

# ZGP2 Series High Temperature Zirconia Oxygen Probe

Superior technology and  
quality from the world  
leader in oxygen  
measurement



### Dependable

- measurement of O<sub>2</sub> in a wide variety of processes
- virtually instantaneous response
- resistance to sulphurous reducing atmospheres

### Versatile

- 600 to 1250 mm (2 to 4 ft) lengths
- choice of protective sheath materials
- integral thermocouple for automatic temperature compensation

### Low cost-of-ownership

- in situ measurement
- no sampling system required
- test gas port for in situ probe verification

## Introduction

The ZGP2 Zirconia Oxygen Probe is designed to measure oxygen in oxidizing, and some reducing, furnace atmospheres. When used in conjunction with an appropriate electronics unit the probe output voltage may be converted to a signal related either to oxygen concentration (%O<sub>2</sub>, ppm O<sub>2</sub>) or oxidizing potential (kilocalories or millivolts) terms.

Concentration terms are usually applicable to measurements in oxidizing atmospheres and potential terms are used for reducing atmospheres.

The probe provides a true measurement of the atmospheric conditions in situ and permits continuous and accurate measurement over a wide temperature range, without the frequent maintenance associated with external sampling systems. It also eliminates 'equilibrium shift' that is common to systems in which gas samples are cooled before measurement, and has a fast response to changes in atmosphere enabling rapid corrective action to be taken when necessary.

## Applications

- Annealing furnace atmosphere monitoring
- Sintering of metals
- Reheat furnaces
- Ferrite sintering
- Whiteheart malleablizing
- Combustion measurement and control in soaking pits
- Process heaters
- Fluid bed boilers
- High temperature incinerators
- Other combustion processes where the flue gas temperature is in excess of 600 °C (1112 °F)

## Principle of Operation

The probe comprises a ceramic detector cell housed in a protective sheath. A thermocouple is fitted within the probe to enable the process temperature to be monitored and provide automatic temperature compensation. A connector head (protected to IP56) enables connection of the cell output, thermocouple and reference air connections.

The sheath material can be:

### **Aluminous porcelain**

for oxidizing atmospheres at temperatures up to 1250 °C (2284 °F) where limited amounts of corrosive chemicals are present

### **Recrystallized alumina**

for reducing/oxidizing atmospheres at temperatures up to 1400 °C (2552 °F) and where corrosive chemicals are present

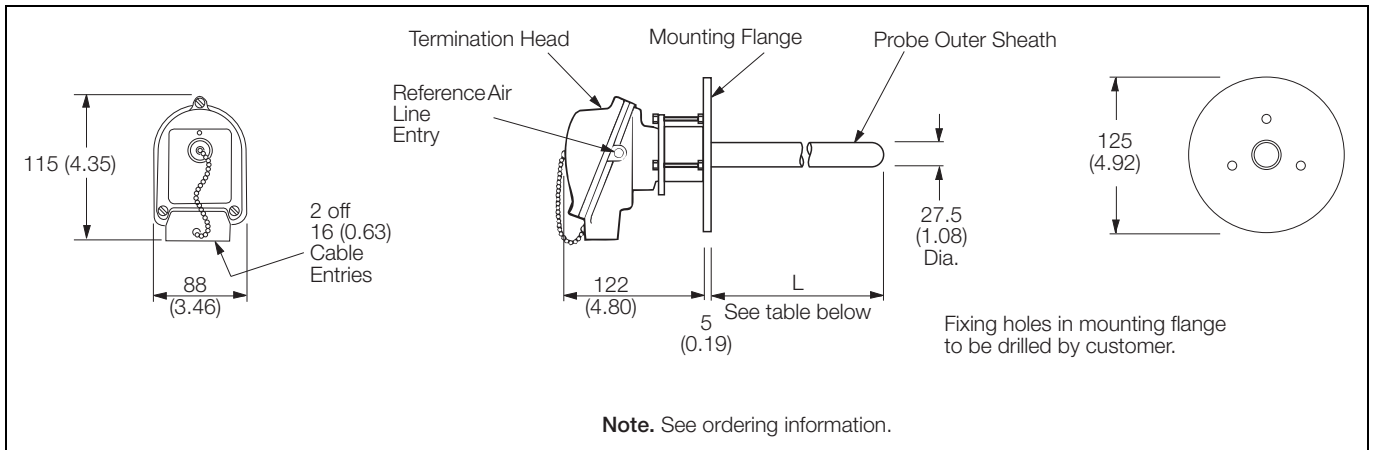
### **Incoloy 800**

for reducing/oxidizing atmospheres at temperatures up to 850 °C (1562 °F) when mounted horizontally and up to 1000 °C (1832 °F) when mounted vertically.

A calibration gas inlet port is provided to enable the probe to be checked using test gas mixtures without removing it from the process.

Reference air (500 to 1000 ml/min [1 to 2 ft<sup>3</sup>/hr]) is required for accurate operation and can be supplied from an ABB mains-powered pump unit or a flow-regulator unit.

**Overall Dimensions**



Coded insertion length	Actual length 'L'
600 mm (23.62 in.)	556 mm (21.89 in.)
700 mm (27.56 in.)	701 mm (27.60 in.)
800 mm (31.50 in.)	801 mm (31.53 in.)
900 mm (35.43 in.)	901 mm (35.47 in.)
1000 mm (39.37 in.)	956 mm (37.64 in.)
1250 mm (49.21 in.)	1251 mm (49.25 in.)

## Advanced Transmitter

The Endura AZ20 transmitter incorporates the most up-to-date design and technology available today.

ABB's universal human/machine interface (HMI) with its large, clear, backlit graphical display, 'through-the-glass' control and intuitive menu structure simplifies transmitter configuration and operation.

The user-friendly interface enables fast, easy data entry for all parameters and the 'Easy Setup' menu speeds and simplifies system commissioning.

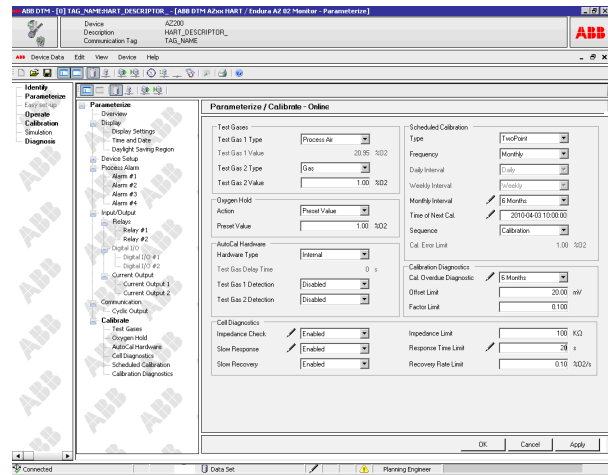
Advanced diagnostics, in accordance with NAMUR NE107, classify alarms and warnings as 'Maintenance Required', 'Check Function', 'Failure' and 'Out-of-Specification'. Cell performance is monitored by the transmitter; indicators such as cell impedance, rate-of-response to test gasses and changes in calibration offset/factor are recorded and analyzed. The current cell 'quality' is displayed by the transmitter as a visual indication of the measurement confidence; providing the operator all the information required to keep the monitor operating at peak performance.

The Performance Log holds up to 100 time-stamped events. When the log is full, the oldest data is overwritten by new entries. The log contains details of measurements and coefficients for all calibrations and accuracy checks.

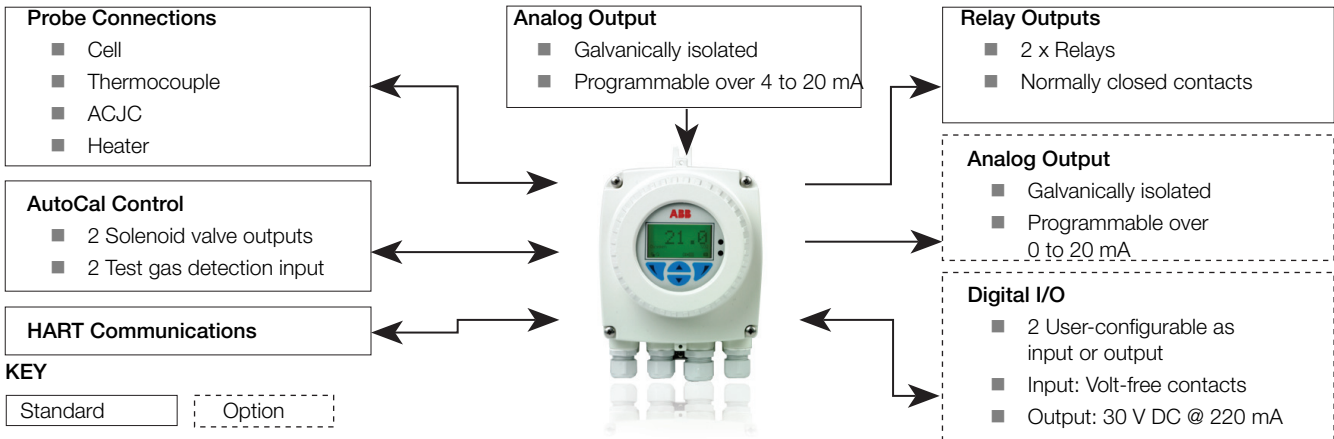
2 Relay outputs and a traditional analog output are fitted as standard, with the option of adding a second analog output or 2 digital inputs/outputs (I/O).

The Endura AZ20 transmitter is equipped with HART communication as standard, supported by a full Device Type Manager (DTM) to enable remote access to the analyzer through a user-friendly graphical interface. The DTM provides full access to the transmitter setup, logged data and diagnostics information as well as live data.

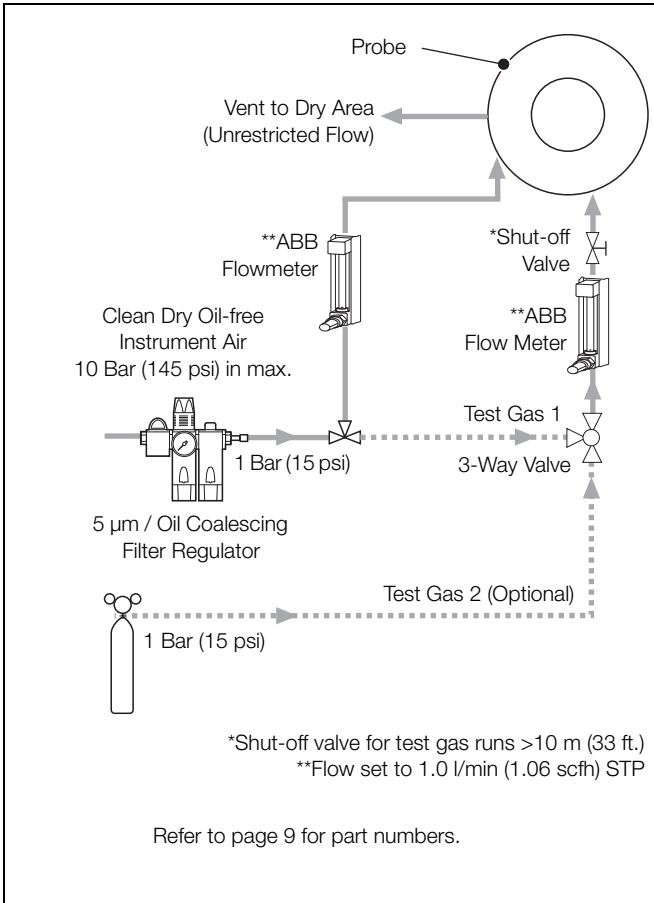
The IrDA standard infrared communication port can also be used with the DTM to upload and download device configurations. In addition, it enables data logged values and diagnostics to be viewed on a hyperterminal interface or a PC. The device's firmware can also be upgraded using this port.



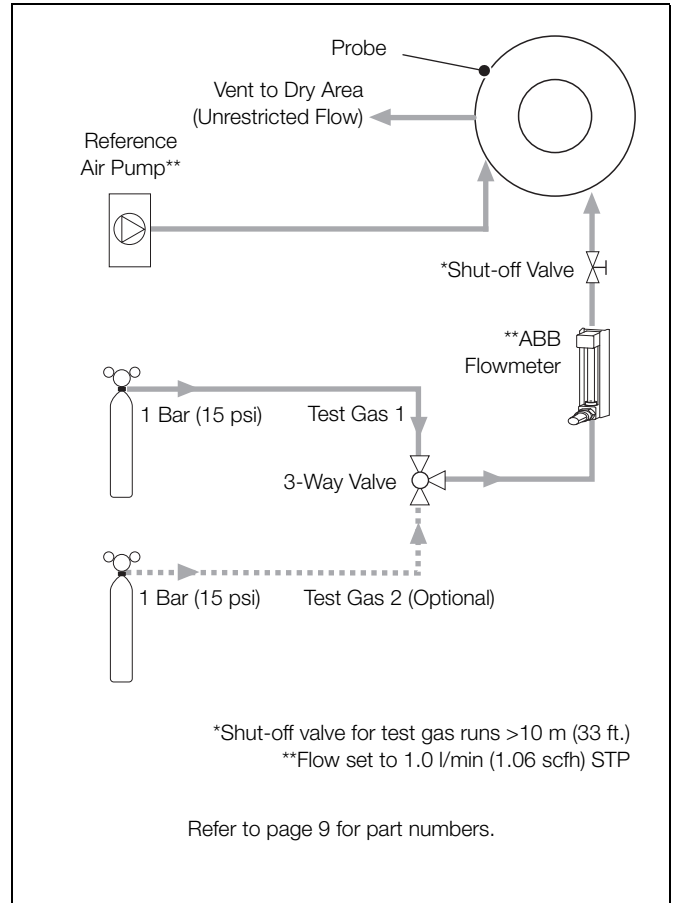
DTM Graphical Interface



**ZGP2 Series**  
High Temperature Zirconia Oxygen Probe



Configuration with reference air regulator



Configuration with reference air pump

## Probe Specification

### Temperature range

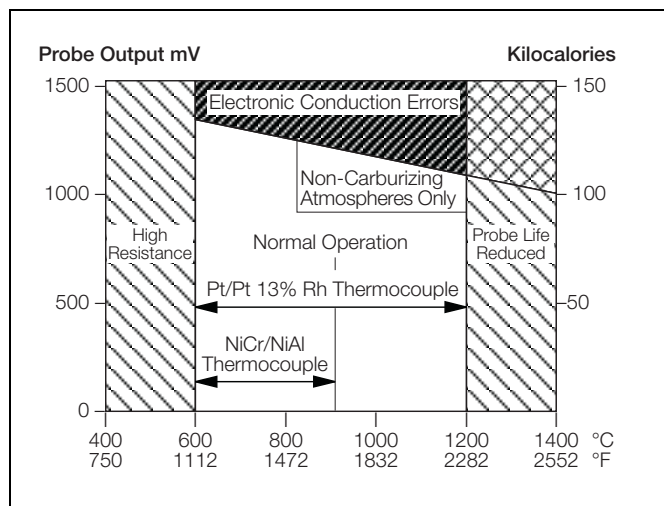
600 to 1250 °C (1112 to 2282 °F) continuous  
1400 °C (2552 °F) max.

### Measuring range

Refer to 'Operating Limits' diagram (below). The lower limit of operation, determined by the onset of electronic conduction in the solid electrolyte, is dependent on temperature.

The following limits are given as a guide for 1 % electronic conduction but, in practice, it may be possible to measure at even lower oxygen potential levels without introducing significant errors.

Temperature Concentration		Minimum O <sub>2</sub> Output	Minimum O <sub>2</sub> Potential		
°C	°F		Kcals	bar	psi
600	1112	-145	10 <sup>-36</sup>	145 <sup>-36</sup>	1532
900	1652	-132	10 <sup>-25</sup>	145 <sup>-25</sup>	1391
1200	2192	-117	10 <sup>-17</sup>	145 <sup>-17</sup>	1228



Operating Limits

### Response rate

<42 s to 63 % of final value, <47 s to 90 % of final value

### Reference air

Clean oil-free air  
Flow rate 500 to 1000 ml/minute (1 to 2 ft<sup>3</sup>/hr)

### Construction

Solid electrolyte      stabilized zirconia oxide  
Protective sheath    aluminous porcelain  
                                 Incoloy 800  
                                 recrystallized alumina

### Mounting

Vertical or horizontal 42 mm (1.65 in) minimum hole diameter

### Connecting cable

2-core copper, overall screened for probe output  
2-core compensating cable to suit thermocouple fitted

### Thermocouple

Pt/Pt 13 % Rh – EN 60584.1 Pt2 type R	600 to 1250 °C (1112 to 2282 °F)
NiCr/NiAl – Pt4 EN 60584.1 Pt4 type K	600 to 900 °C (1112 to 1652 °F)

### Weight

2.5 kg (5.5 lb) nett (600 mm [22 in] probe)  
2.8 kg (6.2 lb) nett (1000 mm [37.5 in] probe)

## Transmitter Specification

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### Transmitter enclosures

#### Remote

- Wall-, pipe- or stand-mounted
- 4 gland entries
- Optional 1/2 in NPT, M20

#### Integral

- Head-mounted
- 3 gland entries
- Optional 1/2 in NPT, M20

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### Automatic calibration

#### AutoCal hardware

- Isolated solenoid valve control as standard, 24 V @ 2 W per valve\*
- Dedicated isolated digital inputs to monitor pressure switch contacts as standard – voltage-free, normally closed with gas present

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### Display and switches

#### Display type

- Graphical 128 x 64 pixel LCD

#### Display backlight

- Green LED

#### Operator switches

- 4 capacitive switches  
(operated through the front glass)

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### Relay outputs

#### Number

- 2 standard

#### Type

- Normally closed
- 5 A @ 230 V AC or 30 V DC (non-inductive)

#### Functions

- User-configurable – can be activated by one or more of the following signals:

- Process alarm 1, 2, 3, 4
- Calibration in progress
- Calibration failed
- Out of test gas 1, 2
- Test gas 1 valve control
- Test gas 2 valve control
- Failure diagnostic
- Out-of-specification diagnostic
- Maintenance required diagnostic
- Function check diagnostic

\*For driving internal automatic calibration (AutoCal) probes or can be used to drive external calibration units on remote transmitters only.

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### Analog outputs

#### Standard

- 1 isolated current output
- Programmable to retransmit oxygen (linear or logarithmic) or temperature
- Programmable over 4 to 20 mA
- Over-range capability to indicate system failure programmable from 4 to 22 mA

#### Optional

- 1 isolated current output
- Programmable to retransmit oxygen (linear or logarithmic) or temperature
- Programmable over 0 to 20 mA
- Over-range capability to indicate system failure programmable from 0 to 22 mA

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### Digital inputs/outputs

#### Number

- 2 (optional)

#### Type

- User-configurable as either input or output

#### Input

- Volt-free contact

#### Output

- Transistor switch capable of sinking 220 mA
- Low output, < 2 V DC
- Switch voltage 30 V DC maximum

#### Isolation

- Not isolated from each other or from other circuitry

#### Input functions

- User-configurable for:
  - Automatic calibration start
  - Automatic calibration stop
  - Automatic calibration start/stop

#### Functions

- User-configurable – can be activated by one or more of the following signals:
  - Process alarm 1, 2, 3, 4
  - Calibration in progress
  - Calibration failed
  - Out of test gas 1
  - Out of test gas 2
  - Test gas 1 valve control
  - Test gas 2 valve control
  - Failure diagnostic
  - Out-of-specification diagnostic
  - Maintenance required diagnostic
  - Function check diagnostic

## ZGP2 Series

High Temperature Zirconia Oxygen Probe

### ...Transmitter Specification

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#### Hart communications

##### Version

5.7 as standard

##### Integration

Device Type Manager (DTM) and Electronic Device Description (EDD)  
Provide online/offline device configuration, online monitoring of measurement values and diagnostic states

##### DTM

FDT v1.2.1 compliant  
Works with FDT framework packages  
(for example, ABB Asset Vision Basic)

##### EDD

Compliant with suitable framework tools  
(for example, SDC 625 and Simatic PDM tools)

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#### Infrared service port

##### Accessibility

Through front face

##### Type

IrDA standard

##### Baud rate

Up to 115K baud

##### Functions

Firmware update  
Remote HMI  
Diagnostic log download  
Datalog output  
HART via IrDA

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#### Languages

English

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#### Calibration

##### Manual calibration

1 point (offset)  
1 point (factor)  
2 point (offset + factor)

##### Automatic calibration

1 point (offset)  
2 point (offset + factor)

##### Calibration control

Front panel controls  
Digital inputs  
HART commands  
User-defined schedule

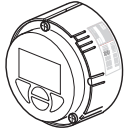
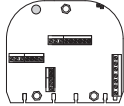
##### Calibration scheduler

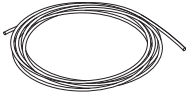
User-defined schedule enables automatic calibration frequency to be set from 1 day to 12 months



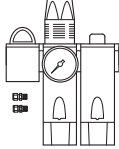
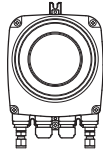
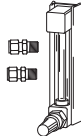
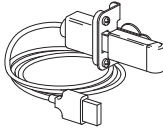
## Spares and Accessories

### Transmitter Spares

Part No.	Description	
AZ200 750	AZ20 Transmitter Cartridge Standard	
AZ200 751	Standard + Analog O/P	
AZ200 752	Standard + Digital O/P	
AZ200 758	Remote (Type 4) Transmitter Backplane	

Part No.	Description	
E35	Connection cables Type K	
E37	Type R	
YBM 1178	Signal cable	

### Accessories

Part No.	Description	
AZ200 731	Coalescing Filter-Regulator 1/4 NPT	
AZ200 732	1/4 BSP	
AZ200 770	ABB Reference Air Pump 1/4 BSP (Metric) 230 V AC 50 / 60 Hz	
AZ200 771	1/4 BSP (Metric) 115 V AC 50 / 60 Hz	
AZ200 772	1/4 NPT (Imperial) 230 V AC 50 / 60 Hz	
AZ200 773	1/4 NPT (Imperial) 115 V AC 50 / 60 Hz	
AZ200 788	ABB Flowmeter 1/4 NPT	
AZ200 789	1/4 BSP	
AZ200 785	USB to IrDA Adaptor Kit	

**ZGP2 Series**  
High Temperature Zirconia Oxygen Probe

**Ordering information – Endura AZ20 Probe/Transmitter**

	AZ20/	Tx			Probe										STD
		X	X	X	0	0	0	0	0	0	0	0	0	0	
<b>Transmitter Options</b>															
None		0													
Standard		1													
Standard + 2 <sup>nd</sup> analog output		2													
Standard + 2 digital inputs/outputs		3													
<b>Transmitter Entry Type</b>															
None (no transmitter required)			0												
Metric (M20)			1												
Imperial (NPT)			2												
<b>Transmitter System Type</b>															
None (no transmitter required)				0											
Remote				2											
<b>Transmitter Only</b>															

**Ordering Information – ZGP2 Probe**

ZGP2 Series High Temperature Zirconia Oxygen Probe	ZGP2/	X	X	X	X	X
<b>Nominal Insertion Length mm (in)</b>						
600 (23.6)		1				
1000 (39.4)		2				
700 (27.6)		3				
800 (31.5)		4				
900 (35.5)		5				
1250 (49.2)		6				
Special		9				
<b>Thermocouple</b>						
Pt/Pt 13% Rh EN 60584.1 Pt2 Type R			1			
NiCr/NiAl EN 60584 Pt4 Type K			2			
Pt/Pt 10% RH EN 60584.1 Pt 1 Type S			3			
Special			9			
<b>Sheath</b>						
Aluminous porcelain (Standard)				1		
Incoloy 800				2		
Recrystallized alumina				3		
Special				9		
<b>Mounting</b>						
Standard						1
1 in NPT						2
Special						9
<b>Termination Head</b>						
Twin-gland type C95						1

**Notes**

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