Superior technology and quality from the world leader in oxygen measurement

Environmental Certification
— MCERTS SIRA Certificate MC990001

Combustion monitoring control
— true wet measurement of net excess oxygen
— in situ measurement

Low cost-of-ownership
— fully site-serviceable probe

Versatile
— four insertion lengths: 0.4 m (16 in), 1.0 m (39 in), 1.5 m (58 in) and 2 m (78 in)
— flame trap for gas-fired boiler applications
— soot filter as standard
— fast response options
Introduction
The ZFG2 Flue Gas Oxygen Probe is one of the most advanced in the world. A simplified design makes all the component parts easily accessible and field serviceable. This innovative probe construction gives the ultimate system flexibility while retaining all the features, benefits and reliability of the previous generation.

The in situ probe is inserted directly into the boiler smoke box, or flue duct, eliminating the need for high-maintenance costly sampling installations.

Operating in the process temperature range of 20 to 600 °C (68 to 1112 °F) the system gives true wet analysis of net excess oxygen in combustion gases. When the probe is fitted with the standard flame arrester and mounted in an application as shown in the installation instructions (Section 3) all parts of the probe that are wetted by the measured gas are safe against causing ignition of the gases. This applies to all Group IIB gases with ignition temperatures below 200 °C which generally includes all conventional combustion fuels. This makes the probe completely safe for continuous use even through ‘startup’ and ‘flame out’ conditions without the need for power down interlocks.

Installation and commissioning are particularly easy and the level of in-service maintenance is extremely low.

Principle of Operation
The detector cell is constructed from stabilized zirconia featuring integral platinum electrodes and is specific to oxygen. Air is supplied to the internal (reference) electrode to provide a constant partial pressure of oxygen while the measured gases are in contact with the outer electrode, producing a potential proportional to \( \text{O}_2 \) concentration.

The Probe
The zirconia probes, constructed from 316 stainless steel, house a ceramic dust filter, flame trap, detector cell, cell heater and thermocouple. Wiring and reference-air tube between the electronics unit and the probe can be carried in a single flexible conduit up to 20 m (66 ft) in length. Standard options include dual conduit to separate signal/power cables and IP65 rated versions. For other non-standard options contact ABB. The standard probe insertion lengths are 0.4, 1.0, 1.5 and 2.0 m (16, 39, 58 and 78 in) and fixing to the duct or smoke box is by means of a drilled flange. Standoff fixings can be used to reduce the insertion length for smaller ducts. An alternative 2 1/2 in screwed bush is also available for fixing the 0.4 m (16 in) probe to the duct or smoke box. A Deflector Plate can be fitted if excessive dust flows are experienced in the flue.

All components of the probe are easily removable and can be replaced on-site without the use of special tools or bonding agents. Replacement of the zirconia oxygen sensor can be made without the need for recalibration of the electronics unit.

A calibration gas inlet port is fitted to the probes to enable accuracy checks to be made without removal of the probes from their mountings.

Where a faster response is necessary the probe can be supplied with a fast response cell adaptor that replaces the filter and flame arrester.

Deflector Plate fitted to ZFG2 Zirconia Oxygen Probe
Probe Construction

Standard Cell

Applications include:
- Industrial boilers, all fuel types
- Utility boilers, all fuel types
- Recovery boilers
- Waste incinerators

Fast Response Cell

Applications include:
- Industrial boilers, clean fuels only
- Utility boilers, clean fuels only

Flow-through Cell

Application:
The Flow-through cell adaptor enables the 0.4 m (16 in) probe to be used as an extractive (dry) O₂ analyzer system.

Note. If protection against ignition of flammable gas mixtures during flame-out conditions is required when using the fast response adapter two methods of protection can be implemented:

- Using the burner flame-out alarm, to cut off the probe power supply through a lock-out mains switch.
- Using the burner flame-out alarm to apply ‘calibration test gas’ as a purge to prevent flammable gases reaching the hot sensor. Test gas should be at 3 l/min and have 21 % O₂ (air) or less with nitrogen balance.
**Specification**

**General**

**Calibration (in situ)**
- One point using clean air
- Two point using certified test gas and air

**Flue temperature**
- 20 ... 600 °C (68 ... 1112 °F) at 20 °C (68 °F)

**Pressure**
- Suitable for all normal positive or negative flue pressures

**Dimensions**
- See Overall Dimensions on Page 6

**Probe fixing**
- Flange (or 2½ in NPT screwed fitting for ZFG2 0.4 m [16 in])

**Probe insertion**
- 0.4, 1.0, 1.5 or 2.0 m (16, 39, 58 or 78 in)

**Flange options**

<table>
<thead>
<tr>
<th>Flange Options</th>
<th>Dimensions</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.4 m (16 in)</td>
<td>ZFG2 Standard</td>
<td>The Flange types listed are NOT pressure retaining.</td>
</tr>
<tr>
<td>+0.4 mm thick</td>
<td>101.0 ±1 mm dia.</td>
<td></td>
</tr>
<tr>
<td>6 holes</td>
<td>7.3 mm dia.</td>
<td></td>
</tr>
<tr>
<td>1.0, 1.5 and 2.0 m (39, 58 and 78 in) ZFG2 Standard</td>
<td>12.0 ±1 mm thick x 165.0 ±2 mm dia.</td>
<td></td>
</tr>
<tr>
<td>6 holes</td>
<td>12.5 ±0.5 mm dia.</td>
<td></td>
</tr>
<tr>
<td>Rosemount/Westinghouse Model 132 equivalent</td>
<td>6.0 ±0.4 mm thick x 127.0 ±1 mm dia.</td>
<td></td>
</tr>
<tr>
<td>4 holes</td>
<td>9.5 mm (0.375 in) dia.</td>
<td></td>
</tr>
<tr>
<td>ANSI B 16.5 (2 in) 150 lb</td>
<td>12.0 ±1 mm thick x 185.0 ±0.5 mm dia.</td>
<td></td>
</tr>
<tr>
<td>4 holes</td>
<td>18 mm dia.</td>
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<tr>
<td>DIN 2501 Part 1 DN605 PN 16, 25 and 4</td>
<td>12.0 ±1 mm thick x 153 ±0.5 mm dia.</td>
<td></td>
</tr>
<tr>
<td>4 holes</td>
<td>20.0 ±0.2 mm eqiwspaced on 121.0 ±0.2 mm PCD</td>
<td></td>
</tr>
<tr>
<td>JIS B 2238 DN65 5K</td>
<td>12.0 ±1 mm thick x 155.0 ±0.5 mm dia.</td>
<td></td>
</tr>
<tr>
<td>4 holes</td>
<td>15 eqiwspaced on 130.0 ±0.2 mm PCD</td>
<td></td>
</tr>
</tbody>
</table>

**Cable length**
- 6 m, 10 m, 15 m and 20 m (20 ft 33 ft, 49 ft or 66 ft) fitted.
- For 15 m and 20 m options (49 ft and 66 ft) contact ABB.
- Maximum cable length between the probe and the electronics unit 100 m (328 ft) using EXFG/0194 signal cable and EXFG/0195 power cables.

**Probe weight**
- 0.4 m (16 in) – 6 kg (13.2 lb) [including 6 m (20 ft) cable]
- 1.0 m (39 in) – 10.8 kg (23.7 lb) [including 6 m (20 ft) cable]
- 1.5 m (58 in) – 11.6 kg (25.5 lb) [including 6 m (20 ft) cable]
- 2.0 m (78 in) – 12.5 kg (27.5 lb) [including 6 m (20 ft) cable]

**Measuring Range**

**Response Range**
- Typical response to introducing test gas
- < 10 s to t90 (less than 10 s to 90% of step change)
- Probe response to process gas is application and probe configuration dependent

**Reference gas**
- Clean, oil-free air. Flow rate 150 to 1000 cc/minute

**Construction**
- 316 stainless steel and ceramic

**Thermocouple**
- NiCr/NiAl EN 60584.1 PE4 Type K

**Insertion length**
- 0.4 m, 1.0 m, 1.5 m or 2.0 m (16 in, 39 in, 58 in, 78 in)

**Protection class**
- Meets requirements of NEMA 4X/IP65

**Environmental data**

**Storage**
- –25 °C to 55 °C (–13 to 131 °F)
- Up to 95 % humidity (non condensing)
ZFG2 Series
Zirconia Oxygen Probe

Flanges & Fittings
(Dimensions in mm [in])

**Note.** The flange types listed are **NOT** pressure retaining.

**Standard Mounting Flange 0.4 m (16 in) Probe**

- 6 holes 7.3 Ø (0.29) on 80 (3.15) p.c.d.
- 6 (0.25) Dia.
- 101 (3.97) Dia.

**Mounting Flange – mates with ANSI B16.5 (2 in) 150 lb (All Probes)**

- 4 holes 20 (0.78) on 121 (4.72) p.c.d.
- 12 (0.47) Dia.
- 153 (6) Dia.

**Standard Mounting Flange 1.0 m, 1.5 m & 2.0 m (39 in, 58 in & 78 in) Probes**

- 6 holes 12.5 (0.5) on 140 (5.5) p.c.d.
- 12 (0.47) Dia.
- 165 (6.5) Dia.

**JIS Mounting Flange – mates with JIS B2238 DN65 5K (all Probes)**

- 4 holes 15 (0.6) on 130 (5.12) p.c.d.
- 12 (0.47) Dia.
- 155 (6.1) Dia.

**DIN Mounting Flange – mates with DIN 2501 Part 1 DN65 PN 16, 25 and 40 (all Probes)**

- 4 holes 18 (0.7) on 145 (5.7) p.c.d.
- 12 (0.47) Dia.
- 185 (7.28) Dia.

**Model 132 Mounting Flange 0.4 m (16 in) Probe**

- 4 holes 9.5 (0.37) on 99 (3.9) p.c.d.
- 6 (0.25) Dia.
- 127 (5) Dia.
Mounting Plates

Dimensions in mm (in)

Six M6 studs equispaced on 80 p.c.d.

0.4 m (16 in) Probe

160 (6.30)

16 (0.63)

6

7 (0.27)

160 (6.30)

Six M10 studs equispaced on 140 p.c.d.

1.0, 1.5 and 20 m (39, 58 and 78 in) Probes

20 (0.80)

3 (0.12)

Overall Dimensions

Dimensions in mm (in)

150 (5.9)

152 (5.98)

190 (7.48) nom.

400 (15.74)

62 (2.44)

62 (2.44) dia.

0.4 m (16 in) Probe

For Flange Dimensions see Page 5

1.0, 1.5 and 2.0 m Models
(39, 58 and 78 in)

62 (2.44) dia.

410 (16.14) nom.

1000, 1500 or 2000
(39.73, 59.05 or 78.74)
ZFG2 Series
Zirconia Oxygen Probe

Ordering Information

<table>
<thead>
<tr>
<th>ZFG2 Zirconia Oxygen Probe</th>
<th>ZFG2</th>
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</thead>
<tbody>
<tr>
<td>Insertion length</td>
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<tr>
<td>0.4m (16 in)</td>
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<tr>
<td>1.0m (39 in)</td>
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</tr>
<tr>
<td>1.5m (58 in)</td>
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<tr>
<td>2.0m (78 in)</td>
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<tr>
<td>Flange Type</td>
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<td>JIS</td>
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<td>Conduit</td>
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<tr>
<td>Entry Type</td>
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<tr>
<td>1/2 in NPT</td>
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<td>Cell</td>
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<td>Standard cell</td>
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<td>Flow-through cell</td>
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<tr>
<td>Fast response cell</td>
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<td>Flame Arrester</td>
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<td>Flame arrester*</td>
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<td>Reference Air</td>
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<td>External</td>
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<td>Mounting Plate Assembly</td>
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<tr>
<td>Standard (0.4 m [16 in] probes) (ABB standard flange only)</td>
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<tr>
<td>Standard (long probes) (ABB standard flange only) 2 1/2 in NPT 0.4 m (16 in) probe only</td>
<td>2</td>
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</tbody>
</table>

*Available for Standard cell only.

Ordering Example

ZFG2 Zirconia Oxygen Probe
Insertion length – 1.0 m (16 in)
Flange type – standard
Conduit entry type – 20 mm (0.78 in)
Number of conduits – two
Conduit length – 6 m (20 ft)
Cell type – standard
Flame arrester – fitted
Reference air – internal tubing (within conduit)
Mounting plate assembly – standard (long probes)

Transmitters
For details of transmitters for use with the ZFG2 probe see data sheets SS/ZMT and SS/ZDT/FG.