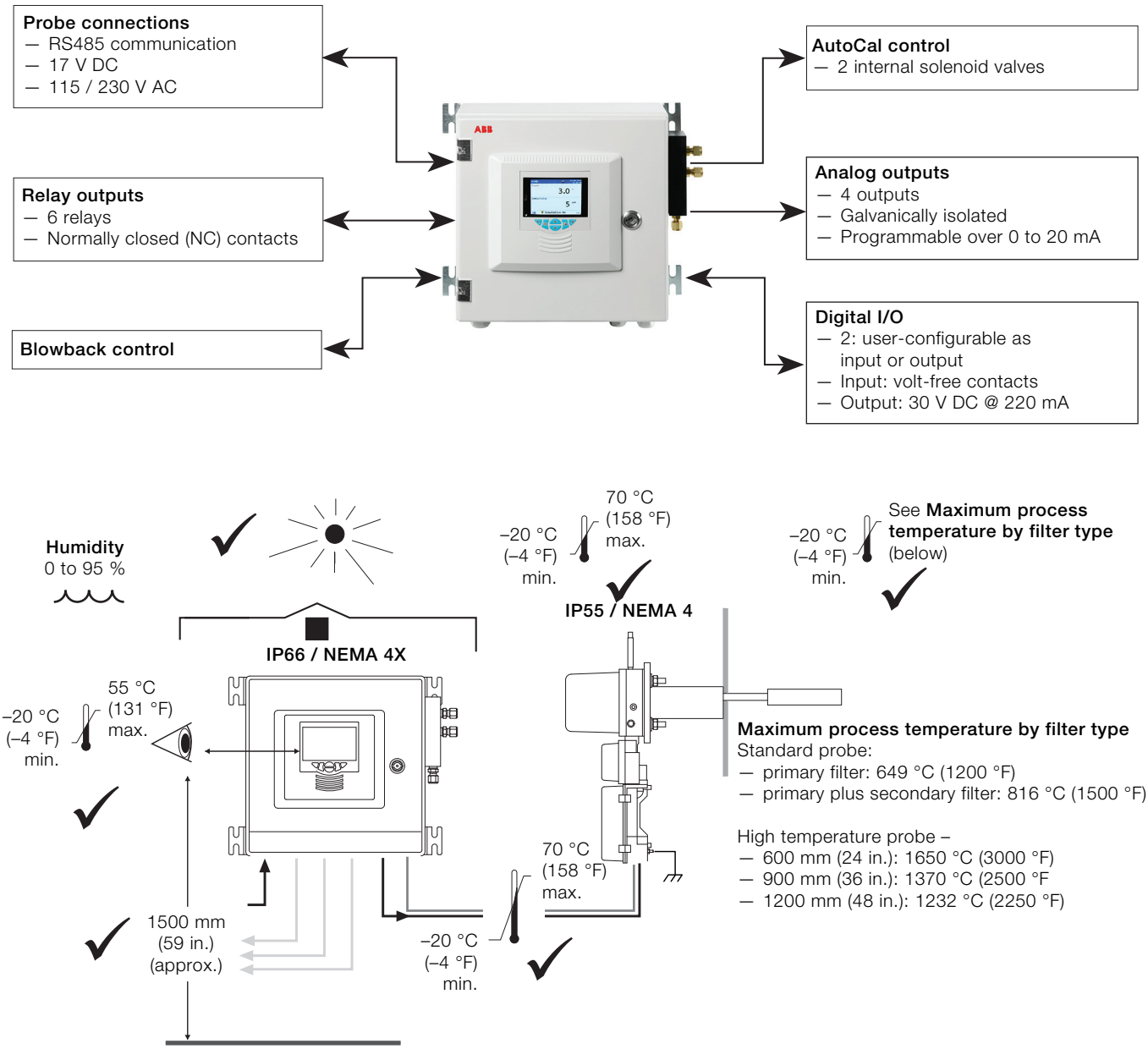
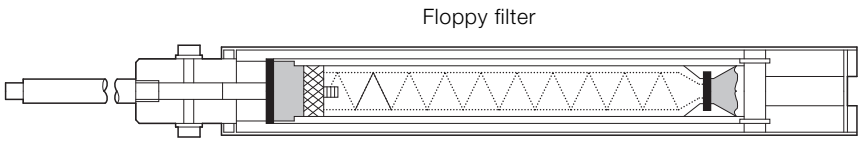


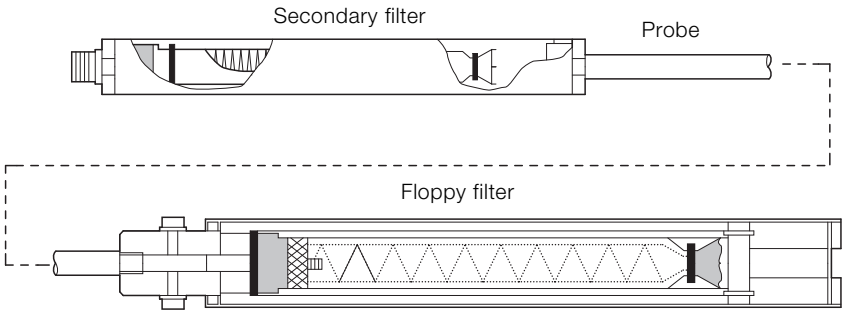
Fig. 10: Environmental requirements

Filter and probe assembly

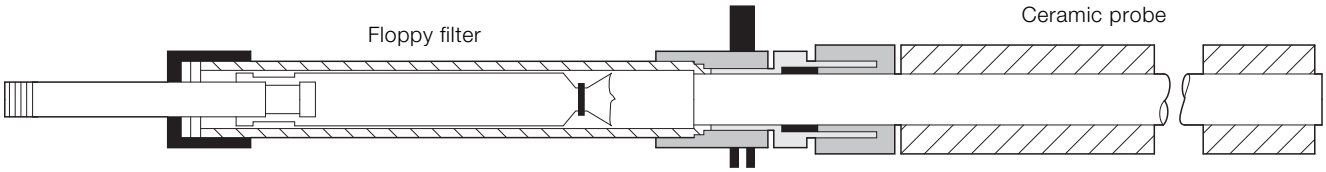
Standard probe with filter



Standard probe with optional dual filter



Optional high temperature probe with filter

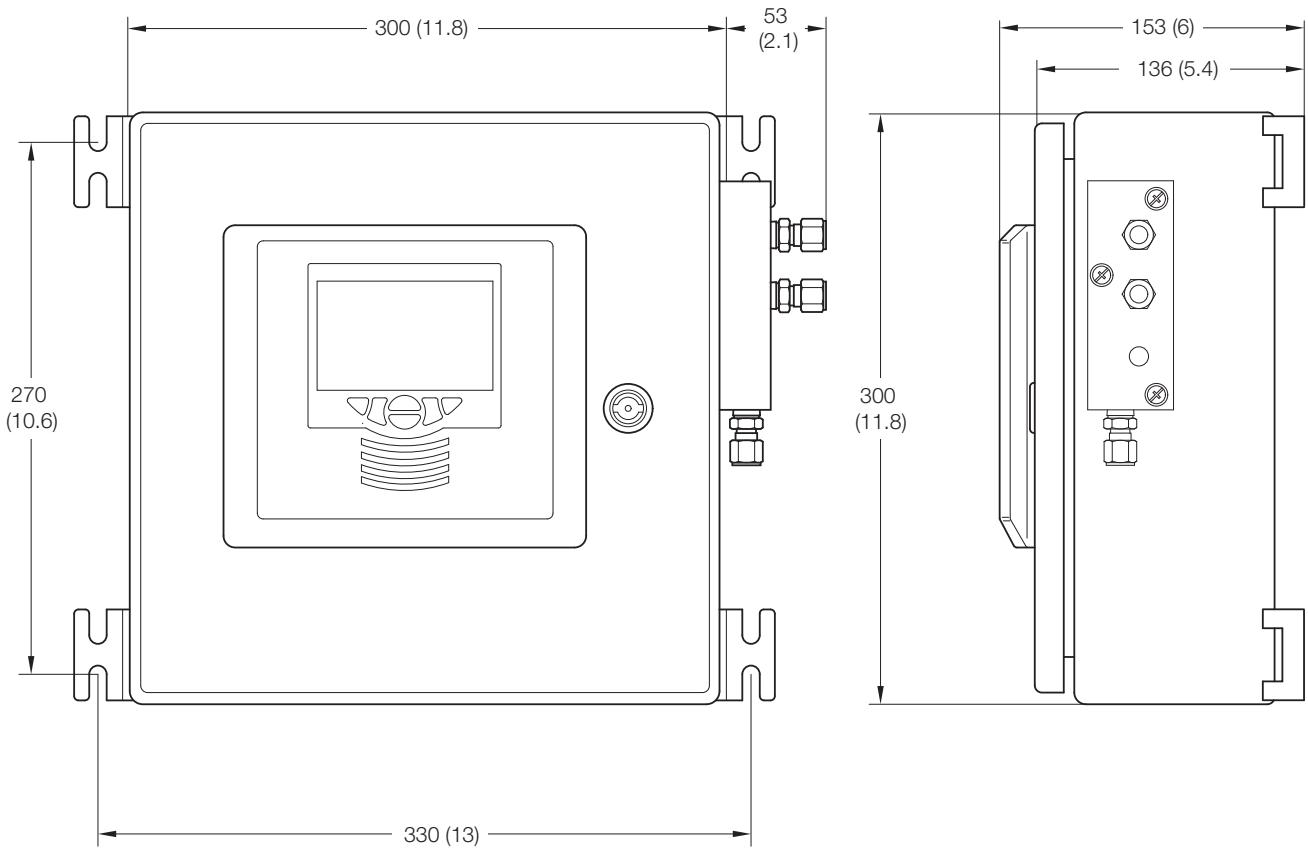


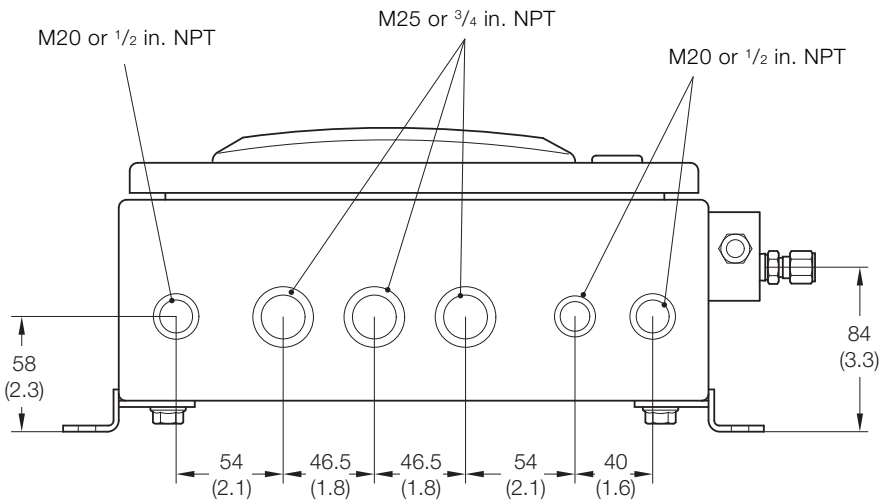
Endura AZ40
Oxygen and carbon monoxide equivalent (COe) analyzer

Dimensions

Transmitter

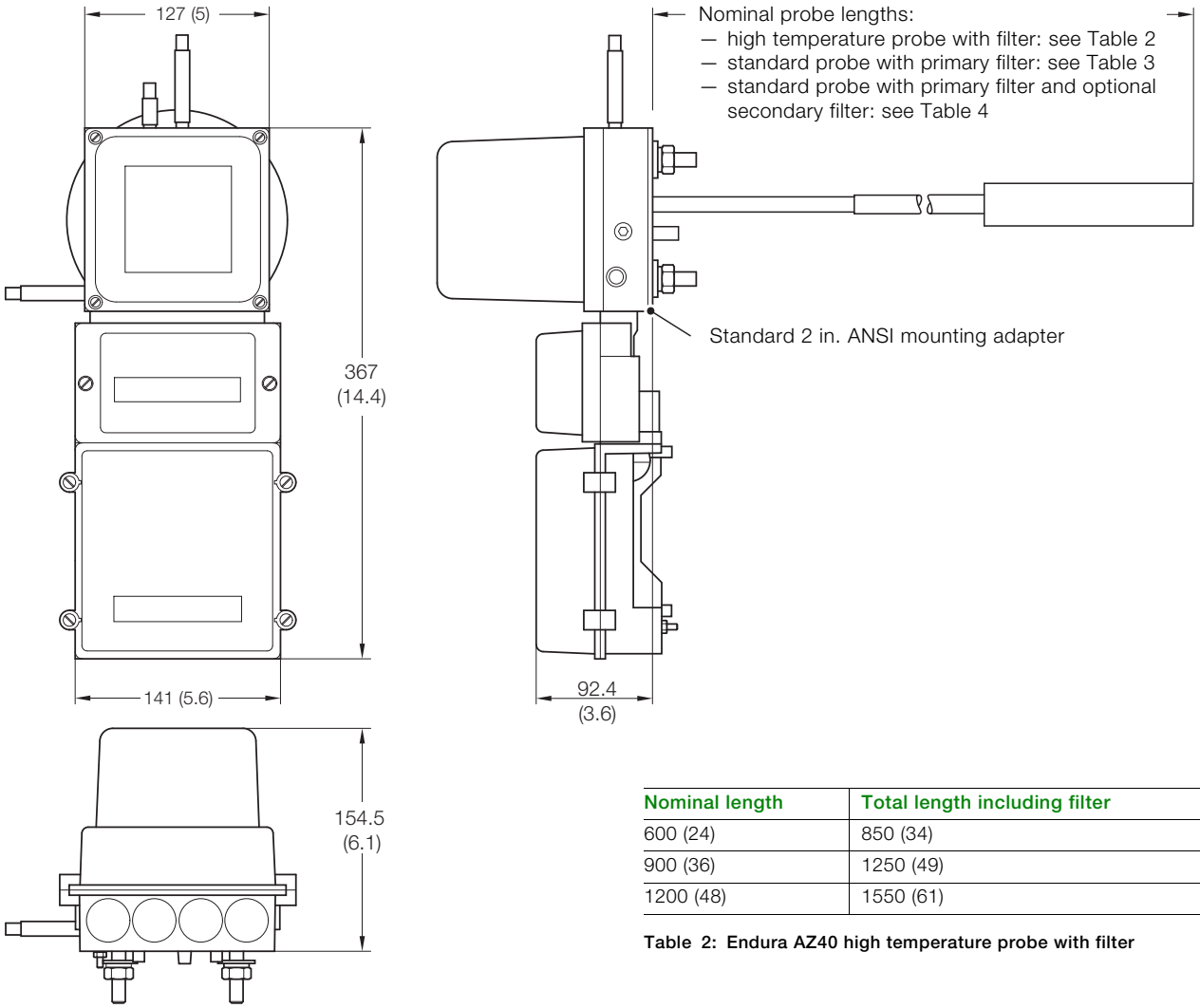
Dimensions in mm (in.)





Sensor

Dimensions in mm (in.)



Nominal length	Total length including filter
600 (24)	850 (34)
900 (36)	1250 (49)
1200 (48)	1550 (61)

Table 2: Endura AZ40 high temperature probe with filter

Nominal length	Total length including filter
600 (24)	950 (37)
900 (36)	1265 (50)
1200 (48)	1550 (61)
1500 (60)	1850 (73)
1800 (72)	2150 (85)
2100 (84)	2460 (97)

Table 3: Endura AZ40 standard probe with primary filter

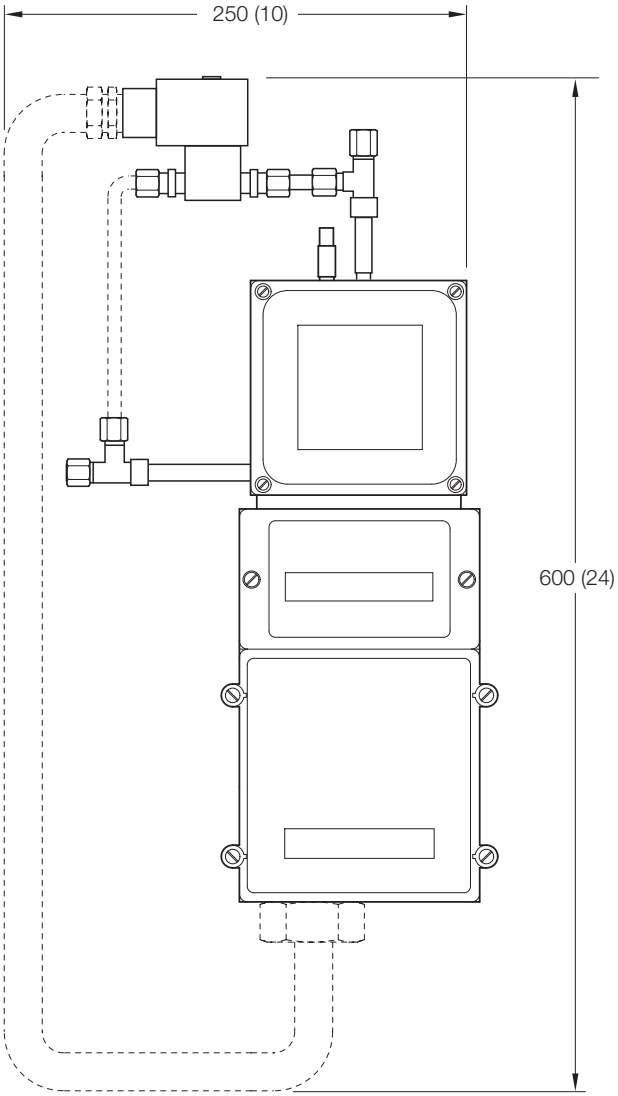
Nominal length	Total length including filter
600 (24)	1150 (45)
900 (36)	1465 (57)
1200 (48)	1750 (69)
1500 (60)	2050 (81)
1800 (72)	2350 (93)
2100 (84)	2660 (105)

Table 4: Endura AZ40 standard probe with primary filter and optional secondary filter

Endura AZ40
Oxygen and carbon monoxide equivalent (COe) analyzer

Sensor assembly with blowback assembly fitted (nominal dimensions)

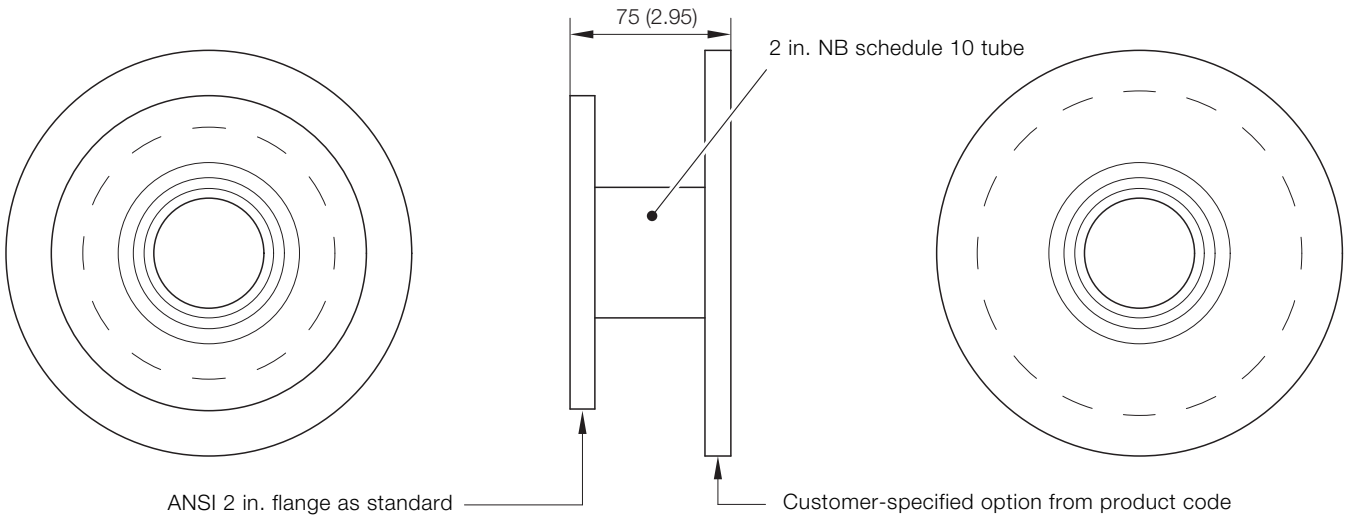
Dimensions in mm (in.)



Probe flanges (all probe lengths) and mounting plates for standard probe flanges

Dimensions in mm (in).

Note. The pressure ratings for these flanges do not apply.



Flange type	A	B	C (Ø)	D (PCD)
ABB standard	165 (6.50)	12 (0.47)	12.5 (0.50)	140 (5.51)

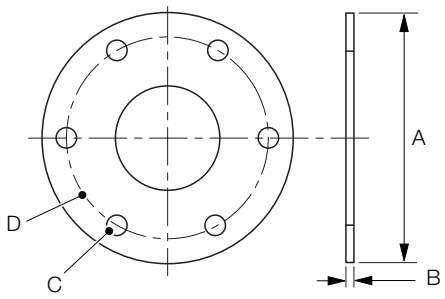


Table 5: ABB probe flange types

Flange type	A	B	C (Ø)	D (PCD)
ANSI 3 in 150	190.5 (7.50)	12 (0.47)	19 (0.75)	152.4 (6.00)

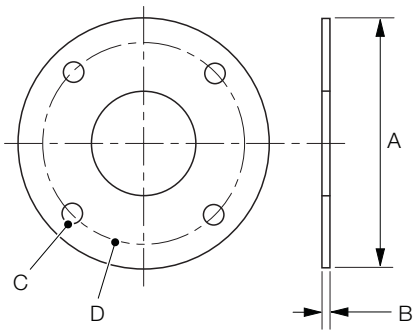


Table 6: 4-Hole probe flange types and dimensions

Flange type	A	B	C (Ø)	D (PCD)
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)

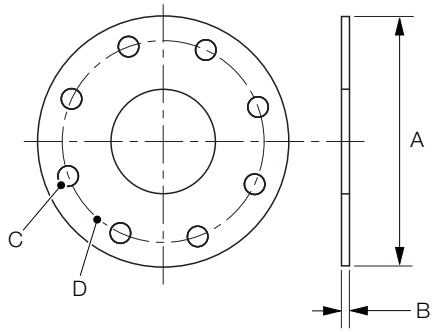


Table 7: 8-Hole probe flange types and dimensions

Weights

Dimensions in mm (in.), weights in kg (lb).

Nominal length	Unpacked weight	Packed weight
600 (24)	1.50 (3.30)	4.4 (9.70)
900 (36)	1.70 (3.75)	4.6 (10.14)
1200 (48)	1.95 (4.30)	4.85 (10.69)
1500 (60)	2.20 (4.85)	7.6 (16.75)
1800 (72)	2.40 (5.29)	7.8 (17.19)
2100 (84)	2.60 (5.73)	8.0 (17.63)

Table 8: Endura AZ40 standard temperature probe with filter

Nominal length	Unpacked weight	Packed weight
600 (24)	1.80 (4.00)	4.70 (10.36)
900 (36)	2.02 (4.45)	4.90 (10.80)
1200 (48)	2.25 (5.00)	5.25 (11.57)
1500 (60)	2.47 (5.44)	7.90 (17.41)
1800 (72)	2.78 (6.13)	8.10 (17.85)
2100 (84)	2.92 (6.43)	8.30 (18.29)

Table 9: Endura AZ40 standard temperature probe with optional secondary filter

Nominal length	Unpacked weight	Packed weight
600 (24)	1.10 (2.40)	5.10 (11.24)
900 (36)	1.35 (3.00)	5.35 (11.80)
1200 (48)	1.60 (3.50)	5.60 (12.34)

Table 10: Endura AZ40 high temperature probe with filter

Unpacked weight	Packed weight
9.0 (20)	12 (26)

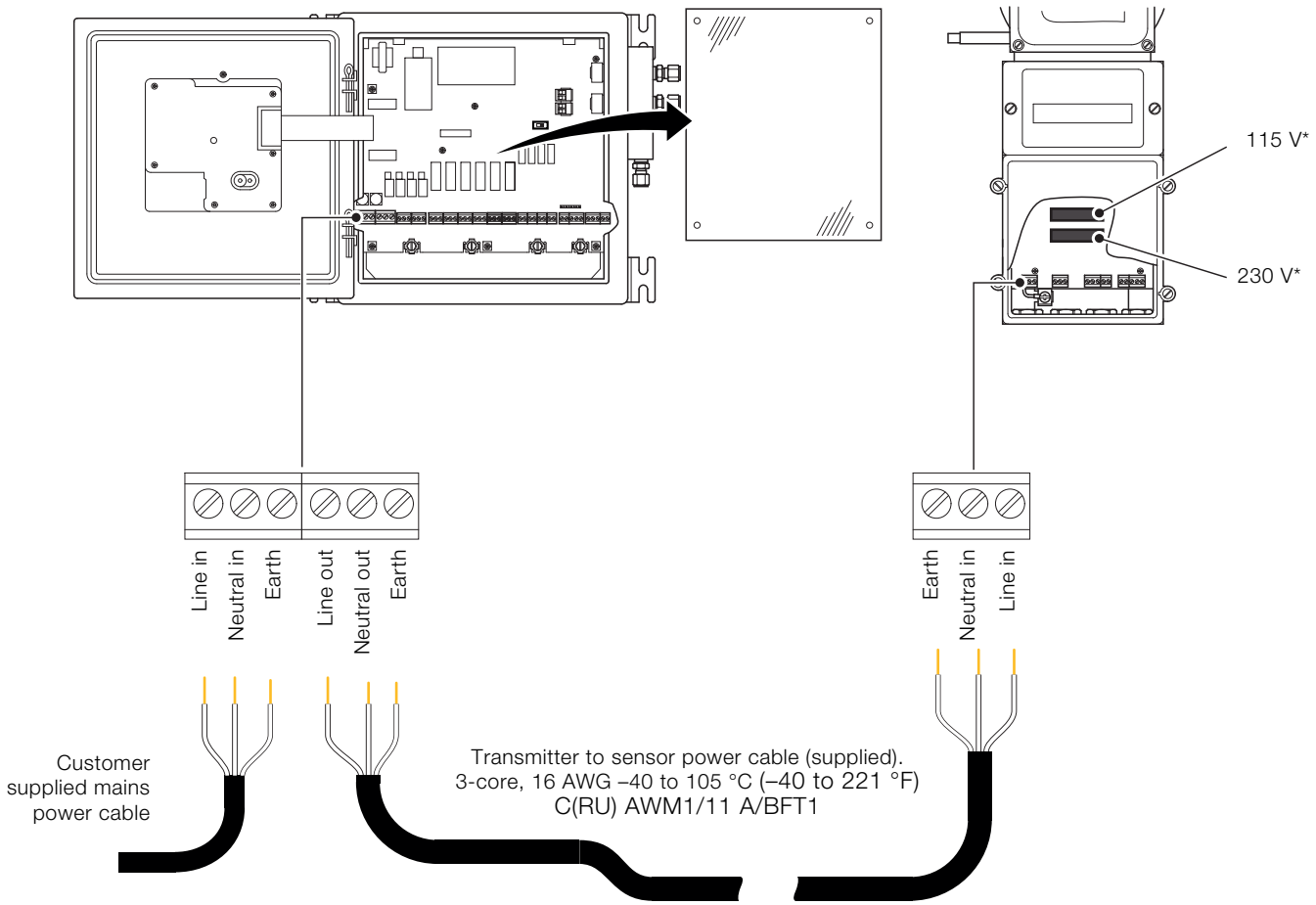
Table 11: Endura AZ40 sensor assembly

Unpacked weight	Packed weight
7.6 (17)	11 (24)

Table 12: Endura AZ40 transmitter

Electrical connections

Mains power



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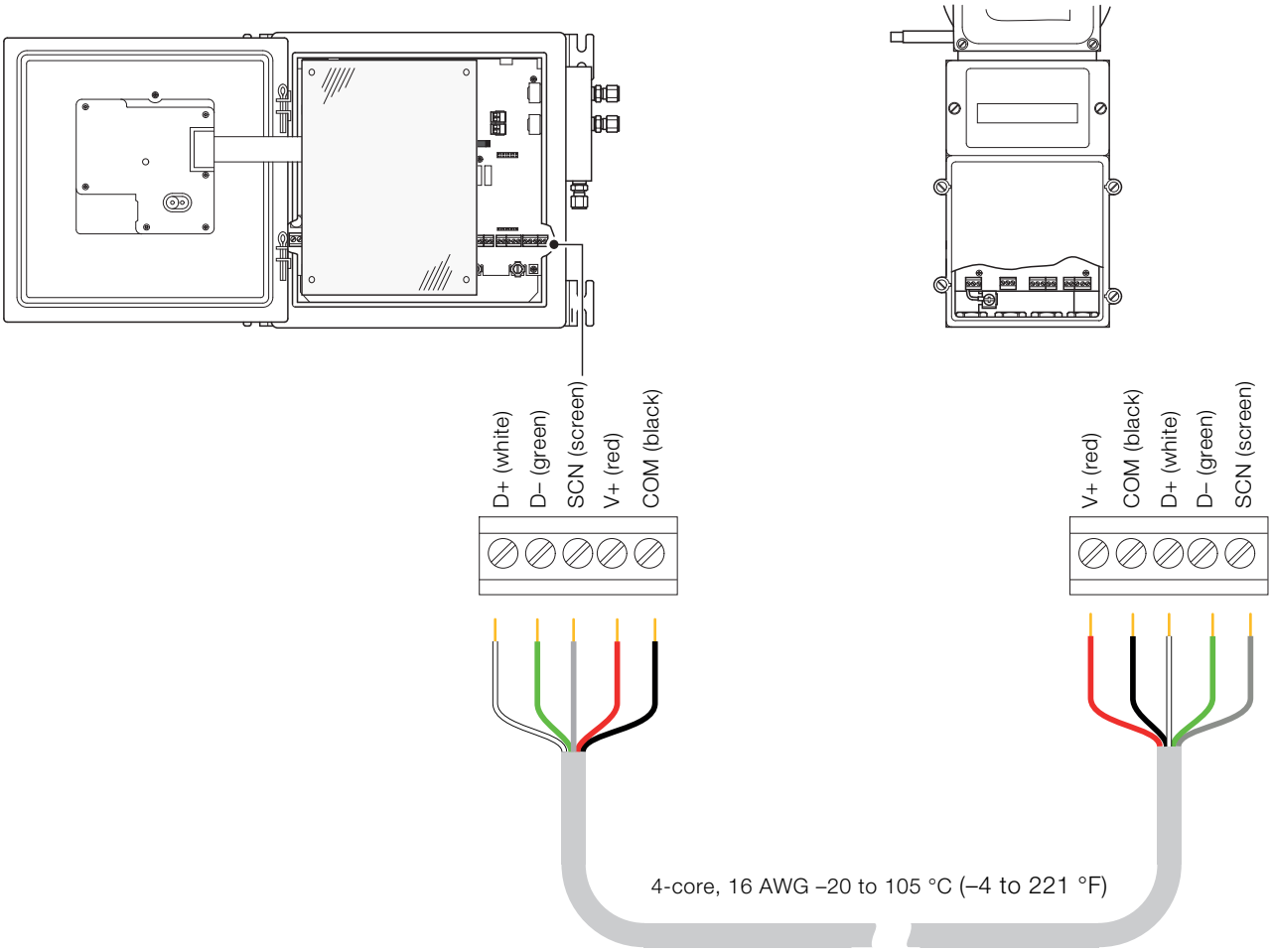
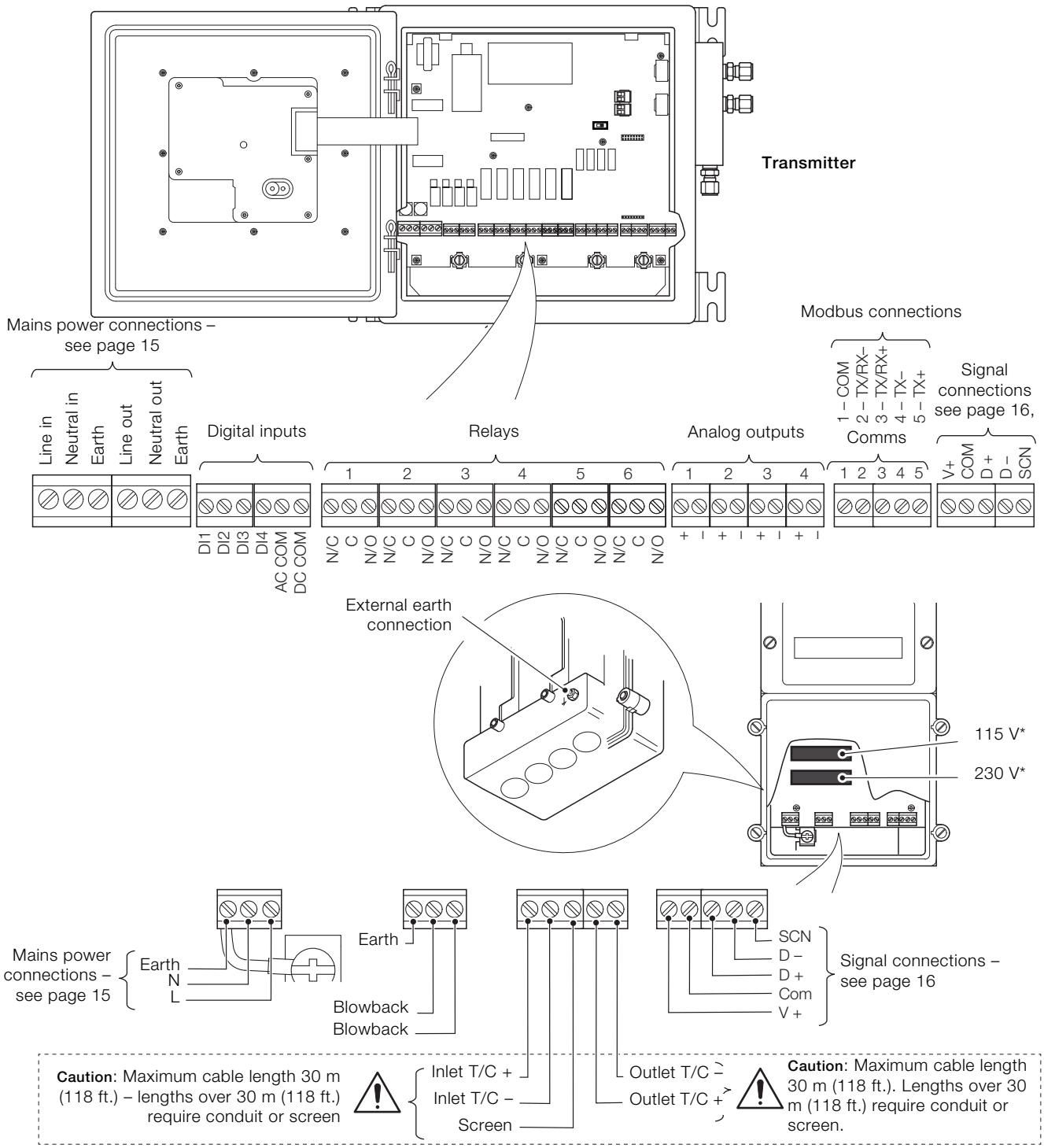
Signal cable



Customer-made connections



Endura AZ40
Oxygen and carbon monoxide equivalent (COe) analyzer

Specification

Range
O_2 span
Minimum 0 to 5 %
Maximum 0 to 25 %
CO_e span
Minimum 0 to 500 ppm
Maximum 0 to 20,000 ppm (2.00 %)
Temperature zero
–46 to 1371 °C (–50 to 2500 °F)
Temperature span
Minimum 260 °C (500 °F)
Maximum 1649 °C (3000 °F)

Sensor response time to 63 % span (t_{63})
O_2
< 3.5 seconds
CO_e
< 13 seconds

Display measurement accuracy
O_2
±2.5 % of reading or ±0.5 % O_2 whichever is greater
CO_e
±20 ppm COe or ±2 % of selected span whichever is greater (from 200 to 999 ppm)
±400 ppm COe or ±2 % of selected span whichever is greater (from 1,000 to 20,000 ppm)
Temperature
Thermocouple type B, E, J, K, N, R, S and T

Analog output accuracy
O_2
±2.5 % of reading or ±0.5 % O_2 whichever is greater
CO_e
±20 ppm COe or ±2 % of selected span whichever is greater (from 200 to 999 ppm)
±400 ppm COe or ±2 % of selected span whichever is greater (from 1,000 to 20,000 ppm)
Temperature
Thermocouple type B, E, J, K, N, R, S, T

Ambient operating temperature
Transmitter
–20 to 55 °C (–4 to 131 °F)
Sensor
–20 to 70 °C (–4 to 158 °F)
Interconnecting cable
Signal: –20 to 105 °C (–4 to 221 °F)
Power: –40 to 105 °C (–40 to 221 °F) C(RU) AWM1/11 A/BFT1

Storage temperature
–40 to 85 °C (–40 to 185 °F)

Operating humidity
Up to 95 % RH, non condensing

Ingress protection
Transmitter
IP66 / NEMA 4X
Sensor
IP55 / NEMA 4

Power supply requirements
Supply voltage
85 to 265 V AC, 50 / 60 Hz
Transmitter
<60 W
Sensor
<730 W (during start up) and <310 W (when operating)

EMC
Emissions and immunity
EN61326 Industrial specification

Safety
General safety
CE (EN61010)

Probe insertion length

Dimensions in mm (in.)

Standard probe

No filter	Primary filter	Primary and secondary filter
600 (24)	950 (37)	1150 (45)
900 (36)	1265 (50)	1465 (57)
1200 (48)	1550 (61)	1750 (69)
1500 (60)	1850 (73)	2050 (81)
1800 (72)	2150 (85)	2350 (93)
2100 (84)	2460 (97)	2660 (105)

High temperature probe

No filter	High temperature filter
600 (24)	850 (34)
900 (36)	1250 (49)
1200 (48)	1550 (61)

Process connections

Standard / high temperature probes

ANSI 2 / 3 / 4 in.
DIN 80 / 100

Temperature range

Standard probe

–20 to 650 °C (0 to 1,200 °F)

High temperature probe

–20 to 1650 °C (0 to 3,000 °F)

Maximum process temperature by filter type

Standard probe

Filter type	Maximum temperature
Primary	649 °C (1200 °F)
Primary + secondary	816 °C (1500 °F)

High temperature probe

Probe length	Maximum temperature
600 mm (24 in.)	1650 °C (3000 °F)
900 mm (36 in.)	1370 °C (2500 °F
1200 mm (48 in.)	1232 °C (2250 °F)

Process pressure range

±5 kPa (±20 in. WG)

Air supply

207 kPa at 15 l/min (standard temperature and pressure)
30.0 psi at 0.55 SCFM (standard temperature and pressure)

Calibration

Manual or automatic

Automatic calibration

AutoCal hardware

Built-in solenoid valves for test gas flow
Isolated solenoid valve control as standard, 24 V at 2 W per valve

Blowback function

Optional solenoid valve

Transmitter enclosure

Wall mount
Painted stainless steel (approx dimensions – 300 x 300 x 150 mm [11.8 x 11.8 x 5.9 in.])
Optional NPT or metric gland entries

Display and switches

Display type

Backlit, 89 mm (3.5 in.) color

Operator switches

6

Analog outputs

Number

4 (standard)

Output 1 to 4

Isolated 0 to 22 mA

Function

Fixed retransmission functions
O/P 1: process O_2
O/P 2: process COe
O/P 3: process temperature
O/P 4: combustion efficiency

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Digital outputs
Number
6
Type
Normally closed 2 A at 230 V AC (30 V DC non-inductive)
Function
Digital output functions
Digital output 1: process alarm O_2
Digital output 2: process alarm COe
Digital output 3: process temperature alarm
Digital output 4: combustion efficiency alarm
Digital output 5: analyzer fault alarm
Digital output 6: calibration in progress

Digital inputs
Number
4
Input
Volt-free contact
Input functions
Fixed functions:
DI 1: remote calibration trigger
DI 2: remote blowback trigger
DI 3: remote zero gas trigger
DI 4: remote span gas trigger

Digital communication
MODBUS

SD card option
Logs
Audit, alarm, calibration and diagnostics
Data logging
COe, O_2, inlet and outlet temperature and efficiency
Sample rate programmable between 1 second and 60 minutes
Configuration
Upload / download
Firmware
Field upgradable

Languages
English

Ordering information

		Transmitter			Sensor				Probe				Additional				
Endura AZ40 oxygen and COe analyzer	**AZ40/**	X	X	X	X	X	X	X	X	X	X	XX	X	X	X	XX	XX
Transmitter options																	
None (no transmitter required)	0																
Standard (no communications)	1																
Standard + Modbus	2																
Transmitter cable entry type																	
None (no gland pack)		0															
Metric (M20 and M25 plastic gland pack)		1															
Imperial (1/2 and 3/4 in. NPT plastic gland pack)		2															
Transmitter system type																	
None (no transmitter required)			0														
Remote (transmitter included)			2														
Sensor type																	
None (no sensor required)				0													
Oxygen only				1													
Oxygen + combustibles				2													
SMA 90 to AZ40 upgrade kit (no sensor required)				3													
Sensor cable entry type																	
None (no gland pack)					0												
Metric (M20 and M25 plastic gland pack)					1												
Imperial (1/2 and 3/4 in. NPT plastic gland pack)					2												
Smart sensor type																	
None (No sensor required)						0											
AZ40 version						1											
SMA 90 to AZ40 upgrade kit						2											
SMA 90 replacement sensor						3											
Probe type																	
None (no probe required)							0										
Standard							1										
High temperature							2										
Nominal probe length																	
None (no probe required)								0									
600 mm (24 in.)								1									
900 mm (36 in.)								2									
1200 mm (48 in.)								3									
1500 mm (60 in.)								4									
1800 mm (72 in.)								5									
2100 mm (84 in.)								6									

Continued overleaf ...

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		Transmitter			Sensor				Probe			Additional				
Endura AZ40 oxygen and COe analyzer	**AZ40/**	X	X	X	X	X	X	X	X	X	XX	X	X	X	XX	XX
									See page 21							
Probe flange type																
None (no probe required)									0							
ABB (Heritage)									1							
DIN 80 mm									2							
DIN 100 mm									3							
ANSI 2 in. (no adapter)									4							
ANSI 3 in.									5							
ANSI 4 in.									6							
Probe filter options																
None (No filter required)										0						
Standard										1						
Standard + secondary *										2						
Standard (high temperature)										3						
Probe cable length																
None											00					
10 m (33 ft.) standard											11					
25 m (82 ft.) standard											21					
50 m (164 ft.) standard											31					
75 m (246 ft.) standard											41					
Blowback																
None												0				
Blowback hardware												1				
Certification																
CE only													1			
Language																
English														E		
Power supply																
115 V AC															V1	
230 V AC															V2	
Options																
Calibration set-up kit																C1
Stainless steel tag																S1

***** Secondary filter required when process temperature is between 650 and 815 °C (1200 and 1500 °F)

Acknowledgements

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