AWT420
Universal 4-wire, dual-input transmitter

Introduction
The AWT420 is a universal 4-wire, dual-input transmitter suitable for the measurement and control of a wide range of parameters including pH, ORP, conductivity, turbidity/suspended solids and dissolved oxygen.

The AWT420 supports both traditional analog and advanced digital EZLink sensors.

This Commissioning Instruction provides installation, operation and maintenance procedures for the AWT420 transmitter for use in non-hazardous areas.

For information on the AWT420 transmitter for use in hazardous areas, refer to INF/ANAINST/012-EN.

For information on the sensors, including installation, commissioning, operation and maintenance procedures, refer to the specific sensor manual.

For more information
Further publications for the AWT420 transmitter are available for free download from: www.abb.com/measurement or by scanning this code:

Links and reference numbers for the transmitter publications are also shown below:

<table>
<thead>
<tr>
<th>Publication</th>
<th>Reference Number</th>
</tr>
</thead>
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</tr>
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<td>OI/AWT420-EN</td>
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<td>COM/AWT420/HART-EN</td>
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<td>AWT420 transmitter – HART FDS Communications Supplement</td>
<td>COM/AWT420/HART/FDS-EN</td>
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<tr>
<td>AWT420 transmitter – PROFIBUS Communications Supplement</td>
<td>COM/AWT420/PROFIBUS-EN</td>
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<tr>
<td>AWT420 transmitter – MODBUS Communications Supplement</td>
<td>COM/AWT420/MODBUS-EN</td>
</tr>
<tr>
<td>AWT420 transmitter – Ethernet Communications Supplement</td>
<td>COM/AWT420/ETHERNET-EN</td>
</tr>
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1 Health & Safety

Document symbols

Symbols that appear in this document are explained below:

⚠️ **DANGER**

The signal word ‘DANGER’ indicates an imminent danger. Failure to observe this information will result in death or severe injury.

⚠️ **WARNING**

The signal word ‘WARNING’ indicates an imminent danger. Failure to observe this information may result in death or severe injury.

⚠️ **CAUTION**

The signal word ‘CAUTION’ indicates an imminent danger. Failure to observe this information may result in minor or moderate injury.

**NOTICE**

The signal word ‘NOTICE’ indicates potential material damage.

Note

‘Note’ indicates useful or important information about the product.

Safety precautions

Be sure to read, understand and follow the instructions contained within this manual before and during use of the equipment. Failure to do so could result in bodily harm or damage to the equipment.

⚠️ **WARNING**

Bodily injury

Installation, operation, maintenance and servicing must be performed:

- by suitably trained personnel only
- in accordance with the information provided in this manual
- in accordance with relevant local regulations

Potential safety hazards

**AWT420 transmitter – electrical**

**WARNING**

Bodily injury

To ensure safe use when operating this equipment, the following points must be observed:

- Up to 240 V AC may be present. Be sure to isolate the supply before removing the terminal cover.

Safety advice concerning the use of the equipment described in this manual or any relevant Material Safety Data Sheets (where applicable) can be obtained from the Company, together with servicing and spares information.

Safety standards

This product has been designed to satisfy the requirements of IEC61010-1:2010 3rd edition ‘Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use’ and complies with US NEC 500, NIST and OSHA.

Product symbols

Symbols that may appear on this product are shown below:

- Protective earth (ground) terminal.
- Functional earth (ground) terminal.
- Alternating current supply only.
- Direct current supply only.
- This symbol, when noted on a product, indicates a potential hazard which could cause serious personal injury and/or death. The user should reference this instruction manual for operation and/or safety information.
- This symbol, when noted on a product enclosure or barrier, indicates that a risk of electrical shock and/or electrocution exists and indicates that only individuals qualified to work with hazardous voltages should open the enclosure or remove the barrier.
- The equipment is protected through double insulation.
- Recycle separately from general waste under the WEEE directive.
Product recycling and disposal (Europe only)

ABB is committed to ensuring that the risk of any environmental damage or pollution caused by any of its products is minimized as far as possible. The European Waste Electrical and Electronic Equipment (WEEE) Directive that initially came into force on August 13, 2005 aims to reduce the waste arising from electrical and electronic equipment; and improve the environmental performance of all those involved in the life cycle of electrical and electronic equipment. In conformity with European local and national regulations, electrical equipment marked with the above symbol may not be disposed of in European public disposal systems after 12 August 2005.

NOTICE
For return for recycling, please contact the equipment manufacturer or supplier for instructions on how to return end-of-life equipment for proper disposal.

End-of-life battery disposal
The transmitter contains a small lithium battery (located on the processor/display board) that must be removed and disposed of responsibly in accordance with local environmental regulations.

Information on ROHS Directive 2011/65/EU (RoHS II)

ABB, Industrial Automation, Measurement & Analytics, UK, fully supports the objectives of the ROHS II directive. All in-scope products placed on the market by IAMA UK on and following the 22nd of July 2017 and without any specific exemption, will be compliant to the ROHS II directive, 2011/65/EU.

Cleaning
The complete transmitter can be hosed down if it has been installed to IP66/NEMA 4X standards, i.e. cable glands are correctly fitted and all unused cable entry holes are blanked off – see page 11 and page 10.

Warm water and a mild detergent can be used.

2 Cyber security

This product is designed to be connected to and to communicate information and data via a digital communication interface. It is your sole responsibility to provide and continuously ensure a secure connection between the product and your network or any other network (as the case may be). You shall establish and maintain any appropriate measures (such as but not limited to the application of authentication measures etc.) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information.

ABB Ltd and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

Communication protocol specific
The HART protocol is an unsecured protocol, as such the intended application should be assessed to ensure that these protocols are suitable before implementation.

The Modbus protocol is an unsecured protocol, as such the intended application should be assessed to ensure that these protocols are suitable before implementation.

The PROFIBUS PA protocol is an unsecured protocol, as such the intended application should be assessed to ensure that these protocols are suitable before implementation.

The PROFIBUS DP protocol is an unsecured protocol, as such the intended application should be assessed to ensure that these protocols are suitable before implementation.
3 Overview

The AWT420 is a universal 4-wire single or dual-input transmitter suitable for the measurement and control of a wide range of parameters including pH, ORP, conductivity, turbidity/suspended solids and dissolved oxygen (depending on the module[s] fitted).

Sensor and communication modules plug directly into their corresponding slot on the transmitter backboard – see page 11 for module locations.

The AWT420 supports both traditional analog and advanced digital EZLink sensors. The transmitter can be wall-, panel- or pipe-mounted.

Information from the sensor is sent to the transmitter via a sensor interface board. The process reading is displayed on the main page and can be displayed as a graph in the Chart View – refer to page 23 for details of view options. Diagnostic messages inform the user of the system status and can be logged for review. The system status can also be assessed remotely using optional HART®, MODBUS®, Profibus® or Ethernet communications.

Installation and commissioning is simplified with plug-and-play digital sensor connections and automatic sensor recognition and set-up.

4 Mechanical installation

Transmitter installation

Optional accessories
Optional installation accessories:
- Cable gland kit
- Weathershield
- Panel-mount kit
- Pipe-mount kit

Location

For general location requirements refer to Figure 2. Select a location away from strong electrical and magnetic fields. If this is not possible, particularly in applications where mobile communications equipment is expected to be used, screened cables within flexible, earthed metal conduit must be used.

Install in a clean, dry, well ventilated and vibration-free location providing easy access. Avoid rooms containing corrosive gases or vapors, for example, chlorination equipment or chlorine gas cylinders.

Figure 2 Transmitter location

Sensor installation

Refer to the associated sensor Operating Instructions for installation procedures.
Transmitter dimensions
Dimensions in mm (in)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>164 (6.46)</td>
</tr>
<tr>
<td>Height</td>
<td>144 (5.67)</td>
</tr>
<tr>
<td>Depth</td>
<td>73 (2.87)</td>
</tr>
</tbody>
</table>

Optional weathershield dimensions
Dimensions in mm (in)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>175 (6.89)</td>
</tr>
<tr>
<td>Height</td>
<td>209 (8.22)</td>
</tr>
</tbody>
</table>

Wall-mounting
Dimensions in mm (in)

NOTICE
If the optional weathershield D is used, position it between the transmitter and wall and pass 2 screws C (not supplied) through fixing holes (both sides) in weathershield.

Referring to Figure 5:
1. Position the left- and right-hand mounting brackets A into the recesses on the rear of the transmitter as shown and secure with the bracket securing screws. Ensure the plastic washers remain in the positions fitted.
2. Mark fixing centers B and drill suitable holes in the wall.
3. Secure the transmitter to the wall using 2 screws C in each mounting bracket.

Sensor modules
Sensor modules are fitted to the transmitter baseboard when the transmitter is configured after being ordered.

Communication module
If an optional communication module is ordered, it is fitted to the transmitter baseboard when the transmitter is configured after being ordered.


...4 Mechanical installation

...Transmitter installation

Panel-mounting (optional)
Dimensions in mm (in)

Referring to Figure 6:
1 Cut the correct sized hole in panel A.
2 Insert the transmitter into the panel cut-out B.
3 Screw one panel clamp anchor screw C into the left-hand bracket D until 10 to 15 mm (0.39 to 0.59 in) of the thread protrudes from the other side of the bracket and position one clamp E over the end of the thread.

NOTICE

The correct torque is critical to ensure proper compression of the panel seal and achieve the IP66/NEMA 4X hosedown rating.

4 Holding assembly F together, position bracket D into the left-hand recess on the rear of the transmitter and secure with bracket securing screw G. Ensure that the plastic washer remains in the position fitted.
5 Repeat steps 3 and 4 for the right-hand panel clamp assembly.
6 Torque each panel clamp anchor screw to 0.5 to 0.6 Nm (4.42 to 5.31 lbf-in).

Figure 6 Panel-mounting the transmitter
Pipe-mounting (optional)
Dimensions in mm (in)

**NOTICE**
If the optional weathershield (F) is used, locate it against the transmitter back panel and attach the pipe-mount kit to the weathershield rear face and transmitter.

Referring to Figure 7, secure the transmitter to a pipe as follows:

1. Fit two M6 x 50 mm hexagon-head screws (A) through one clamp plate as shown.

2. Using the appropriate holes to suit vertical or horizontal pipe, secure the clamp plate to the pipe-mounting bracket (B) using two M6 x 8 mm hexagon-head screws and spring lock washers (C).

3. Position the pipe-mounting bracket into the recesses on the rear of the transmitter as shown and secure with the two bracket securing screws (D). Ensure the plastic washers remain in the positions fitted.

4. Secure the transmitter to the pipe using the remaining clamp plate, spring lock washers and nuts (E).

**Figure 7** Pipe-mounting the transmitter
5 Electrical installation

⚠️ DANGER

Bodily injury

- Before making any connections, the external protective earth stud must be connected to the local earth bonding point using suitably sized ground cable – see page 16.

- The transmitter is not fitted with a switch – an isolation device such as a switch or circuit breaker conforming to local safety standards must be fitted to the final installation. It must be fitted in close proximity to the transmitter, within easy reach of the operator and marked clearly as the isolation device for the transmitter.

- Remove all power from supply, relay, any powered control circuits and high common mode voltages before accessing or making any connections. For the mains power, use 3-core cable rated 3A and for the relay connections use cable rated 5A. Use cable rated 105 °C (221 °F) minimum that conforms to either IEC 60227 or IEC 60245, or to the National Electrical Code (NEC) for the US or the Electrical Code for Canada. The terminals accept cables AWG 24 to 16 (0.2 to 1.5 mm²).

- All connections to secondary circuits must have insulation to required local safety standards. After installation, there must be no access to live parts, for example, terminals. Use screened cable for signal inputs and relay connections. Route signal leads and power cables separately, preferably in an earthed (grounded) flexible metal conduit.

USA and Canada only

- Supplied cable glands are an optional extra and provided for the connection of MODBUS, Profibus and Ethernet communication wiring ONLY. A special cable gland is supplied with the Ethernet communications option and should be used only for the Ethernet cable.

- The use of cable glands, cable/flexible cord for connection of the mains power source to the mains input and relay contact output terminals is not permitted in the USA or Canada.

- For connection to mains (the mains input and relay contact outputs), use only suitably rated field wiring insulated copper conductors rated min. 300 V, 16 AWG, 105 °C (221 °F). Route wires through suitably rated flexible conduits and fittings.

⚠️ WARNING

Bodily injury

- If the transmitter is used in a manner not specified by the Company, the protection provided by the equipment may be impaired.

- Ensure the correct fuses are fitted – see Figure 9, page 11 for fuse details.

- Replacement of the internal battery must be carried out by an approved technician only.

- The transmitter conforms to Installation Category II of IEC 61010.

- All equipment connected to the transmitter’s terminals must comply with local safety standards (IEC 60950, EN61010-1).

- The DC power supply and the optional Ethernet and bus interface connectors must be connected to Safety Extra Low Voltage (SELV) circuits.

Earth bonding

⚠️ WARNING

Before making any electrical connections:

- The external protective earth stud (see Figure 12 on page 15) must be connected to the local earth bonding point using suitably sized ground cable. To connect to the protective earth stud, use a closed M4 cable lug.

- Never connect the protective earth with an end sleeve or an open cable lug.

Cable entries

![Figure 8 Cable entries](image-url)

- **A** M20 – mains power
- **B** M16 – sensor 1
- **C** M16 – sensor 2
- **D** M20 – communications
- **E** M20 – digital I/O
- **F** M20 – analog outputs
- **G** M20 – relay contacts
Terminal connections

**Figure 9 Electrical connections overview**
...5 Electrical installation

7998 turbidity sensor junction box connections

P H and conductivity connections

pH/ORP/pIon sensor module connections

NOTICE

ORP (Redox) and Antimony pH sensors do not feature temperature compensation therefore do not have temperature sensors or related wiring.

Digital I/O, relays and analog output connections

 Relay and analog outputs
 Relays (1 to 4)

 Analog outputs (1 to 4)

 Digital output (open collector)
 EXT PSU 12 to 30 V DC (150 mA max.)

 Digital input (volt-free)

Figure 10 7998 turbidity sensor junction box connections

Figure 11 Digital I/O, relays and analog output connections
### Standard sensors without diagnostic functions

**NOTICE**

Ensure sensor diagnostics are **Off** when using standard sensors without diagnostic functions.

<table>
<thead>
<tr>
<th>Sensor type</th>
<th>RTD wiring</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
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<tr>
<td>2867</td>
<td>2-lead</td>
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<td>Black</td>
<td>Red</td>
<td>White</td>
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<td>–</td>
</tr>
<tr>
<td>TB5</td>
<td>2-lead</td>
<td>Blue</td>
<td>–</td>
<td>–</td>
<td>Black</td>
<td>Red</td>
<td>White</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>AP1xx</td>
<td>2-lead</td>
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<td>–</td>
<td>–</td>
<td>Black</td>
<td>Red</td>
<td>White</td>
<td>–</td>
<td>Grey</td>
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<tr>
<td>APS1xx</td>
<td>2-lead*</td>
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</table>

* Cut and remove grey wire

### Standard sensors with diagnostic functions

**NOTICE**

Ensure sensor diagnostics are **On** when using standard sensors with diagnostic functions.

<table>
<thead>
<tr>
<th>Sensor type</th>
<th>RTD wiring</th>
<th>1</th>
<th>2</th>
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<td>Dark green</td>
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</tr>
<tr>
<td></td>
<td>2-lead*</td>
<td>Clear</td>
<td>Red</td>
<td>Blue</td>
<td>Green/Yellow</td>
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<td>White</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>3-lead</td>
<td>Clear</td>
<td>Red</td>
<td>Blue</td>
<td>Green/Yellow</td>
<td>Red</td>
<td>White</td>
<td>–</td>
<td>Grey</td>
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</table>

* Cut and remove grey wire

### Conductivity sensor module connections

#### 2-electrode sensors

<table>
<thead>
<tr>
<th>Sensor type</th>
<th>RTD wiring</th>
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<th>3</th>
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<th>RTD 2</th>
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<th>7</th>
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<td>Black</td>
<td>Green/Yellow</td>
<td>Blue</td>
<td>Brown</td>
<td>–</td>
<td>–</td>
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<td>Black</td>
<td>Brown</td>
<td>Green/Yellow</td>
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<td>Yellow</td>
<td>Dark green</td>
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<td>TB2</td>
<td>2-lead</td>
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<td>–</td>
<td>Black</td>
<td>Blue</td>
<td>Yellow</td>
<td>Dark green</td>
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</tr>
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<td>–</td>
<td>Black</td>
<td>Blue/Red</td>
<td>Yellow</td>
<td>Dark green</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3-lead</td>
<td>Green</td>
<td>–</td>
<td>–</td>
<td>Black</td>
<td>Yellow</td>
<td>Red</td>
<td>Dark green</td>
<td>Blue</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*2085 cable attached cells

#### 4-electrode sensors

<table>
<thead>
<tr>
<th>Sensor type</th>
<th>RTD wiring</th>
<th>DRIVE +</th>
<th>1</th>
<th>SENSE +</th>
<th>2</th>
<th>SENSE –</th>
<th>3</th>
<th>DRIVE –</th>
<th>4</th>
<th>RTD 1</th>
<th>5</th>
<th>RTD 2</th>
<th>6</th>
<th>SHIELD</th>
<th>7</th>
<th>RTD 3</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB4</td>
<td>2-lead</td>
<td>Green</td>
<td>Red</td>
<td>White</td>
<td>Black</td>
<td>Blue</td>
<td>Yellow</td>
<td>Dark green</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*2085 cable attached cells
…5 Electrical installation

Turbidity sensor module connections

<table>
<thead>
<tr>
<th>Sensor type</th>
<th>RTD wiring</th>
<th>1 White</th>
<th>2 Yellow</th>
<th>3 Red</th>
<th>4 Green</th>
<th>5 Black</th>
<th>6 Blue</th>
<th>7 Braid</th>
<th>8 –</th>
</tr>
</thead>
<tbody>
<tr>
<td>4690</td>
<td>N/A</td>
<td>Initiate cleaner pulse</td>
<td>+12 V emitter switched power</td>
<td>+12 V cleaner/receiver power</td>
<td>Turbidity input signal</td>
<td>Wiper acknowledge signal</td>
<td>0 V common</td>
<td>RFI ground</td>
<td>Not used</td>
</tr>
</tbody>
</table>

Power supply connection – plastic enclosure

⚠️ WARNING

Bodily injury – USA and Canada only
• The use of cable glands, cable/flexible cord for connection of the mains power source to the mains input and relay contact output terminals is not permitted.

NOTICE

For metal enclosure power connections refer to Information sheet INF/ANAINST/012-EN.

NOTICE

Electrical installation – ABB recommendations:
• Ferrules are fitted to all cables.
• Use M4 ring terminals (crimped) on the earth conductor prior to fitting to the earth stud on the gland plate.
• Only 1 cable per cable gland.

Connecting the transmitter power supply

Referring to Figure 12, page 15:
1. Using a suitable screwdriver, release door retaining screw A and open the transmitter door.
2. Release terminal cover retaining screw B and remove terminal cover plate C.
3. Slide retaining clip D off blanking plug E and remove the blanking plug if fitted.
4. Fit cable gland F and secure using nut G.
5. Remove gland cover H and route mains power supply cable I through it.
6. Route the cable through cable gland F and into the enclosure case.

NOTICE

Use a single-holed bush for the mains power cable.

7. Make connections to the power supply connection terminals J. Connect earth wire K to earth stud L.
8. Tighten gland cover H.
9. Refit terminal cover C and secure it with retaining screw B.
10. Close the transmitter door and secure with door retaining screw A.
Figure 12  Connecting the transmitter power supply – plastic enclosure
...5 Electrical installation
Fitting the EZLink modules

**WARNING**

**Bodily injury**
- Up to 240 V AC may be present. Isolate the power supply before removing the opening the transmitter door.

Referring to Figure 13:
1. Remove connector block cradle A from EZLink module(s) and retain for connection.
2. Unlock and open transmitter door B.
3. Fit EZLink modules as follows:
   a. If one EZLink module is used, push-fit it into location C (sensor 1).  
      **Note.** When fitting the cable assembly, the EZLink connector for sensor 1 passes through cable entry D.
   b. If two EZLink modules are used, push-fit sensor 1 module into location C and sensor 2 module into location E.  
      **Note.** When fitting the cable assemblies, the EZLink connector for sensor 1 passes through cable entry D and the EZLink connector for sensor 2 passes through cable entry F.

Referring to Figure 14:
4. Pass EZLink connector cable G through the correct cable entry – see step 3.
5. Pass thread alignment washer H over EZLink connector cable G, ensuring alignment tab I is orientated correctly.
6. Pass thread back nut J over EZLink correctly connector cable G.

**Figure 13** EZLink module positions and EZLink cable entries

**Figure 14** Preparing EZLink connector cable fixings
Referring to Figure 15:
7 Fit alignment tab İ into gland plate slot K (on plastic case variant) or in the casting slot (on metal case variant).
8 Insert EZLink connector body L fully into cable entry and align the connector body using the flats on the alignment washer (see Figure 14).
9 Screw back nut J onto connector body and tighten using a spanner.

Referring to Figure 16:
10 Place EZLink cable plug M into EZLink connector block cradle A.
11 Plug connector block cradle A into EZLink module N.
12 If a second EZLink module is required, repeat all steps.
13 Close and lock transmitter door B.
5 Electrical installation

Connecting EZLink sensors

**NOTICE**

Maximum length of cable from transmitter to sensor(s) – refer to sensor Operating instruction.

Referring to Figure 17:
1. Align the pins in sensor cable connector A with the holes in EZLink connector B and push the connectors together.
2. Turn nut C clockwise to secure the connectors together.

The transmitter detects the type of sensor connected automatically.

**NOTICE**

When installing sensor extension cables, ensure the male end (end with label) of the cable is installed towards the transmitter.

Long cables
If cables are longer than 30 m (94 ft), or they are outside, the following cables must be screened or contained in conductive conduit:
- digital I/O
- analog outputs
- communication

6 Easy Setup

When the transmitter is started up for the first time, or when Restore defaults is selected from the Configuration/Device Setup/Initial Setup menu, the ‘Easy Setup’ prompt is displayed:

Press the \( \text{F} \) key \((\text{F})\) to start Easy Setup or press the \( \text{X} \) key \((\text{X})\) to cancel and exit to the main Operator page.

Press the \( \text{F} \) key (Edit) to change the default value/setting to the required value/selection. Press the \( \text{X} \) key (Next) to accept the default or revised value/selection and advance to the next parameter.

Transmitter parameters that can be configured in this way are: Language, Instrument Tag, Diagnostics View, Signals View, Chart View, Alarm View, Analog OP View, Calibration Log, Alarm Log, Audit Log, Diagnostics Log, Date Format and Date & Time. On completion of Easy Setup, the display returns to the Easy Setup start screen:

Press the \( \text{F} \) key (Select) to revise/amend the settings just made or press the \( \text{X} \) key (Exit) to cancel and exit to the main Operator page.

All transmitter parameters can be revised.changed at any time by selecting Enter Configuration from any Operator or View page menu, followed by Advanced from the Access Level menu.

**NOTICE**

- If Easy Setup does not detect a key press within 5 minutes, the display changes automatically to the main Operator page.
- Refer to page 19 for details of menu navigation and parameter selection/adjustment.
7 Operation

Front panel keys

The transmitter is operated using the front panel keys.

Prompts associated with active keys are displayed on each screen.

---

Figure 18 Front panel keys

<table>
<thead>
<tr>
<th>Key</th>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Navigation key – left and Operator menu access key</td>
<td>When any Operating, View or Log page is displayed, opens or closes the Operator menu and returns to the previous menu level.</td>
</tr>
<tr>
<td>B</td>
<td>View key</td>
<td>Toggles the view between Operator pages, View screens and Log screens – see Figure 19. Note. Disabled in Configuration mode.</td>
</tr>
<tr>
<td>C</td>
<td>Up key</td>
<td>Used to navigate up menu lists, highlight menu items and increase displayed values.</td>
</tr>
<tr>
<td>D</td>
<td>Down key</td>
<td>Used to navigate down menu lists, highlight menu items and decrease displayed values.</td>
</tr>
<tr>
<td>E</td>
<td>Group key</td>
<td>Toggles between: • Operator pages (1 to 5) when an Operator page is selected with the View key. • View screens (Diagnostics View, Signals View, Alarms View, and Outputs View) when the Diagnostics View screen is selected with the View key. • Log screens (Calibration Log, Alarm Log, Audit Log and Diagnostics Log) when the Calibration Logs screen is selected with the View key. See Figure 19. Note. Disabled in Configuration mode.</td>
</tr>
<tr>
<td>F</td>
<td>Navigation key – right and Cal shortcut key</td>
<td>At menu level, selects the highlighted menu item, operation button or edits a selection. When any Operator, View or Log page is displayed, used as a shortcut key to access the Calibrate level.</td>
</tr>
</tbody>
</table>

Table 2 Key functions

---

Figure 19 Menu navigation overview

Note.
The calibration log for a sensor (S1 to S2) is displayed only if that sensor is fitted.
...7 Operation

Modes of operation

The transmitter has 4 modes of operation – all modes are accessed from the Operator menu – see Figure 20:

- **Operating**: displays real-time sensor values on Operating Pages – see page 21.
- **View**: displays diagnostic messages, alarms, output values, signals (including the flow rate where applicable) and (chart) traces – see page 23.
- **Log**: displays recorded diagnostic, calibration and audit events and alarms – see page 24.
- **Configuration**: enables the transmitter to be configured.

Operator menus

**NOTICE**

Operator menus cannot be accessed directly from the Configuration level.

Referring to Figure 20:

- Operator menus are accessed from any Operator, View or Log page by pressing the key.
- Operator sub-menus (indicated by the arrow) are selected by pressing the key.
- The Calibrate page can be opened directly from an Operator page (bypassing the Configuration level menus) using CAL shortcut. Press the key (below the CAL prompt).

![Figure 20 Operator menus](image)

Operator menus comprise:

- **Operator Pages**: displays the Operator page for each available sensor.
- **Data Views**: displays enabled data views.
- **Logs**: displays enabled Log views.
- **Alarm Acknowledge**: acknowledges the active alarm displayed in the Alarms View.
- **Manual Hold**: holds (freezes) the current outputs and alarms for the selected sensor(s).

**NOTICE**

Active values are still indicated on the display.

- **Manual Clean**: initiates a sensor cleaning cycle.
- **Ack.Sensor Removed** (displayed only if a sensor is disconnected from the transmitter): confirms permanent sensor removal and resets transmitter configuration settings to factory default for the sensor input.
- **Media Card**: displays the status of the SD card and enables the operator to place the media online/offline.
- **Autoscroll** (enabled on Operator pages only): displays Operator pages sequentially when multiple sensors are fitted.
- **Enter Configuration** (enabled on all pages): enters Configuration parameters via the Access Level – see page 26 for access levels and password security options.
Operating modes

In operating mode, process values (PVs) from connected sensors are displayed on Operator Pages. A maximum of 3 Operator Pages can be displayed.

Operator Page 1 (the default page) displays the PVs from all connected sensors simultaneously (a maximum of 2 sensors can be connected). The remaining 2 Operator pages display values from individual sensors (in sensor order).

In Figure 21, Operator page 1 shows that 2 sensors are connected (pH and turbidity).

*The highest priority diagnostic or alarm is displayed. Other active diagnostic/alarm states can be viewed on the Diagnostics View.

Figure 21  Operator Page (multiple sensors)
...7 Operation

Figure 22 shows an overview of Operator pages 2 to 3. Each Operator Page displays the PV and temperature from a single sensor. Fixed, color-coded, user-assignable tags (one for each fitted sensor) and color-coded bargraphs aid identification of each sensor.

The bargraph indicates the PV. Minimum and maximum PVs are configurable in the Sensor Setup level. If the measured PV is above the maximum specified range of the sensor (refer to the sensor’s Operating Instruction), the bargraph flashes to indicate the value is outside the specified range. When multiple sensors are fitted and Autoscroll is selected from the Operator Menu (see page 20), the display scrolls through each available Operator Page consecutively.

Figure 22  Operator pages – overview
**View mode**

Pages displayed in View mode comprise:

- **Diagnostics View** – displays a list of active diagnostic messages identified by priority and message – see Figure 23
- **Signals View** – displays a list of active signals and their values (1 page per sensor) – see Figure 24
- **Chart View** – represents the sensor readings as a series of color-coded traces – see Figure 25
- **Alarms View** – displays a list of alarms, source and status – see Figure 26
- **Outputs View** – displays a list of the analog outputs, output value and percentage of output value – see Figure 27

**Diagnostics View**

- NAMUR icon and message priority
- Diagnostic message
- View icon

**Signals View**

- Signal value
- Units
- Signal type

**Alarms View**

- Alarm source
- Alarm status
- Alarm acknowledge status (Y/N)

**Outputs View**

- Output value
- % of output value
- Analog output ID
7 Operation

Log mode

Log mode pages display logged information in the sequence it occurred.

Log mode pages comprise:
- **Calibration Logs**: a history of calibration routines. One log is provided for each sensor and is displayed only if the sensor is fitted. Each log can store 15 entries that are displayed in date order.
- **Alarm Log**: a history of alarm events.
- **Audit Log**: a history of analyzer activity.
- **Diagnostics Log**: a history of diagnostic events.

Log entries

Example Calibration Log entries with descriptions are shown in Table 3. Example Audit Log entries together with a description are shown in Table 4. The Diagnostics Log shows the history of diagnostic messages that have been displayed in the Diagnostic View.

<table>
<thead>
<tr>
<th>Log entry</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cal Failed</td>
<td>Calibration procedure failed due to low slope or sample temperature error.</td>
</tr>
<tr>
<td>Cal Aborted</td>
<td>Calibration aborted manually by the user.</td>
</tr>
<tr>
<td>Cal Missed</td>
<td>Note. Sensor-type specific.</td>
</tr>
</tbody>
</table>

Table 3 Calibration Log entries

<table>
<thead>
<tr>
<th>Log entry</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Failure</td>
<td>Power to the transmitter is lost.</td>
</tr>
<tr>
<td>Power Recovery</td>
<td>Transmitter restarted after a power loss.</td>
</tr>
<tr>
<td>In Config.</td>
<td>User in Advanced/Configuration mode.</td>
</tr>
<tr>
<td>Time/Date Changed</td>
<td>User has changed date/time.</td>
</tr>
<tr>
<td>Daylight Saving</td>
<td>Time changed due to daylight saving.</td>
</tr>
</tbody>
</table>

Table 4 Audit Log entries

---

*Icons not displayed on Alarm Log or Calibration Log

Figure 28 Log page example (Audit Log shown)
8 Data logging

SD card

An SD card is kept in the transmitter. Data is archived to the removable media automatically at set intervals. Archiving continues until the removable media is full, archiving then stops. To ensure all required data is archived successfully, swap the SD card periodically for an empty one.

NOTICE

- Logging of data is possible only when an SD card is fitted and online – in this state, Data and Events are lost.
- ABB’s DataManager Pro software can be used to store and view data archived from the transmitter.
- A 2 GB SD card has sufficient external storage capacity for >5 years data.

NOTICE

- To avoid potential damage or corruption to data recorded on removable media, take care when handling and storing.
- Do not expose to static electricity, electrical noise or magnetic fields.
- When handling an SD card, take care not to touch any exposed metal contacts.
- Back-up critical data stored on removable media regularly.

SD card insertion and removal

Referring to Figure 29:
1. Using a suitable screwdriver, release door retaining screw A.
2. Open the transmitter door and remove media cover B.
3. Insert removable media C by pushing up into slot, then releasing to spring-lock in place. If required, press button D to place the media online. LED E is lit when the removable media is online.
4. To remove the media, if LED E is lit, press button D to take the media offline and ensure LED E is not lit.
5. Push removable media C up to release spring-lock, then pull down and out of the socket.
6. Refit media cover B.
7. Close the transmitter door and secure with door retaining screw A.

Figure 29 SD card insertion and removal
9 Password security and Access Level

Setting passwords

Passwords are entered at the Enter Password screen accessed via the Access Level see Figure 30.

Passwords can be set to enable secure access at 2 levels: Calibrate and Advanced. The Service level is password protected at the factory and reserved for factory use only. Passwords can contain up to 6 characters and are set, changed or restored to their default settings at the Device Setup/ Security Setup parameter.

**NOTICE**

When the transmitter is powered-up for the first time, the Calibrate and Advanced levels can be accessed without password protection. Protected access to these levels can be allocated as required.

Access Level

The Access Level is entered via the Operator menu/Enter Configuration menu option – see page 20.

Access levels – scroll to level using the keys and press the key (Select) to enter

Table 5 Access level menu details

<table>
<thead>
<tr>
<th>Level</th>
<th>Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logout</td>
<td>Displayed only after Calibrate or Advanced levels are accessed. Logs the user out of the current level. If passwords are set, a password must be entered to access these levels again after selecting Logout.</td>
</tr>
<tr>
<td>Read Only</td>
<td>View all parameters in read-only mode.</td>
</tr>
<tr>
<td>Calibrate</td>
<td>Enables access and adjustment of Calibrate parameters. Calibration is sensor-specific – refer to the sensor Operating instruction for calibration details.</td>
</tr>
<tr>
<td>Advanced</td>
<td>Enables configuration access to all parameters.</td>
</tr>
<tr>
<td>Service</td>
<td>Reserved for authorized service technicians only.</td>
</tr>
</tbody>
</table>

Figure 30 Access level screen

Cursor/Password character indicator (maximum 6 characters)

Figure 31 Enter password screen
## 10 Sensor setup

### 2-electrode conductivity

<table>
<thead>
<tr>
<th>Menu</th>
<th>Comment</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tag</td>
<td>Enter an alphanumeric sensor tag (16 characters maximum) to identify the sensor on the Operator Pages.</td>
<td>TAG1</td>
</tr>
<tr>
<td>Measurement Type</td>
<td>Select measurement type:</td>
<td>Conductivity</td>
</tr>
<tr>
<td></td>
<td>• Conductivity/Concentration/Resistivity</td>
<td></td>
</tr>
<tr>
<td>Note</td>
<td>If a change is made the I/O sources are reset.</td>
<td></td>
</tr>
<tr>
<td>Note. The following menus are displayed only if measurement type = Conductivity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conductivity Unit</td>
<td>Select the conductivity units:</td>
<td>μS/cm</td>
</tr>
<tr>
<td></td>
<td>• mS/cm/μS/cm</td>
<td></td>
</tr>
<tr>
<td>Cell Constant</td>
<td>Enter the cell constant of the measuring cell used –</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>see the relevant conductivity cell manual.</td>
<td></td>
</tr>
<tr>
<td>Range High</td>
<td>Set the span value used in Chart and Bargraph views.</td>
<td>Cell constant dependent – see table below</td>
</tr>
<tr>
<td>Range Low</td>
<td>Set the zero value used in Chart and Bargraph views.</td>
<td>0</td>
</tr>
<tr>
<td>Note. The following menus are displayed only if measurement type = Concentration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cell Constant</td>
<td>Enter the cell constant of the measuring cell used –</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>see the relevant conductivity cell manual.</td>
<td></td>
</tr>
<tr>
<td>Concentration Unit</td>
<td>Select the concentration units:</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>• None(Blank)/ppm/mg/l/ppb/μg/l/%/Custom</td>
<td></td>
</tr>
<tr>
<td>Custom Units</td>
<td>Note. Displayed only if concentration units = Custom</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Enter an alphanumeric string (6 characters maximum) for the custom (user defined) concentration units.</td>
<td></td>
</tr>
<tr>
<td>Conc. Curve Table</td>
<td>Set the user defined concentration curve using the 6-point linearizer table (concentration against conductivity).</td>
<td>N/A</td>
</tr>
<tr>
<td>Range High</td>
<td>View the span value used in Chart and Bargraph views.</td>
<td>N/A</td>
</tr>
<tr>
<td>Range Low</td>
<td>View the zero value used in Chart and Bargraph views.</td>
<td>N/A</td>
</tr>
<tr>
<td>Filter Type</td>
<td>Select the signal filtering type:</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>• None/Low/Medium/High</td>
<td></td>
</tr>
<tr>
<td>Temp. Comp. Type</td>
<td>Set the type of temperature compensation:</td>
<td>Automatic</td>
</tr>
<tr>
<td></td>
<td>• Manual/Automatic/None</td>
<td></td>
</tr>
<tr>
<td>Manual Temperature</td>
<td>Note. Displayed only if temperature compensation type = Manual</td>
<td>25.0 °C</td>
</tr>
<tr>
<td></td>
<td>Enter the temperature of the sample within the range –10.0 to 120.0 °C.</td>
<td></td>
</tr>
<tr>
<td>TC Curve</td>
<td>Note. Not displayed only if temperature compensation type = None</td>
<td>TC Coeff</td>
</tr>
<tr>
<td></td>
<td>Set the temperature compensation characteristic required:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• TC Coeff./Standard KCl/UPW (Low TC)/UPW (High TC)/Pure H2O (Neutral)/</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pure H2O (Acid)/Pure H2O (Base)/NaOH/HCl/NaCl/NH3/User Defined</td>
<td></td>
</tr>
<tr>
<td>User Def. TC Curve</td>
<td>Note. Displayed only if temperature compensation curve = User Defined</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Set the user defined temperature compensation curve using the six point linearizer table (% against °C).</td>
<td></td>
</tr>
<tr>
<td>TC Coefficient</td>
<td>Note. Displayed only if temperature compensation curve = User Defined</td>
<td>2.00 %/°C</td>
</tr>
<tr>
<td></td>
<td>Enter the temperature coefficient (α x 100) of the solution (0.01 to 5.00 %/°C).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If unknown, the temperature coefficient (α) of the solution must be calculated – see page 72.</td>
<td></td>
</tr>
<tr>
<td>Sensor Diagnostics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polarisisation</td>
<td>Detect excessive polarisation condition:</td>
<td>Disabled</td>
</tr>
<tr>
<td></td>
<td>• Enabled/Disabled</td>
<td></td>
</tr>
<tr>
<td>Out Of Solution</td>
<td>Detect Out Of Solution condition:</td>
<td>Disabled</td>
</tr>
<tr>
<td></td>
<td>• Enabled/Disabled</td>
<td></td>
</tr>
<tr>
<td>Reset To Defaults</td>
<td>Select to reset all Sensor Setup parameters to their default values.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conductivity cell constant</th>
<th>Conductivity measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.01</td>
<td>0 to 200 μS/cm</td>
</tr>
<tr>
<td>0.05</td>
<td>0 to 1000 μS/cm</td>
</tr>
<tr>
<td>0.10</td>
<td>0 to 1 mS/cm</td>
</tr>
<tr>
<td>0.10</td>
<td>0 to 2 mS/cm</td>
</tr>
<tr>
<td>1.00</td>
<td>0 to 20,000 μS/cm</td>
</tr>
<tr>
<td>1.00</td>
<td>0 to 20 mS/cm</td>
</tr>
</tbody>
</table>
### 2-electrode conductivity – dual input calculated values setup

<table>
<thead>
<tr>
<th>Menu</th>
<th>Comment</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculation Type</td>
<td>Calculations are performed using the inputs from both sensors.</td>
<td>No Calculation</td>
</tr>
<tr>
<td></td>
<td>Select the required calculation from the following options:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No Calculation/Inferred pH (NaOH)/Inferred pH (NaOH+NaCl)/Inferred pH (NH3)/</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inferred pH (NH3+NaCl)/Difference/Ratio/% Passage/% Rejection</td>
<td></td>
</tr>
<tr>
<td>Inferred pH (NaOH)</td>
<td>Calculates a pH value in the range 7.00 to 11.00 pH based on the type of chemical dosing and the conductivity readings.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Note: The temperature compensation characteristic TC Curve for signal B should be set to NaOH.</td>
<td></td>
</tr>
<tr>
<td>Inferred pH (NaOH+NaCl)</td>
<td>Calculates a pH value in the range 7.00 to 11.00 pH based on the type of chemical dosing and the conductivity readings.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Note: The temperature compensation characteristic TC Curve for signal B should be set to NaCl.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Note: The temperature compensation characteristic TC Curve for signal B should be set to NaOH.</td>
<td></td>
</tr>
<tr>
<td>Inferred pH (NH3)</td>
<td>Calculates a pH value in the range 7.00 to 10.00 pH based on the type of chemical dosing and the conductivity readings.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Note: The temperature compensation characteristic TC Curve for signal B should be set to NH3.</td>
<td></td>
</tr>
<tr>
<td>Inferred pH (NH3+NaCl)</td>
<td>Calculates a pH value in the range 7.00 to 10.00 pH based on the type of chemical dosing and the conductivity readings.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Note: The temperature compensation characteristic TC Curve for signal A should be set to NaCl.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Note: The temperature compensation characteristic TC Curve for signal B should be set to NH3.</td>
<td></td>
</tr>
<tr>
<td>Difference</td>
<td>Calculates the difference between the two conductivity inputs:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Difference = B — A</td>
<td></td>
</tr>
<tr>
<td>Ratio</td>
<td>Calculates the ratio of the two conductivity inputs:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ratio = ( \frac{B}{A} )</td>
<td></td>
</tr>
<tr>
<td>% Passage</td>
<td>Calculates the amount of conductivity as a percentage that passes through the cation exchange unit:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>%Passage = ( \frac{A}{B} ) × 100</td>
<td></td>
</tr>
<tr>
<td>% Rejection</td>
<td>Calculates the amount of conductivity as a percentage that is absorbed in the cation exchange unit:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>%Rejection = ( \left(1 - \frac{A}{B}\right) ) × 100</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* The following menus are displayed only if Calculation Type = Inferred pH.

**Before Cation Limit**
- Set the required before-cation conductivity limit, between:
  - 0.000 and 100.0 μS/cm Inferred pH (NaOH)
  - 0.000 and 100.0 μS/cm Inferred pH (NaOH+NaCl)
  - 0.000 and 25.0 μS/cm Inferred pH (NH3)
  - 0.000 and 25.0 μS/cm Inferred pH (NH3+NaCl)

**After Cation Limit**
- Set the required after-cation conductivity limit, between:
  - 1.000 and 100.0 μS/cm Inferred pH (NaOH)
  - 1.000 and 250.0 μS/cm Inferred pH (NaOH+NaCl)
  - 0.060 and 10.00 μS/cm Inferred pH (NH3)
  - 0.060 and 25.00 μS/cm Inferred pH (NH3+NaCl)

**pH Range**
- View the measuring range for the selected Inferred pH calculation
  - 7.00 to 11.00 pH Inferred pH (NaOH)
  - 7.00 to 11.00 pH Inferred pH (NaOH+NaCl)
  - 7.00 to 10.00 pH Inferred pH (NH3)
  - 7.00 to 10.00 pH Inferred pH (NH3+NaCl)

**Signal Arrangement**
- Set the signal arrangement:
  - A = S1, B = S2/A = S2, B = S1
  - A = Conductivity measurement After cation column.
  - B = Conductivity measurement Before cation column.

Note: For inferred pH:
4-electrode conductivity

Menu | Comment | Default
--- | --- | ---
Tag | Enter an alphanumeric sensor tag (16 characters maximum) to identify the sensor on the Operator Pages. | TAG1
Measurement Type | Select measurement type:  
- Conductivity/Concentration | Conductivity

Note. If a change is made the I/O sources are reset.

Conductivity Unit | Select the conductivity units:  
- mS/cm/μS/cm | mS/cm

Sensor Group | Enter the sensor group for the measuring cell used –  
- Group A/Group B  
see the relevant conductivity cell manual. | Group A

Range High | Set the span value used in Chart and Bargraph views. | Sensor Group dependent – see table below

Range Low | Set the zero value used in Chart and Bargraph views. | 0

Note. The following menus are displayed only if Measurement Type = Concentration

Sensor Group | Enter the sensor group for the measuring cell used –  
- Group A/Group Bw  
see the relevant conductivity cell manual. | N/A

Conc. Solution | Note. Displayed only if Sensor Group = Group A  
Select the Concentration Solution  
- NaOH/HCl/H2SO4/H3PO4/NaCl/KOH/Custom | N/A

Concentration Unit | Note. Displayed only if Conc. Solution = Custom  
Select the Concentration Units  
- None(Blank)/ppm/mg/l/ppb/μg/l/%/Custom | N/A

Custom Units | Note. Displayed only if Concentration Units = Custom  
Enter an alphanumeric string (6 characters maximum) for the custom (user defined) concentration units. | N/A

Conc. Curve Table | Set the user defined concentration curve using the 6-point linearizer table (concentration against conductivity). | N/A

Range High | View the span value used in Chart and Bargraph views. | N/A

Range Low | View the zero value used in Chart and Bargraph views. | N/A

Filter Type | Select the signal filtering type:  
- None/Low/Medium/High | None

Temp. Comp. Type | Set the type of temperature compensation:  
- Manual/Automatic/None | Automatic

Manual Temperature | Note. Displayed only if Temp. Comp. Type = Manual  
Enter the temperature of the sample within the range –10.0 to 120.0 °C. | 25.0 °C

TC Curve | Note. Not displayed only if Temp. Comp. Type = None  
Set the type of automatic temperature compensation required:  
- TC Coeff./Standard KCl/NaOH/NaCl/HCl/H2SO4/H3PO4/KOH/User Defined | TC Coeff

User Def. TC Curve | Note. Displayed only if TC Curve = User Defined.  
Set the user defined temperature compensation curve using the six point linearizer table (% against °C). | N/A

TC Coefficient | Note. Displayed only if TC Curve = User Defined.  
Enter the temperature coefficient (α x 100) of the solution (0.01 to 5.00 %/°C).  
If unknown, the temperature coefficient (α) of the solution must be calculated. | 2.00 %/°C

Sensor Diagnostics

Dirty Sensor | Detect dirty sensor condition:  
- Enabled/Disabled | Disabled

Out Of Solution | Detect Out Of Solution condition:  
- Enabled/Disabled | Disabled

Reset To Defaults | Select to reset all Sensor Setup parameters to their default values

<table>
<thead>
<tr>
<th>Sensor group</th>
<th>Conductivity measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0 to 2000 mS/cm</td>
</tr>
<tr>
<td>B</td>
<td>0 to 2000 μS/cm</td>
</tr>
</tbody>
</table>
...10 **Sensor setup**

### pH/Redox/ORP

<table>
<thead>
<tr>
<th>Menu</th>
<th>Comment</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tag</strong></td>
<td>Enter an alphanumeric sensor tag (16 characters maximum) to identify the sensor on the Operator Pages.</td>
<td>TAG1</td>
</tr>
<tr>
<td><strong>Measurement Type</strong></td>
<td>Select measurement type:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• pH/Redox/ORP</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Note.</strong> If a change is made the I/O sources are reset.</td>
<td></td>
</tr>
<tr>
<td><strong>Range High</strong></td>
<td>Set the span value used in Chart and Bargraph views.</td>
<td>14.00</td>
</tr>
<tr>
<td><strong>Range Low</strong></td>
<td>Set the zero value used in Chart and Bargraph views.</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Filter Type</strong></td>
<td>Select the signal filtering type:</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>• None/Low/Medium/High</td>
<td></td>
</tr>
</tbody>
</table>

**Note.** The following menus are displayed only if **Measurement Type** = **pH**.

| **Temp. Compensation** | Set the type of temperature compensation:                               | Automatic |
|                       | • Manual/Automatic/Auto solution                                         |          |

| **Solution Coeff.**    | **Note.** Displayed only if **Temp. Compensation** type = Auto solution. | N/A      |
|                       | Set the solution coefficient (pH or mV change per 10 deg C) of the solution being monitored. |          |

| **Manual Temperature** | **Note.** Displayed only if **Temp. Compensation** type = Manual.          | N/A      |
|                       | Enter the temperature of the sample within the range –10.0 to 120.0 °C.   |          |

**Note.** The following menus are displayed only if **Measurement Type** = **Redox/ORP**.

| **Temperature Sensor** | Set the type of temperature measurement:                                | N/A      |
|                       | • Manual/Automatic                                                      |          |
|                       | **Note.** If **Temperature Sensor** type = Manual, the temperature value is not displayed in the associated Operator page or Signals View. |          |

| **Low Slope Limit**    | A pH probe degrades over time. As this happens the slope calculated by a calibration procedure gradually decreases. Set the slope value below which a calibration fails. The low slope warning diagnostic is activated if the calibration calculates a slope less than 20 % above this value. | 40%      |

| **Sensor Diagnostics** |                                                                 |         |
| **Broken Glass**       | **Note:** Displayed only if **Measurement Type** = **pH**.              | Disabled |
|                       | Detect broken glass condition:                                         |          |
|                       | • Enabled/Disabled                                                      |          |
| **Out Of Solution**    | Detect Out Of Solution condition:                                      | Disabled |
|                       | • Enabled/Disabled                                                      |          |
| **Ref. Poisoning**     | **Note:** Displayed only if a digital (EZLink) sensor is connected.     | Disabled |
|                       | Detect a contaminated reference electrode:                             |          |
|                       | • Enabled/Disabled                                                      |          |
| **Ref. Failure**       | **Note:** Displayed only if a digital (EZLink) sensor is connected.     | Disabled |
|                       | Detect a failed reference electrode:                                   |          |
|                       | • Enabled/Disabled                                                      |          |
| **Ref. Blocked**       | Detect a blocked reference electrode:                                  | Disabled |
|                       | • Enabled/Disabled                                                      |          |
| **Ref. Alarm Limit**   | **Note:** Displayed only if **Ref. Blocked** sensor diagnostic is Enabled. | N/A      |
|                       | A blocked reference electrode is detected when the impedance of the reference electrode exceeds a given limit. Set the impedance value above which the reference blocked diagnostic is activated. |          |
| **Reset To Defaults**  | Select to reset all Sensor Setup parameters to their default values.    |          |
## RDO

<table>
<thead>
<tr>
<th>Menu</th>
<th>Comment</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tag</strong></td>
<td>Enter an alphanumeric sensor tag (16 characters maximum) to identify the sensor on the Operator Pages.</td>
<td>TAG1</td>
</tr>
</tbody>
</table>
| **Measurement Type** | Select the required probe type:  
  • Dissolved Oxygen/% Saturation  
  **Note.** If a change is made the I/O sources are reset.                                                                                   | Dissolved Oxygen |
| **Units**     | Select the measurement units:  
  • mg/l/ppm                                                                                                                                                                                               | ppm         |
| **PV Resolution** | Select the PV Resolution:  
  • Normal/High                                                                                                                                                                                               | Normal      |
| **Range High** | Set the span value in Chart and Bargraph views.                                                                                                                                                    | 50 ppm (200%) |
| **Range Low** | Set the zero value in Chart and Bargraph views.                                                                                                                                                       | 0           |
| **Filter Type** | Select the signal filtering type:  
  • None/Low/Medium/High                                                                                                                                                                         | None        |
| **Salinity Unit** | Select the required salinity units:  
  • PSU (Practical Salinity Units) or ppt (parts-per-thousand).                                                                                                                                 | PSU         |
| **Salinity Correction** | Required when monitoring water containing high quantities of dissolved salts:  
  • enter the required value between 0 and 42 Practical Salinity Units (PSU).  
  • leave at the default value of 0 PSU if salinity correction is not required.                                                                 | 0 PSU       |
| **Pressure Unit** | Select the required barometric pressure units:  
  • mBar/mmHg                                                                                                                                                                                           | mBar        |
| **Barometric Pressure** | Barometric pressure compensation.  
  Set the local barometric pressure to 506 to 1114 mbar (380 to 835 mm/Hg).  
  If the barometric pressure is unknown, leave at the default sea-level value of 1013 mbar (760 mm/Hg).                              | 1013 mbar   |
| **Reset To Defaults** | Select to reset all Sensor Setup parameters to their default values.                                                                                                                                   | N/A         |
## 10 Sensor setup

### Turbidity

<table>
<thead>
<tr>
<th>Menu</th>
<th>Comment</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tag</td>
<td>Enter an alphanumeric sensor tag (16 characters maximum) to identify the sensor on the Operator Pages.</td>
<td>TAG1</td>
</tr>
<tr>
<td>Sensor Type</td>
<td>Select the sensor type:</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>• 7998 011/7998 012/7998 016</td>
<td></td>
</tr>
<tr>
<td>Turbidity Units</td>
<td>Select the turbidity units:</td>
<td>NTU</td>
</tr>
<tr>
<td></td>
<td>• NTU/FNU</td>
<td></td>
</tr>
<tr>
<td>Range High</td>
<td>Set the span value used in Chart and Bargraph views.</td>
<td>40.00 NTU</td>
</tr>
<tr>
<td></td>
<td>(sensor types: 7998 011, 7998 016)</td>
<td>400.0 NTU</td>
</tr>
<tr>
<td>Range Low</td>
<td>Fixed at 0.0 NTU.</td>
<td>0.0</td>
</tr>
<tr>
<td>Filter Type</td>
<td>Select the signal filtering type:</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>• None/Low/Medium/High</td>
<td></td>
</tr>
<tr>
<td>Bubble Rejection</td>
<td>Select the bubble rejection filtering type:</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>• None/Low/Medium/High</td>
<td></td>
</tr>
</tbody>
</table>

**Note.** The following menus are displayed only if the sensor has a wiper fitted. Validity sensor type: 7998 011 or 7998 012

<table>
<thead>
<tr>
<th>Menu</th>
<th>Comment</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wiper Clean Freq.</td>
<td>Set the interval between cleans:</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>• Off/15 mins/30 mins/45 mins/1 to 24 Hours</td>
<td></td>
</tr>
<tr>
<td>Next Clean</td>
<td>Note. Displayed only if a wiper clean frequency has been configured</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Set the time for the next wiper clean to occur.</td>
<td></td>
</tr>
<tr>
<td>Reset Wiper Lifetime</td>
<td>Use to restart the wiper lifetime counter after wiper replacement.</td>
<td>N/A</td>
</tr>
<tr>
<td>Reset To Defaults</td>
<td>Select to reset all Sensor Setup parameters to their default values.</td>
<td></td>
</tr>
</tbody>
</table>
## Turbidity/suspended solids

<table>
<thead>
<tr>
<th>Menu</th>
<th>Comment</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tag</td>
<td>Enter an alphanumeric sensor tag (16 characters maximum) to identify the sensor on the Operator Pages.</td>
<td>TAG1</td>
</tr>
<tr>
<td>Measurement Type</td>
<td>Select measurement type:</td>
<td>Turbidity</td>
</tr>
<tr>
<td></td>
<td>• Turbidity/Suspended solids</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Note.</strong> If a change is made the I/O sources are reset.</td>
<td></td>
</tr>
<tr>
<td>Turbidity Units</td>
<td>Select the turbidity units</td>
<td>NTU</td>
</tr>
<tr>
<td></td>
<td>• NTU/FNU</td>
<td></td>
</tr>
<tr>
<td>TSS Units</td>
<td>Select the total suspended solids units</td>
<td>mg/l</td>
</tr>
<tr>
<td></td>
<td>• mg/l/ppm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>for readings above 1000 mg/l (ppm) the units change automatically to g/l (ppt).</td>
<td></td>
</tr>
<tr>
<td>Range High</td>
<td>Set the span value used in Chart and Bargraph views.</td>
<td>4000 NTU</td>
</tr>
<tr>
<td>Range Low</td>
<td>Set the zero value used in Chart and Bargraph views.</td>
<td>0</td>
</tr>
<tr>
<td>Filter Type</td>
<td>Select the signal filtering type:</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>• None/Low/Medium/High</td>
<td></td>
</tr>
</tbody>
</table>

**Note.** The following menus are displayed only if the sensor has a wiper fitted.

| Wiper Clean Freq.     | Set the interval between cleans:                                                                                                                                                                     | Off      |
|                       |  • Off/15 mins/30 mins/45 mins/1 to 24 Hours                                                                                                                                                           |          |
| Next Clean            | **Note.** Displayed only if a wiper clean frequency has been configured                                                                                                                                 | N/A      |
|                       | Set the time for the next wiper clean to occur.                                                                                                                                                        |          |
| Reset Wiper Lifetime  | Use to restart the wiper lifetime counter after wiper replacement.                                                                                                                                       | N/A      |
| Reset To Defaults     | Select to reset all Sensor Setup parameters to their default values.                                                                                                                                       |          |
11 Specifications

**Operation**

Display
- 89 mm (3.5 in) color ¼ VGA TFT, liquid crystal display (LCD) with built-in backlight and brightness/contrast adjustment

Language
- English, German, French, Italian, Spanish, Portuguese, Russian, Turkish, Chinese, Polish

Keypad
- 6 tactile membrane keys:
  - Group select/Left cursor
  - View select/Right cursor
  - Menu key
  - Up
  - Down
  - Enter key

No. of inputs
- Up to 2 analog or digital sensors

**Mechanical data**

Protection
- IP66/NEMA 4X

Dimensions
- Height: 144 mm (5.67 in) minimum (excluding glands)
- Width: 144 mm (5.67 in) door closed – min.
- Depth: 99 mm (3.89 in) door closed – min.
  (excluding fixing brackets)
- Weight: aluminum enclosure
  - 1.36 kg (3 lb) approx. (unpacked)
- Weight: polycarbonate enclosure
  - 1 kg (2.2 lb) approx. (unpacked)

Panel dimensions
- Cut-out height: 138 +1 –0 mm (5.43 +0.04 –0 in)
- Cut-out width: 138 +1 –0 mm (5.43 +0.04 –0 in)
- Thickness: 6.35 mm (0.25 in) max.
- Depth behind panel: 100 mm (4 in) min.
  (after fixing with brackets to panel)
- Distance between cut-outs: 40 mm (1.57 in) min.

Materials of construction
- Aluminum enclosure – LM20 aluminum
- Polycarbonate enclosure – LEXAN 505RU
  10 % glass-filled polycarbonate

Cable entries
- Five holes to accept M20 or ½ in cable glands or conduit hubs
- Two holes to accept M16 cable glands or conduit hubs or EZLink connectors

**Security**

Password protection
- Access to configuration levels is enabled only after the user has entered a password:
  - Calibrate level: user-assigned password
  - Advanced level: user-assigned password
- Service level: service level user-assigned password

**Electrical**

Supply voltage
- 100 to 240 V AC ±10 %, 50/60 Hz
- 24 V DC (18 min. to 36 V DC max.)

Power consumption
- <15 W

Terminal connections rating
- Solid/Flexible wire: AWG 24 to 16 (0.2 to 1.5 mm²)
- Ferrule with plastic sleeve 0.2 to 0.75 mm²
- Ferrule without plastic sleeve 0.2 to 1.5 mm²

Cable specification
- Cable glands:
  - M20: 5 to 9 mm (0.2 to 0.35 in)
  - M16: 2 to 6 mm (0.08 to 0.24 in)
  - ½ in NPT: 6 to 12 mm (0.24 to 0.47 in)
  - Ethernet: 4.7 to 6.35 mm (0.187 to 0.25 in)

**Analog outputs**

Number
- Two supplied as standard
- Four with module board fitted

Output ranges
- Analog output programmable to any value between 0 and 22 mA to indicate system failure

Accuracy
- ±0.25 % of reading or 10 µA (whichever is the greater)

Maximum load resistance
- 500 Ω at 20 mA

Configuration
- Can be assigned to either measured variable or either sample temperature

Isolation
- Revision A:
  - 500 V DC from any other circuitry but not from each other
- Revision B:
  - 500 V DC from any other circuitry

**Relay outputs**

- 4 standard single-pole changeover
- Fully-programmable
  - Contacts rating: 5 A @ 110/240 V AC (Non-Inductive) 5 A @ 30 V DC

**Digital input/output**

- 1 standard, user-programmable as input or output
- Minimum input pulse duration: 125 ms
- Input – volt-free
- Output – open-collector, 12 to 24 V, 250 mA max.
Connectivity/Communications (optional)

Ethernet
- HTTP, HTTPS, FTP, Secure FTP

PROFIBUS DP
- DPV0, DPV1

MODBUS
- RTU RS485

HART
- Fieldcomm certified version – HART 7
- Configured range
  - 4 to 20 mA, user-programmable across measurement range
- Dynamic range
  - 3.8 to 20.5 mA with 3.6 mA low alarm level, 21 mA high alarm level
- Accuracy
  - ±0.25 % of reading
- Maximum load resistance
  - 500 Ω at 20 mA
- Configuration
  - Can be assigned to either measured variable
- Isolation
  - 500 V DC from any other circuitry

Data logging

Storage
- Measurement value storage
  (programmable sample rate)
- Audit log*, Alarm log*, Calibration log, Diagnostics log

Storage media
- SD card, up to 32 GB capacity

Chart view
- On local display

Historical review
- Of data

Data transfer
- SD card interface – Windows-compatible FAT file system,
  data and log files in Excel and DataManager Pro compatible formats

Environmental data

Ambient operating temperature:
- −10 to 55 °C (14 to 131 °F)

Ambient operating humidity:
- Up to 95 % RH non-condensing

Storage temperature:
- −20 to 70 °C (−4 to 158 °F)

Altitude:
- 2000 m (6562 ft) max. above sea level

2-electrode conductivity

Conductivity input

Measurement range and resolution

<table>
<thead>
<tr>
<th>Cell constant</th>
<th>Conductivity range</th>
<th>Display resolution</th>
<th>Accuracy repeatability</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.01</td>
<td>0 to 200 µS/cm</td>
<td>0.001 µS/cm</td>
<td>±1.0 % of measurement range per decade</td>
</tr>
<tr>
<td>0.05</td>
<td>0 to 1000 µS/cm</td>
<td>0.01 µS/cm</td>
<td></td>
</tr>
<tr>
<td>0.1</td>
<td>0 to 2000 µS/cm</td>
<td>0.01 µS/cm</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0 to 20000 µS/cm</td>
<td>0.1 µS/cm</td>
<td></td>
</tr>
</tbody>
</table>

Dynamic response
- <3 s for 90 % step change when damping is Off

Damping
- Configurable: Off, Low, Medium and High

Temperature input

Temperature element types
- Automatic temperature sensor recognition for Pt100, Pt1000 and 3k Balco RTDs in either 2-lead or 3-lead configurations
- Temperature element can be used for automatic temperature compensation of the conductivity solution

Measurement range and resolution

<table>
<thead>
<tr>
<th>Sensor group</th>
<th>Temperature range</th>
<th>Display resolution</th>
<th>Accuracy repeatability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt100</td>
<td>−4 to 392 °F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pt1000</td>
<td>−20 to 200 °C</td>
<td>0.1 °C (0.18 °F)</td>
<td></td>
</tr>
<tr>
<td>3K Balco</td>
<td>−20 to 300 °C</td>
<td>0.1 °C</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>User-programmable</td>
<td>−20 to 300 °C (−4 to 572 °F)</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Temperature compensation modes
- Linear, UPW, NaCl, HCl and NH₃

Reference temperature
- 25 °C (77 °F)

Configured output range

<table>
<thead>
<tr>
<th>Cell constant</th>
<th>Min. span</th>
<th>Max. span</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.01</td>
<td>1 µS/cm</td>
<td>200 µS/cm</td>
</tr>
<tr>
<td>0.05</td>
<td>5 µS/cm</td>
<td>1000 µS/cm</td>
</tr>
<tr>
<td>0.1</td>
<td>10 µS/cm</td>
<td>2000 µS/cm</td>
</tr>
<tr>
<td>1</td>
<td>100 µS/cm</td>
<td>20000 µS/cm</td>
</tr>
</tbody>
</table>

* Audit log and Alarm log data are stored in the same log file
Specifications

4-electrode conductivity

Conductivity input

Measurement range and resolution

<table>
<thead>
<tr>
<th>Sensor group</th>
<th>Conductivity range</th>
<th>Display resolution</th>
<th>Accuracy repeatability</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0 to 2000 mS/cm</td>
<td>0.1 µS/cm</td>
<td>±0.5 % of measurement range per decade</td>
</tr>
<tr>
<td>B</td>
<td>0 to 2000 µS/cm</td>
<td>0.01 µS/cm</td>
<td></td>
</tr>
</tbody>
</table>

Dynamic response

<3 s for 90 % step change when damping is Off

Damping

Configurable: Off, Low, Medium and High

Temperature input

Temperature element types

- Automatic temperature sensor recognition for Pt100, Pt1000 and 3k Balco RTDs in either 2-lead or 3-lead configurations
- Temperature element can be used for automatic temperature compensation of the conductivity solution

Temperature range and resolution

<table>
<thead>
<tr>
<th>Sensor group</th>
<th>Temperature range</th>
<th>Display resolution</th>
<th>Accuracy repeatability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt100</td>
<td>-20 to 200 °C</td>
<td>0.1 °C</td>
<td></td>
</tr>
<tr>
<td>(-4 to 392 °F)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pt1000</td>
<td>-200 °C to 300 °C</td>
<td>0.1 °C</td>
<td></td>
</tr>
<tr>
<td>(320 °F to 572 °F)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3K Balco</td>
<td>User-programmable</td>
<td>0.1 °C</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>-20 to 300 °C</td>
<td>(0.1 °F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-4 to 572 °F)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Temperature compensation modes

- 0 to 15 % NaOH
- 0 to 18 % HCl
- 0 to 20 % H₂SO₄
- 0 to 40 % H₃PO₄
- 0 to 20 % NaCl
- 0 to 50 % KOH
- User-defined table

Reference temperature

25 ºC (77 ºF)

Configured output range

<table>
<thead>
<tr>
<th>Sensor group</th>
<th>Min. span</th>
<th>Max. span</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>100 µS/cm</td>
<td>2000 mS/cm</td>
</tr>
<tr>
<td>B</td>
<td>10 µS/cm</td>
<td>2000 µS/cm</td>
</tr>
</tbody>
</table>

pH/ORP (Redox)

pH/ORP (Redox) input

Sensor types

- pH: Glass, Antimony (Sb)
- ORP (Redox): Platinum (Pt), Gold (Au)

Input impedance

>1×10¹² Ω

Measurement range and resolution

<table>
<thead>
<tr>
<th>Type</th>
<th>Range</th>
<th>Display resolution</th>
<th>Accuracy repeatability</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>0 to 14 pH</td>
<td>0.01 pH</td>
<td>±0.01 pH</td>
</tr>
<tr>
<td>ORP</td>
<td>±2000 mV</td>
<td>1 mV</td>
<td>±1800 mV: ±1 mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>±2000 mV: ±3 mV</td>
</tr>
</tbody>
</table>

Dynamic response

<3 s for 90 % step change when damping is Off

Damping

Configurable: Off, Low, Medium and High

Temperature input

Temperature element types

- Automatic temperature sensor recognition for Pt100, Pt1000 and 3k Balco RTDs in either 2-lead or 3-lead configurations
- Temperature element can be used for automatic temperature compensation of the conductivity solution

Temperature range and resolution

<table>
<thead>
<tr>
<th>Sensor group</th>
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<td>Pt100</td>
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</tr>
<tr>
<td></td>
<td>-20 to 300 °C</td>
<td>(0.1 °F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-4 to 572 °F)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Temperature compensation modes

- pH: Manual, Automatic Nernstian, Nernstian with solution coefficient
- ORP: Manual, solution compensation coefficient

Reference temperature

25 ºC (77 ºF)

Configured output range

<table>
<thead>
<tr>
<th>Type</th>
<th>Min. span</th>
<th>Max. span</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>1 pH</td>
<td>14 pH</td>
</tr>
<tr>
<td>ORP</td>
<td>100 mV</td>
<td>4000 mV</td>
</tr>
</tbody>
</table>
**Turbidity**

**Measurement range and resolution**

<table>
<thead>
<tr>
<th>Sensor No.</th>
<th>Sensor type</th>
<th>Display resolution (NTU)</th>
<th>Minimum span (NTU)</th>
<th>Maximum span (NTU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7998 011</td>
<td>Flow-through (with wiper unit)</td>
<td>0.001 (&lt; 5)</td>
<td>1.000</td>
<td>40.00</td>
</tr>
<tr>
<td>7998 012</td>
<td>Flow-through (with wiper unit)</td>
<td>0.01 (&gt; 5)</td>
<td>0.1</td>
<td>400.0</td>
</tr>
<tr>
<td>7998 016</td>
<td>Flow-through (without wiper unit)</td>
<td>0.001 (&lt; 5)</td>
<td>1.000</td>
<td>40.00</td>
</tr>
</tbody>
</table>

**Measurement Principle**

90° scattered light measurement. Compliant to ISO 7027

**Maximum Linearity**

Typically, <1.0 %

**Accuracy**

1,2 Low range version ±2 % of reading

High range version ±5 % of reading or 0.3 NTU (whichever is greater)

**Repeatability**

3 0 to 200 NTU: < 1 %

200 to 400 NTU: 2 %

**Limit of Detection**

4 Low range version: 0.003 NTU

High range version: 0.3 NTU

**Response time**

T90 < 1 min at 1 l/min

**Flow Rate**

0.5 to 1.5 l/min (0.13 to 0.39 gall [US]/min)

**Integral wiper cleaning system**

Programmable operational frequency every 15, 30, 45 minutes or multiples of 1 hour up to 24 hours.

**Sample operating temperature**

0 to 50 °C (32 to 122 °F)

**Sample pressure**

Up to 3 bar (43.5 psi)

**Ambient operating temperature**

0 to 50 °C (32 to 122 °F)

**Ambient operating humidity**

Up to 95 % RH (Non-condensing)

**Damping**

Configurable: Off, Low, Medium and High

**Bubble Filter**

Configurable: Off, Low, Medium and High

---

1 Maximum measured error across full measurement range (limited by uncertainty in Formazine standards).


4 Tested in accordance with BS ISO 15839: 2003.
### 11 Specifications

**Approvals, certification and safety**

**Safety approval**
- cULus

**CE mark**
- Covers EMC & LV Directives (including latest version IEC 61010)

**General safety**
- IEC 61010-1
- Pollution degree 2
- Insulation class 1

**IECeX/ATEX**
- Non-incendive
- For models with EZLink channels:
  - II 3(3) G Ex ic ec nC [ic Gc] IIC T4 Gc
- For models without EZLink channels:
  - II 3 G Ex ic ec nC IIC T4 Gc

**cULus**
- Non-incendive
- For models with EZLink channels:
  - Class I Division 2 Groups A, B, C, D T4 (providing non-incendive field wiring outputs for Class I Division 2 Groups A, B, C, D hazardous locations)
- For models without EZLink channels:
  - Class I Division 2 Groups A, B, C, D T4

**Bluetooth**
- The Bluetooth Low Energy Module within the AWT420 transmitter has received the regulatory approval for the following countries:
  - Europe/CE
    - [CE 0197](image)
  - Japan/MIC: 005-101150
    - [Japan](image)
  - Korea/KCC: MSIP-CRM-mcp-BM71BLES1FC2
    - [Korea](image)
  - China/SRRC: CMIIT ID: 2016DJ5890
  - United States/FCC ID: A8TBM71S2

### Bluetooth

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.
Canada/ISED
- IC: 12246A-BM71S2
- HVIN: BM71BLES1FC2

This device complies with Industry Canada's license-exempt RSS standard(s).

Operation is subject to the following two conditions:
- This device may not cause interference, and
- This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d’Industrie Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes:
- l'appareil ne doit pas produire de brouillage, et
- l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement

- Taiwan/NCC No: CCAN16LP0011T7

Taiwan
CCAN16LP0011T7

注意：低功率電波輻射性電機管理辦法
第十二條 經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。
第十四條 低功率射頻電機之使用不得影響飛航安全及干擾合法通信；
經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。
前項合法通信，指依電信規定作業之無線電信，低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。
12 Spares

Sensor module assemblies

AWT420 pH/ORP PCB upgrade/spares kit
Part number
3KX8777420L0014

AWT420 2-electrode conductivity PCB upgrade/spares kit
Part number
3KX8777420L0013

AWT420 4-electrode conductivity PCB upgrade/spares kit
Part number
3KX8777420L0011

AWT420 Turbidity PCB upgrade/spares kit
Part number
3KX8777420L0016

EZLink module assemblies

AWT420 EZLink PCB upgrade/spares kit
Part number
3KX8777420L0015

AWT420 EZLink HazLoc PCB upgrade/spares kit
Part number
3KX8777420L0018

Communications module assemblies

AWT420 HART PCB upgrade/spares kit
Part number
3KX8777420L0051

AWT420 Profibus PCB upgrade/spares kit
Part number
3KX8777420L0052

AWT420 Modbus PCB upgrade/spares kit
Part number
3KX8777420L0054

AWT420 Ethernet PCB upgrade/spares kit
Part number
3KX8777420L0065

AWT420 analog output PCB upgrade/spares kit
Part number
3KX8777420L0056
### Mounting kits

#### Panel-mount kit

**Part number** 3KXA877210L0101  
Panel-mount kit, including fixings, flanges, clamps and seal

#### Pipe-mount kit

**Part number** 3KXA877210L0102  
Pipe-mount kit, including pipe-mount adapter plate, brackets and fixings (excludes pipe)

#### Wall-mount kit

**Part number** 3KXA877210L0105  
Wall-mount kit

### Gland packs/EZLink connectors

#### Gland packs

**Part number** 3KXA877420L0111  
M20 (qty. 5), M16 (qty. 2)

**Part number** 3KXA877420L0112  
1/2 in NPT (qty. 5), M16 (qty. 2)

**Part number** 3KXA877420L0113  
M20 (qty. 4), M16 (qty. 2)  
Ethernet (qty. 1)

**Part number** 3KXA877420L0114  
1/2 in NPT (qty. 4), M16 (qty. 2)  
Ethernet (qty. 1)

**Part number** 3KXA877420L0115  
Ethernet gland (qty. 1)

**Part number** 3KXA877420L0116  
Ex-E gland pack (5 × M20, 2 × M16)

**Part number** 3KXA877420L0117  
Ex-E gland pack (5 × 1/2 in NPT, 2 × M16)

**Part number** 3KXA877420L0118  
Ex-E gland pack (4 × M20, 2 × M16, 1 × Ethernet)

**Part number** 3KXA877420L0119  
Ex-E gland pack (4 × 1/2 in NPT, 2 × M16, 1 × Ethernet)

#### EZLink and EZLink HazLoc connector assembly

**Part number** 3KXA877420L0066

#### EZLink extension cable assembly

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWT40090010</td>
<td>1 m (3.3 ft)</td>
</tr>
<tr>
<td>AWT40090050</td>
<td>5 m (16.4 ft)</td>
</tr>
<tr>
<td>AWT40091000</td>
<td>10 m (32.8 ft)</td>
</tr>
<tr>
<td>AWT40091500</td>
<td>15 m (49.2 ft)</td>
</tr>
<tr>
<td>AWT40092500</td>
<td>25 m (82.0 ft)</td>
</tr>
<tr>
<td>AWT40095000</td>
<td>50 m (164.0 ft)</td>
</tr>
<tr>
<td>AWT40099000</td>
<td>100 m (328.0 ft)</td>
</tr>
</tbody>
</table>
Acknowledgements

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- Android is a trademark of Google LLC.
- Bluetooth is a registered trademark of Bluetooth SIG, Inc.
- HART is a registered trademark of the FieldComm Group.
- iOS is a trademark of Apple Inc., registered in the U.S. and other countries.
- LEXAN is a registered trademark of SABIC GLOBAL TECHNOLOGIES B.V.
- Modbus is a registered trademark of Schneider Electric USA Inc.
- PROFIBUS is a registered trademark of PROFIBUS organization.
Notes