Introduction

This Commissioning Instruction provides basic installation, operation and software information for the AWT210 2-wire transmitter. The transmitter is fully compatible with ABB’s range of pH and redox (ORP) electrodes and with ABB’s range of 2-electrode, 4-electrode and toroidal sensors. The transmitter has automatic temperature sensor recognition for Pt100, Pt1000 and 3k Balco RTDs in either 2-lead or 3-lead configurations.

The AWT210 transmitter is available with a traditional 4 to 20 mA output or with advanced digital communications utilizing FOUNDATION Fieldbus (FF), PROFIBUS PA (PA) or HART. The transmitter is equipped with an LCD display used to show the current process data and 4 keys beneath the display enable the transmitter to be configured locally.

For more information

Further publications for the AWT210 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>Transmitter Publication</th>
<th>Search for or click on</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWT210 transmitter – Data Sheet</td>
<td>DS/AWT210-EN</td>
</tr>
<tr>
<td>AWT210 transmitter – Operating Instruction</td>
<td>OI/AWT210-EN</td>
</tr>
<tr>
<td>AWT210 transmitter – HART Communications Supplement</td>
<td>COM/AWT210/ HART-EN</td>
</tr>
<tr>
<td>AWT210 transmitter – HART FDS Communications Supplement</td>
<td>COM/AWT210/ HART/FDS-EN</td>
</tr>
<tr>
<td>AWT210 transmitter – PROFIBUS Communications Supplement</td>
<td>COM/AWT210/ PROFIBUS-EN</td>
</tr>
<tr>
<td>AWT210 transmitter – FIELDBUS Communications Supplement</td>
<td>COM/AWT210/ FIELDBUS-EN</td>
</tr>
</tbody>
</table>
Contents

1 Health & Safety ........................................ 4
   Document symbols .................................. 4
   Safety precautions .................................. 4
   Potential safety hazards ......................... 4
   AWT210 transmitter – electrical ............... 4
   Safety standards .................................. 4
   Product symbols .................................. 4
   Product recycling and disposal (Europe only) . . . 5
   End-of-life battery disposal ...................... 5
   Information on ROHS Directive 2011/65/EU (RoHS II) . 5

2 Cyber security ........................................ 5

3 Overview .............................................. 6
   Name plate/certification label ................. 6
   Transmitters without hazardous area approval . 6
   Transmitters with FM/CSA approval and ATEX IECEx . 6

4 Hazardous area considerations ................. 7
   Approvals ........................................ 7
   CE Mark ........................................ 7
   Ignition protection ................................ 7
   Ground ........................................ 7
   Interconnection ................................ 7
   Power supply for intrinsically safe applications . 7
   Configuration .................................. 7
   Service and repair ................................ 7
   Risk of electrostatic discharge ............... 7
   Hazardous area relevant information .......... 8
   Factory Mutual (FM) ........................... 8
   Canadian Standards Authority (CSA) .......... 9
   ATEX/IECEx ................................ 10
   Specific conditions of use ..................... 10

5 Mechanical installation .......................... 11
   Sensor installation ................................ 11
   Transmitter installation ......................... 11
   Transmitter dimensions ....................... 11
   Fitting communication modules ............... 11
   Location ...................................... 11
   Optional accessories ........................... 11
   Wall mounting ................................ 12
   Panel mounting (optional) .................... 13
   Pipe mounting (optional) ...................... 14

6 Electrical installation .......................... 15
   Terminal connections ........................... 15
   pH/ORP/pION sensor module connections .... 16
      Standard sensors without diagnostic functions ......................... 16
      Standard sensors with diagnostic functions ............... 16
      BNC adaptor option ........................................ 16
   Conductivity sensor module connections .... 17
      2-electrode sensors ................................ 17
      4-electrode sensors ................................ 17
      Toroidal sensors ................................ 17
   Communication module connections .......... 18
      HART module ................................ 18
      FOUNDATION Fieldbus module ............ 18
      Profibus PA module .......................... 18
   Ground connection ................................ 18
   Gland entries ................................ 18

7 Operation ............................................. 19
   Operator Page – normal conditions ........... 19
   Operator Page – alarm conditions ............ 19
   Operator menu .................................. 20
   Signals View .................................... 20

8 Diagnostic alarms ................................. 21
9 Password security and Access Level .......... 23
   Access Level ..................................... 23
   Write protect switch ................................ 23
   Setting passwords .................................. 23
   Password recovery .................................. 23
      Advanced level password recovery .............. 23
      Service level password recovery .............. 23

10 Menu overview .................................. 24
   pH menus ........................................... 24
   2-electrode conductivity menus .................. 25
   4-electrode conductivity menus .................. 26
   Toroidal conductivity menus ...................... 27

11 Calibration ...................................... 28
   pH sensor calibration ................................ 28
      Auto Buffer Cal ................................ 28
      1-point manual calibration ...................... 29
      2-point manual calibration ...................... 29
   2-electrode conductivity sensor calibration .... 30
   4-electrode conductivity sensor calibration .... 31
   Toroidal conductivity sensor calibration ...... 31
      PV Zero calibration .............................. 31
      PV Span calibration ............................. 32

12 Specification ................................... 33

13 Spare parts ..................................... 36
   Communications module assemblies .......... 36
   Sensor module assemblies ...................... 36
   Main case assemblies ............................ 36
   Gland packs ....................................... 36
      Glands (packs of 2) ........................... 36
      Blanking plugs ................................ 36
   Mounting kits .................................... 36
      Panel-mount kit ................................. 36
      Pipe-mount kit ................................. 36
      Wall-mount kit ................................ 36
   Weathershield kit ................................ 36
      Weathershield kit ............................... 36
      Weathershield and pipe-mount kit ............ 36
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.

>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
Serious damage to health/risk to life
The AWT210 transmitter is a certified product suitable for use in hazardous area locations. Before using this product refer to the product labeling for details of hazardous area certification. Maintenance and installation and must be carried out only by the manufacturer, authorized agents or persons conversant with the construction standards for hazardous area certified equipment.

Potential safety hazards
AWT210 transmitter – electrical
Damage to the equipment.

⚠️ WARNING
Bodily injury.
To ensure safe use when operating this equipment, the following points must be observed:

- Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and/or temperature.

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.

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.

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.

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.

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.
3 Overview

**NOTICE**

After commissioning, the factory reset switch must be set to the OFF position. This will ensure the device does not lose configuration settings in the event of a power loss.

**Name plate/certification label**

The following name plates are examples only. The name plates attached to the transmitter may be different.

**Transmitters without hazardous area approval**

**Transmitters with FM/CSA approval and ATEX IECEx**

**Aluminium enclosure**

**Plastic enclosure**

---

**Figure 1** AWT210 transmitter – main components
4 Hazardous area considerations

Special regulations must be observed in hazardous areas for the auxiliary power connection, signal inputs/outputs and ground connection.

**DANGER**

- All parts must be installed in accordance with manufacturer information and relevant standards and regulations.
- Startup and operation must be performed in accordance with ATEX User Directive 99/92/EC or BetrSichV (EN60079-14).

### Approvals

**CE Mark**
The AWT210 transmitter meets all requirements for the CE mark in accordance with applicable EC Directives 2004/108/EC (EMC), 2006/95/EC (LVD) and 94/9/EC (ATEX).

**Ignition protection**
The AWT210 transmitter is available with FM, CSA and ATEX/IEC approval. Hazardous area relevant information is included later in this section.

### Ground

If for functional reasons, the intrinsically safe circuit must be grounded by connecting it to an equipotential bonding system, it must be grounded at a single location only.

### Interconnection

Special interconnections, dependent on the safety requirements, are required when the transmitter is used in hazardous areas. Proof of interconnection may be required during the installation if the transmitter is operated in an intrinsically safe circuit.

**Power supply for intrinsically safe applications**
The power supply SPS inputs must have corresponding input protection circuits available to eliminate spark hazards. An interconnection inspection must be performed. For proof of intrinsic safety, the electrical limit values must be used as the basis for the prototype test certificates of the transmitters, including the capacitance and inductance values of the wires. Proof of intrinsic safety is granted if the following conditions are fulfilled.

<table>
<thead>
<tr>
<th>Output parameter of power supply/SPS input</th>
<th>Input parameter of AWT210 transmitter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. output voltage</td>
<td>$U_o \leq U_i$</td>
</tr>
<tr>
<td>Max. output current</td>
<td>$I_o \leq I_i$</td>
</tr>
<tr>
<td>Max. output power</td>
<td>$P_o \leq P_i$</td>
</tr>
<tr>
<td>Max. output inductance</td>
<td>$L_o \geq L_i + L_c$</td>
</tr>
<tr>
<td>Max. output capacitance</td>
<td>$C_o \geq C_i + C_c$</td>
</tr>
</tbody>
</table>

### Configuration

AWT210 transmitters can be installed in hazardous areas in compliance with proof-of-interconnection and directly in a hazardous area using approved handheld HART/Fieldbus terminals (proof of interconnection may be required during the installation) as well as by coupling an ignition-proof modem to the circuit outside the hazardous area.

### Service and repair

**DANGER**

This product has no live maintenance facility. The instrument must be de-energized before any maintenance is performed.

If the instrument is located in a hazardous area, other than the serviceable items listed on page 36, none of the instrument’s components can be serviced by the user. Only personnel from ABB, its approved representative(s) or persons conversant with the construction standards for hazardous area certified equipment, is (are) authorized to attempt repairs to the system and only components formally approved by the manufacturer should be used. Any attempt at repairing the instrument in contravention of these principles could cause damage to the instrument and corporal injury to the person carrying out the repair. It renders the warranty null and void and could compromise the hazardous area certification, correct working of the instrument, electrical integrity and the CE compliance of the instrument.

If you have any problems with installation, starting or using the instrument please contact the company that sold it to you. If this is not possible, or if the results of this approach are not satisfactory, please contact the manufacturer’s Customer Service.

### Risk of electrostatic discharge

If the instrument is mounted in a hazardous area and the exterior of the instrument requires cleaning, care should be taken to minimize the risk of electrostatic discharge. Use a damp cloth or similar to clean all surfaces.
…4 Hazardous area considerations

Hazardous area relevant information

**NOTICE**

The hazardous area designation is displayed on the name plate/certification label – see page 6.

Factory Mutual (FM)
Intrinsic safety
Class I, Div 1, Group A,B,C,D T4
Class II/III, Div 1, Group E,F,G T4

Ingress protection classification
4X*/IPX6

Ambient temperature range
–25 °C <= Ta <= 60 °C

Figure 2 Intrinsic safety – FM

FM Intrinsic Safety control drawing
Click here to download the FM Intrinsic safety control drawing for AWT210 transmitter, or scan this code:

![QR Code]

Output parameters of sensor: 4-electrode, 2-electrode, toroidal, pH

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum open-circuit voltage (Uo)</td>
<td>11.8 V</td>
</tr>
<tr>
<td>Maximum short-circuit current (Io)</td>
<td>11.8 mA</td>
</tr>
<tr>
<td>Maximum output power (Po)</td>
<td>36 mW</td>
</tr>
<tr>
<td>Maximum inductance (Lo)</td>
<td>1 H</td>
</tr>
<tr>
<td>Maximum capacitance (Co)</td>
<td>1.5 µF</td>
</tr>
</tbody>
</table>

Non-incendive
Class I, Div 2, Group A,B,C,D T4
Class II/III, Div 2, Group F,G T4

Ingress protection classification
4X*/IPX6

Ambient temperature range
–25 °C <= Ta <= 60 °C

Figure 3 Non-incendive (using non-incendive field wiring) – FM

FM Non-incendive Safety control drawing
Click here to download the FM Non-incendive safety control drawing for AWT210 transmitter, or scan this code:

![QR Code]

Input parameters of AWT210 transmitter: HART

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum voltage (U)</td>
<td>30 V</td>
</tr>
<tr>
<td>Maximum input current (I)</td>
<td>100 mA</td>
</tr>
<tr>
<td>Maximum power (P)</td>
<td>0.8 W</td>
</tr>
<tr>
<td>Internal inductance (L)</td>
<td>3.3 mH</td>
</tr>
<tr>
<td>Internal capacitance (C)</td>
<td>0.56 nF</td>
</tr>
</tbody>
</table>

Input parameters of AWT210 transmitter: Fieldbus

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum voltage (U)</td>
<td>24 V</td>
</tr>
<tr>
<td>Maximum input current (I)</td>
<td>250 mA</td>
</tr>
<tr>
<td>Maximum power (P)</td>
<td>1.2 W</td>
</tr>
<tr>
<td>Internal inductance (L)</td>
<td>0 mH</td>
</tr>
<tr>
<td>Internal capacitance (C)</td>
<td>1.1 nF</td>
</tr>
</tbody>
</table>

Input parameters of AWT210 transmitter: Proibus

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum voltage (U)</td>
<td>24 V</td>
</tr>
<tr>
<td>Maximum input current (I)</td>
<td>250 mA</td>
</tr>
<tr>
<td>Maximum power (P)</td>
<td>1.2 W</td>
</tr>
<tr>
<td>Internal inductance (L)</td>
<td>0 mH</td>
</tr>
<tr>
<td>Internal capacitance (C)</td>
<td>1.1 nF</td>
</tr>
</tbody>
</table>

**NOTICE**

Parameters apply to entire system inclusive of cables.
Each specified electrical parameter must be applied individually and in combination. Do not exceed the maximum values when applying the electrical parameters individually or in combination.

*4X Hosedown self-assessed not approved by 3rd party.

**NOTICE**

Installation must be in accordance with the National Electrical Code (NFPA 70).
Canadian Standards Authority (CSA)

Intrinsic safety
- Class I, Div 1, Group A,B,C,D T4
- Class II/III, Div 1, Group E,F,G T4

Ingress protection classification
- 4X*/IPX6

Ambient temperature range
- $-25 \degree C \leq T_a \leq 60 \degree C$

**Figure 4** Intrinsic safety – CSA

CSA Intrinsic Safety control drawing
Click here to download the CSA Intrinsic safety control drawing for AWT210 transmitter, or scan this code:

---

**Output parameters of sensor: 4-electrode, 2-electrode, toroidal, pH**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum open-circuit voltage</td>
<td>$U_o = 11.8 \text{ V}$</td>
</tr>
<tr>
<td>Maximum short-circuit current</td>
<td>$I_o = 11.8 \text{ mA}$</td>
</tr>
<tr>
<td>Maximum output power</td>
<td>$P_o = 36 \text{ mW}$</td>
</tr>
<tr>
<td>Maximum inductance</td>
<td>$L_o = 1 \text{ H}$</td>
</tr>
<tr>
<td>Maximum capacitance</td>
<td>$C_o = 1.5 \mu \text{ F}$</td>
</tr>
</tbody>
</table>

---

**Non-incendive**
- Class I, Div 2, Group A,B,C,D T4
- Class II/III, Div 2, Group F,G T4

Ingress protection classification
- 4X*/IPX6

Ambient temperature range
- $-25 \degree C \leq T_a \leq 60 \degree C$

**Figure 5** Non-incendive (using non-incendive field wiring) – CSA

CSA Non-incendive Safety control drawing
Click here to download the CSA Non-incendive safety control drawing for AWT210 transmitter, or scan this code:

---

**Output parameters of sensor: 4-electrode, 2-electrode, toroidal, pH**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum open-circuit voltage</td>
<td>$U_o = 11.8 \text{ V}$</td>
</tr>
<tr>
<td>Maximum short-circuit current</td>
<td>$I_o = 11.8 \text{ mA}$</td>
</tr>
<tr>
<td>Maximum output power</td>
<td>$P_o = 36 \text{ mW}$</td>
</tr>
<tr>
<td>Maximum inductance</td>
<td>$L_o = 1 \text{ H}$</td>
</tr>
<tr>
<td>Maximum capacitance</td>
<td>$C_o = 1.5 \mu \text{ F}$</td>
</tr>
</tbody>
</table>

---

**NOTICE**

Parameters apply to entire system inclusive of cables.

Each specified electrical parameter must be applied individually and in combination. Do not exceed the maximum values when applying the electrical parameters individually or in combination.

*4X Hosedown self-assessed not approved by 3rd party.

**NOTICE**

Installation must be in accordance with C22.1 Canadian Electrical Code, Part 1.
4 Hazardous area considerations

…Hazardous area relevant information

ATEX/IECEx
Intrinsic safety
II 1G Ex ia IIC T4 Ga when used with appropriate barriers.

Ingress protection classification
IPX6

Ambient temperature range
–20 °C <= Ta <= 60 °C

Figure 6 Intrinsic safety – ATEX/IEC

ATEX-IECEEx Safety control drawing
Click here to download the ATEX-IECEEx safety control drawing for AWT210 transmitter, or scan this code:

<table>
<thead>
<tr>
<th>Input parameters of AWT210 transmitter: HART</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum voltage</td>
<td>Ui = 30 V</td>
<td></td>
</tr>
<tr>
<td>Maximum input current</td>
<td>Ii = 100 mA</td>
<td></td>
</tr>
<tr>
<td>Maximum power</td>
<td>Pi = 0.8 W</td>
<td></td>
</tr>
<tr>
<td>Internal inductance</td>
<td>Li = 3.3 mH</td>
<td></td>
</tr>
<tr>
<td>Internal capacitance</td>
<td>Ci = 0.56 nF</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input parameters of AWT210 transmitter: Fieldbus</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum voltage</td>
<td>Ui = 24 V</td>
<td></td>
</tr>
<tr>
<td>Maximum input current</td>
<td>Ii = 250 mA</td>
<td></td>
</tr>
<tr>
<td>Maximum power</td>
<td>Pi = 1.2 W</td>
<td></td>
</tr>
<tr>
<td>Internal inductance</td>
<td>Li = 0 mH</td>
<td></td>
</tr>
<tr>
<td>Internal capacitance</td>
<td>Ci = 1.1 nF</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input parameters of AWT210 transmitter: Profinus</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum voltage</td>
<td>Ui = 24 V</td>
<td></td>
</tr>
<tr>
<td>Maximum input current</td>
<td>Ii = 250 mA</td>
<td></td>
</tr>
<tr>
<td>Maximum power</td>
<td>Pi = 1.2 W</td>
<td></td>
</tr>
<tr>
<td>Internal inductance</td>
<td>Li = 0 mH</td>
<td></td>
</tr>
<tr>
<td>Internal capacitance</td>
<td>Ci = 1.1 nF</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output parameters of sensor: 4-electrode, 2-electrode, toroidal, pH</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum open-circuit voltage</td>
<td>Uo = 11.8 V</td>
</tr>
<tr>
<td>Maximum short-circuit current</td>
<td>Io = 11.8 mA</td>
</tr>
<tr>
<td>Maximum output power</td>
<td>Po = 36 mW</td>
</tr>
<tr>
<td>Maximum inductance</td>
<td>Lo = 1 H</td>
</tr>
<tr>
<td>Maximum capacitance</td>
<td>Co = 1.5 µF</td>
</tr>
</tbody>
</table>

NOTICE
Parameters apply to entire system inclusive of cables.
Each specified electrical parameter must be applied individually and in combination. Do not exceed the maximum values when applying the electrical parameters individually or in combination.

NOTICE
Installation must be in accordance with IEC 60079-14 and the wiring practices for the country of installation.

Specific conditions of use

1 For the aluminium enclosure for EPL Ga –
the AWT210 enclosure option (code position 8, option 2 – see Data Sheet DS/AWT210-EN) contains aluminium and is considered to present a potential risk of ignition by impact or friction. Care shall be taken into account during installation and use to prevent impact or friction.

2 For the aluminium enclosure –
for areas subject to explosive dust atmospheres the painted surface of the AWT210 may store electrostatic charge and become a source of ignition in applications with a low relative humidity <30% relative humidity where the painted surface is relatively free of surface contamination such as dirt, dust, or oil. Guidance on protection against the risk of ignition due to electrostatic discharge can be found in IEC TS 60079-32-1. Cleaning of the painted surface shall only be done in accordance with the manufacturer’s instructions (see page 7).

3 For the Lexan enclosure –
for areas subject to explosive gas atmospheres the Lexan enclosure AWT210 may store electrostatic charge and become a source of ignition in applications with a low relative humidity <30% relative humidity where the Lexan is relatively free of surface contamination such as dirt, dust, or oil. Guidance on protection against the risk of ignition due to electrostatic discharge can be found in IEC TS 60079-32-1. Cleaning of the surface shall only be done in accordance with the manufacturer’s instructions (see page 7).

4 For aluminium and Lexan enclosures –
the AWT210 shall not be used where UV light or radiation may impinge on the enclosure or the window of the enclosure.

5 For Non–Incendive applications the sensor can be used only in non-flammable materials.
5 Mechanical installation

Sensor installation
Refer to the sensor’s Operating Instruction for installation procedures.

Transmitter installation
Transmitter dimensions
Dimensions in mm (in)

Figure 7 Transmitter dimensions

Fitting communication modules
Referring to Figure 8:
1. Ensure the locking spindle on both modules is in the UNLOCKED position.
2. Fit communication module A to baseboard B (the left, COMMUNICATION MODULE position).
3. Turn the locking spindle ¼ turn to the LOCKED position.
4. Fit sensor module C to baseboard D (the right, SENSOR MODULE position).
5. Turn the locking spindle ¼ turn to the LOCKED position.

Figure 8 Fitting communication modules

Location
For general location requirements refer to Figure 9. 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.

Optional accessories (see page 36)
- Cable gland kits
- Panel-mount kit
- Pipe-mount kit
### ...5 Mechanical installation

#### ...Transmitter installation

**Wall mounting**

Referring to Figure 10:

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) (not supplied) in each mounting bracket.

---

**NOTICE**

If the optional weathershield (D) is used, position it between the transmitter and wall and pass 2 screws (C) through fixing holes (both sides) in weathershield.

---

Dimensions in mm (in)

![Diagram showing wall mounting of the transmitter](image)

**Figure 10** Wall mounting the transmitter
Panel mounting (optional)
Referring to Figure 11:
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 IPX6/NEMA 4X hosedown rating – see step 6.

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).

Dimensions in mm (in)

Figure 11 Panel mounting the transmitter
...5 Mechanical installation

...Transmitter installation

Pipe mounting (optional)
Referring to Figure 12, secure the transmitter to a pipe as follows:

1. Fit two M6 x 50 mm hexagon-head screws 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 using two M6 x 8 mm hexagon-head screws and spring lock washers.

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. 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.

Dimensions in mm (in)

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

Figure 12 Pipe mounting the transmitter
6 Electrical installation

**DANGER**

- If the transmitter is used in a manner not specified by the Company, the protection provided by the equipment may be impaired.
- Refer to page 7 for electrical installation considerations in Hazardous areas.
- 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).

**DANGER – CONNECTION/CABLE REQUIREMENTS**

- The connection terminals accept cables with peripheral wire cross-section of:
  - min.: 0.14 mm² (26 AWG)
  - max.: 1.5 mm² (14 AWG)
- Do not use a rigid conductor material as this can result in wire breaks.
- Ensure the connecting cable is flexible.
- To ensure the sensor cable length is sufficient, allow an additional 100 mm (4 in) of cable to pass through cable glands into the housing.
- Ensure the correct connections are made to suit the transmitter variant.

**Terminal connections**

![Connections overview](image-url)

- **Communication module connections**
  - HART modules
  - FOUNDATION Fieldbus and Profibus PA modules

- **Sensor module connections**
  - pH/ORP/plon modules
  - 2-electrode conductivity modules
  - 4-electrode conductivity modules
  - Toroidal conductivity modules

*Figure 13  Connections overview*
### 6 Electrical installation

#### 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.

**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>SENSE 1</th>
<th>GUARD 2</th>
<th>REF 3</th>
<th>S.GND 4</th>
<th>RTD 1 5</th>
<th>RTD 2 6</th>
<th>SHIELD 7</th>
<th>RTD 3 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>2867</td>
<td>2-lead</td>
<td>Clear</td>
<td>–</td>
<td>Black</td>
<td>–</td>
<td>Red</td>
<td>White</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>TB5</td>
<td>2-lead</td>
<td>Blue</td>
<td>–</td>
<td>Black</td>
<td>–</td>
<td>Red</td>
<td>White</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>AP1xx</td>
<td>2-lead</td>
<td>Clear</td>
<td>–</td>
<td>Black</td>
<td>–</td>
<td>Red</td>
<td>White</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>3-lead</td>
<td>Clear</td>
<td>–</td>
<td>Black</td>
<td>–</td>
<td>White</td>
<td>Red</td>
<td>–</td>
<td>Red</td>
</tr>
<tr>
<td>AP3xx</td>
<td>2-lead*</td>
<td>Blue</td>
<td>–</td>
<td>Black</td>
<td>–</td>
<td>Red</td>
<td>White</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>3-lead</td>
<td>Blue</td>
<td>–</td>
<td>Black</td>
<td>–</td>
<td>Red</td>
<td>White</td>
<td>–</td>
<td>Grey</td>
</tr>
<tr>
<td>APS1xx</td>
<td>2-lead*</td>
<td>Blue</td>
<td>Yellow</td>
<td>Black</td>
<td>–</td>
<td>Red</td>
<td>White</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>APS5xx</td>
<td>2-lead</td>
<td>Blue</td>
<td>Yellow</td>
<td>Black</td>
<td>–</td>
<td>Red</td>
<td>White</td>
<td>–</td>
<td>Grey</td>
</tr>
<tr>
<td>APS7xx</td>
<td>3-lead</td>
<td>Blue</td>
<td>Yellow</td>
<td>Black</td>
<td>–</td>
<td>Red</td>
<td>White</td>
<td>–</td>
<td>Grey</td>
</tr>
</tbody>
</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>SENSE 1</th>
<th>GUARD 2</th>
<th>REF 3</th>
<th>S.GND 4</th>
<th>RTD 1 5</th>
<th>RTD 2 6</th>
<th>SHIELD 7</th>
<th>RTD 3 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBX5</td>
<td>2-lead</td>
<td>Blue</td>
<td>Yellow</td>
<td>Black</td>
<td>Green</td>
<td>Red</td>
<td>White</td>
<td>Dark green</td>
<td>–</td>
</tr>
<tr>
<td>AP2xx</td>
<td>2-lead*</td>
<td>Clear</td>
<td>Red</td>
<td>Blue</td>
<td>Green/Yellow</td>
<td>Red</td>
<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>
</tr>
</tbody>
</table>

* Cut and remove grey wire

**NOTICE**

AWT210 pH sensor modules are supplied standardized to theoretical sensor characteristics. Following installation, but before use, a process calibration should be performed to ensure optimum accuracy. For pH sensor calibration procedures see Operating Instruction OI/AWT210-EN.

**BNC adaptor option**

For pH/ORP/pION sensors using a BNC connector, ABB recommends using the optional BNC adapter. ABB does not recommend stripping or cutting sensor cabling due to the nature of the signal and cabling used.
### Conductivity sensor module connections

#### 2-electrode sensors

<table>
<thead>
<tr>
<th>Sensor type</th>
<th>RTD wiring</th>
<th>DRIVE +</th>
<th>SENSE +</th>
<th>SENSE –</th>
<th>DRIVE –</th>
<th>RTD 1</th>
<th>RTD 2</th>
<th>SHIELD</th>
<th>RTD 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>2025, 2045, 2077, 2078, 2085, 2089</td>
<td>2-lead</td>
<td>Red</td>
<td>–</td>
<td>–</td>
<td>Black</td>
<td>Green/Yellow/Blue</td>
<td>Brown</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>TB2</td>
<td>2-lead</td>
<td>Red</td>
<td>–</td>
<td>–</td>
<td>Black</td>
<td>Brown</td>
<td>Green/Yellow</td>
<td>–</td>
<td>Blue</td>
</tr>
<tr>
<td>AC2xx</td>
<td>2-lead</td>
<td>Green</td>
<td>–</td>
<td>–</td>
<td>Black</td>
<td>Blue</td>
<td>Yellow</td>
<td>Dark green</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>3-lead</td>
<td>Green</td>
<td>–</td>
<td>–</td>
<td>Black</td>
<td>Blue</td>
<td>Red</td>
<td>Dark green</td>
<td>Blue</td>
</tr>
</tbody>
</table>

**NOTICE**

AWT210 2-electrode conductivity sensor modules are supplied standardized to theoretical sensor characteristics. Following installation, but before use, a process calibration should be performed to ensure optimum accuracy. For 2-electrode conductivity sensor calibration procedures see Operating Instruction OI/AWT210-EN.

#### 4-electrode sensors

<table>
<thead>
<tr>
<th>Sensor type</th>
<th>RTD wiring</th>
<th>DRIVE +</th>
<th>SENSE +</th>
<th>SENSE –</th>
<th>DRIVE –</th>
<th>RTD 1</th>
<th>RTD 2</th>
<th>SHIELD</th>
<th>RTD 3</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>
</tr>
</tbody>
</table>

**NOTICE**

AWT210 4-electrode conductivity sensor modules are supplied standardized to theoretical sensor characteristics. Following installation, but before use, a process calibration should be performed to ensure optimum accuracy. For 4-electrode conductivity sensor calibration procedures see Operating Instruction OI/AWT210-EN.

#### Toroidal sensors

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

**NOTICE**

AWT210 toroidal conductivity sensor modules are supplied standardized to theoretical sensor characteristics. Following installation, but before use, a process calibration should be performed to ensure optimum accuracy. For toroidal conductivity sensor calibration procedures see Operating Instruction OI/AWT210-EN.
...6 Electrical installation

Communication module connections

**HART module**

```
<table>
<thead>
<tr>
<th></th>
<th>Power</th>
<th>Ammeter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+</td>
<td>–</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
```

*Non IS installations* 14 to 42 V DC

*IS installations* 14 to 30 V DC

**FOUNDATION Fieldbus module**

```
<table>
<thead>
<tr>
<th></th>
<th>Connected internally</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>
```

*Non IS installations* 9 to 32 V DC

*IS installations* 9 to 24 V DC

**Profibus PA module**

```
<table>
<thead>
<tr>
<th></th>
<th>Connected internally</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>
```

*Non IS installations* 9 to 32 V DC

*IS installations* 9 to 24 V DC

**Ground connection**

Normal grounding practice is to terminate all grounds at the control room side, in which case the field side of the screen should be adequately protected to avoid contact with metallic objects. The transmitter case should be grounded.

**WARNING**

**Bodily injury**

If conduit hubs are used, they will not provide a bonding of the enclosure or system.

Referring to Figure 14, ground connections are provided: internally A and externally B.

![Figure 14 AWT210 ground connections](image)

**NOTICE**

HART, Profibus and Fieldbus protocols are not secure. Therefore, the intended application should be assessed before implementation to ensure these protocols are suitable.

**Gland entries**

For hazardous area installations, suitable Ex glands and blanking elements must be used to seal the entry holes.
7 Operation

Operator Page – normal conditions

HART Tag (HART devices) or Tag Descriptor (FF and PA devices)

Access level
- Read Only
- Calibrate
- Advanced
- Service
- Write Protected

Process values
Operator pages can be configured independently to display:
- PV
- PV + temperature
- PV + temperature + PV %
- PV + temperature + OP (HART devices only)

Figure 15  Example Operator pages – normal conditions

Operator Page – alarm conditions

If any of the diagnostic alarms are active the NAMUR status of the device is indicated by displaying the class and category of the highest priority active alarm.

Alarm class
- Failure
- Check Function
- Off Specification
- Maintenance Required

Figure 16  Example Operator pages – alarm conditions
...7 Operation

Operator menu

From the Operator menu, use the ±/ keys to highlight the required menu and press the Enter key to select:

Operator menus comprise:

- Diagnostics: displays a list of active diagnostic alarm messages in priority order – see page 21.
- Configuration: enters the Configuration level menus.
- Operator Page 1: displays the first Operator Page.
- Operator Page 2: displays the second Operator Page (available only if Operator Page 2 enabled).
- Autoscroll: switches automatically between the two Operator pages (available only if Operator Page 2 enabled).
- Signals View: displays a list of active signals.

Signals View

<table>
<thead>
<tr>
<th>Signal</th>
<th>Sensor type</th>
<th>Sensor type</th>
<th>Sensor type</th>
<th>Sensor type</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV</td>
<td>pH, ORP, Ion Conc or pION</td>
<td>Conductivity or Concentration</td>
<td>Conductivity or Concentration</td>
<td>Conductivity or Concentration</td>
</tr>
<tr>
<td>SV</td>
<td>Temperature</td>
<td>Temperature</td>
<td>Temperature</td>
<td>Temperature</td>
</tr>
<tr>
<td>TV</td>
<td>Reference impedance</td>
<td>Conductivity without temperature compensation</td>
<td>Conductivity without temperature compensation</td>
<td>Conductivity without temperature compensation</td>
</tr>
<tr>
<td>QV</td>
<td>pH, Cell output (mV)</td>
<td>Conductivity</td>
<td>Conductivity</td>
<td>Conductivity</td>
</tr>
<tr>
<td>PV%</td>
<td>Primary variable percentage of engineering range</td>
<td>Primary variable percentage of engineering range</td>
<td>Primary variable percentage of engineering range</td>
<td>Primary variable percentage of engineering range</td>
</tr>
<tr>
<td>O/P</td>
<td>Current output (HART versions only)</td>
<td>Current output (HART versions only)</td>
<td>Current output (HART versions only)</td>
<td>Current output (HART versions only)</td>
</tr>
</tbody>
</table>

Table 1 Signals View/Sensor type values displayed
8 Diagnostic alarms

![Diagnostic alarms diagram]

**Alarm class**
- Failure
- Check Function
- Off Specification
- Maintenance Required

**Alarm message**
(uppercase)

**Recovery action**
(lowercase)

**Alarm code in the format:**
--XPPP.NNN--

X = Alarm class
- F = Failure
- C = Check function
- S = Off specification
- M = Maintenance required

PPP = Alarm priority
(high number = high priority)

NNN = Alarm number

---

**Example diagnostic alarm**

**Note.**
Alarms are listed in alarm priority order (high number = high priority alarm).

**Table 2 Diagnostic alarms**

<table>
<thead>
<tr>
<th>Diagnostic message</th>
<th>ALARM MESSAGE</th>
<th>Recovery action</th>
<th>pH</th>
<th>2-electrode conductivity</th>
<th>4-electrode conductivity</th>
<th>Toroidal conductivity</th>
<th>HART</th>
<th>FF</th>
<th>PA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electronics</strong></td>
<td>SENSOR MODULE MEMORY FAILURE</td>
<td>Change sensor module</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>--F119.018--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Electronics</strong></td>
<td>COMMS MODULE MEMORY FAILURE</td>
<td>Change comms module</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>--F118.023--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Electronics</strong></td>
<td>CURRENT OUTPUT NOT CALIBRATED</td>
<td>Trim output</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>--F106.032--</td>
<td></td>
<td>If problem persists</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Configuration</strong></td>
<td>DATA SIMULATION</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>--C098.041--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Configuration</strong></td>
<td>CURRENT OUTPUT FIXED</td>
<td>Enable loop current mode. Disable loop test/trim &amp; PV cal.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>--C097.030--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Process</strong></td>
<td>CURRENT OUTPUT SATURATED</td>
<td>Adjust engineering range</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>--C096.031--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Electronics</strong></td>
<td>SENSOR MODULE FAILURE</td>
<td>Change sensor module</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>--F088.016--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Process</strong></td>
<td>OPEN CABLE OR SENSOR OUT OF SOLUTION</td>
<td>Check sensor wiring</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>--F087.040--</td>
<td></td>
<td>Verify that sensor is in solution</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Electronics</strong></td>
<td>PRIMARY VARIABLE INPUT READ ERROR</td>
<td>Check sensor</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>--F086.000--</td>
<td></td>
<td>If problem persists change sensor module</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Electronics</strong></td>
<td>2ND PRIMARY VARIABLE INPUT READ ERROR</td>
<td>Check sensor</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>--F085.003--</td>
<td></td>
<td>If problem persists change sensor module</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operation</strong></td>
<td>SHORTED CABLE OR GROUND LOOPS PRESENT</td>
<td>Check sensor wiring</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>--M084.038--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sensor</strong></td>
<td>SENSOR POLARIZATION</td>
<td>Check process</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>--M083.007--</td>
<td></td>
<td>Check sensor wiring</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## 8 Diagnostic alarms

<table>
<thead>
<tr>
<th>Diagnostic message</th>
<th>ALARM MESSAGE</th>
<th>Recovery action</th>
<th>pH</th>
<th>2-electrode conductivity</th>
<th>4-electrode conductivity</th>
<th>Toroidal conductivity</th>
<th>HART</th>
<th>FF</th>
<th>PA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process --M082.005--</td>
<td>SENSOR IS DIRTY</td>
<td>Clean sensor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electronics --M081.006--</td>
<td>DIAGNOSTIC INPUT READ ERROR</td>
<td>Check terminals Check sensor wiring Check electrode</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electronics --M080.039--</td>
<td>LOW ELECTRODE IMPEDANCE</td>
<td>Check terminals Check sensor wiring Check electrode</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process --S078.004--</td>
<td>PRIMARY VARIABLE OUTSIDE PHYS. LIMITS</td>
<td>Check sensor wiring Check configuration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process --S076.010--</td>
<td>PRIMARY VARIABLE OUTSIDE RANGE LIMITS</td>
<td>Adjust engineering range</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electronics --S074.001--</td>
<td>TEMPERATURE INPUT READ ERROR</td>
<td>Check sensor If problem persists change sensor module</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process --S072.011--</td>
<td>SENSOR TEMPERATURE OUTSIDE LIMITS</td>
<td>Check sensor wiring Check temperature configuration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensor --S068.043--</td>
<td>HIGH SENSOR EFFICIENCY (slope)</td>
<td>Check calibration Clean sensor Check sensor wiring</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensor --S064.045--</td>
<td>LOW SENSOR OFFSET</td>
<td>Check calibration Clean sensor Check sensor wiring</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensor --S062.046--</td>
<td>LOW SENSOR OFFSET</td>
<td>Check calibration Clean sensor Check sensor wiring</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electronics --M060.037--</td>
<td>DIAGNOSTIC INPUT READ ERROR</td>
<td>Check sensor wiring If problem persists change sensor module</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electronics --M056.002--</td>
<td>REFERENCE IMPEDANCE INPUT READ ERROR</td>
<td>Check sensor wiring If problem persists change sensor module</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensor --M054.012--</td>
<td>HIGH REFERENCE IMPEDANCE</td>
<td>Check sensor Check sensor wiring</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation --M024.033--</td>
<td>POWER SUPPLY VOLTAGE OUTSIDE LIMITS</td>
<td>Trim output Ensure power supply voltage is within limits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electronics --M023.036--</td>
<td>SENSOR MODULE VOLTAGE WARNING</td>
<td>Check sensor wiring If problem persists change sensor module</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Configuration --S010.047--</td>
<td>MANUAL TEMPERATURE COMPENSATION MODE</td>
<td>Check temperature sensor and perform TC recognition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

...Table 2 Diagnostic alarms
9 Password security and Access Level

Passwords are entered at the Enter Password screen accessed via the Access Level – see below.

Access Level

The Access Level is entered via the Operator/Enter Configuration menu option. Use the / keys to highlight the required level and press (Enter) to enter the level.

![Access Level Menu](image)

**Figure 18 Access level screen**

<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 level only (calibration menus are sensor-specific).</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>

Table 3 Access level menu details

Password recovery

**Advanced level password recovery**

To recover the Advanced level password, move the Write Protect switch to the OFF position (see page 6). Select the Service Access level and enter the Service level password to gain access. From the Service level, the Device Setup menu can be accessed to reset the Advanced level password.

**Service level password recovery**

If the Service level password is lost, the only way to recover it is by following the procedure to reset all parameters to the factory default values as described in Operating Instruction OI/AWT210-EN. This resets all parameters including passwords.

Write protect switch

When the Write Protect switch (see page 6) is in the ON position, the transmitter is write-protected (and the Write Protected icon A is displayed – see page 19). This means that only the Read Only access level is available to the operator.

When this switch is in the OFF position, all access levels are available (Read Only, Calibrate, Advanced and Service).

Setting passwords

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 – see Operating Instruction OI/AWT210-EN.

**Note.** The transmitter is supplied with blank passwords for the Calibrate and Advanced levels, therefore, the Calibrate and Advanced levels levels can be accessed without password protection. It is recommended to set passwords for these access levels.

Password recovery

**Advanced level password recovery**

To recover the Advanced level password, move the Write Protect switch to the OFF position (see page 6). Select the Service Access level and enter the Service level password to gain access. From the Service level, the Device Setup menu can be accessed to reset the Advanced level password.

**Service level password recovery**

If the Service level password is lost, the only way to recover it is by following the procedure to reset all parameters to the factory default values as described in Operating Instruction OI/AWT210-EN. This resets all parameters including passwords.

Cursor/Password character indicator (maximum 6 characters)

![Password Screen](image)

**Figure 19 Enter password screen**

Cursor – scroll characters using the / keys; press (Next) to accept character; press (OK) to accept password while last character is highlighted
10 Menu overview

pH menus

<table>
<thead>
<tr>
<th>Level</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy Setup</td>
<td>Language</td>
</tr>
<tr>
<td></td>
<td>Measurement Type</td>
</tr>
<tr>
<td></td>
<td>pH Sensor Type</td>
</tr>
<tr>
<td></td>
<td>- Isopotential Point</td>
</tr>
<tr>
<td></td>
<td>- Asymmetric Potential</td>
</tr>
<tr>
<td></td>
<td>PV Unit</td>
</tr>
<tr>
<td></td>
<td>Valence</td>
</tr>
<tr>
<td></td>
<td>Magnitude</td>
</tr>
<tr>
<td></td>
<td>End Magnitude</td>
</tr>
<tr>
<td></td>
<td>End mV</td>
</tr>
<tr>
<td></td>
<td>Temperature Units</td>
</tr>
<tr>
<td></td>
<td>Temp. Comp. Type</td>
</tr>
<tr>
<td></td>
<td>- Manual Temperature</td>
</tr>
<tr>
<td></td>
<td>- Solution Coefficient</td>
</tr>
<tr>
<td>Operator page 1</td>
<td>Automatic Buffer Cal.</td>
</tr>
<tr>
<td></td>
<td>PV Manual Cal</td>
</tr>
<tr>
<td></td>
<td>Hold Output (HART only)</td>
</tr>
<tr>
<td></td>
<td>Auto Buffer Setup</td>
</tr>
<tr>
<td></td>
<td>- Temperature Compensation Coefficient</td>
</tr>
<tr>
<td></td>
<td>- Buffer Type</td>
</tr>
<tr>
<td></td>
<td>- Buffer 1 Value</td>
</tr>
<tr>
<td></td>
<td>- Buffer 2 Value</td>
</tr>
<tr>
<td></td>
<td>- User Defined Buffer 1</td>
</tr>
<tr>
<td></td>
<td>- User Defined Buffer 2</td>
</tr>
<tr>
<td></td>
<td>Calibration Limits</td>
</tr>
<tr>
<td></td>
<td>Edit Calibration</td>
</tr>
<tr>
<td></td>
<td>Restore Defaults</td>
</tr>
<tr>
<td>Sensor Setup</td>
<td>Measurement Type</td>
</tr>
<tr>
<td></td>
<td>pH Sensor Type</td>
</tr>
<tr>
<td></td>
<td>- Isopotential Point</td>
</tr>
<tr>
<td></td>
<td>- Asymmetric Potential</td>
</tr>
<tr>
<td></td>
<td>PV Unit</td>
</tr>
<tr>
<td></td>
<td>Valence</td>
</tr>
<tr>
<td></td>
<td>Magnitude</td>
</tr>
<tr>
<td></td>
<td>End Magnitude</td>
</tr>
<tr>
<td></td>
<td>End mV</td>
</tr>
<tr>
<td></td>
<td>Temperature Units</td>
</tr>
<tr>
<td></td>
<td>Temperature Compensation Type</td>
</tr>
<tr>
<td></td>
<td>- Manual Temperature</td>
</tr>
<tr>
<td></td>
<td>- Solution Coefficient</td>
</tr>
<tr>
<td></td>
<td>Temperature Sensor Type</td>
</tr>
<tr>
<td></td>
<td>Detect Temperature Sensor</td>
</tr>
<tr>
<td>Device Setup</td>
<td>Security Setup</td>
</tr>
<tr>
<td></td>
<td>PDM Compatibility (HART only)</td>
</tr>
<tr>
<td></td>
<td>Reset to defaults</td>
</tr>
<tr>
<td>Display</td>
<td>Operator Page 1</td>
</tr>
<tr>
<td></td>
<td>Operator Page 2</td>
</tr>
<tr>
<td></td>
<td>Contrast</td>
</tr>
<tr>
<td></td>
<td>Language</td>
</tr>
</tbody>
</table>

Level | pH

| Input/Output | Engineering Range Low |
|             | Engineering Range High |
|             | Damping |
|             | Fault Current (HART only) |
|             | Output Type (HART only) |
|             | Function Gen Table (HART only) |
|             | Trim 4mA (HART only) |
|             | Trim 20mA (HART only) |
|             | Loop Test (HART only) |
| Diagnostics | Sensor Diagnostics |
|             | Reference Impedance Limit |
|             | Diagnostic Status |
| Communication | HART version: |
|             |   Device Address |
|             |   HART Tag |
|             |   HART Description |
|             |   Message |
|             |   Manuf. ID |
|             |   Last Command |
|             |   HART Revision |
|             |   Resp. Preamble |
|             |   Loop Current Mode |
|             | PA version: |
|             |   Slave Address |
|             |   Device Tag |
|             |   Ident No. Selector |
|             |   Manuf. ID |
|             |   Device Type |
|             |   PA Profile |
|             | Foundation Fieldbus version |
|             |   Node Address |
|             |   Device Tag |
|             |   Manuf. ID |
|             |   Device Type |
|             |   Device Revision |
|             |   Simulation |
| Device Info | Sensor Type |
|             |   Device Serial No. |
|             |   Software Version |
## 2-electrode conductivity menus

<table>
<thead>
<tr>
<th>Level</th>
<th>2-electrode conductivity</th>
</tr>
</thead>
</table>
| Easy Setup | Language  
Measurement Type  
Cell Constant  
- Concentration Units  
- Conductivity Units  
- Concentration Curve Name  
Temperature Units  
Operator page 1 |
| Calibrate | Conductivity Calibration  
Concentration Calibration  
Temperature Calibration  
Hold Output (HART only)  
Edit Calibration  
Restore Defaults |
| Sensor Setup | Measurement Type  
Cell Constant  
- Concentration Units  
- Conductivity Units  
- Concentration Curve Name  
- Concentration Curve Table  
Temperature Units  
Temperature Compensation Type  
- Manual Temperature  
- Auto Temperature Compensation Option  
  - Temperature Compensation Coefficient  
  - Pure H2O Type  
  - User Defined Temperature Compensation Curve  
Reference Temperature  
Temperature Sensor Type  
Detect Temperature Sensor |
| Device Setup | Security Setup  
PDM Compatibility (HART only)  
Reset to defaults |
| Display | Operator Page 1  
Operator Page 2  
Contrast  
Language |
| Input/Output | Engineering Range Low  
Engineering Range High  
Damping  
Fault Current (HART only)  
Output Type (HART only)  
Function Gen Table (HART only)  
Trim 4mA (HART only)  
Trim 20mA (HART only)  
Loop Test (HART only) |
| Diagnostics | Sensor Diagnostics  
Diagnostic Status |
| Communication | HART version:  
Device Address  
HART Tag  
HART Description  
Message  
Manuf. ID  
Last Command  
HART Revision  
Resp. Preamble  
Loop Current Mode  
PA version:  
Slave Address  
Device Tag  
Ident No. Selector  
Manuf. ID  
Device Type  
PA Profile  
Foundation Fieldbus version  
Node Address  
Device Tag  
Manuf. ID  
Device Type  
Device Revision  
Simulation |
| Device Info | Sensor Type  
Device Serial No.  
Software Version |
...10 Menu overview

4-electrode conductivity menus

Level 4-electrode conductivity

- Easy Setup
  - Language
  - Measurement Type
  - Sensor Group
  - Concentration Units
  - Concentration Curve Name
  - Temperature Units
  - Operator page 1

- Calibrate
  - Conductivity Calibration
  - Concentration Calibration
  - Temperature Calibration
  - Hold Output (HART only)
  - Edit Calibration
  - Restore Defaults

- Sensor Setup
  - Measurement Type
  - Sensor Group
  - Concentration Units
  - Conductivity Units
  - Concentration Curve Name
    - Concentration Curve Table
  - Temperature Units
  - Temperature Compensation Type
    - Manual Temperature
    - Auto Temperature Compensation
      - Option
        - Temperature Compensation Coefficient
        - User Defined Temperature Compensation Curve
  - Reference Temperature
  - Temperature Sensor Type
  - Detect Temperature Sensor

- Security Setup
  - PDM Compatibility (HART only)
  - Reset to defaults

- Device Setup
  - Device Info
    - Sensor Type
    - Device Serial No.
    - Software Version

- Operator Page 1
  - Operator Page 2
  - Contrast
  - Language
## Toroidal conductivity menus

<table>
<thead>
<tr>
<th>Level</th>
<th>Toroidal conductivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Menu</td>
<td>Easy Setup</td>
</tr>
<tr>
<td>Exit</td>
<td>Select</td>
</tr>
</tbody>
</table>

Language
Measurement Type
Concentration Type
• Concentration Units
• Concentration Curve Name
Temperature Units
Operator page 1

Menu
Calibrate
Exit
Select

PV Zero Calibration
PV Span Calibration
Temperature Calibration
Hold Output (HART only)
Edit Calibration
Restore Defaults

Menu
Sensor Setup
Exit
Select

Measurement Type
• Concentration Solution
• Concentration Units
• Conductivity Units
• Concentration Curve Name
  - Concentration Curve Table
Temperature Units
Temperature Compensation Type
• Manual Temperature
• Auto Temperature Compensation Option
  - Temperature Compensation Coefficient
  - User Defined Temperature Compensation Curve
Reference Temperature
Temperature Sensor Type
Detect Temperature Sensor

Menu
Diagnostics
Exit
Select

Sensor Diagnostics
Diagnostic Status

Menu
Communication
Exit
Select

Measurement Type
• Concentration Solution
• Concentration Units
• Conductivity Units
• Conductivity Units
• Concentration Curve Name
  - Concentration Curve Table
Temperature Units
Temperature Compensation Type
• Manual Temperature
• Auto Temperature Compensation Option
  - Temperature Compensation Coefficient
  - User Defined Temperature Compensation Curve
Reference Temperature
Temperature Sensor Type
Detect Temperature Sensor

Menu
Device Setup
Exit
Select

Security Setup
PDM Compatibility (HART only)
Reset to defaults

Menu
Device Info
Exit
Select

Sensor Type
Device Serial No.
Software Version

Menu
Display
Exit
Select

Contrast
Language

Menu
Input/Output
Exit
Select

Engineering Range Low
Engineering Range High
Damping
Fault Current (HART only)
Output Type (HART only)
Function Gen Table (HART only)
Trim 4mA (HART only)
Trim 20mA (HART only)
Loop Test (HART only)

Menu
Diagnostics
Exit
Select

HART version:
Device Address
HART Tag
HART Description
Message
Manuf. ID
Last Command
HART Revision
Resp. Preamble
Loop Current Mode

PA version:
Slave Address
Device Tag
Ident No. Selector
Manuf. ID
Device Type
PA Profile

Foundation Fieldbus version
Node Address
Device Tag
Manuf. ID
Device Type
Device Revision
Simulation

Menu
Device Info
Exit
Select

Sensor Type
Device Serial No.
Software Version

Menu
Display
Exit
Select

Contrast
Language
11 Calibration

**pH sensor calibration**

Auto Buffer Cal
Performs a 2 point calibration using 2 pre-defined buffer solutions – see Auto Buffer Setup, page 24.

Available only if **Measurement Type = pH**.

1 **Immerse in Buffer 1**
   The details of buffer solution 1 are displayed.
   Immerse the sensor in the buffer solution and press \( \text{Continue} \) to continue.

2 **Monitoring (Buffer 1)**
   Live process values are displayed.
   The progress of the process value stability check is indicated on the progress bar. The procedure moves automatically to the next stage upon completion.

3 **Immerse in Buffer 2**
   The details of buffer solution 2 are displayed.
   Immerse the sensor in the buffer solution and press \( \text{Continue} \) to continue.

4 **Monitoring (Buffer 2)**
   Live process values are displayed.
   The progress of the process value stability check is indicated on the progress bar. The procedure moves automatically to the next stage upon completion.

5 **Completion**
   Following a successful calibration the calculated coefficients are displayed.
   Following an unsuccessful calibration the reason for failure is displayed.
1-point manual calibration
Performs a manual calibration (Offset adjustment) at a single reference point.

1. **Wait for stable reading**
   Monitor the process value and continue (F) to the next step once the value has stabilized.

2. **Enter the new value**
   Enter the desired PV value by pressing the ↑ key to move the cursor and the ▼ key to change the value. When the new value has been entered press the F key to continue.

3. **Completion**
   Following a successful calibration the calculated coefficients are displayed.

<table>
<thead>
<tr>
<th>PV</th>
<th>7.12 pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV Slope</td>
<td>100.00%</td>
</tr>
<tr>
<td>PV Offset</td>
<td>8.94 mV</td>
</tr>
</tbody>
</table>

Following an unsuccessful calibration the reason for failure is displayed.

<table>
<thead>
<tr>
<th>PV</th>
<th>7.14 pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calibration Failed Offset Too High</td>
<td></td>
</tr>
</tbody>
</table>

2-point manual calibration
Performs a 2-point calibration using 2 pre-defined buffer solutions.

1. **Buffer temperature**
   The temperature of the buffer solutions is displayed. The temperature can be edited by pressing the F key. When the buffer temperature is correct press the ▼ key to continue.

2. **Buffer 1 value**
   The value of the 1st buffer solution is displayed. The value can be edited by pressing the F key. When the buffer value is correct press the ▼ key to continue.

3. **Wait for stable reading – 1st buffer solution**
   Immerse the sensor in the buffer solution, monitor the process value and continue (F) to the next step once the value has stabilized.

<table>
<thead>
<tr>
<th>PV</th>
<th>4.03 pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immerse In Buffer 1 Continue When Stable</td>
<td></td>
</tr>
</tbody>
</table>

4. **Buffer 2 value**
   The value of the 2nd buffer solution is displayed. The value can be edited by pressing the F key. When the buffer value is correct press the ▼ key to continue.

5. **Wait for stable reading – 2nd buffer solution**
   Immerse the sensor in the buffer solution, monitor the process value and continue (F) to the next step once the value has stabilized.

<table>
<thead>
<tr>
<th>PV</th>
<th>7.15 pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immerse In Buffer 2 Continue When Stable</td>
<td></td>
</tr>
</tbody>
</table>

6. **Completion**
   Following a successful calibration the calculated coefficients are displayed.

<table>
<thead>
<tr>
<th>PV</th>
<th>7.00 pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV Slope</td>
<td>98.75%</td>
</tr>
<tr>
<td>PV Offset</td>
<td>8.94 mV</td>
</tr>
</tbody>
</table>

Following an unsuccessful calibration the reason for failure is displayed.

<table>
<thead>
<tr>
<th>PV</th>
<th>7.15 pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calibration Failed Slope Too High</td>
<td></td>
</tr>
</tbody>
</table>
11 Calibration

2-electrode conductivity sensor calibration

2-electrode conductivity does not normally require wet calibration provided that the sensor constant has been entered correctly and the sensor cable resistance is not significant. The procedure is for a manual calibration at a single reference point. Conductivity Calibration and Concentration Calibration procedures are identical.

For cell constants from 0.003 to 0.054
• If the calibration is performed at a conductivity value <0.2 \( \mu \text{S/cm} \) the PV Offset is recalculated.
• If the calibration is performed at a conductivity value \( \geq 0.2 \mu \text{S/cm} \) the PV Slope is recalculated.

For cell constants from 0.055 to 0.299
• If the calibration is performed at a conductivity value <1 \( \mu \text{S/cm} \) the PV Offset is recalculated.
• If the calibration is performed at a conductivity value \( \geq 1 \mu \text{S/cm} \) the PV Slope is recalculated.

For cell constants from 0.3 to 1.999
• If the calibration is performed at a conductivity value <5 \( \mu \text{S/cm} \) the PV Offset is recalculated.
• If the calibration is performed at a conductivity value \( \geq 5 \mu \text{S/cm} \) the PV Slope is recalculated.

1 Wait for stable reading
Monitor the process value and continue (✓) to the next step once the value has stabilized.

2 Enter the new value
Enter the desired PV value by pressing the \( \downarrow \) key to move the cursor and the \( \leftarrow \rightarrow \) keys to change the value. When the new value has been entered press the (✓) key to continue.

3 Completion
Following a successful calibration the calculated coefficients are displayed.

Following an unsuccessful calibration the reason for failure is displayed.
4-electrode conductivity sensor calibration

4-electrode conductivity may require wet calibration for the greatest accuracy.

The procedure is for a manual calibration at a single reference point. Conductivity Calibration and Concentration Calibration procedures are identical.

**For Group A sensors**
- If the calibration is performed at a conductivity value <1 µS/cm the PV Offset is recalculated.
- If the calibration is performed at a conductivity value ≥1 µS/cm the PV Slope is recalculated.

**For Group B sensors**
- If the calibration is performed at a conductivity value <5 µS/cm the PV Offset is recalculated.
- If the calibration is performed at a conductivity value ≥5 µS/cm the PV Slope is recalculated.

1. **Wait for stable reading**
   Monitor the process value and continue (→) to the next step once the value has stabilized.

2. **Enter the new value**
   Enter the desired PV value by pressing the ↓ key to move the cursor and the ← → keys to change the value. When the new value has been entered press the → key to continue.

3. **Completion**
   Following a successful calibration the calculated coefficients are displayed.

Toroidal conductivity sensor calibration

Toroidal conductivity may require wet calibration for the greatest accuracy.

**PV Zero calibration**

1. **Apply zero and wait for stable reading**
   Ensure that a zero solution is present at the sensor, monitor the process value and continue (→) to the next step once the value has stabilized.

2. **Sampling**
   The procedure moves automatically to the next stage once the PV has been sampled.

3. **Completion**
   Following a successful calibration the calculated coefficients are displayed.

Following an unsuccessful calibration the reason for failure is displayed.
11 Calibration

Toroidal conductivity sensor calibration

PV Span calibration

1 Apply span and wait for stable reading
   Ensure that a span solution is present at the sensor, monitor the process value and continue (✓) to the next step once the value has stabilized.

2 Enter the new value
   Enter the desired PV value by pressing the < key to move the cursor and the > keys to change the value. When the new value has been entered press the ✓ key to continue.

3 Sampling
   The procedure moves automatically to the next stage once the PV has been sampled.

4 Completion
   Following a successful calibration the calculated coefficients are displayed.

   Following an unsuccessful calibration the reason for failure is displayed.
12 Specification

Operation
Display/LCD (W x H)
75 x 65 mm (3.0 x 2.55 in)

Mechanical data
Terminal connections
AWG 26 to 14 (0.14 to 2.5 mm²)

Input
pH/ORP/plon sensor types
pH: Glass, Antimony (Sb)
ORP: (Redox): Platinum (Pt), Gold (Au)
pION: Custom user-programmable

Input impedance
>1x10^13Ω

pH/ORP/plon 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 (~2 to 16 over range)</td>
<td>0.01 pH</td>
<td>±0.01 pH</td>
</tr>
<tr>
<td>ORP</td>
<td>−1500 to 1500 mV</td>
<td>1 mV</td>
<td>±1 mV</td>
</tr>
<tr>
<td>pION</td>
<td>−1500 to 1500 mV</td>
<td>1 mV</td>
<td>±1 mV</td>
</tr>
</tbody>
</table>

Dynamic response
<1 second for 90% step change at 0 seconds damping

Damping
Configurable: 0 to 99.9 seconds

Conductivity sensor types
AWT210: ABB 2-electrode conductivity sensors
AWT210: ABB 4-electrode conductivity sensors
AWT210: ABB toroidal conductivity sensors

Conductivity measurement range and resolution

<table>
<thead>
<tr>
<th>Sensor</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>

Temperature input

Temperature element types
Pt100 (2 or 3-wire) Automatic temperature compensation
Pt1000 (2 or 3-wire) Automatic temperature compensation
3k Balco (2 or 3-wire) Automatic temperature compensation
None Manual temperature compensation

Measurement range and resolution

<table>
<thead>
<tr>
<th>Temperature element</th>
<th>Temperature range</th>
<th>Accuracy/repeatability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt100</td>
<td>−20 to 200 °C (~−4 to 392 °F)</td>
<td>±0.1 °C (~±0.18 °F) – after calibration</td>
</tr>
<tr>
<td>Pt1000</td>
<td>3K Balco</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>User-programmable</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>20 to 300 °C (~−4 to 572 °F)</td>
<td></td>
</tr>
</tbody>
</table>

pH/ORP/plon temperature compensation modes

<table>
<thead>
<tr>
<th>Type</th>
<th>Manual</th>
<th>Automatic</th>
<th>Nernstian with solution coefficient</th>
<th>Solution compensation coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>ORP</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pION</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Conductivity temperature compensation modes

<table>
<thead>
<tr>
<th>Temperature element</th>
<th>AWT210 2-electrode</th>
<th>AWT210 4-electrode</th>
<th>AWT210 toroidal</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 15% NaOH</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>0 to 20% NaCl</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>0 to 18% HCl</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>0 to 20% H₂SO₄</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Pure water neutral salt</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Pure water trace base</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Pure water trace acid</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>User-defined</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>
...12 Specification

Power supply (FF models and PA models)
Supply voltage
- 9 to 32 V DC (General purpose installations)
- 9 to 24 V DC (Intrinsically Safe Ex ia)

Quiescent current
- 15 mA quiescent current consumption

Power supply (HART models)
Supply voltage
- 14 to 42 V DC (General purpose installations)
- 14 to 30 V DC (Intrinsically safe Ex ia installations)
Polarity safe
Lift off voltage: 14 V DC

Under-voltage protection
Supply voltage < 12 V DC results in < 3.8 mA

Maximum permissible ripple
Maximum ripple for supply voltage during communication in accordance with HART FSK physical layer specification, version 8.1 (08/1999) section 8.1

Maximum load
Max. load = (supply voltage – 14 V)/22 mA

Output (HART models)
Configured range
- 4 to 20 mA, User-programmable across measurement range.
  Linear and non-linear.

AWT210 2-electrode pH transmitter:

<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>3000 mV</td>
</tr>
<tr>
<td>pION</td>
<td>100 mV</td>
<td>3000 mV</td>
</tr>
</tbody>
</table>

AWT210 2-electrode conductivity transmitter:

<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>0.1</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>

AWT210 4-electrode conductivity transmitter:

<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>

AWT210 toroidal conductivity transmitter:

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

All conductivity models
- when configured for concentration:

<table>
<thead>
<tr>
<th>Sensor group</th>
<th>Min. span</th>
<th>Max. span</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>5% when configured for concentration</td>
<td>2000</td>
</tr>
</tbody>
</table>

Dynamic range
- 3.8 to 20.5 mA with 3.6 mA low alarm level,
  21 mA high alarm level

Environmental data
Operating temperature
-20 to 60 °C (−4 to 140 °F)

Humidity
< 95 % RH non-condensing

Storage temperature
-40 to 70 °C (−40 to 158 °F)

Vibration
IEC 60068-2-6 Test FC: vibration, sinusoidal
Approvals, certification and safety

Factory Mutual (FM) Intrinsic Safety
Available with polycarbonate & aluminium enclosures

Intrinsic Safety
- Class I, Div 1, Group A, B, C, D, T4
- Class II, Div 1, Group E, F, G, T4
- Exia

Enclosure type/ingress protection classification
- 4X*/IPX6

Ambient temperature range
- \(-25^\circ C \leq Ta \leq 60^\circ C\)

Factory Mutual (FM) Non-incendive
Available with aluminium enclosure only

Non-incendive
- Class I, Div 2, Group A, B, C, D, T4
- Class II, Div 2, Group F, G, T4
- Class III

Enclosure type/ingress protection classification
- 4X*/IPX6

Ambient temperature range
- \(-25^\circ C \leq Ta \leq 60^\circ C\)

Canadian Standards Authority (CSA) Intrinsic Safety
Available with polycarbonate & aluminium enclosures

Intrinsic Safety
- Class I, Div 1, Group A, B, C, D, T4
- Class II, Div 1, Group E, F, G, T4
- Exia

Enclosure type/ingress protection classification
- 4X*/IPX6

Ambient temperature range
- \(-25^\circ C \leq Ta \leq 60^\circ C\)

Canadian Standards Authority (CSA) Non-incendive
Available with aluminium enclosure only

Non-incendive
- Class I, Div 2, Group A, B, C, D, T4
- Class II, Div 2, Group F, G, T4
- Class III

Enclosure type/ingress protection classification
- 4X*/IPX6

Ambient temperature range
- \(-25^\circ C \leq Ta \leq 60^\circ C\)

ATEX Intrinsic Safety
Available with polycarbonate & aluminium enclosures

Intrinsic Safety
- II 1G Ex ia IIC T4 Ga when used with appropriate barriers

Ingress protection classification
- IPX6

Ambient temperature range
- \(-20^\circ C \leq Ta \leq 60^\circ C\)

IECEEx Intrinsic Safety
Available with polycarbonate & aluminium enclosures

Intrinsic Safety
- II 2G Ex ia IIC T4 Ga when used with appropriate barriers

Ingress protection classification
- IPX6

Ambient temperature range
- \(-20^\circ C \leq Ta \leq 60^\circ C\)

EMC

Emissions and immunity
Meets requirements of IEC61326 for an industrial environment.

*4X Hosedown self-assessed not approved by 3rd party.
### 13 Spare parts

#### Communications module assemblies

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3KXA877210L0051</td>
<td>HART module</td>
</tr>
<tr>
<td>3KXA877210L0052</td>
<td>PA module</td>
</tr>
<tr>
<td>3KXA877210L0053</td>
<td>FF module</td>
</tr>
</tbody>
</table>

#### Sensor module assemblies

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3KXA877210L0014</td>
<td>pH/ORP module for use with analog sensors</td>
</tr>
<tr>
<td>3KXA877210L0013</td>
<td>2-electrode conductivity module</td>
</tr>
<tr>
<td>3KXA877210L0011</td>
<td>4-electrode conductivity module</td>
</tr>
<tr>
<td>3KXA877210L0012</td>
<td>toroidal conductivity module</td>
</tr>
</tbody>
</table>

#### Main case assemblies

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWT210A1Y0Y0Y0</td>
<td>Polycarbonate case assembly: CE label</td>
</tr>
<tr>
<td>AWT210A1Y0Y0E5</td>
<td>Polycarbonate case assembly: ATEX/IECEx label – FM/CSA label</td>
</tr>
<tr>
<td>AWT210A2Y0Y0Y0</td>
<td>Aluminium case assembly: CE label</td>
</tr>
<tr>
<td>AWT210A2Y0Y0E6</td>
<td>Aluminium case assembly: ATEX/IECEx label – FM/CSA label</td>
</tr>
</tbody>
</table>

#### Gland packs

**Glands (packs of 2)**

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3KXA877210L0112</td>
<td>M16 standard gland</td>
</tr>
<tr>
<td>3KXA877210L0115</td>
<td>M16 Exe gland</td>
</tr>
<tr>
<td>3KXA877210L0111</td>
<td>M20 standard gland</td>
</tr>
<tr>
<td>3KXA877210L0114</td>
<td>M20 Exe gland</td>
</tr>
<tr>
<td>3KXA877210L0113</td>
<td>½ in NPT standard gland M16</td>
</tr>
<tr>
<td>3KXA877210L0116</td>
<td>½ in NPT Exe gland M20</td>
</tr>
</tbody>
</table>

#### Blanking plugs

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3KXA877210L0117</td>
<td>Exe blanking plug pack (2 x M20, 2 x M16)</td>
</tr>
</tbody>
</table>

#### Mounting kits

#### Panel-mount kit

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3KXA877210L0101</td>
<td>Panel-mount kit, including fixings, flanges, clamps and seal</td>
</tr>
</tbody>
</table>

#### Pipe-mount kit

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3KXA877210L0102</td>
<td>Pipe-mount kit, including pipe-mount adaptor plate, brackets and fixings (excludes pipe)</td>
</tr>
</tbody>
</table>

#### Wall-mount kit

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3KXA877210L0105</td>
<td>Wall-mount kit</td>
</tr>
</tbody>
</table>

#### Weathershield kit

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3KXA877210L0103</td>
<td>Weathershield kit (suitable for AWT210/AWT420)</td>
</tr>
</tbody>
</table>

#### Weathershield and pipe-mount kit

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3KXA877210L0104</td>
<td>Weathershield and pipe-mount kit (suitable for AWT210/AWT420)</td>
</tr>
</tbody>
</table>
Acknowledgments

• Fieldbus is a registered trademark of the Fieldbus Foundation
• HART is a registered trademark of the FieldComm Group
• Modbus is a registered trademark of Schneider Electric USA Inc.
• PROFINET is a registered trademark of PROFINET organization
Notes
...Notes