Endura AZ20 oxygen monitor
Combustion gas analysis
Measurement made easy
Superior technology and quality from the world leader in oxygen measurement

Advanced design and precision manufacturing
• Robust, long-life probe for process temperatures up to 800 °C (1472 °F)
• Proven cell design from over 50 years experience
• Fast response to process variations
• Stable and accurate oxygen measurement

Unique integrated auto-calibration system
• Easy compliance for emission monitoring regulation
• Reduced installation costs; eliminates requirement for expensive external calibration panel
• Reduced maintenance costs

Probe lengths up to 4.0 m (13.1 ft) and industry-standard flange configurations
• Suitable for a wide range of applications
• Extensive installation options

Easy cell release
• Fully site-serviceable probe
• Easy access to internal components

Advanced transmitters
• Easy configuration, monitoring and intuitive HMI
• HART communications
• Cell performance logging and diagnostics
Introduction

The Endura AZ20 is the latest in a long line of high-quality, combustion gas analyzers from ABB.

The sensor, based on a zirconium oxide cell, is mounted at the tip of the probe that is inserted in the flue duct. The resulting direct, in situ measurement provides accurate and rapid oxygen reading for combustion control optimization and emissions monitoring.

Advanced design

Designed and manufactured to exacting standards, the Endura AZ20 ensures long periods of trouble-free operation in even the most arduous of applications.

The operating process temperature of up to 800 °C (1472 °F) extends system suitability into previously impossible applications and enables optimum probe location within the process.

The modular design, with reduced component count, improves the robustness and reliability of the system and simplifies routine maintenance and servicing.

Complete traceability ensures only the highest quality materials are used in the analyzer’s construction and rigorous manufacturing, inspection and testing procedures (to international standard ISO 9001) result in a monitor of superior quality with prolonged probe life.
Probe lengths up to 4.0 m (13.1 ft)

A wide range of probe insertion lengths from 0.5 to 4.0 m (1.7 to 13.1 ft) enable installation to the optimum measuring point for accurate oxygen measurement within the duct; even in the largest flue gas ducts and stacks.

A comprehensive range of mounting flanges provide simple installation when plant-wide standard flanges are required or when replacing existing probes.

The transmitter can be probe- or remote-mounted at distances of up to 100 m (328 ft), thus providing versatile system options for all applications. The probe-mounted transmitter option provides the lowest cost of installation. However, the remote-mounted transmitter provides flexibility when the operationally ideal probe location does not provide easy access for the user.

Easy cell release

The Endura AZ20 probe has retained the easy-access cell arrangement of the previous generation ZFG2 probes. Cell replacement can be performed on-site using basic hand tools; even after long periods of high temperature operation where screw threads have ‘seized’ and can no longer be released.

Kits containing all the parts needed to complete maintenance are available from ABB to ensure a technician can perform services quickly, efficiently and at minimum cost.

Proven cell design

ABB’s metallurgically bonded, multi-layer electrode technology increases the cell’s resistance to sulphurous and reducing atmospheres and high temperature operation. This extends the life-cycle of the cell in the most arduous applications such as sulphur recovery processes, crematoria and industrial/clinical waste incineration.
Optional flow rate control to the sensor

The correct flow rate of test gas and reference air is essential to ensure the accurate operation of Zirconia-based AZ20 oxygen analyzers.

This is achieved using one of two options:
- using flow restrictors (no flowmeters required):
  - flow restrictors fitted in the sensor head guarantee the correct flow of test gases and reference air by applying the gases/air to the probe at a fixed pressure of 15 psi (1.0 bar)
- using flowmeters (no restrictors):
  - the Endura AZ20 uses flow meters with flow control valves to regulate the flow of test gases and reference air into the sensor

Optional corrosion resistant coating

Used in applications where the process temperature is close to the sample acid dew point. This PFA coating protects the probe body against corrosion caused when acids condense out onto the probe. The exact temperature at which this occurs is dependent on the acid gas concentration and the water vapor content of the sample. This option is suitable where the process temperature is below 250 °C (482 °F)

Unique integrated automatic calibration

The all new Endura AZ20 automatic calibration system eliminates the need for the expensive ancillary equipment required for automatic calibration on traditional flue gas oxygen analyzer systems. ABB’s fully integrated, automatic calibration feature controls the test gas sequence and detects test gas availability, eliminating incorrect calibrations due to loss of test gas.

Advanced automatic calibration facility

Integrated automatic calibration secures the oxygen measurement, providing complete confidence in the analyzer’s performance.

Long-term operation without technician intervention minimizes operating costs, total cost-of-ownership, optimizes system accuracy and contributes to the CEMS (Continuous Emissions Monitoring Compliance). A significant proportion of service visits to an analyzer result in ‘no fault found’. Endura AZ20’s high-quality manufacture, advanced diagnostics and fully-integrated, automatic calibration is targeted at reducing this wasted effort and cost.

The AutoCal option can be used with or without the flow restrictors option.

Filter options

An optional large surface area filter for high dust applications is available and can be easily retro-fitted if required.

Large surface area filter
**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 gases 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.

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### Probe connections
- Cell
- Thermocouple
- ACJC
- Heater

### AutoCal control
- 2 solenoid valve outputs
- 2 test gas detection input

### HART communications

### Analog output
- Galvanically isolated
- Programmable over 4 to 20 mA

### Relay outputs
- 2 x Relays
- Normally closed contacts
- 5 A @ 230 V AC, 30 V DC

### Analog output
- Galvanically isolated
- Programmable over 0 to 20 mA

### Digital I/O
- 2 User-configurable as input or output
- Input: volt-free contacts
- Output: 30 V DC @ 220 mA
AZ20 system options

Probe with integral transmitter

Transmitter / Terminal housing environment

Pneumatic fittings
- 1/4 in BSP, for 6 mm OD pipes (with metric cable gland option)
- or
- 1/4 in NPT for 1/4 in OD pipes (with 1/2 in NPT cable gland option)

ABB supply options

Mains supply
Relays
Output signals

Integral transmitter**

IP66 and NEMA 4X

-20 °C (–4 °F)
55 °C (131 °F)

Flue / process *

-20 °C (–4 °F)
800 °C (1472 °F)

0.5 to 4.0 m
(1.7 to 13.1 ft.)

*Designed to withstand 35 kPa (5.1 psi) – positive or negative pressure.
Pressure compensation required above 5 kPa (0.7) psi – transmitter can supply fixed pressure compensation
**Transmitter does not contain a reference air supply for the probe.
...AZ20 system options

Probe with remote transmitter

Transmitter / Remote terminal housing environment

IP66 and NEMA 4X

Flue / process

Pneumatic fittings

1/4 in BSP, for 6 mm OD pipes (with metric cable gland option) or 1/4 in NPT for 1/4 in OD pipes (with 1/2 in NPT cable gland option)

ABB supply options

'Special' remote transmitter housing / probe 16-core Endura AZ20 probe cable (ABB supplied) – max. 100 m (300 ft.)

Customer-supplied (alternative) cabling should conform to the cable specifications detailed on page 13 and local installation regulations.
**Probe with remote transmitter (stainless steel)/terminal housing**

Transmitter / Remote terminal housing environment

- **IP66 and NEMA 4X**
- **Pneumatic fittings**
  - ¼ in BSP, for 6 mm OD pipes (with metric cable gland option)
  - ¼ in NPT for ¼ in OD pipes (with ½ in NPT cable gland option)
- ABB supply options

- **Flue / process**
- 0.5 to 2.0 m (1.7 to 6.6 ft.)
- 800 °C (1472 °F)
- 70 °C (158 °F)

**Bypass system**

This accessory enables standard AZ20 or AZ30 sensor systems to operate in high temperature environments of up to 1400 °C (2552 °F) without compromising their hazardous-area certification.

An air-powered ejector draws sample into the bypass system, passes it over the sensor and then returns it to the process.

**Process flanges:**
- DN80
- DN100
- ANSI 3 in
- ANSI 4 in

**Ceramic inlet tube lengths:**
- 600 mm
- 900 mm

Customer-supplied (alternative) cabling should conform to the cable specifications detailed on page 13 and local installation regulations.
**Test gas and reference air supply configurations**

**Automatic calibration (AutoCal) systems**

**AutoCal with air supply and restrictors**

- Clean dry oil-free instrument air in – 10 bar (145 psi) max.
- 1 bar (15 psi)
- **5 µm / oil-coalescing filter-regulator**
- 1 bar (15 psi)
- Test gas 1
- Test gas 2 (optional)

**AutoCal with test gas(es) and restrictors**

- Reference air pump*
- Reference air supply 0.3 to 0.5 l/min (0.64 to 1.06 scfh)*
- 1 bar (15 psi)
- Test gas 1
- Test gas 2 (optional)

**AutoCal with test gas(es) and no restrictors**

- Reference air pump**
- Reference air supply 0.3 to 0.5 l/min (0.64 to 1.06 scfh)*
- 1 bar (15 psi)
- Test gas 1
- Test gas 2 (optional)

**AutoCal with air supply and no restrictors**

- *Flow set to 2.2 l/min (4.662 scfh) STP
- **Flow set to 0.3 to 0.5 l/min (0.64 to 1.06 scfh) STP*

*Refer to page 17 for part numbers

**ABB flowmeter**

- *ABB flowmeter
- *Flow set to 2.2 l/min (4.662 scfh) STP
- **Refer to page 17 for part numbers
Non-automatic calibration (non-AutoCal) systems

Non-AutoCal with air supply and restrictors

Non-AutoCal with air supply and no restrictors

Non-AutoCal with test gas(es) and restrictors

Non-AutoCal with test gas(es) and no restrictors
Overall dimensions

Probe and integral transmitter
Dimensions in mm (in)

<table>
<thead>
<tr>
<th>Length m (ft)</th>
<th>Unpacked – kg (lb)</th>
<th>Packed – kg (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 (1.7)</td>
<td>12.5 (27.5)</td>
<td>17.72 (39.1)</td>
</tr>
<tr>
<td>1.0 (3.3)</td>
<td>14.8 (32.5)</td>
<td>21.43 (47.3)</td>
</tr>
<tr>
<td>1.5 (5.0)</td>
<td>17.0 (37.5)</td>
<td>25.14 (55.5)</td>
</tr>
<tr>
<td>2.0 (6.6)</td>
<td>19.3 (42.5)</td>
<td>28.35 (63.6)</td>
</tr>
<tr>
<td>2.5 (8.2)</td>
<td>21.5 (47.5)</td>
<td>34.17 (75.4)</td>
</tr>
<tr>
<td>3.0 (9.9)</td>
<td>23.8 (52.4)</td>
<td>37.38 (83.5)</td>
</tr>
<tr>
<td>3.5 (11.5)</td>
<td>26.0 (57.4)</td>
<td>41.59 (91.7)</td>
</tr>
<tr>
<td>4.0 (13.1)</td>
<td>28.3 (62.3)</td>
<td>45.30 (99.9)</td>
</tr>
</tbody>
</table>
Remote probe
Dimensions in mm (in)

Remote probe weights

<table>
<thead>
<tr>
<th>Length m (ft)</th>
<th>Probe only unpacked – kg (lb)</th>
<th>Probe only packed – kg (lb)</th>
<th>Probe and remote transmitter unpacked – kg (lb)</th>
<th>Probe and remote transmitter packed – kg (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 (1.7)</td>
<td>9 (19.9)</td>
<td>14.2 (31.4)</td>
<td>11.5 (25.4)</td>
<td>16.7 (36.9)</td>
</tr>
<tr>
<td>1.0 (3.3)</td>
<td>11.3 (24.9)</td>
<td>17.9 (39.6)</td>
<td>13.6 (30.3)</td>
<td>20.5 (45.1)</td>
</tr>
<tr>
<td>1.5 (5.0)</td>
<td>13.5 (29.8)</td>
<td>21.7 (47.7)</td>
<td>16.0 (35.3)</td>
<td>24.2 (53.3)</td>
</tr>
<tr>
<td>2.0 (6.6)</td>
<td>15.8 (34.8)</td>
<td>25.4 (55.9)</td>
<td>18.3 (40.3)</td>
<td>27.9 (61.4)</td>
</tr>
<tr>
<td>2.5 (8.2)</td>
<td>18 (39.7)</td>
<td>30.7 (67.7)</td>
<td>20.5 (45.2)</td>
<td>33.2 (73.3)</td>
</tr>
<tr>
<td>3.0 (9.9)</td>
<td>20.3 (44.7)</td>
<td>34.4 (75.8)</td>
<td>22.8 (50.2)</td>
<td>36.9 (81.3)</td>
</tr>
<tr>
<td>3.5 (11.5)</td>
<td>22.5 (49.6)</td>
<td>38.1 (84.0)</td>
<td>25.0 (55.2)</td>
<td>40.6 (89.5)</td>
</tr>
<tr>
<td>4.0 (13.1)</td>
<td>24.8 (54.6)</td>
<td>41.8 (92.2)</td>
<td>27.3 (60.1)</td>
<td>44.3 (97.7)</td>
</tr>
</tbody>
</table>

Remote transmitter
Dimensions in mm (in)
Overall dimensions

Remote transmitter (stainless steel)

Dimensions in mm (in)

*Wall-/Pipe-mount bracket plus U-bolt, pipe clamp and M8 fixings supplied as standard

Remote transmitter weights

<table>
<thead>
<tr>
<th>Description</th>
<th>Remote transmitter unpacked – kg (lb)</th>
<th>Remote transmitter packed – kg (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15.0 (30.07)</td>
<td>15.3 (33.73)</td>
</tr>
</tbody>
</table>

Bypass system overall dimensions and flange option

Dimensions in mm (in)

Single option only – ABB standard flange:
Ø101 (3.97) x 6 (0.25) x 80 (3.15)
PCB 6 off Ø7.3 (0.29) holes

Flange options

<table>
<thead>
<tr>
<th>Description</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>PCD</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 in ANSI</td>
<td>190</td>
<td>12</td>
<td>19</td>
<td>4</td>
<td>152</td>
</tr>
<tr>
<td>4 in ANSI</td>
<td>228</td>
<td>12</td>
<td>19</td>
<td>8</td>
<td>190</td>
</tr>
<tr>
<td>DN80</td>
<td>200</td>
<td>12</td>
<td>18</td>
<td>8</td>
<td>160</td>
</tr>
<tr>
<td>DN100</td>
<td>220</td>
<td>12</td>
<td>18</td>
<td>8</td>
<td>180</td>
</tr>
</tbody>
</table>

Bypass system weights

<table>
<thead>
<tr>
<th>Description</th>
<th>kg (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 in ANSI – 600 mm probe</td>
<td>13.0 (28.66)</td>
</tr>
<tr>
<td>3 in ANSI – 900 mm probe</td>
<td>13.2 (29.10)</td>
</tr>
<tr>
<td>DN80 flange – 600 mm probe</td>
<td>13.6 (29.98)</td>
</tr>
<tr>
<td>DN80 flange – 900 mm probe</td>
<td>13.8 (30.42)</td>
</tr>
<tr>
<td>DN100 flange – 600 mm probe</td>
<td>15.0 (33.07)</td>
</tr>
<tr>
<td>DN100 flange – 900 mm probe</td>
<td>15.2 (33.51)</td>
</tr>
<tr>
<td>4 in ANSI – 600 mm probe</td>
<td>15.5 (34.17)</td>
</tr>
<tr>
<td>4 in ANSI – 900 mm probe</td>
<td>15.7 (34.61)</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Flange type</th>
<th>A (in)</th>
<th>B (mm)</th>
<th>C (Ø) (mm)</th>
<th>D (PCD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABB standard</td>
<td>101 (3.97)</td>
<td>6 (0.24)</td>
<td>7.3 (0.29)</td>
<td>80 (3.15)</td>
</tr>
<tr>
<td>ABB standard</td>
<td>165 (6.50)</td>
<td>12 (0.47)</td>
<td>12.5 (0.50)</td>
<td>140 (5.51)</td>
</tr>
</tbody>
</table>

**Flange types, dimensions**

4-hole probe flange types and dimensions

<table>
<thead>
<tr>
<th>Flange type</th>
<th>A (in)</th>
<th>B (mm)</th>
<th>C (Ø) (mm)</th>
<th>D (PCD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSI 4 in 150</td>
<td>228.6 (9.0)</td>
<td>12 (0.47)</td>
<td>19 (0.75)</td>
<td>190.5 (7.50)</td>
</tr>
<tr>
<td>DIN 80 PN16</td>
<td>200 (7.87)</td>
<td>12 (0.47)</td>
<td>18 (0.70)</td>
<td>160 (6.30)</td>
</tr>
<tr>
<td>DIN 100 PN16</td>
<td>220 (8.66)</td>
<td>12 (0.47)</td>
<td>18 (0.70)</td>
<td>180 (7.08)</td>
</tr>
<tr>
<td>JIS 100 SK</td>
<td>200 (7.87)</td>
<td>12 (0.47)</td>
<td>19 (0.75)</td>
<td>165 (6.50)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mounting plate</th>
<th>A (range)</th>
<th>B (range)</th>
<th>C (range)</th>
<th>D (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optional accessory</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5 m (1.7 ft)</td>
<td>160 (6.3)</td>
<td>160 (6.3)</td>
<td>7 (0.27)</td>
<td>16 (0.63)</td>
</tr>
<tr>
<td>1.0 to 4.0 m (3.3 to 13.1 ft)</td>
<td>203 (8.0)</td>
<td>203 (8.0)</td>
<td>20 (0.79)</td>
<td>32 (1.26)</td>
</tr>
</tbody>
</table>

Comprising: mounting plate, gasket, 6 each: M6/M10 shakeproof washers, plain washers and nuts

**ABB flange mounting plates**

6 M6 studs equispaced on 80 (3.15) PCD

Standard mounting plate for 0.5 m (1.7 ft) probe – part no. AZ200 796

6 M10 studs equispaced on 140 (5.5) PCD

Standard mounting plate for 1.0 to 4 m (3.3 to 13.1 ft) probes – part No. AZ200 795
Probe cable connections – remote transmitter (stainless steel) terminal housing to probe

Standard ABB cable specifications

<table>
<thead>
<tr>
<th>Tx wire ident number</th>
<th>Terminal label color</th>
<th>(Position) Terminal block connection</th>
<th>Cable color</th>
<th>Cable requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Blue</td>
<td>(1) Heater</td>
<td>Blue</td>
<td>0.75 mm²</td>
</tr>
<tr>
<td>2</td>
<td>Brown</td>
<td>(2) Heater</td>
<td>Brown</td>
<td>0.75 mm²</td>
</tr>
<tr>
<td>Heaterscreen/drain</td>
<td></td>
<td></td>
<td></td>
<td>0.5 mm²</td>
</tr>
<tr>
<td>Chassis earth</td>
<td>Yellow(SCN)</td>
<td>(3) Screen (twisted pair/sleeved)</td>
<td>Screens(Yellow/Green)</td>
<td>0.5 mm²</td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>(4) Thermocouple(negative)</td>
<td>White</td>
<td>0.5 mm²</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>(5) Thermocouple(positive)</td>
<td>Green</td>
<td>0.5 mm²</td>
</tr>
<tr>
<td></td>
<td>Black</td>
<td>(6) Oxygen input(negative)</td>
<td>Black</td>
<td>0.5 mm²</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>(7) Oxygen input(positive)</td>
<td>Red</td>
<td>0.5 mm²</td>
</tr>
<tr>
<td></td>
<td>Grey</td>
<td>(8) PT1000 Cold Junction Compensation</td>
<td>Grey</td>
<td>0.5 mm²</td>
</tr>
<tr>
<td></td>
<td>Violet</td>
<td>(9) PT1000 Cold Junction Compensation</td>
<td>Violet</td>
<td>0.5 mm²</td>
</tr>
<tr>
<td></td>
<td>White/Yellow</td>
<td>(10) Pressure Switch(1) Gas 2</td>
<td>White/Yellow</td>
<td>0.5 mm²</td>
</tr>
<tr>
<td></td>
<td>White/Black</td>
<td>(11) Pressure Switch/Common</td>
<td>White/Black</td>
<td>0.5 mm²</td>
</tr>
<tr>
<td></td>
<td>White/Orange</td>
<td>(12) Pressure Switch/Gas 1</td>
<td>White/Orange</td>
<td>0.5 mm²</td>
</tr>
<tr>
<td></td>
<td>White/Green</td>
<td>(13) Solenoid Valve/Gas 1</td>
<td>White/Green</td>
<td>0.5 mm²</td>
</tr>
<tr>
<td></td>
<td>White/Red</td>
<td>(14) Solenoid Valve/Common</td>
<td>White/Red</td>
<td>0.5 mm²</td>
</tr>
<tr>
<td></td>
<td>White/Blue</td>
<td>(15) Solenoid Valve/Gas 2</td>
<td>White/Blue</td>
<td>0.5 mm²</td>
</tr>
</tbody>
</table>

Requirements for non-ABB supplied cable/conduit

Screens and drains:
- Heater wires must be sleeved separately from the screened signal cables.

Heater cores (items 1 and 2) and heater drain
- Heater cores: 0.75 mm², 24/0.2 Cu wire, resistance (20°C) 26 Ω/km max.
- Heater drain: 0.5 mm², 16/0.2 Cu wire, resistance (20°C) 39 Ω/km max.

Signal cores (items 3, 15) and signal drain
- Signal cores/signal drain: 0.5 mm², 16/0.2 Cu wire, resistance (20°C) 39 Ω/Km max.

Voltage rating
- 300 V to earth.
- 500 V between cores.

Cable (non-ABB supply) operating temperature requirements
- -20 °C (-4 °F) min.; 80 °C (176 °F) max.
Probe internal connections *

Pressure switch 2 (white / yellow)
Pressure switch COM (white / black)
Pressure switch 1 (white / orange)
Solenoid valve 1 (white / green)
Solenoid valve COM (white / red)
Solenoid valve 2 (white / blue)

Probe cable AutoCal connections

Probe cable standard connections

Hazardous area gland – refer to page 12

Probe cable
ABB 'special' cable or non-ABB cable – refer to page 13

Remote transmitter terminal housing

Hazardous area gland – refer to page 12

Numbered connections from transmitter**

*Probe internal connections already made at the factory.

**Numbered connections from the transmitter to the transmitter’s terminal housing already made at the factory.

***Screens must be connected to terminal 3 in the remote terminal housing where they are earthed via a de-coupling capacitor. Screens must not be connected directly to earth elsewhere.
...Probe cable connections – remote transmitter terminal housing to probe

Connections at remote transmitter

- 10 P2
- 11 P COM
- 12 P1
- 13 SV2
- 14 SV COM
- 15 SV 1
- 1 H
- 2 H
- 9 Cell +
- 8 Cell –
- 7 ACJC
- 6 ACJC
- 5 T/C +
- 4 T/C –
- 3 SCN

Connections at probe head

- PS 2 (white / yellow)
- PS COM (white / black)
- PS 1 (white / orange)
- SV 1 (white / green)
- SV COM (white / red)
- SV 2 (white / blue)
- ACJC (violet)
- ACJC (grey)
- Cell + (red)
- Cell – (black)
- T/C + (green)
- T/C – (white)
- SCN (screen)
- H (brown)
- H (blue)

Electrical connections – remote transmitter and probe
Integral and remote (stainless steel) transmitter – power supply and output connections

Remote transmitter – power supply and output connections
System specification

**Measurement performance**

**Range:**
- 0.01 to 100 % O₂

**Test gas response time**
- Initial dead time 3 seconds
- T90 < 10 seconds

**System accuracy**
- < ±0.75 % of reading or 0.05 % O₂, whichever is the greater, based on a nominal range of 0.01 to 25 % O₂ or 20 to 100 % O₂

**Drift**
- < ±1 % maximum % O₂ range value per month (without calibration)
- < ±0.2 % typical

**Environmental data**

**Ambient operating temperature**
- Transmitter: –20 to 55 °C (–4 to 131 °F)
- Probe: –20 to 70°C (–4 to 158 °F)

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

**Operating humidity**
- Up to 95 % RH, non-condensing

**Sunlight**
- Store and operate out of direct sunlight

**Ingress protection**
- Probe (excludes remote/integral transmitter): IP66 (NEMA 4X)
- Electronics enclosures – remote and integral: IP66 (NEMA 4X)

**Power supply**

**AC power supply**
- 100 to 240 V AC ±10 % (90 V min. to 264 V max.) 50/60 Hz

**Electronics**
- < 10 W

**Probe heater**
- < 100 W

**Approvals**
- FM for USA and Canada
- CE marked
- EAC (Russia)
- MCERTS (QAL 1)
- TÜV (QAL 1)
- Metrology (Russia)

**Emissions immunity**
- Conforms to EN61326-1

**General safety**
- Conforms to EN61010-1

**Performance**
- Conforms to EN15267-3

**SIL2**
- Conforms to EN61508
---

**Probe specification**

**Physical**

Probes insertion lengths
- 0.5 m (1.7 ft)
- 1.0 m (3.3 ft)
- 1.5 m (5.0 ft)
- 2.0 m (6.6 ft)
- 2.5 m (8.2 ft)
- 3.0 m (9.9 ft)
- 3.5 m (11.5 ft)
- 4.0 m (13.1 ft)

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
  - NPT
    (flange pressure ratings do not apply)
- 0.5 m (1.7 ft) probes
  - ABB 500 mm (19.7 in) standard flange
- 1.0 m (3.3 ft) and longer
  - ABB 1000 mm (39.4 in) standard flange

Probes body material
- 316L stainless steel

Mounting angle
- Horizontal to vertically down

**Note.** Horizontally-mounted probes greater than 2.0 m (6.6 ft) in length may need to be supported.

**Process conditions**

Standard process temperature
- All probe lengths* –20 to 800 °C (−4 to 1472 °F)

Process pressure
- Designed to withstand 35 kPa (5.1 psi) – positive or negative (pressure compensation required above 5 kPa (0.7 psi) – transmitter can apply fixed pressure compensation)

**Operating requirements**

**Reference air**

- Regulated supply
  - Probes with restrictors
    - 1 bar (15 psi), 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
    - 0.3 to 0.5 l/min
      (0.64 to 1.06 scfh)

**Test gas**

User-selectable, 100 to 0.1 % O₂ balance N₂ and/or air
- (air is recommended as one of the test gases)
  - Probes with restrictors
    - 1 bar (15 psi) – flowmeters not required
  - Probes without restrictors
    - 1 bar (15 psi) – flowmeters required, set to 2.2 l/min (4.662 scfh)

**Calibration**

Manual, semi-automatic or automatic
- (controlled by Endura AZ20 transmitter)

**Automatic calibration**

**AutoCal hardware**
- Optional built-in solenoid valves for control of test gas flow
- Built-in pressure switches to detect presence of test gases

**Heater operational requirements**

**AZ20 Probe**

- Nominally 190 Ω, 70 W at 115 V AC – power is limited to 70 W max. by AZ20 transmitter over an 85 to 265 V AC range

---

* For > 2 m (6.6 ft) probes, special conditions may apply
Transmitter specification

Transmitter enclosures
Remote
Wall-, pipe- or stand-mounted
4 gland entries
Optional ½ in NPT, M20
Integral
Head-mounted
3 gland entries
Optional ½ in NPT, M20

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

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)

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.
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

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
...Transmitter specification

**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)

**Infrared service port**

Accessibility
- Through front face

Type:
- IrDA standard

Baud rate
- Up to 115 K baud

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

**Languages**
- English
- German
- French
- Spanish
- Italian

**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
Part numbers for Endura AZ20 replacement heaters, thermocouple/electrode assemblies and ABB flowmeters

<table>
<thead>
<tr>
<th>Probe length</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 m (1.7 ft)</td>
<td>AZ200 710</td>
</tr>
<tr>
<td>1.0 m (3.3 ft)</td>
<td>AZ200 711</td>
</tr>
<tr>
<td>1.5 m (5.0 ft)</td>
<td>AZ200 712</td>
</tr>
<tr>
<td>2.0 m (6.6 ft)</td>
<td>AZ200 713</td>
</tr>
<tr>
<td>2.5 m (8.2 ft)</td>
<td>AZ200 714</td>
</tr>
<tr>
<td>3.0 m (9.9 ft)</td>
<td>AZ200 715</td>
</tr>
<tr>
<td>3.5 m (11.5 ft)</td>
<td>AZ200 716</td>
</tr>
<tr>
<td>4.0 m (13.1 ft)</td>
<td>AZ200 717</td>
</tr>
</tbody>
</table>

Endura AZ20 – standard heater assembly

<table>
<thead>
<tr>
<th>Probe length</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 m (1.7 ft)</td>
<td>AZ200 701</td>
</tr>
<tr>
<td>1.0 m (3.3 ft)</td>
<td>AZ200 702</td>
</tr>
<tr>
<td>1.5 m (5.0 ft)</td>
<td>AZ200 703</td>
</tr>
<tr>
<td>2.0 m (6.6 ft)</td>
<td>AZ200 704</td>
</tr>
<tr>
<td>2.5 m (8.2 ft)</td>
<td>AZ200 705</td>
</tr>
<tr>
<td>3.0 m (9.9 ft)</td>
<td>AZ200 706</td>
</tr>
<tr>
<td>3.5 m (11.5 ft)</td>
<td>AZ200 707</td>
</tr>
<tr>
<td>4.0 m (13.1 ft)</td>
<td>AZ200 708</td>
</tr>
</tbody>
</table>

Thermocouple/Electrode assembly

<table>
<thead>
<tr>
<th>Probe length</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>¼ NPT flowmeter (reference air): 0.1 to 0.85 l/min (0.21 to 1.8 scfh) STP</td>
<td>AZ200 786</td>
</tr>
<tr>
<td>¼ BSP flowmeter (reference air): 0.1 to 0.85 l/min (0.21 to 1.8 scfh) STP</td>
<td>AZ200 787</td>
</tr>
<tr>
<td>¼ NPT flowmeter (test gas): 0.6 to 4.4 l/min (1.27 to 9.32 scfh) STP</td>
<td>AZ200 788</td>
</tr>
<tr>
<td>¼ BSP flowmeter (test gas): 0.6 to 4.4 l/min (1.27 to 9.32 scfh) STP</td>
<td>AZ200 789</td>
</tr>
</tbody>
</table>

ABB Flowmeters NPT/BSP
Spares and accessories

Documentation and software

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI/AZ30M-EN</td>
<td>Maintenance Guide</td>
</tr>
</tbody>
</table>

Download* the guide from:

[www.ABB.com/analytical-instruments](http://www.ABB.com/analytical-instruments)

*Enter this address in your browser and then type "MI/AZ30M-EN" in the search box – the Maintenance Guide is the top link.

AZ20 DTM Software

Device Type Manager – contact ABB for details

Transmitter spares

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AZ20 750</td>
<td>AZ20 Transmitter cartridge</td>
</tr>
<tr>
<td>AZ20 751</td>
<td>• Standard</td>
</tr>
<tr>
<td>AZ20 752</td>
<td>• Standard + Analog O/P</td>
</tr>
<tr>
<td></td>
<td>• Standard + Digital O/P</td>
</tr>
<tr>
<td>AZ20 758</td>
<td>Remote (type 4) Transmitter backplane</td>
</tr>
<tr>
<td>AZ20 757</td>
<td>Integral (type 3) Transmitter backplane</td>
</tr>
</tbody>
</table>

Probe spares

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length dependent – see page 25 for part numbers</td>
<td>Thermocouple/electrode assembly</td>
</tr>
<tr>
<td>AZ20 700</td>
<td>Cell assembly – includes C-ring and commissioning label</td>
</tr>
<tr>
<td>AZ20 727</td>
<td>Restrictor upgrade kit</td>
</tr>
<tr>
<td>AZ20 728</td>
<td>Probe end cap – includes wiring labels</td>
</tr>
<tr>
<td>AZ20 729</td>
<td>Diffuser assembly – includes C-ring</td>
</tr>
<tr>
<td>AZ20 730</td>
<td>AutoCal upgrade assembly</td>
</tr>
<tr>
<td>AZ20 737</td>
<td>Large surface area filter upgrade kit</td>
</tr>
<tr>
<td>AZ20 747</td>
<td>Large surface area filter spares kit</td>
</tr>
<tr>
<td>AZ20 746</td>
<td>Test gas injection pipe spares kit</td>
</tr>
<tr>
<td>AZ200 600</td>
<td>• 3 in ANSI 600 mm probe</td>
</tr>
<tr>
<td>AZ200601</td>
<td>• 3 in ANSI 900 mm probe</td>
</tr>
<tr>
<td>AZ200602</td>
<td>• 4 in ANSI 600 mm probe</td>
</tr>
<tr>
<td>AZ200603</td>
<td>• 4 in ANSI 900 mm probe</td>
</tr>
<tr>
<td>AZ200604</td>
<td>• DN80 600 mm probe</td>
</tr>
<tr>
<td>AZ200605</td>
<td>• DN80 900 mm probe</td>
</tr>
<tr>
<td>AZ200606</td>
<td>• DN100 600 mm probe</td>
</tr>
<tr>
<td>AZ200607</td>
<td>• DN100 900 mm probe</td>
</tr>
</tbody>
</table>
## Accessories

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AZ200 731</td>
<td>Coalescing filter-regulator*</td>
</tr>
<tr>
<td>AZ200 732</td>
<td>• ¼ NPT 5 µm</td>
</tr>
<tr>
<td></td>
<td>• ¼ BSP 5 µm</td>
</tr>
<tr>
<td></td>
<td>*Required for reference and test gas air</td>
</tr>
</tbody>
</table>

Pre-June 2013 regulator  
Post-June 2013 regulator

| AZ200 740 | Filter elements for pre-June 2013 regulator: |
| AZ200 741 | • 5µm filter element |
| AZ200 742 | • Oil coalescing filter element |

AZ200 743  
Filter elements for post-June 2013 regulator  
• 5µm filter cartridge  
• Oil coalescing filter cartridge

| AZ200 770 | ABB reference air pump |
| AZ200 771 | • ¼ BSP (metric) |
|           | 230 V AC 50/60 Hz |
| AZ200 772 | • ¼ NPT (imperial) |
|           | 230 V AC 50/60 Hz |
| AZ200 773 | • ¼ NPT (imperial) |
|           | 115 V AC 50/60 Hz |

| AZ200 798 | Probe tool kit* |
| AZ200 799 | NPT (AZ20) |
|           | BSP (AZ20) |
|           | *Included with probe as standard |

Application dependent – see page 25 for part numbers

| AZ200 785 | USB to IrDA adaptor kit |
| AZ200 735 | Filter dust shield |
| AZ200 736 | Probe body erosion shield |
### Ordering information

#### Endura AZ20 probe/transmitter

<table>
<thead>
<tr>
<th>AZ20/</th>
<th>Tx</th>
<th>Probe</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

#### Transmitter options
- None: 0
- Standard: 1
- Standard + 2nd analog output: 2
- Standard + 2 digital inputs/outputs: 3

#### Transmitter entry type
- None (no transmitter required): 0
- Metric (M20): 1
- Imperial (NPT): 2

#### Transmitter system type
- None (no transmitter required): 0
- Integral: 1
- Remote: 2
- Remote (stainless steel): 3

#### Probe type
- None (no probe required): 0
- Standard: 1

#### Probe entry type
- None (no probe required): 0
- Metric (M20): 1
- Imperial (NPT): 2

#### Probe system type
- None (no probe required): 0
- Integral: 1
- Remote: 2

#### Automatic calibration
- None (no probe required): 0
- No automatic calibration (with flow restrictors): 1
- No automatic calibration (without flow restrictors): 2
- Automatic calibration (with flow restrictors): 3
- Automatic calibration (without flow restrictors): 4

#### Insertion length
- None (no probe required): 0
- 0.5 m (1.7 ft): 1
- 1.0 m (3.3 ft): 2
- 1.5 m (5.0 ft): 3
- 2.0 m (6.6 ft): 4
- 2.5 m (8.2 ft): 5
- 3.0 m (9.9 ft): 6
- 3.5 m (11.5 ft): 7
- 4.0 m (13.1 ft): 8

Continued on next page...
<table>
<thead>
<tr>
<th>Tx</th>
<th>Probe</th>
</tr>
</thead>
<tbody>
<tr>
<td>A220/</td>
<td>X</td>
</tr>
</tbody>
</table>

### Flange type
- None (no probe required) 0
- ABB standard flange 1
- DIN 65 mm flange 2
- DIN 80 mm flange 3
- DIN 100 mm flange 4
- ANSI 2 in. flange 5
- ANSI 2.5 in. flange 6
- ANSI 3 in. flange 7
- ANSI 4 in. flange 8
- JIS 65 mm flange 9
- JIS 80 mm flange A
- JIS 100 mm flange B

### Thermocouple type
- None (no probe required) 0
- Type K 1

### Cell options
- None (no probe required) 0
- Standard cell 1
- Large surface area filter 4

### Cable length
- None 0
- 5 m (16 ft) 1
- 10 m (33 ft) 2
- 25 m (82 ft) 3
- 50 m (164 ft) 4
- 75 m (246 ft) 5
- 100 m (328 ft) 6

### Cable type
- None 0
- STD 1
- CSA 2

### Certification option
- None 0
- Mcert 4
- cFMus general safety 5
- EAC 6

### Language
- English
- German
- French
- Spanish
- Italian

### Special features
- Standard
- PFA coated
- Special