

ABB MEASUREMENT & ANALYTICS | DATA SHEET

## Endura AZ40

Oxygen and carbon monoxide equivalent (COe) analyzer



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## Measurement made easy

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

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### Oxygen only or oxygen plus combustibles

- increased combustion efficiency
- burner malfunction identification
- enhanced plant safety

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### Close-coupled sample system

- integral flame arrestors
- stable sample temperature and pressure
- heated sample path

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### Comprehensive diagnostics

- NAMUR-compliant diagnostic symbols
- supports predictive maintenance
- fully logged diagnostic events

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### Automatic sensor calibration

- fully programmable schedule
- locally triggered

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### Process logging and trending of all measured and calculated values

- oxygen and carbon monoxide equivalent (COe)
- process temperature measurement
- combustion efficiency calculation

## AZ40

The AZ40 oxygen and combustibles analyzer continuously samples and analyzes 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.



Figure 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.

#### Blowback type

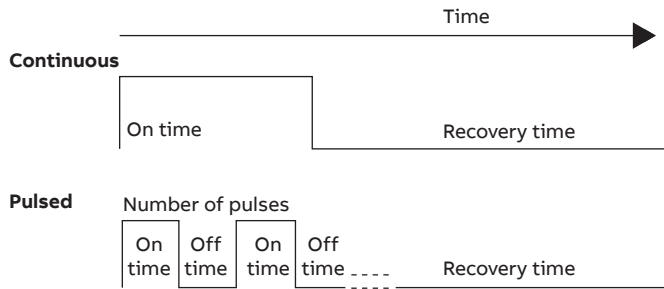


Figure 2 Blowback programming

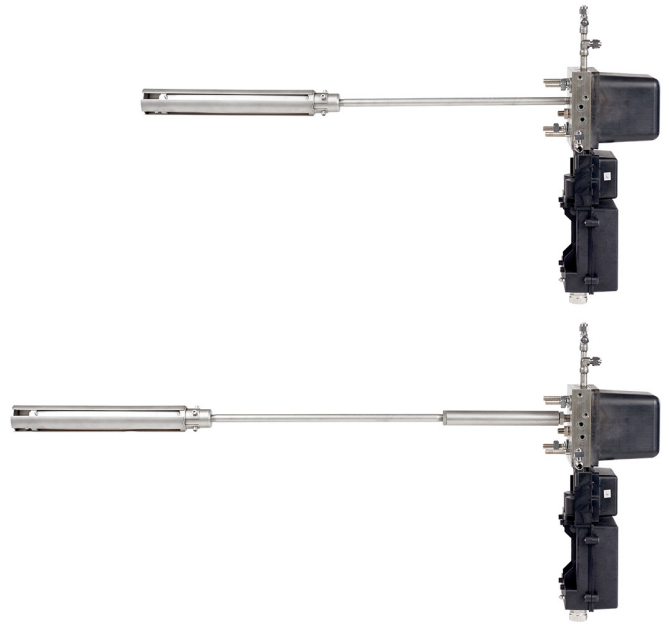


Figure 4 Primary and secondary filters



Figure 3 Sensor fitted with blowback

### 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.




Figure 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.

Audit Log				2015-04-09 14:00:10
No.	Event	Date	Time	
01	In Config.	2015-04-09	13:57:12	
Alarm Log				2015-04-09 14:01:28
No.	Event	Date	Time	
01	COe High Alarm	2015-04-09	12:52:00	
Diagnostic Log				2015-04-09 14:00:45
No.	Event	Date	Time	
01	Stabilizing	2015-04-09	12:51:03	
Calibration Log				2015-04-09 14:01:06
No.	Event	Date	Time	
01	Cal Aborted	2015-03-12	12:08:44	
02	Cal Aborted	2015-03-12	12:08:44	
03	Cal Aborted	2015-03-05	13:01:23	
04	Cal Aborted	2015-03-05	13:01:23	

Figure 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 O<sub>2</sub>, CO<sub>e</sub> and temperature readings.

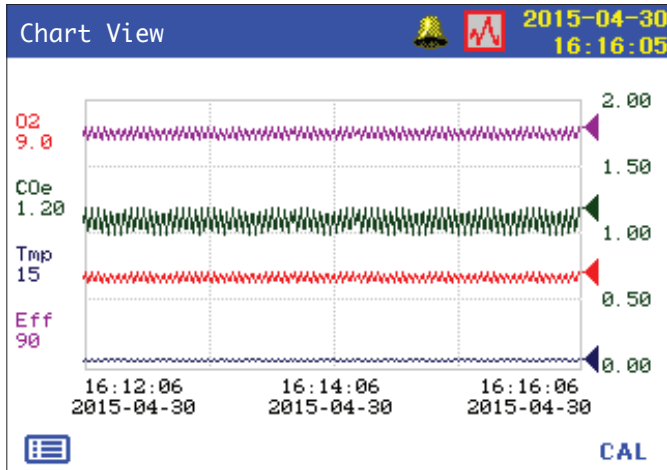


Figure 7 Trending analysis

## 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.



Figure 8 Inserting SD card



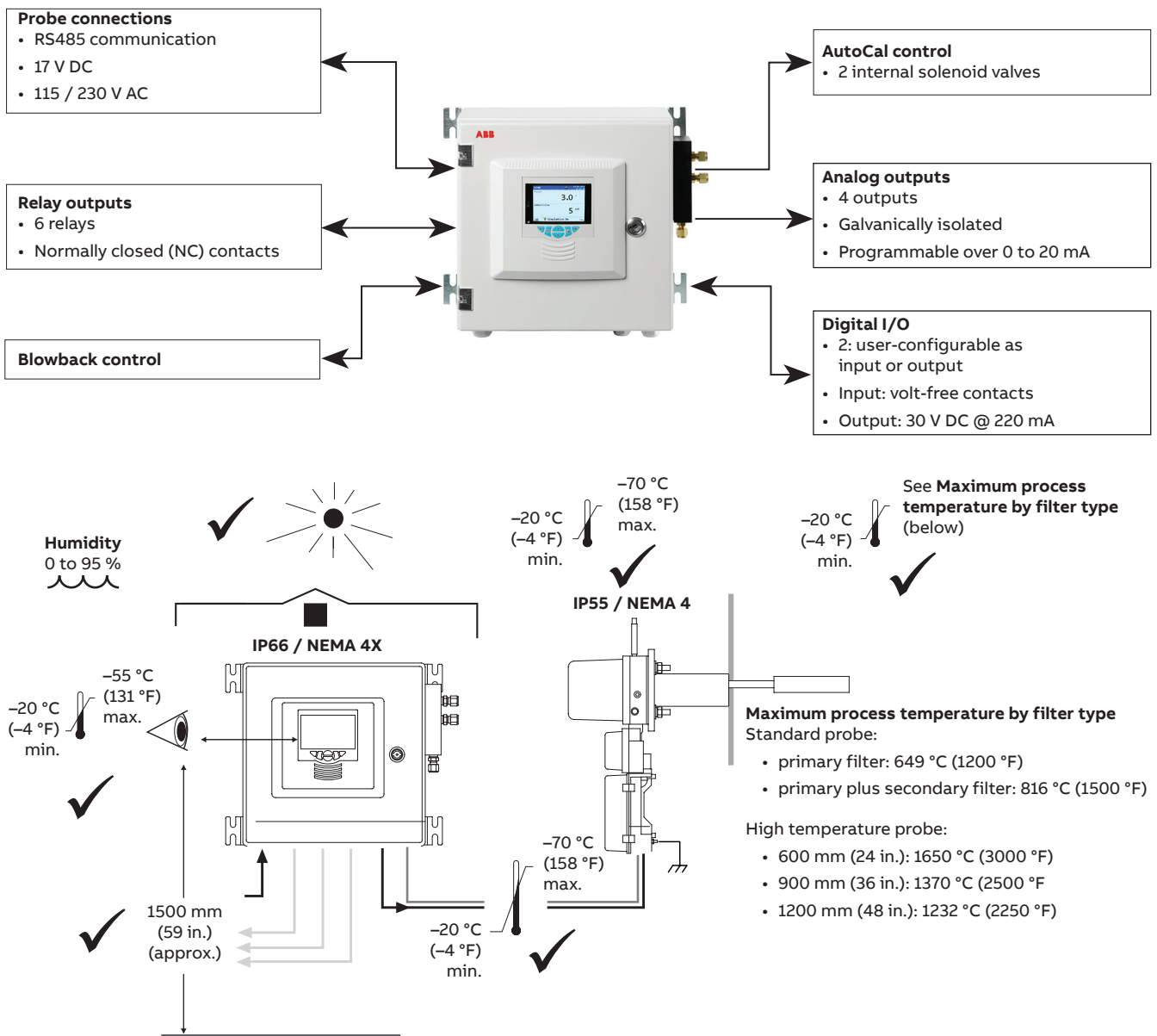
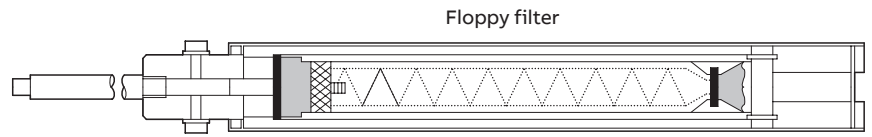


Figure 10 Environmental requirements

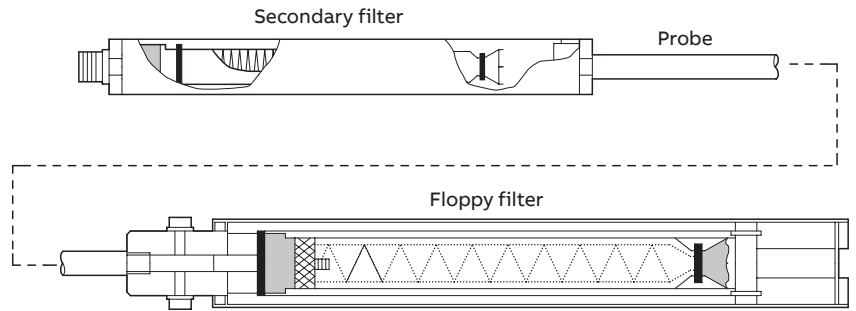


## Filter and probe assembly

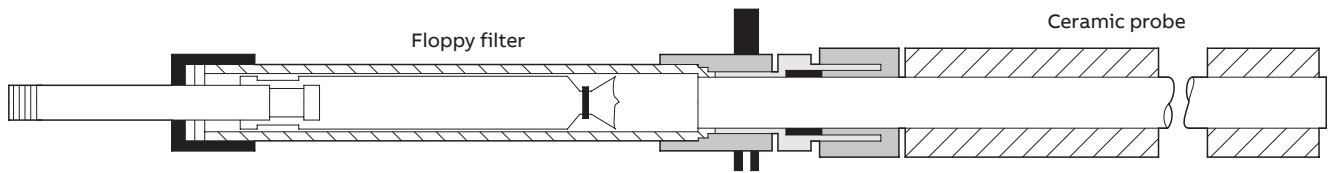
### Standard probe with filter



### Standard probe with optional dual filter



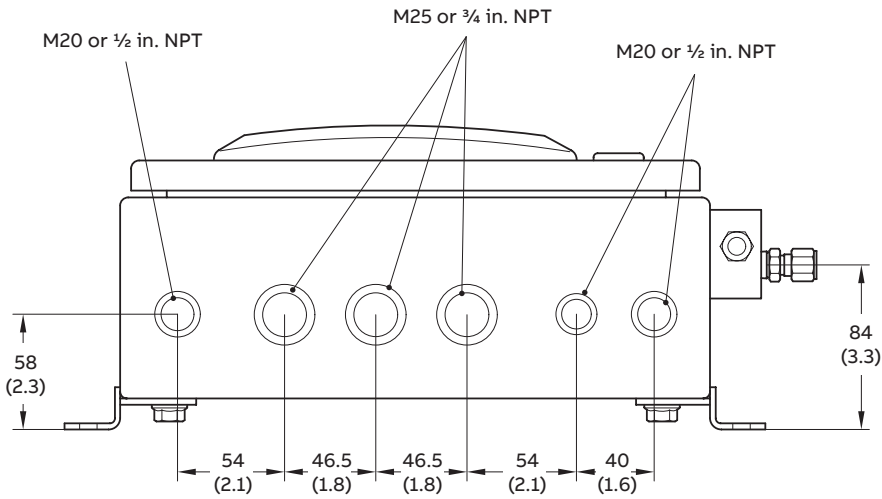
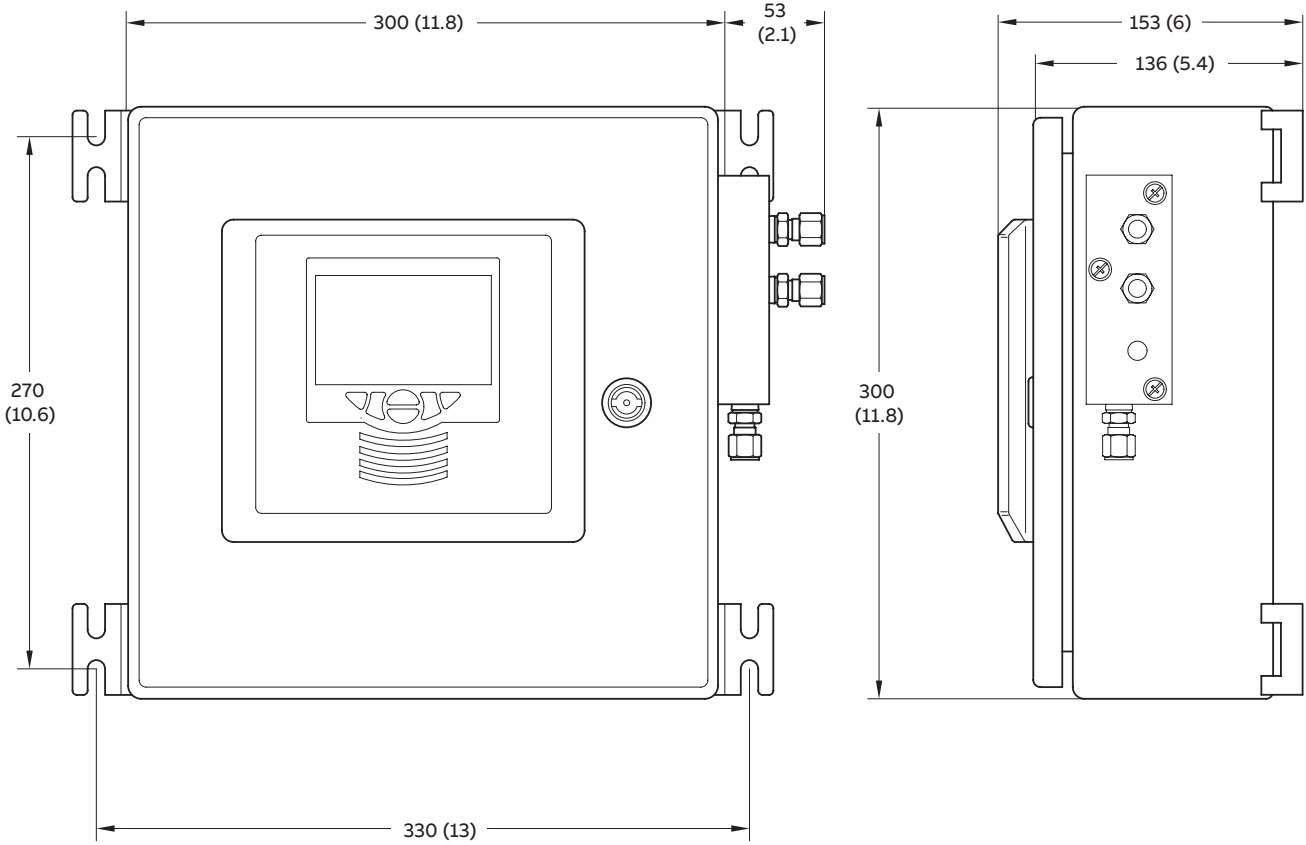
### Optional high temperature probe with filter



# Dimensions

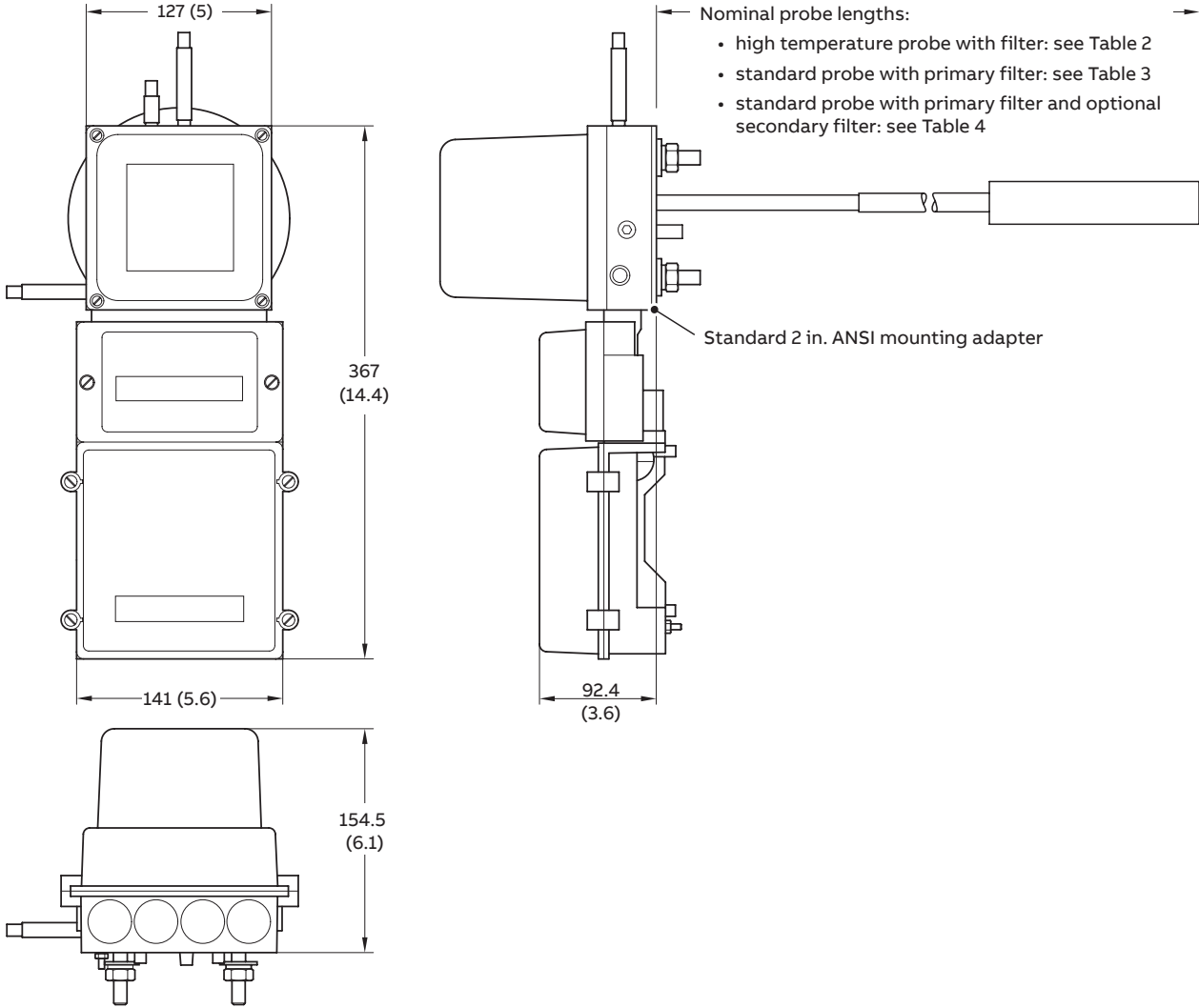
## Transmitter

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

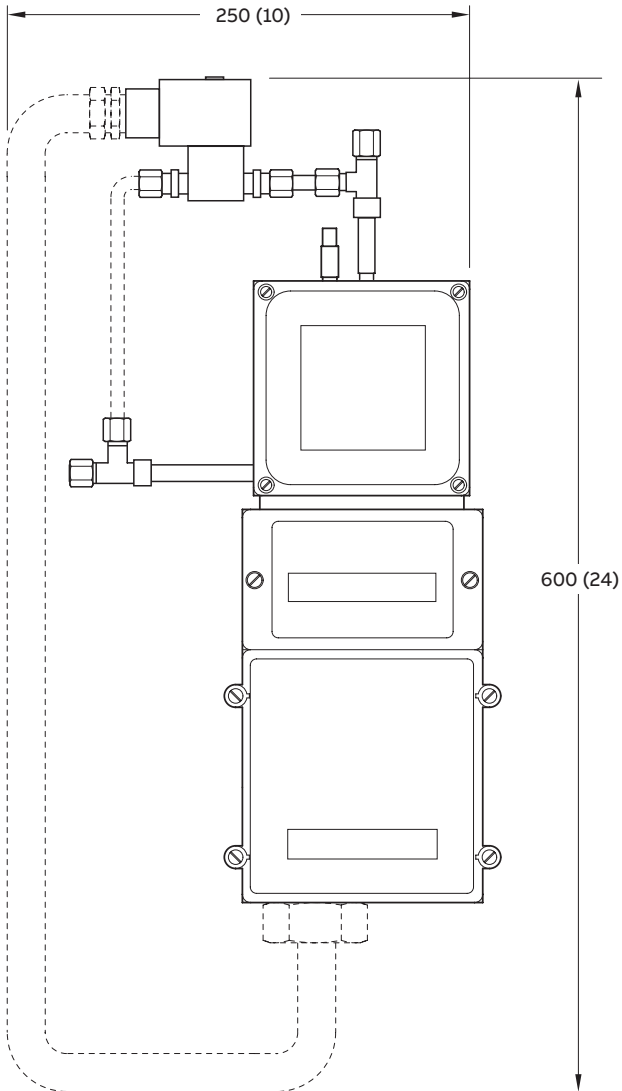
Nominal length	Total length including filter
600 (24)	1150 (45)
900 (36)	1465 (57)
1200 (48)	1750 (69)
1500 (60)	2050 (81)
1800 (72)	2350 (93)
2100 (84)	2660 (105)

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

**...Dimensions**

**Sensor assembly with blowback assembly fitted (nominal dimensions)**

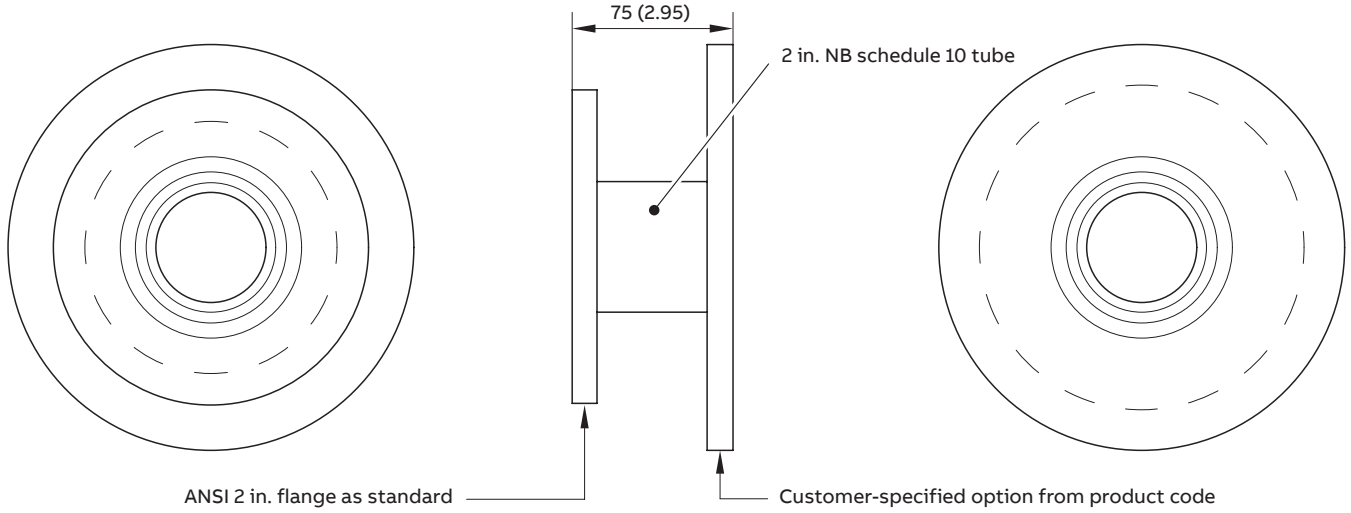
Dimensions in mm (in.)



**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)

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)

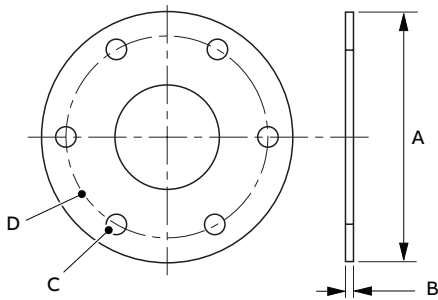


Table 5 ABB probe flange types

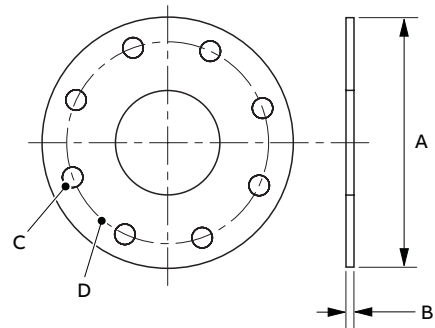


Table 7 8-Hole probe flange types and dimensions

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)

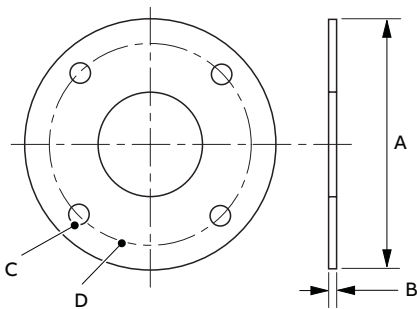


Table 6 4-Hole probe flange types and dimensions

## 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)

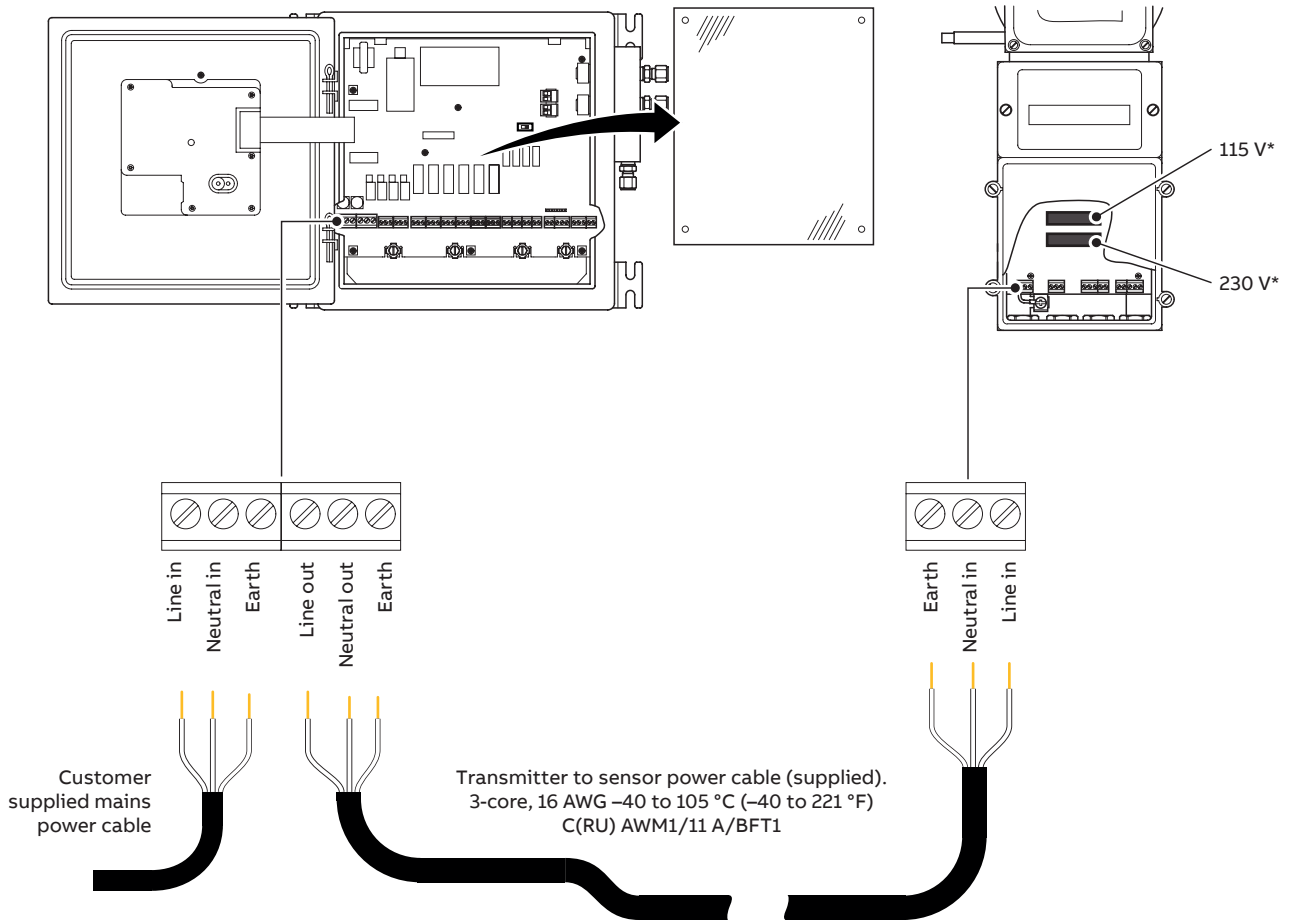
Table 11 Endura AZ40 sensor assembly

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

Table 12 Endura AZ40 transmitter

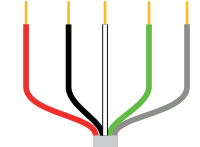
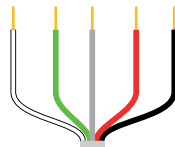
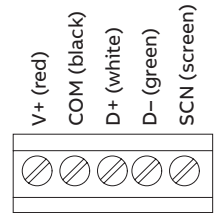
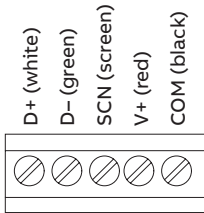
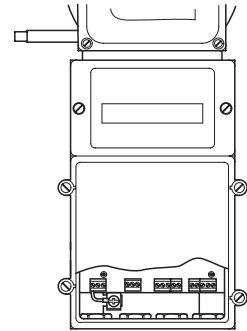
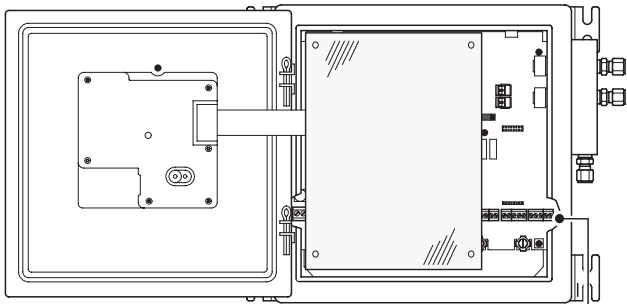
## Electrical connections

### Mains power



# Electrical connections

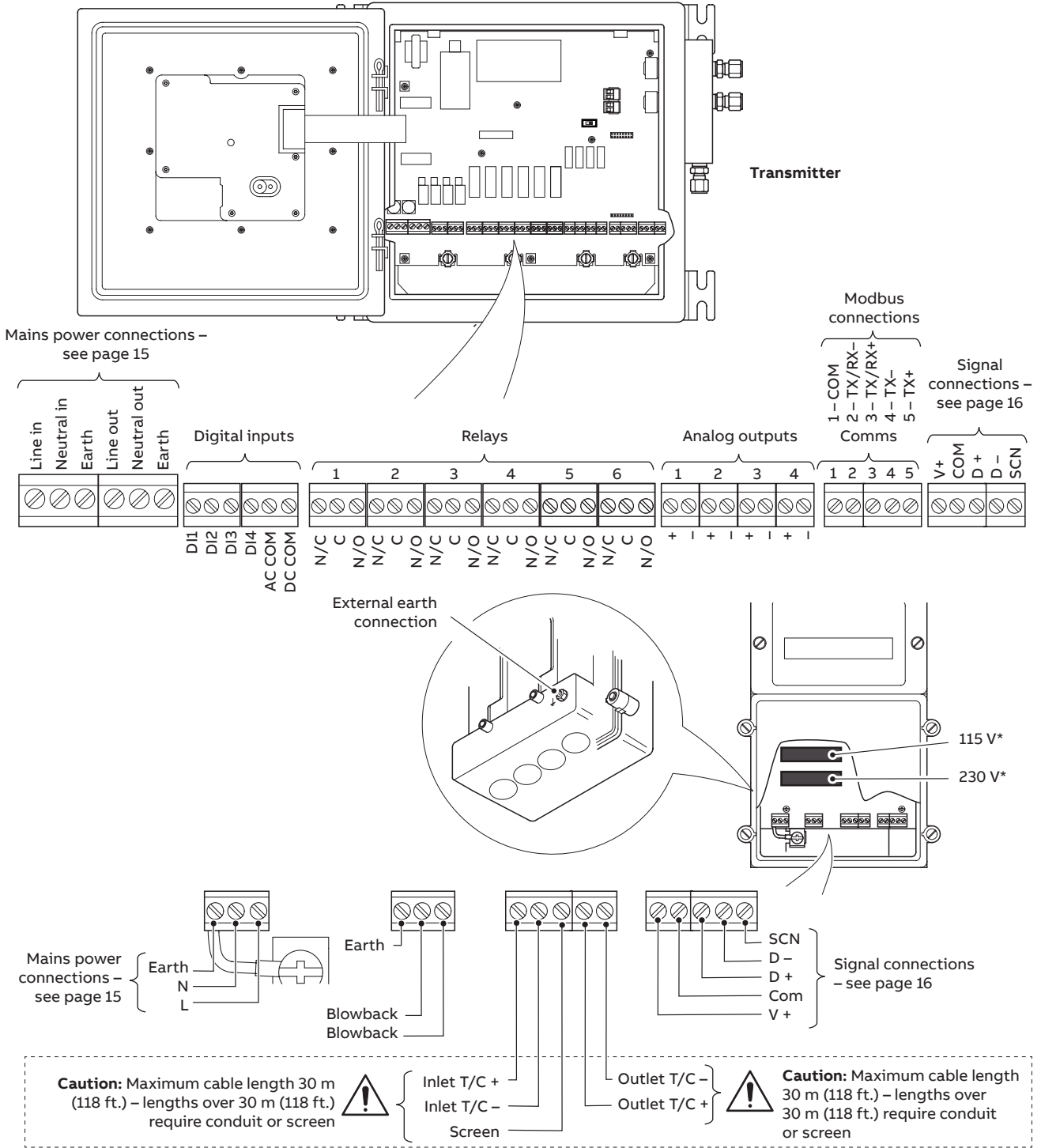
## Signal cable



4-core, 16 AWG -20 to 105 °C (-4 to 221 °F)



**Customer-made connections**



## Specification

### Range

#### O<sub>2</sub> span

- Minimum 0 to 5 %
- Maximum 0 to 25 %

#### COe 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<sub>2</sub>

< 3.5 seconds

#### COe

< 13 seconds

### Display measurement accuracy

#### O<sub>2</sub>

±2.5 % of reading or ±0.5 % O<sub>2</sub> whichever is greater

#### COe

- ±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<sub>2</sub>

±2.5 % of reading or ±0.5 % O<sub>2</sub> whichever is greater

#### COe

- ±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<sub>2</sub>
- O/P 2: process CO<sub>e</sub>
- O/P 3: process temperature
- O/P 4: combustion efficiency

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## ...Specification

### 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<sub>2</sub>
- 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<sub>2</sub>, 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
<b>Transmitter options</b>																	
None (no transmitter required)	0																
Standard (no communications)	1																
Standard + Modbus	2																
<b>Transmitter cable entry type</b>																	
None (no gland pack)		0															
Metric (M20 and M25 plastic gland pack)		1															
Imperial (½ and ¾ in. NPT plastic gland pack)		2															
<b>Transmitter system type</b>																	
None (no transmitter required)						0											
Remote (transmitter included)						2											
<b>Sensor type</b>																	
None (no sensor required)						0											
Oxygen only						1											
Oxygen + combustibles						2											
SMA 90 to AZ40 upgrade kit (no sensor required)						3											
<b>Sensor cable entry type</b>																	
None (no gland pack)							0										
Metric (M20 and M25 plastic gland pack)							1										
Imperial (½ and ¾ in. NPT plastic gland pack)							2										
<b>Smart sensor type</b>																	
None (no sensor required)								0									
AZ40 version								1									
SMA 90 to AZ40 upgrade kit								2									
SMA 90 replacement sensor								3									
<b>Probe type</b>																	
None (no probe required)									0								
Standard									1								
High temperature									2								
<b>Nominal probe length</b>																	
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...

## ...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	
	See page 21																	
<b>Probe flange type</b>																		
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
<b>Probe filter options</b>																		
None (no filter required)																		0
Standard																		1
Standard + secondary *																		2
Standard (high temperature)																		3
<b>Probe cable length</b>																		
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
<b>Blowback</b>																		
None																		0
Blowback hardware																		1
<b>Certification</b>																		
CE only																		1
<b>Language</b>																		
English																		E
<b>Power supply</b>																		
115 V AC																		V1
230 V AC																		V2
<b>Options</b>																		
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

MODBUS is a registered trademark of the Modbus-IDA organization.

Sales



Service



Software





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