AWT210

2-wire conductivity, pH/ORP pION transmitter

AWT210
2-wire transmitter

Measurement made easy

Introduction

This Operating Instruction provides installation, operation and maintenance procedures for the AWT210 2-wire transmitter.

The transmitter is fully compatible with ABB's range of analog pH and redox (ORP) electrodes and with ABB's range of 2-electrode, 4-electrode and toroidal sensors and EZLink digital pH and redox (ORP) 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 four 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:

	Search for or click on:
AWT210 transmitter – Data Sheet	DS/AWT210
AWT210 transmitter – Commissioning Instruction	CI/AWT210
AWT210 transmitter – HART Communications Supplement	COM/AWT210/HART
AWT210 transmitter – HART FDS Communications Supplement	COM/AWT210/HART/FDS
AWT210 transmitter – PROFIBUS Communications Supplement	COM/AWT210/PROFIBUS
AWT210 transmitter – FIELDBUS Communications Supplement	COM/AWT210/FIELDBUS
AWT210 transmitter – Safety Instruction	SI/AWT210

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1 Health and 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

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.

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)

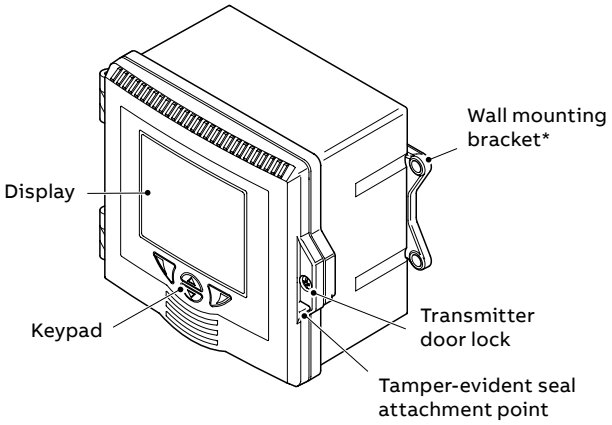
ABB, Industrial Automation, Measurement & Analytics, UK, fully supports the objectives of the ROHS II directive. All in-scope products placed on the market by IAMA UK on and following the 22nd of July 2017 and without any specific exemption, will be compliant to the ROHS II directive, 2011/65/EU.

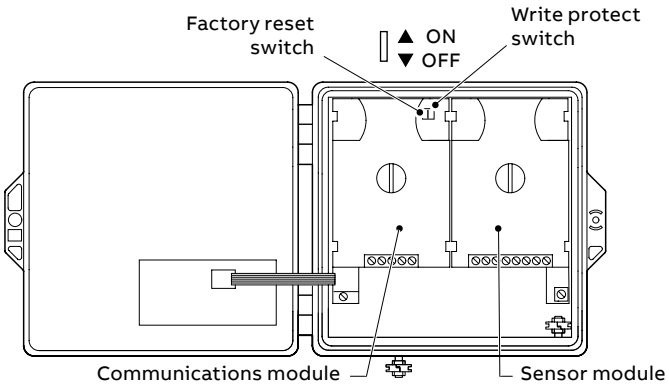
2 Cybersecurity

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





*Panel- and pipe-mount options are also available – see page 13

Figure 1 AWT210 transmitter – main components

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

ABB Ltd. St Neots, PE19 8EU, UK
ABB Ltd. Stonehouse, GL10 3TA, UK (Manf.)
AWT210 2 Wire Transmitter
AWT200050
Serial No.: 3K210000000000
Supply:
HART ⎓ 14-30VDC, 4-20mA
FF/PA ⎓ 9-24VDC, 15mA
DATE OF MANUFACTURE: MM/YYYY
UK CA 1725 CE 2809

Transmitters with cFMus approval and ATEX, IECEx & UKEX

Aluminum enclosure

☐ II 1 G Ex ia IIC T4 Ga
FM18ATEX0017X / IECEx FME 18.0001X
FM22UKEX0046X
Installation Dwg. AWT200034
☐ II 3 G Ex ic IIC T4 Gc
FM21ATEX0011X / IECEx FME 18.0001X
FM22UKEX0047X
Installation Dwg. AWT200035
-20°C ≤ Ta ≤ +60 °C / IP66

FM C US APPROVED

IS: Class I, Div 1 Gps ABCD T4
Class II, Div 1 Gps EFG T4
Class I, Zone 2 AEx/Ex ic IIC T4 Gc
-25°C ≤ Ta ≤ +60 °C
Exia
NI: Class I, Div 2 Gps ABCD
Class II/III, Div 2 Gps FG
-25°C ≤ Ta ≤ +60 °C
FM18US0040X / FM18CA0019X
Installation Dwg.
USA: AWT200030 & AWT200031
Canada: AWT200032 & AWT200033

Communications Module Fitted
☐ HART Module: AWT210xxxxH1xxxxxxxx
☐ Fieldbus Module: AWT210xxxxF1xxxxxxxx
☐ Profibus Module: AWT210xxxxP1xxxxxxxx

Sensor Module Fitted
☐ Toroidal Conductivity Module: AWT210xxC1xxxxxxxxxx
☐ 2-Electrode Conductivity Module: AWT210xxC2xxxxxxxxxx
☐ 4-Electrode Conductivity Module: AWT210xxC4xxxxxxxxxx
☐ Digital EZLink Module: AWT210xxD1xxxxxxxxxx
☐ pH/ORP Module: AWT210xxP1xxxxxxxxxx

WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.
AVERTISSEMENT: LA SUBSTITUTION DE COMPOSANTS PEUT NUIRE À LA SÉCURITÉ INTRINSÈQUE.

Transmitters with cFMus approval and ATEX, IECEx & UKEX

Plastic enclosure

☐ II 1 G Ex ia IIC T4 Ga
FM18ATEX0017X / IECEx FME 18.0001X
FM22UKEX0046X
Installation Dwg. AWT200034
☐ II 3 G Ex ic IIC T4 Gc
FM21ATEX0011X / IECEx FME 18.0001X
FM22UKEX0047X
Installation Dwg. AWT200035
-20°C ≤ Ta ≤ +60 °C / IP66

FM C US APPROVED

IS: Class I, Div 1 Gps ABCD T4
Class II, Div 1 Gps EFG T4
Class I, Zone 2 AEx/Ex ic IIC T4 Gc
-25°C ≤ Ta ≤ +60 °C
Exia
FM18US0040X / FM18CA0019X
Installation Dwg.
USA: AWT200030
Canada: AWT200032

Communications Module Fitted
☐ HART Module: AWT210xxxxH1xxxxxxxx
☐ Fieldbus Module: AWT210xxxxF1xxxxxxxx
☐ Profibus Module: AWT210xxxxP1xxxxxxxx

Sensor Module Fitted
☐ Toroidal Conductivity Module: AWT210xxC1xxxxxxxxxx
☐ 2-Electrode Conductivity Module: AWT210xxC2xxxxxxxxxx
☐ 4-Electrode Conductivity Module: AWT210xxC4xxxxxxxxxx
☐ Digital EZLink Module: AWT210xxD1xxxxxxxxxx
☐ pH/ORP Module: AWT210xxP1xxxxxxxxxx

WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.
AVERTISSEMENT: LA SUBSTITUTION DE COMPOSANTS PEUT NUIRE À LA SÉCURITÉ INTRINSÈQUE.

4 Hazardous area considerations

Special regulations must be observed in hazardous areas for the auxiliary power connection, signal inputs/outputs and ground connection. The user shall mark, on installation, the variant of communication module and sensor module on the label.

⚠ 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 & UKEX Marks
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 2014/34/EU (ATEX).

Ignition protection
The AWT210 transmitter is available with cFMus and ATEX, IECEx and UKEX 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.

Output parameter of power supply/SPS input			Input parameter of AWT210 transmitter	
Max. output voltage	Uo	≤	Ui	Max. input voltage
Max. output current	Io	≤	Ii	Max. input current
Max. output power	Po	≤	Pi	Max. input power
Max. output inductance	Lo	≥	Li+Lc	Internal inductance + inductance of cable
Max. output capacitance	Co	≥	Ci=Cc	Internal capacitance + capacitance of cable

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 in Appendix C on page 61, 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/UKCA 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.

cFMus
Intrinsic safety
CLASS I, DIV 1 GROUPS A, B, C, D; T4
CLASS II, DIV 1 GROUPS E, F, G; T4
CLASS I, ZONE 2 AEx/Ex ic IIC T4 Gc

Ingress protection classification
4X*/IP66

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

cFMus Instrinsic Safety control drawing
To download the cFMus intrinsic safety control drawing for the US, click here or scan this code:

To download the cFMus intrinsic safety drawing for Canada, click here or scan this code:

Table 1 Input parameters of AWT210 transmitter: HART

CLASS I, DIV 1 GROUPS A, B, C, D; T4 CLASS II, DIV 1 GROUPS E, F, G; T4			
Maximum voltage	Ui	=	30 V
Maximum input current	Ii	=	100 mA
Maximum power	Pi	=	0.8 W
Internal inductance	Li	=	3.3 mH
Internal capacitance	Ci	=	0.56 nF
CLASS I, ZONE 2 AEx/Ex ic IIC T4 Gc			
Maximum voltage	Ui	=	30 V
Maximum input current	Ii	=	152 mA
Maximum power	Pi	=	0.8 W
Internal inductance	Li	=	3.3 mH
Internal capacitance	Ci	=	0.56 nF

Table 2 Input parameters of AWT210 transmitter: Fieldbus

CLASS I, DIV 1 GROUPS A, B, C, D; T4 CLASS II, DIV 1 GROUPS E, F, G; T4							
Entity model (linear)							
Maximum voltage			Ui	=	24 V		
Maximum input current			Ii	=	174 mA		
Maximum power			Pi	=	1.2 W		
Internal inductance			Li	=	0.0 mH		
Internal capacitance			Ci	=	1.1 nF		
FISCO field device							
Maximum voltage			Ui	=	17.5 V		
Maximum input current			Ii	=	380 mA		
Maximum power			Pi	=	5.32 W		
Internal inductance			Li	=	0.0 mH		
Internal capacitance			Ci	=	1.1 nF		
CLASS I, ZONE 2 AEx/Ex ic IIC T4 Gc							
Entity model (linear)							
Maximum voltage			Ui	=	24 V		
Maximum input current			Ii	=	250 mA		
Maximum power			Pi	=	1.2 W		
Internal inductance			Li	=	0.0 mH		
Internal capacitance			Ci	=	1.1 nF		
FISCO field device							
Maximum voltage	Ui	=	14.0 V	15.0 V	16.0V	17.0V	17.5V
Maximum input current	Ii	=	274 mA	199 mA	154 mA	121 mA	112 mA
Maximum power			Pi	=	5.32 W		
Internal inductance			Li	=	0.0 mH		
Internal capacitance			Ci	=	1.1 nF		

Table 3 Input parameters of AWT210 transmitter: Profibus

CLASS I, DIV 1 GROUPS A, B, C, D; T4 CLASS II, DIV 1 GROUPS E, F, G; T4							
Entity model (linear)							
Maximum voltage				Ui	=	24 V	
Maximum input current				Ii	=	174 mA	
Maximum power				Pi	=	1.2 W	
Internal inductance				Li	=	0.0 mH	
Internal capacitance				Ci	=	1.1 nF	
FISCO field device							
Maximum voltage				Ui	=	17.5 V	
Maximum input current				Ii	=	360 mA	
Maximum power				Pi	=	2.52 W	
Internal inductance				Li	=	0.0 mH	
Internal capacitance				Ci	=	1.1 nF	
CLASS I, ZONE 2 AEx/Ex ic IIC T4 Gc							
Entity model (linear)							
Maximum voltage				Ui	=	24 V	
Maximum input current				Ii	=	250 mA	
Maximum power				Pi	=	1.2 W	
Internal inductance				Li	=	0.0 mH	
Internal capacitance				Ci	=	1.1 nF	
FISCO field device							
Maximum voltage	Ui	=	14.0 V	15.0 V	16.0 V	17.0 V	17.5 V
Maximum input current	Ii	=	274 mA	199 mA	154 mA	121 mA	112 mA
Maximum power					Pi	=	2.52 W
Internal inductance					Li	=	0.0 mH
Internal capacitance					Ci	=	1.1 nF

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

CLASS I, DIV 1 GROUPS A, B, C, D; T4 CLASS II, DIV 1 GROUPS E, F, G; T4 CLASS I, ZONE 2 AEx/Ex ic IIC T4 Gc			
Maximum open circuit voltage	Uo	=	11.8 V
Maximum short-circuit current	Io	=	11.8 mA
Maximum output power	Po	=	36 mW
Internal inductance	Lo	=	1 H
Internal capacitance	Co	=	1.5 µF

Table 5 Output parameters of sensor: EZLink

CLASS I, DIV 1 GROUPS A, B, C, D; T4 CLASS II, DIV 1 GROUPS E, F, G; T4 CLASS I, ZONE 2 AEx/Ex ic IIC T4 Gc			
Maximum open circuit voltage	Uo	=	5.21 V
Maximum short-circuit current	Io	=	98.2 mA
Maximum output power	Po	=	127.9 mW
Internal inductance	Lo	=	43 mH
Internal capacitance	Co	=	60 µF

...4 Hazardous area considerations

...Hazardous area relevant information

cFMus
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*/IP66

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

cFMus Non-incendive Safety control drawing
To download the cFMus non-incendive safety control dawing for the US, click here or scan this code:

To download the cFMus non-incendive safety control drawing for Canada, click here or scan this code:

Table 6 Input parameters of AWT210 transmitter: HART

CLASS I, DIV 2, GROUP A,B,C,D T4 CLASS II/III, DIV 2, GROUP F,G T4			
Maximum voltage	Ui	=	30 V
Maximum input current	Ii	=	100 mA
Maximum power	Pi	=	0.8 W
Internal inductance	Li	=	3.3 mH
Internal capacitance	Ci	=	0.56 nF

Table 7 Input parameters of AWT210 transmitter: Fieldbus

CLASS I, DIV 2, GROUP A,B,C,D T4 CLASS II/III, DIV 2, GROUP F,G T4			
Maximum voltage	Ui	=	24 V
Maximum input current	Ii	=	250 mA
Maximum power	Pi	=	1.2 W
Internal inductance	Li	=	0.0 mH
Internal capacitance	Ci	=	1.1 nF

Table 8 Input parameters of AWT210 transmitter: Profibus

CLASS I, DIV 2, GROUP A,B,C,D T4 CLASS II/III, DIV 2, GROUP F,G T4			
Maximum voltage	Ui	=	24 V
Maximum input current	Ii	=	250 mA
Maximum power	Pi	=	1.2 W
Internal inductance	Li	=	0.0 mH
Internal capacitance	Ci	=	1.1 nF

Table 9 Output parameters of sensor: 4-electrode, 2-electrode, toroidal, pH

CLASS I, DIV 2, GROUP A,B,C,D T4 CLASS II/III, DIV 2, GROUP F,G T4			
Maximum open circuit voltage	Uo	=	11.8 V
Maximum short-circuit current	Io	=	11.8 mA
Maximum output power	Po	=	36 mW
Internal inductance	Lo	=	1 H
Internal capacitance	Co	=	1.5 µF

Table 10 Output parameters of sensor: EZLink

CLASS I, DIV 2, GROUP A,B,C,D T4 CLASS II/III, DIV 2, GROUP F,G T4			
Maximum open circuit voltage	Uo	=	5.21 V
Maximum short-circuit current	Io	=	98.2 mA
Maximum output power	Po	=	127.9 mW
Internal inductance	Lo	=	43 mH
Internal capacitance	Co	=	60 µF

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

US:
Installation must be in accordance with the National Electric Code (NFPA 70)

Canada:
Installation must be in accordance with C22.1 Canadian Electrical Code, Part 1.

ATEX, IECEx & UKEX

Intrinsic safety

II 1 G Ex ia IIC T4 Ga
II 3 G Ex ic IIC T4 Gc
When used with appropriate associated apparatus.

Ingress protection classification

IP66

Ambient temperature range

–20 °C =< Ta =< 60 °C

II 1 G Ex ia IIC T4 Ga Safety control drawing

Click here to download the II 1 G Ex ia IIC T4 Ga safety control drawing for AWT210 transmitter, or scan this code:

II 3 G Ex ic IIC T4 Gc Safety control drawing

Click here to download the II 3 G Ex ic IIC T4 Gc safety control drawing for AWT210 transmitter, or scan this code:

Table 11 Input parameters of AWT210 transmitter: HART

II 1 G Ex ia IIC T4 Ga			
Maximum voltage	Ui	=	30 V
Maximum input current	Ii	=	100 mA
Maximum power	Pi	=	0.8 W
Internal inductance	Li	=	3.3 mH
Internal capacitance	Ci	=	0.56 nF
II 3 G Ex ic IIC T4 Gc			
Maximum voltage	Ui	=	30 V
Maximum input current	Ii	=	152 mA
Maximum power	Pi	=	0.8 W
Internal inductance	Li	=	3.3 mH
Internal capacitance	Ci	=	0.56 nF

Table 12 Input parameters of AWT210 transmitter: Fieldbus

II 1 G Ex ia IIC T4 Ga							
Entity model (linear)							
Maximum voltage					Ui	=	24 V
Maximum input current					Ii	=	250 mA
Maximum power					Pi	=	1.2 W
Internal inductance					Li	=	0.0 mH
Internal capacitance					Ci	=	1.1 nF
FISCO field device							
Maximum voltage					Ui	=	17.5 V
Maximum input current					Ii	=	380 mA
Maximum power					Pi	=	5.32 W
Internal inductance					Li	=	0.0 mH
Internal capacitance					Ci	=	1.1 nF
II 3 G Ex ic IIC T4 Gc							
Entity model (linear)							
Maximum voltage					Ui	=	24 V
Maximum input current					Ii	=	250 mA
Maximum power					Pi	=	1.2 W
Internal inductance					Li	=	0.0 mH
Internal capacitance					Ci	=	1.1 nF
FISCO field device							
Maximum voltage	Uo	=	14.0 V	15.0 V	16.0 V	17.0 V	17.5 V
Maximum input current	Ii	=	274 mA	199 mA	154 mA	121 mA	112 mA
Maximum power					Pi	=	5.32 W
Internal inductance					Li	=	0.0 mH
Internal capacitance					Ci	=	1.1 nF

Table 13 Input parameters of AWT210 transmitter: Profibus

II 1 G Ex ia IIC T4 Ga							
Entity model (linear)							
Maximum voltage					Ui	=	24 V
Maximum input current					Ii	=	250 mA
Maximum power					Pi	=	1.2 W
Internal inductance					Li	=	0.0 mH
Internal capacitance					Ci	=	1.1 nF
FISCO field device							
Maximum voltage					Ui	=	17.5 V
Maximum input current					Ii	=	360 mA
Maximum power					Pi	=	2.52 W
Internal inductance					Li	=	0.0 mH
Internal capacitance					Ci	=	1.1 nF
II 3 G Ex ic IIC T4 Gc							
Entity model (linear)							
Maximum voltage					Ui	=	24 V
Maximum input current					Li	=	250 mA
Maximum power					Pi	=	1.2 W
Internal conductance					Li	=	0.0 mH
Internal capacitance					Ci	=	1.1 nF
FISCO field device							
Maximum voltage	Uo	=	14.0 V	15.0 V	16.0 V	17.0 V	17.5 V
Maximum input current	Li	=	274 mA	199 mA	154 mA	121 mA	112 mA
Maximum power					Pi	=	2.52 W
Internal capacitance					Ci	=	1.1 nF
Internal inductance					Li	=	0.0 mH

…4 Hazardous area considerations

…Hazardous area relevant information

Table 14 Output parameters of sensor: 4-electrode, 2-electrode, toroidal, pH

II 1 G Ex ia IIC T4 Ga II 3 G Ex ic IIC T4 Gc			
Maximum open circuit voltage	Uo	=	11.8 V
Maximum short-circuit current	Io	=	11.8 mA
Maximum output power	Po	=	36 mW
Internal inductance	Lo	=	1 H
Internal capacitance	Co	=	1.5 µF

Table 15 Output parameters of sensor: EZLink

II 1 G Ex ia IIC T4 Ga II 3 G Ex ic IIC T4 Gc			
Maximum open circuit voltage	Uo	=	5.21 V
Maximum short-circuit current	Io	=	98.2 mA
Maximum output power	Po	=	127.9 mW
Internal inductance	Lo	=	43 mH
Internal capacitance	Co	=	60 µF

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 aluminum enclosure for EPL Ga –**
the AWT210 enclosure option (code position 8, option 2 – see Data Sheet DS/AWT210) contains aluminum 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 aluminum 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.

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.

4 **For aluminum 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)

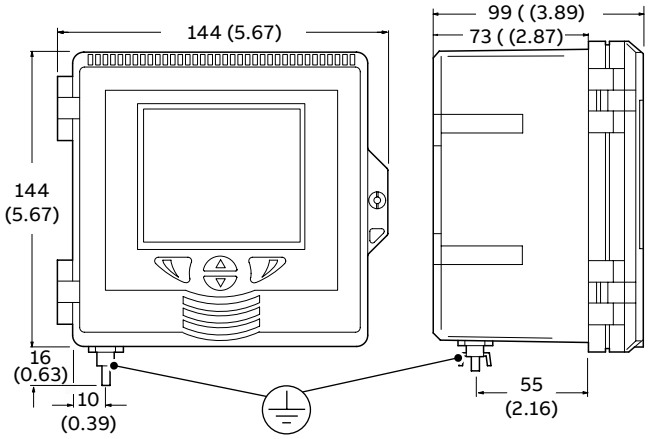


Figure 2 Transmitter dimensions

Fitting communication modules

Referring to Figure 3:

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

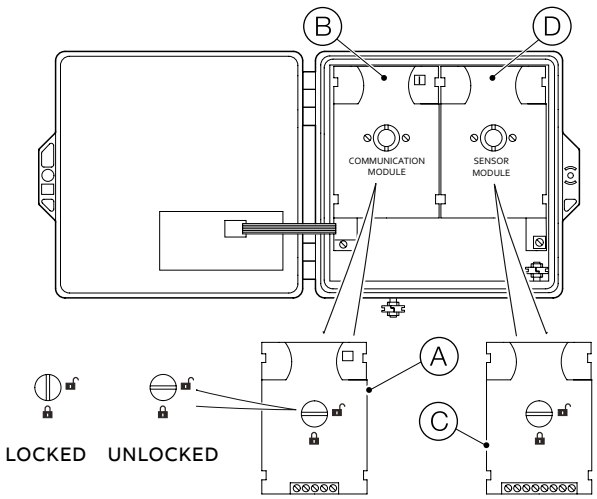


Figure 3 Fitting communication modules

Location

For general location requirements refer to Figure 4. 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.

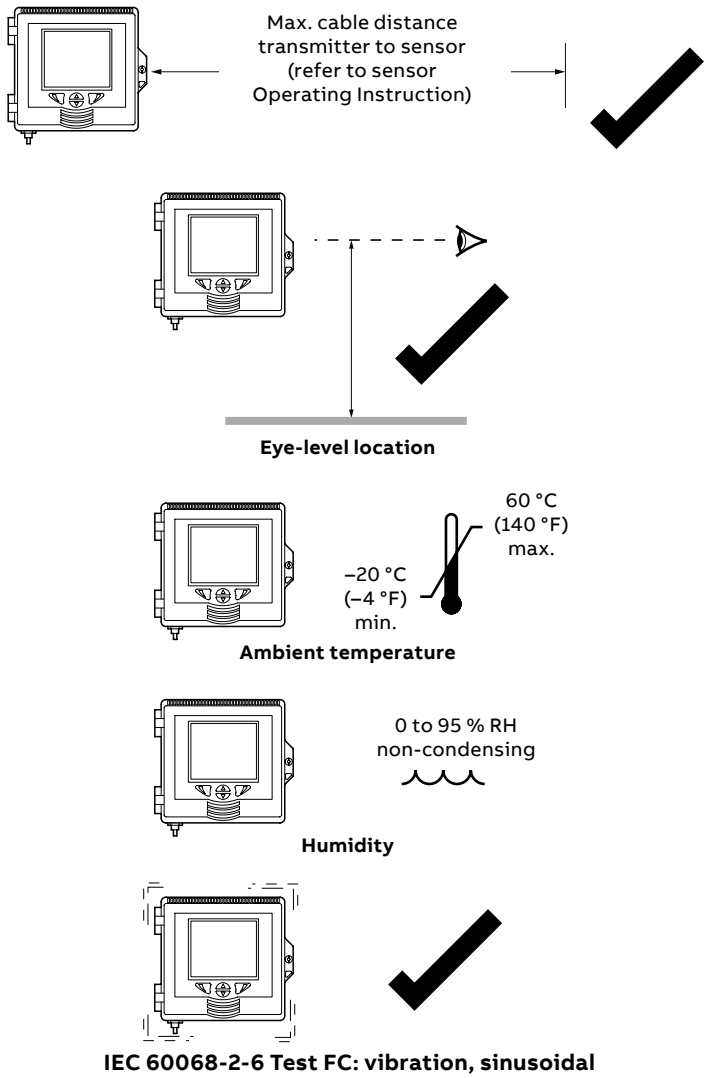


Figure 4 Transmitter location

Optional installation accessories

- Cable gland kit
- Panel-mount kit
- Pipe-mount kit
- Weathershield

…5 Mechanical installation

…Transmitter installation

Wall mounting

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) (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)

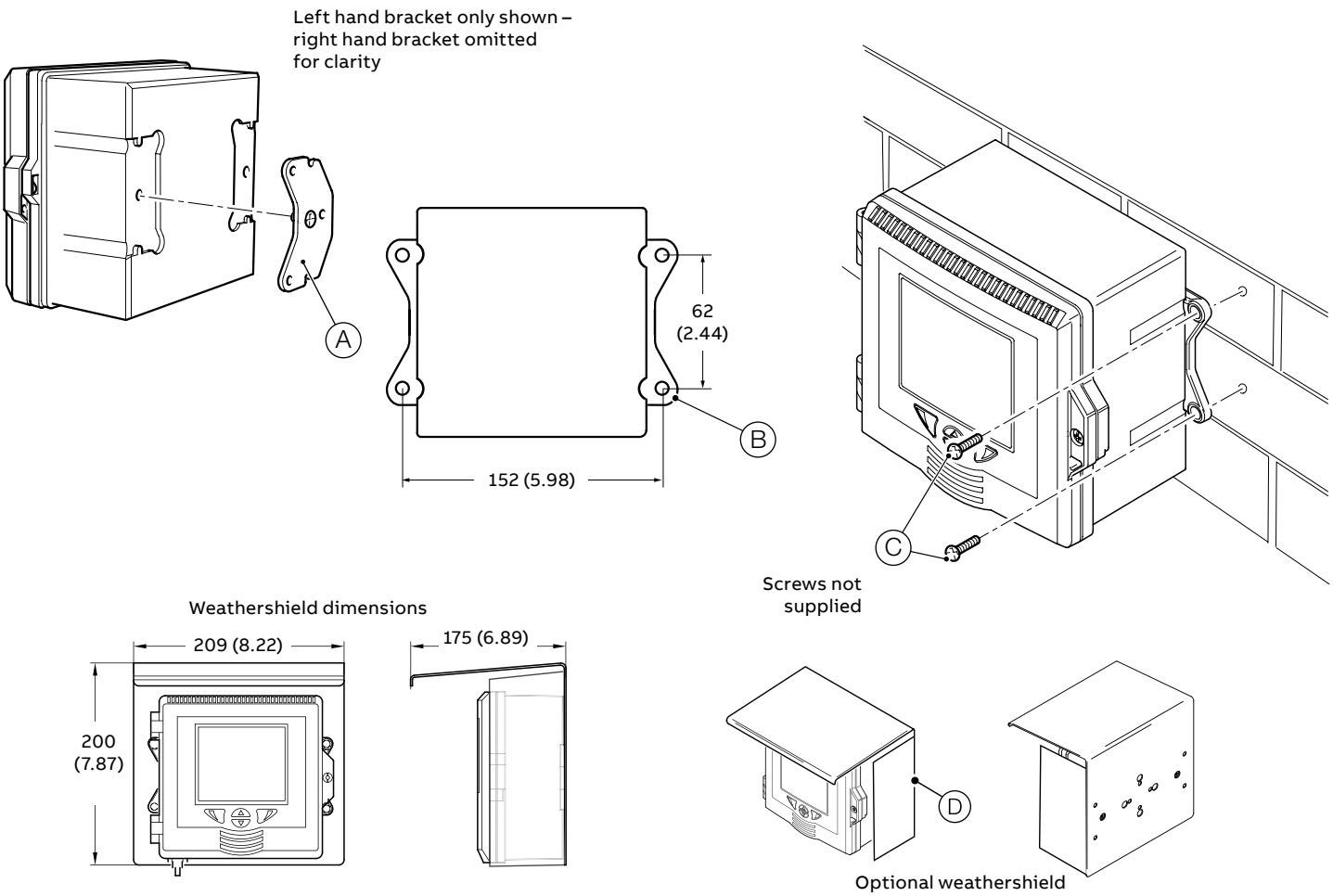


Figure 5 Wall mounting the transmitter

Panel mounting (optional)

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 – 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)

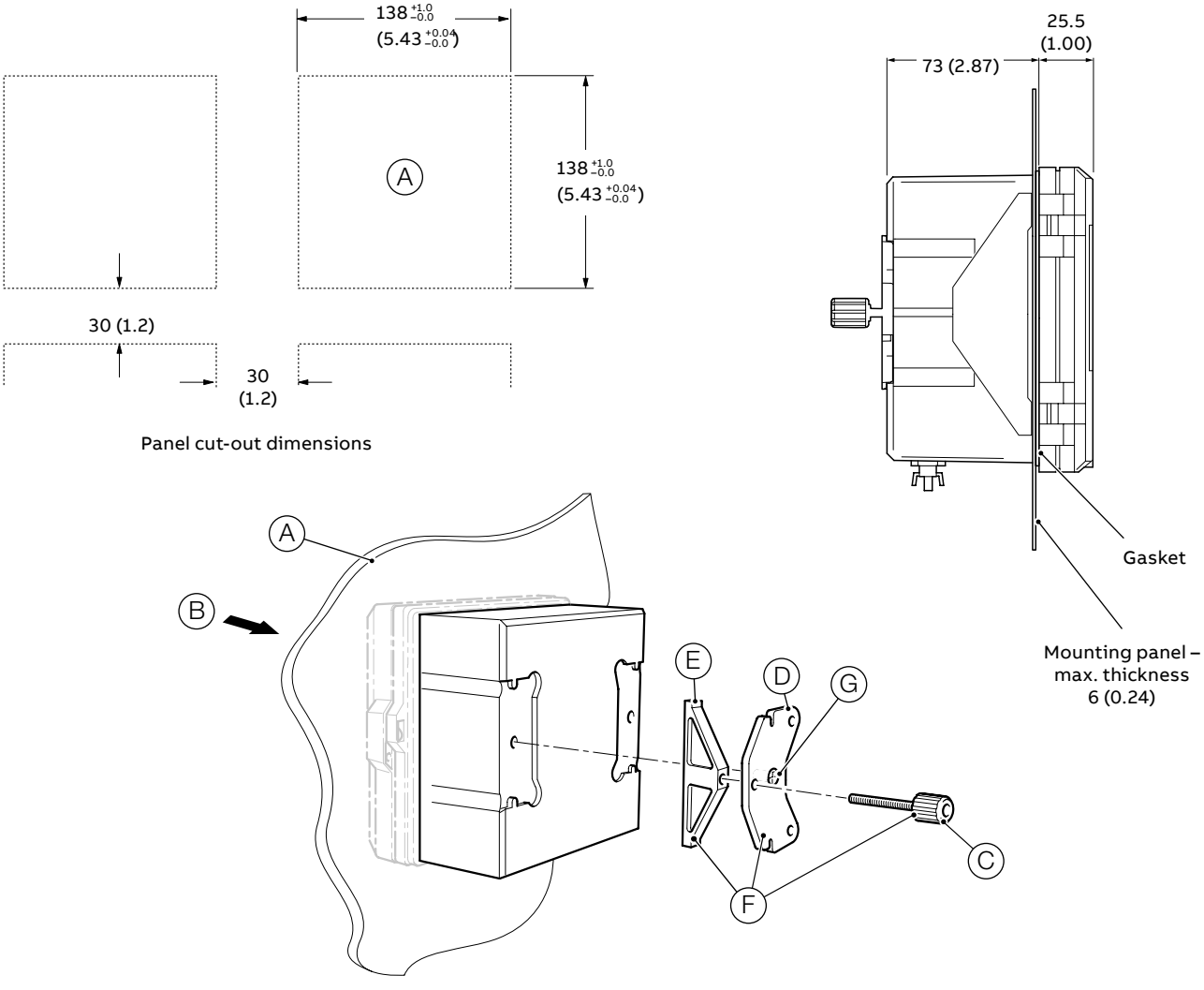


Figure 6 Panel mounting the transmitter

...5 Mechanical installation

...Transmitter installation

Pipe mounting (optional)

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

1. Fit two M6 × 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 × 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).

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.

Dimensions in mm (in)

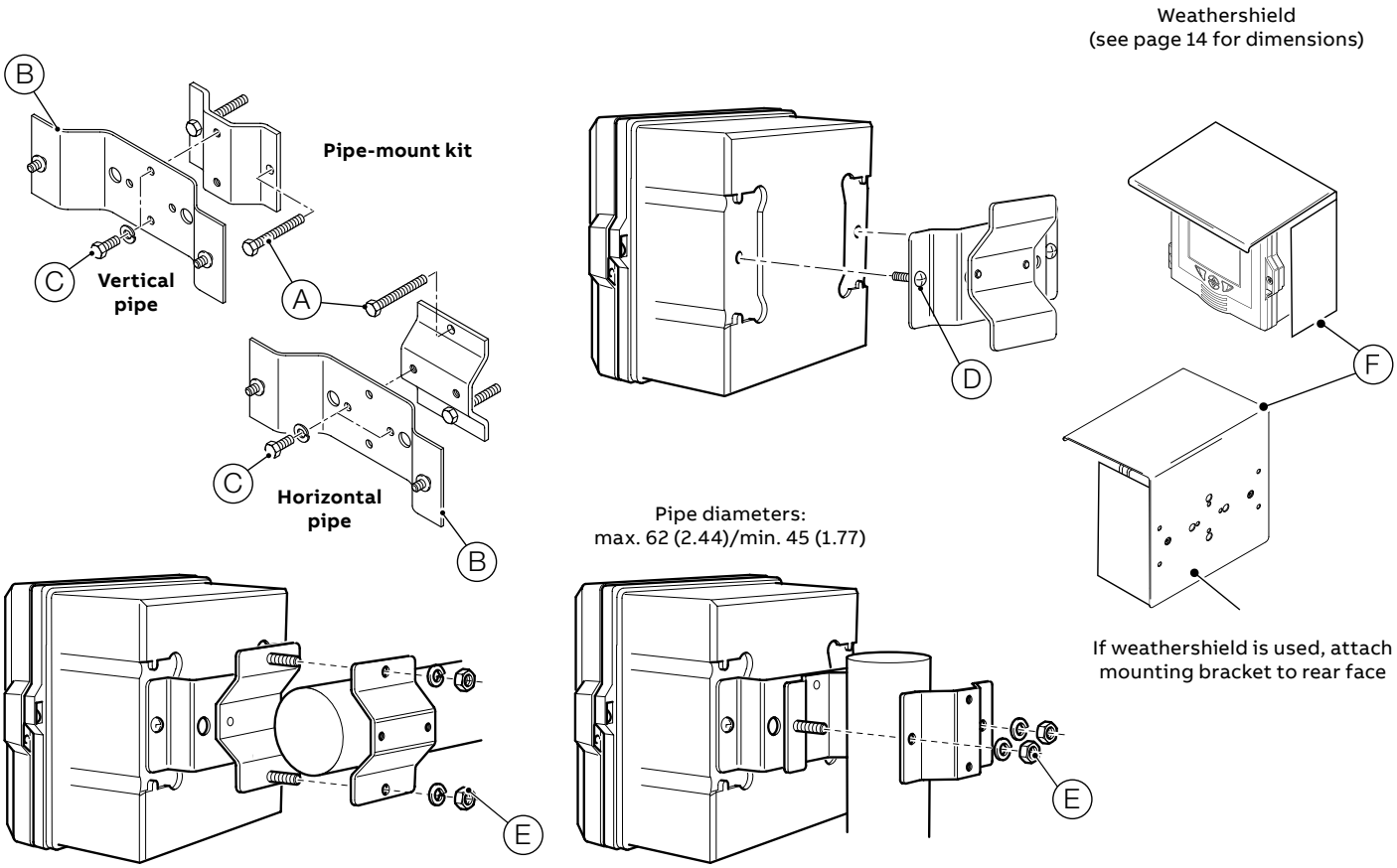


Figure 7 Pipe mounting the transmitter

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

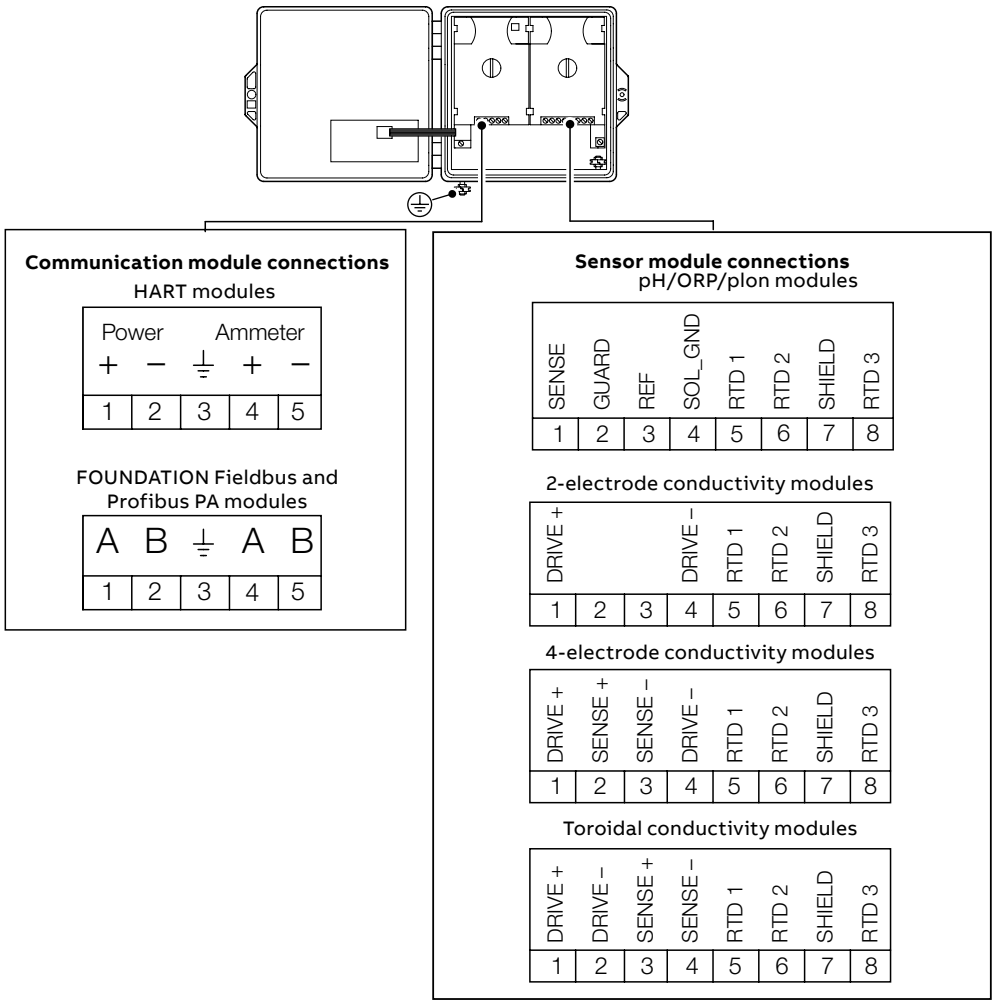


Figure 8 Connections overview

...6 Electrical installation

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 9, ground connections are provided: internally (A) and externally (B).

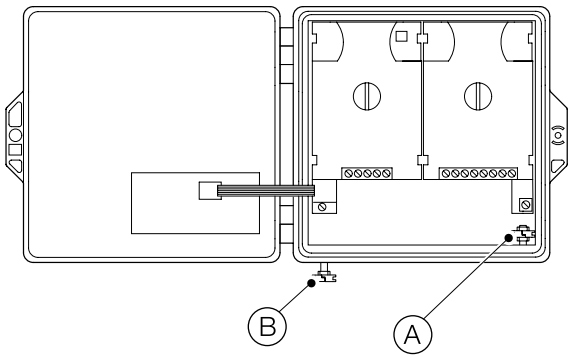


Figure 9 AWT210 ground connections

For IS systems the grounding should be at the safety barrier earth connection. For bus-powered systems the grounding of the screen should be close to the power supply unit. The specific noise immunity and emitted interference are only guaranteed when bus screening is fully effective – for example, ensuring that screening is maintained through any existing junction boxes. Appropriate equipotential bonding must be provided to avoid differences in potential among the individual plant components.

To ensure fault-free communication on Fieldbus (FF or PA) installations, the bus must be properly terminated at both ends. Only approved bus terminators must be used for intrinsically safe circuits.

NOTICE

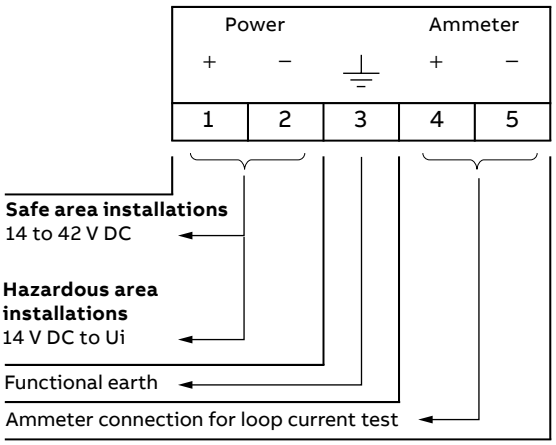
HART, PROFIBUS, and Fieldbus protocols are not secure. Therefore, the intended application should be assessed before implementation to ensure these protocols are suitable.

Gland entries

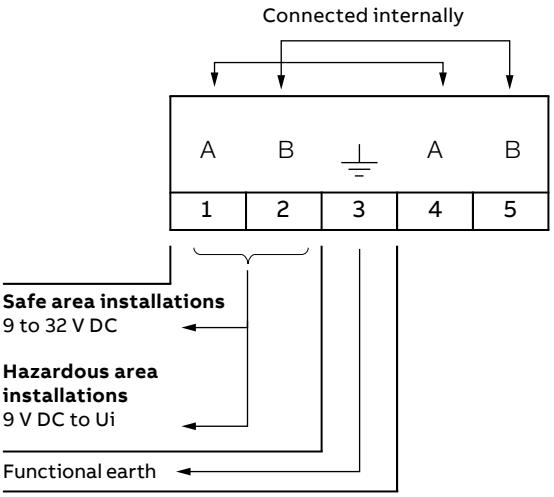
For hazardous area installations, suitable Ex glands and blanking elements must be used to seal the entry holes.

Communication module connections

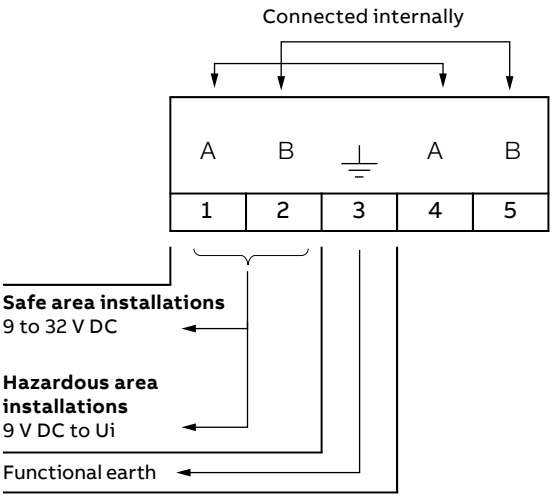
HART module



FOUNDATION Fieldbus module



PROFIBUS PA module



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.

Sensor type	RTD wiring	SENSE 1	GUARD 2	REF 3	S.GND 4	RTD 1 5	RTD 2 6	SHIELD 7	RTD 3 8
2867	2-lead	Clear	–	Black	–	Red	White	–	–
TB5	2-lead	Blue	–	Black	–	Red	White	–	–
AP1xx	2-lead	Clear	–	Black	–	Red Red	White	–	–
	3-lead	Clear	–	Black	–	White	Red	–	Red
AP3xx	2-lead*	Blue	–	Black	–	Red	White	–	–
	3-lead	Blue	–	Black	–	Red	White	–	Gray
APS1xx APS5xx APS7xx	2-lead*	Blue	Yellow	Black	–	Red	White	–	–
	3-lead	Blue	Yellow	Black	–	Red	White	–	Gray

* Cut and remove gray wire

Standard sensors with diagnostic functions

NOTICE

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

Sensor type	RTD wiring	SENSE 1	GUARD 2	REF 3	S.GND 4	RTD 1 5	RTD 2 6	SHIELD 7	RTD 3 8
TBX5	2-lead	Blue	Yellow	Black	Green	Red	White	Dark green	–
AP2xx	2-lead*	Clear	Red	Blue	Green/Yellow	Green	White	–	–
	3-lead	Clear	Red	Blue	Green/Yellow	Green	White	–	Gray

* Cut and remove gray 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 page 50.

...6 Electrical installation

Conductivity sensor module connections

2-electrode sensors

Sensor type	RTD wiring	DRIVE + 1	2	3	DRIVE – 4	RTD 1 5	RTD 2 6	SHIELD 7	RTD 3 8
2085 direct connection	2-lead	Red	–	–	Blue	Yellow	Green	–	–
2085 with extension lead	3-lead	Green	–	–	Black	Red	Yellow	–	Blue
TB2	2-lead	Green	–	–	Black	Blue	Yellow	Dark green	–
AC2xx	2-lead	Green	–	–	Black	Blue/Red	Yellow	White	–
	3-lead	Green	–	–	Black	Yellow	Red	White	Blue

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 page 53.

4-electrode sensors

Sensor type	RTD wiring	DRIVE + 1	SENSE + 2	SENSE – 3	DRIVE – 4	RTD 1 5	RTD 2 6	SHIELD 7	RTD 3 8
TB4	2-lead	Green	Red	White	Black	Blue	Yellow	Dark green	–

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 page 54.

Toroidal sensors

Sensor type	RTD wiring	DRIVE + 1	DRIVE – 2	SENSE + 3	SENSE – 4	RTD 1 5	RTD 2 6	SHIELD 7	RTD 3 8
TB4	2-lead	Black	Blue	White	Red	Green	Yellow	Dark green	–

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 page 54.

Gland entries

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

Fitting the EZLink modules

Referring to Figure 10:

1 Put EZLink bulkhead connector cable (A) through the right-hand 16-mm cable entry.

2 Put the EZLink bulkhead connector cable through the anti-rotation washer (B). Make sure that the alignment tab is in the correct orientation.

3 Put the EZLink bulkhead connector cable (A) through the back nut (C).

4 For the plastic enclosure variant:
Put the alignment tab (E) into the slot in the gland plate.

5 For the aluminum enclosure variant:
Put the alignment tab (E) into the slot in the enclosure floor.

6 Insert EZLink bulkhead connector body (D) fully into the cable entry, and align the bulkhead connector body with the flats on the alignment washer.

7 Tighten the back nut (J) onto the bulkhead connector body with a spanner.

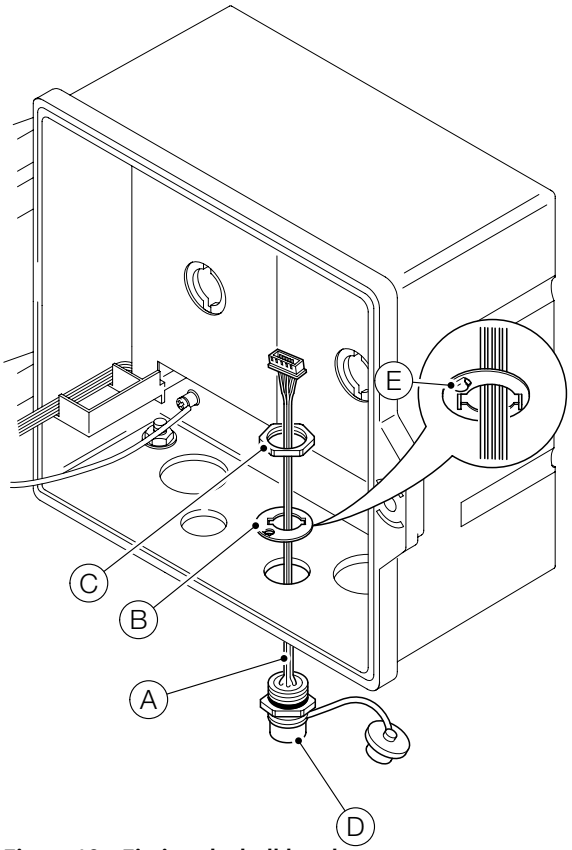


Figure 10 Fitting the bulkhead connector

8 Install the EZLink module to the sensor module position on the baseboard and lock it in position.

Referring to Figure 11 :

9 Place EZLink cable plug (B) into the EZLink connector block cradle (C).

10 Plug connector block cradle C into the EZLink module (A).

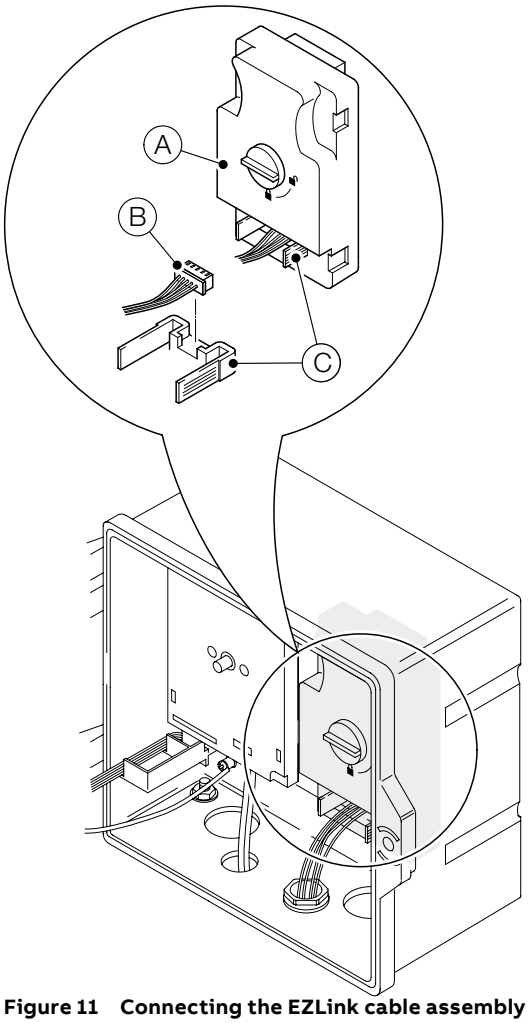


Figure 11 Connecting the EZLink cable assembly

...6 Electrical installation

Connecting the EZLink sensors

NOTICE

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

Referring to Figure 12:

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

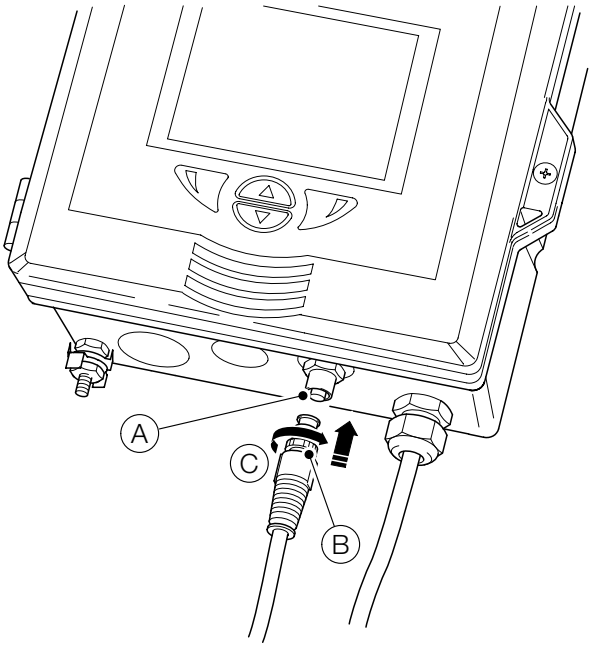


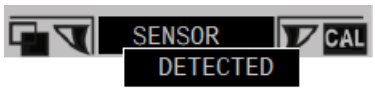
Figure 12 Connecting the sensor EZLink connector - AWT210 can only accept one EZLink in the position shown

Hot plug-in (EZLink sensors only)

Hot plug-in is a feature of the AWT210 transmitter that enables sensors to be added, removed or replaced without the need to power down the transmitter. The EZLink connector enables sensors to be connected and disconnected without tools and without opening the transmitter enclosure. Hot plug-in also enables a sensor to be configured in one location, then installed in a different location without the need to reconfigure the sensor as all the configuration values relating to the process measurement (for example, measurement range, units and calibration data etc.) are stored in the sensor.

Sensor addition

Connect the sensor to the transmitter EZLink connector – see **Connecting the EZLink sensors**. The transmitter detects the new sensor automatically and loads the sensor setup parameters stored in the sensor. The sensor detected message is displayed on the operator page:



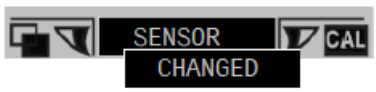
Press the key to access the operator menu.
From the operator menu use the keys to highlight **Sensor Setup** menu and press the key to enter the **Sensor Setup** menu.

Sensor replacement

A sensor can be replaced by a sensor of the same type or a different type. If a sensor is replaced by one of the same type, the sensor setup parameters from the sensor being removed can be retained for use with the new sensor, or set to use the values stored in the new sensor.

Replacing the sensor with a sensor of the same type

Disconnect the old sensor from the EZLink connector. The diagnostic message Electronics is displayed on the Operator page due to an apparent sensor module failure.
Connect the new sensor to the transmitter EZLink connector – see **Connecting the EZLink sensors**. The transmitter detects the new sensor automatically and the sensor changed message is displayed on the operator page:



To retain existing sensor setup parameters

Press the key to access the Operator menu.
From the operator menu use the keys to highlight **Download Config / Transmitter→Sensor** and press the key to download the existing sensor setup parameters from the transmitter to the new sensor.

To use sensor setup parameters from the new sensor

Press the key to access the operator menu.
From the operator menu use the keys to highlight **Upload Config / Sensor→Transmitter** and press the key to upload the sensor setup parameters from the new sensor to the transmitter.

7 Operation

Operator Page – normal conditions

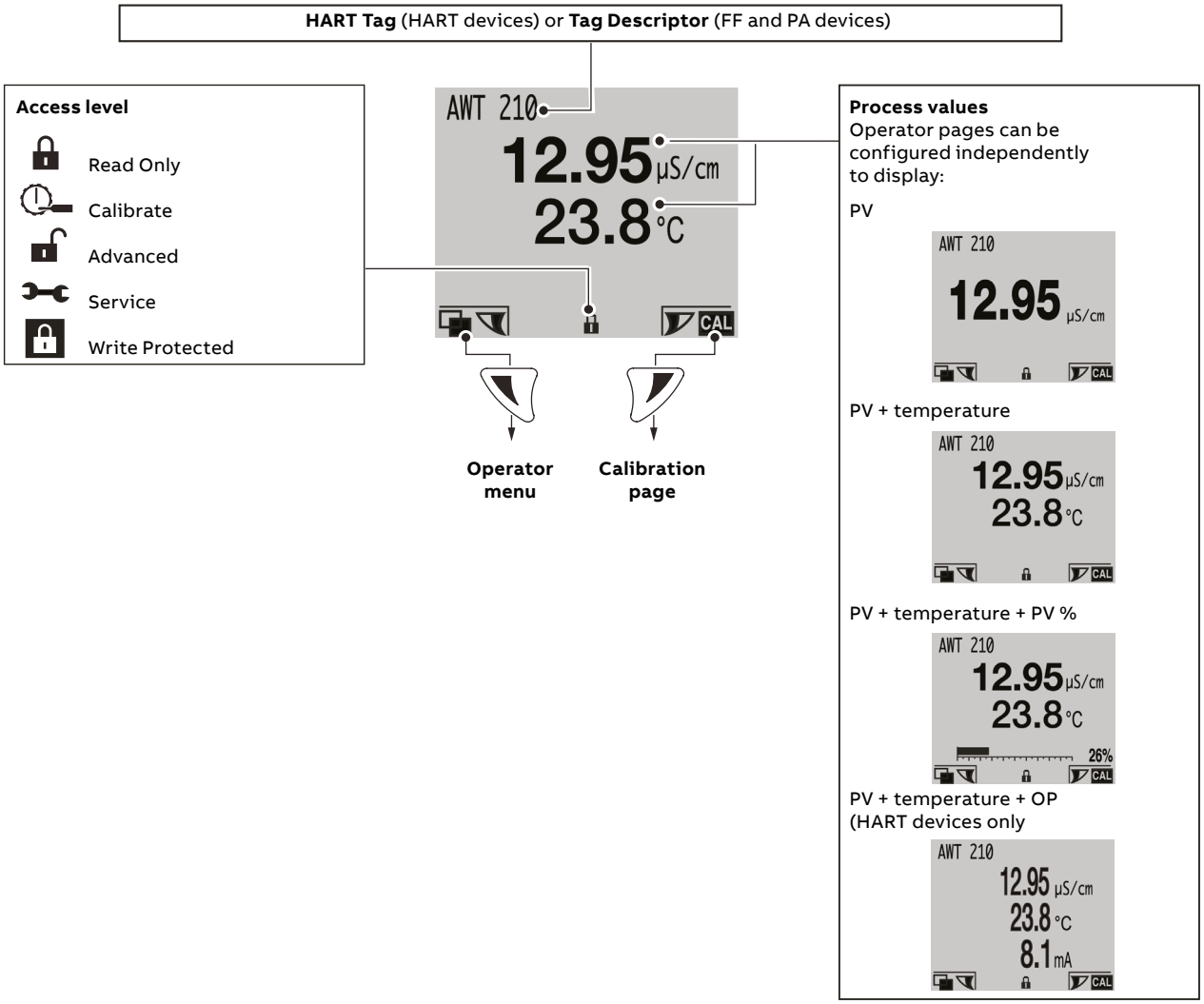


Figure 13 Example Operator pages – normal conditions

Note.
When the instrument starts, the **ABB Initializing** splash screen may show twice, or once, depending on the software version. Firstly, it shows when power is applied to the instrument, then it shows again when all subsystems have initialized. In some software versions, these actions are performed in a single operation.

Figure 14 The splash screen may show two times

...7 Operation

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.

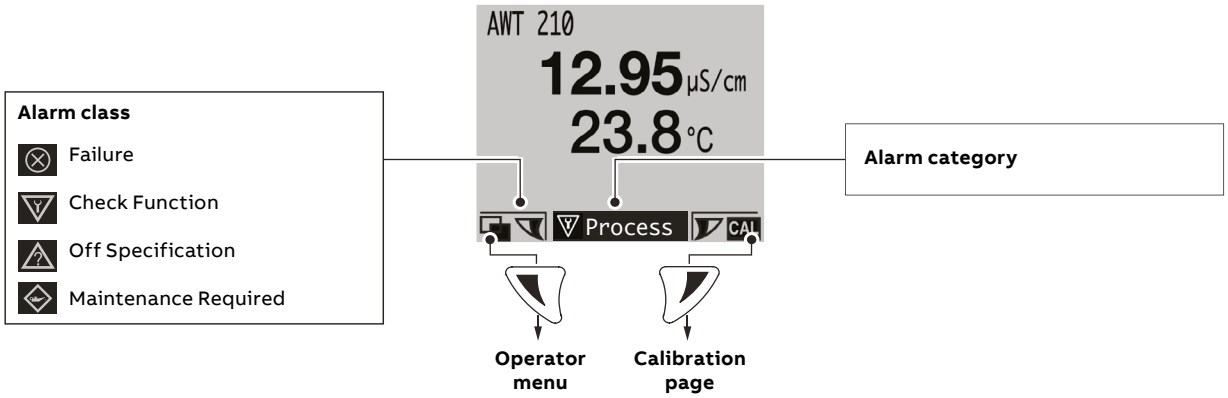
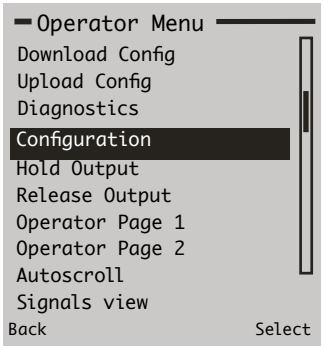


Figure 15 Example Operator pages – alarm conditions

Operator menu

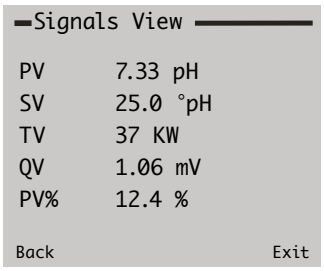
From the Operator menu, use the ▲ ▼ keys to highlight the required menu and press the ◤ key to select:



Operator menus comprise:

- **Download Config**: starts a download of sensor setup parameters from the transmitter to the sensor (available only if an EZLink sensor has been replaced by another of the same type).
- **Upload Config**: starts an upload of sensor setup parameters from a new sensor to the transmitter (available only if an EZLink sensor has been replaced by another of the same type).
- **Diagnostics**: displays a list of active diagnostic alarm messages in priority order – see page 26.
- **Configuration**: enters the Configuration level menus – see page 36.
- **Hold Output/Release Output**: Holds the current output at its current value. The output remains fixed until it is released (HART versions only).
- **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



Standard sensors

Signal	Sensor type pH	Sensor type 2-electrode conductivity 4-electrode conductivity Toroidal conductivity	Sensor type pH (EZLink)	Sensor type
PV	pH, ORP, Ion Conc or pION	Conductivity or concentration	Conductivity or concentration	Conductivity or Concentration
SV	Temperature	Temperature	Temperature	Temperature
TV	Reference impedance	Conductivity without temperature compensation	Conductivity without temperature compensation	Conductivity without temperature compensation
QV	Cell output (mV)	Conductivity	Conductivity	Conductivity
PV%	Primary variable percentage of engineering range	Primary variable percentage of engineering range	Primary variable percentage of engineering range	Primary variable percentage of engineering range
O/P	Current output (HART versions only)	Current output (HART versions only)	Current output (HART versions only)	Current output (HART versions only)

Table 16 Signals View/Sensor type values displayed

EZLink sensors

Signal	Sensor type pH	Sensor type Redox
PV	pH	Redox/ORP
SV	Temperature	—
TV	—	—
QV	Cell output (mV)	Conductivity
PV%	Primary variable percentage of engineering range	Primary variable percentage of engineering range
O/P	Current output (HART versions only)	Current output (HART versions only)

8 Diagnostic alarms

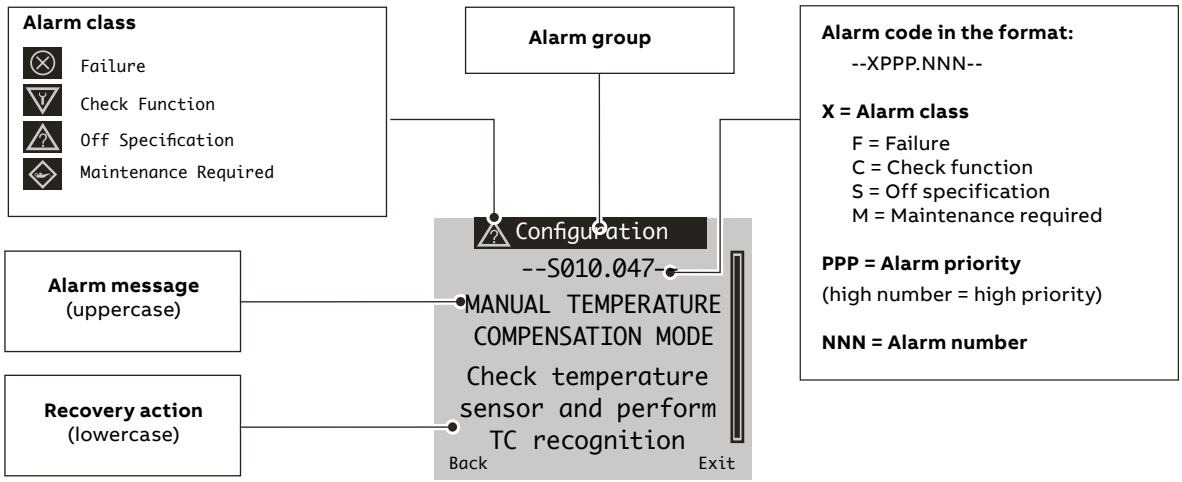


Figure 16 Example diagnostic alarm

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

Table 17 Diagnostic alarms

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

...Table 17 Diagnostic alarms

Diagnostic message	ALARM MESSAGE	Recovery action	pH	2-electrode conductivity	4-electrode conductivity	Toroidal conductivity	pH (EZLink)	HART	FF	PA
Process --M082.005--	SENSOR IS DIRTY	Clean sensor			✓			✓	✓	✓
Electronics --M081.006--	DIAGNOSTIC INPUT READ ERROR	Check terminals Check sensor wiring Check electrode			✓			✓	✓	✓
Electronics --M080.039--	LOW ELECTRODE IMPEDANCE	Check terminals Check sensor wiring Check electrode	✓				✓	✓	✓	✓
Process --S078.004--	PRIMARY VARIABLE OUTSIDE PHYS. LIMITS	Check sensor wiring Check configuration	✓	✓	✓	✓	✓	✓	✓	✓
Process --S076.010--	PRIMARY VARIABLE OUTSIDERANGE LIMITS	Adjust engineering range	✓	✓	✓	✓	✓	✓	✓	✓
Electronics --S074.001--	TEMPERATURE INPUT READ ERROR	Check sensor If problem persists change sensor module	✓	✓	✓	✓	✓	✓	✓	✓
Process --S072.011--	SENSOR TEMPERATURE OUTSIDE LIMITS	Check sensor wiring Check temperature configuration	✓	✓	✓	✓	✓	✓	✓	✓
Sensor --S068.043--	HIGH SENSOR EFFICIENCY (slope)	Check calibration Clean sensor Check sensor wiring	✓					✓	✓	✓
Sensor --F066.044--	LOW SENSOR EFFICIENCY (slope)	Check calibration Clean sensor Check sensor wiring	✓				✓	✓	✓	✓
Sensor --S064.045--	HIGH SENSOR OFFSET	Check calibration Clean sensor Check sensor wiring	✓					✓	✓	✓
Sensor --S062.046--	LOW SENSOR OFFSET	Check calibration Clean sensor Check sensor wiring	✓					✓	✓	✓
Electronics --M060.037--	DIAGNOSTIC INPUT READ ERROR	Check sensor wiring If problem persists change sensor module	✓					✓	✓	✓
Electronics --M056.002--	REFERENCE IMPEDANCE INPUT READ ERROR	Check sensor If problem persists change sensor module	✓					✓	✓	✓
Sensor --M054.012--	HIGH REFERENCE IMPEDANCE	Check sensor Check sensor wiring	✓					✓	✓	✓
Operation --M024.033--	POWER SUPPLY VOLTAGE OUTSIDE LIMITS	Trim output Ensure power supply voltage is within limits	✓	✓	✓	✓		✓		
Electronics --M023.036--	SENSOR MODULE VOLTAGE WARNING	Check sensor wiring If problem persists change sensor module	✓	✓	✓	✓		✓	✓	✓
Configuration --S010.047--	MANUAL TEMPERATURE COMPENSATION MODE	Check temperature sensor and perform TC recognition	✓	✓	✓	✓		✓	✓	✓

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 ◤ to enter the level.

Figure 17 Access level screen

Table 18 Access level menu details

Level	Access
Logout	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**.
Read Only	View all parameters in read-only mode.
Calibrate	Enables access and adjustment of **Calibrate** level only (calibration menus are sensor-specific).
Advanced	Enables configuration access to all parameters.
Service	Reserved for authorized service technicians only.

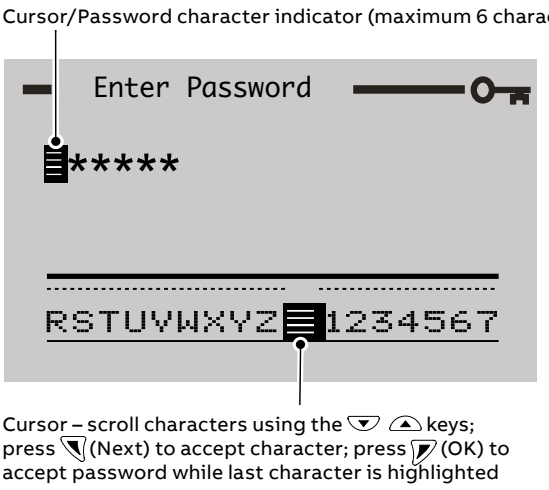


Figure 18 Enter password screen

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 is displayed – see page 23). 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 page 47**.**

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

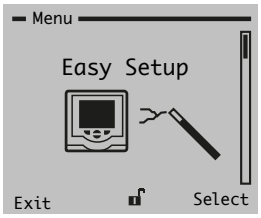
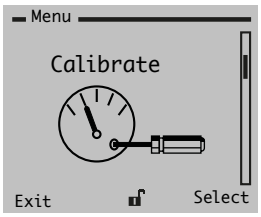
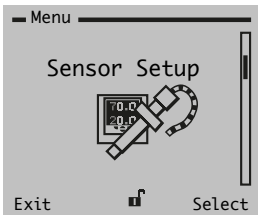
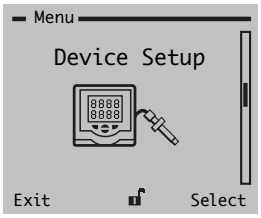
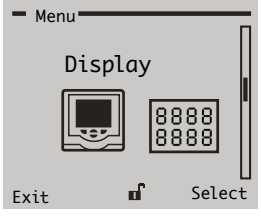
Password recovery

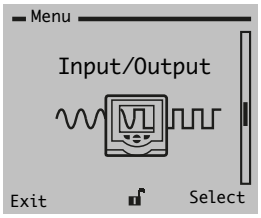
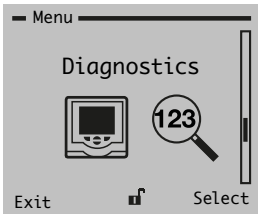
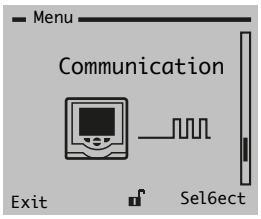
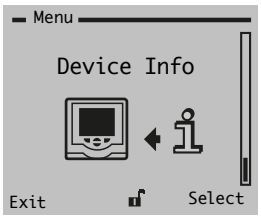
Advanced level password recovery
To recover the **Advanced** level password, move the **Write Protect** switch to the **OFF** position (see page 6). Select the **Service Access** level and enter the **Service** level password to gain access. From the **Service** level, the **Device Setup** menu can be 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 Appendix B, page 60. This resets all parameters including passwords.

10 Menu overview

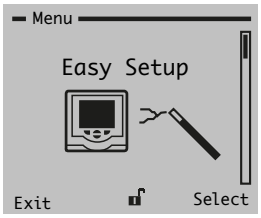
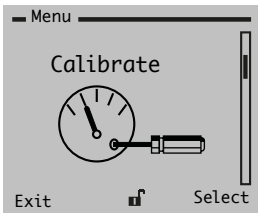
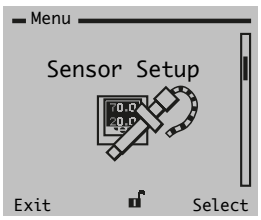
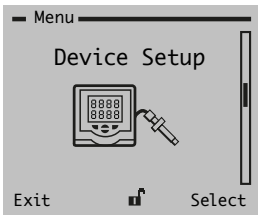
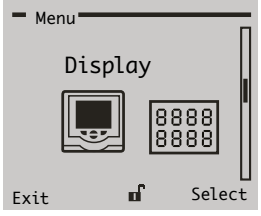
pH menus

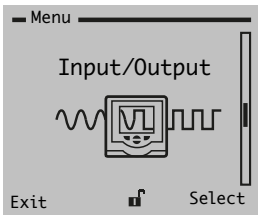
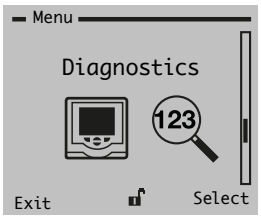
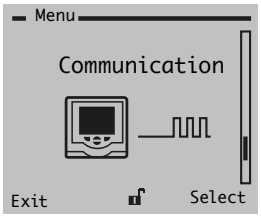
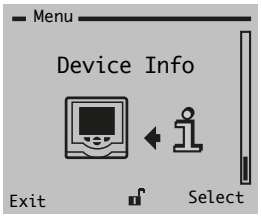
Level	pH
 See page 36	Language Measurement Type • pH Sensor Type – Isopotential Point – Asymmetric Potential • PV Unit • Valence • Magnitude • End Magnitude • End mV Temperature Units Temp. Comp. Type • Manual Temperature • Solution Coefficient Operator page 1
 See page 40	Automatic Buffer Cal. PV Manual Cal Temperature Cal Hold Output (HART only) • Auto Buffer Setup – Temperature Compensation Coefficient – Buffer Type – Buffer 1 Value – Buffer 2 Value – User Defined Buffer 1 – User Defined Buffer 2 Calibration Limits Edit Calibration Restore Defaults
 See page 43	Measurement Type • pH Sensor Type – Isopotential Point – Asymmetric Potential • PV Unit • Valence • Magnitude • End Magnitude • End mV Temperature Units Temperature Compensation Type • Manual Temperature • Solution Coefficient Temperature Sensor Type Detect Temperature Sensor
	Security Setup PDM Compatibility (HART only) Reset to defaults
	Operator Page 1 Operator Page 2 Contrast Language

Level	pH
	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)
	Sensor Diagnostics Reference Impedance Limit Diagnostic Status
	**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
	Sensor Type Device Serial No. Software Version

...10 Menu overview

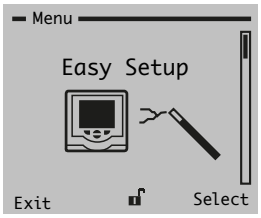
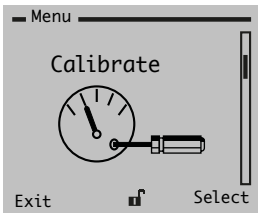
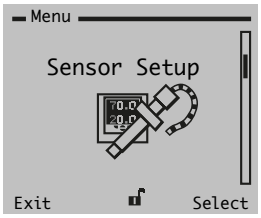
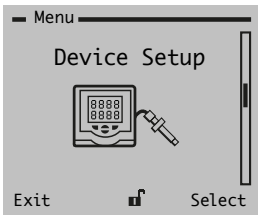
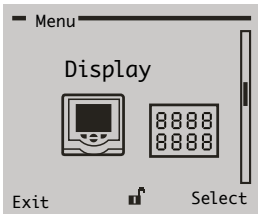
2-electrode conductivity menus

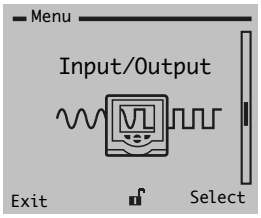
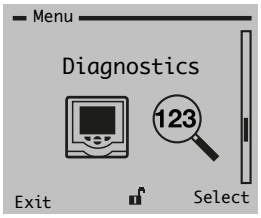
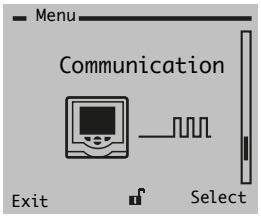
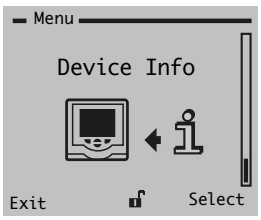
Level	2-electrode conductivity
 See page 37	Language Measurement Type Cell Constant • Concentration Units • Concentration Curve Name Temperature Units Operator page 1
 See page 41	Conductivity Calibration Concentration Calibration Temperature Calibration Hold Output (HART only) Edit Calibration Restore Defaults
 See page 44	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
	Security Setup PDM Compatibility (HART only) Reset to defaults
	Operator Page 1 Operator Page 2 Contrast Language

Level	2-electrode conductivity
	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)
	Sensor Diagnostics Diagnostic Status
	**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
	Sensor Type Device Serial No. Software Version

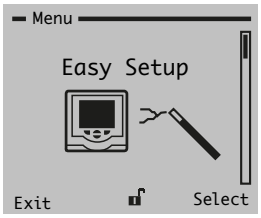
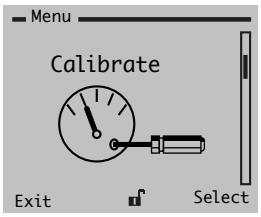
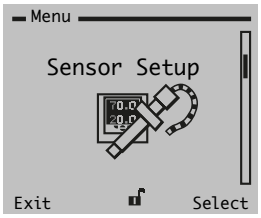
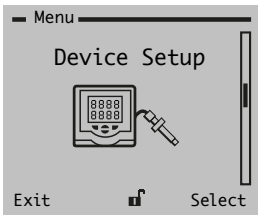
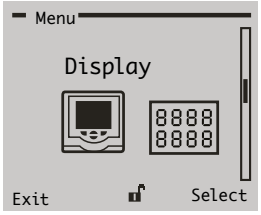
…10 Menu overview

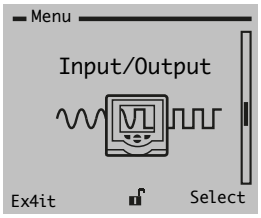
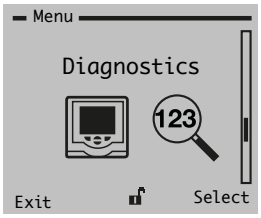
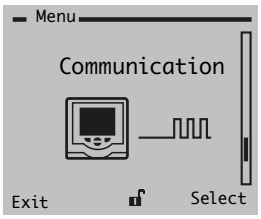
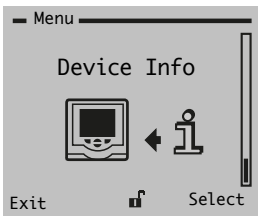
4-electrode conductivity menus

Level	4-electrode conductivity
	Language Measurement Type Sensor Group • Concentration Units • Concentration Curve Name Temperature Units Operator page 1
See page 30	
	• Conductivity Calibration • Concentration Calibration Temperature Calibration Hold Output (HART only) Edit Calibration Restore Defaults
See page 33	
	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
See page 37	
	Security Setup PDM Compatibility (HART only) Reset to defaults
	Operator Page 1 Operator Page 2 Contrast Language

Level	4-electrode conductivity
	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)
	Sensor Diagnostics Diagnostic Status
	**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
	Sensor Type Device Serial No. Software Version

Toroidal conductivity menus

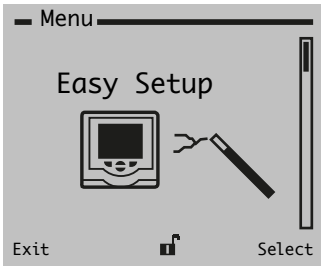
Level	Toroidal conductivity
	Language Measurement Type Concentration Solution • Concentration Units • Concentration Curve Name Temperature Units Operator page 1
See page 31	
	PV Zero Calibration PV Span Calibration Temperature Calibration Hold Output (HART only) Edit Calibration Restore Defaults
See page 34	
	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
See page 38	
	Security Setup PDM Compatibility (HART only) Reset to defaults
	Operator Page 1 Operator Page 2 Contrast Language

Level	Toroidal conductivity
	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)
	Sensor Diagnostics Diagnostic Status
	**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
	Sensor Type Device Serial No. Software Version

11 Configuration

Easy Setup

pH

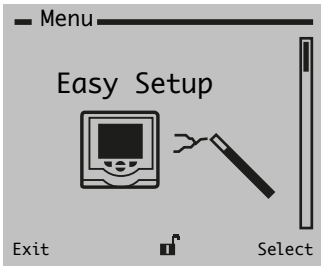


Used to setup standard parameters quickly.

Note. **Easy Setup** menus are sensor-specific – the menus in this section are applicable to transmitters connected to pH sensor types.

Menu	Comment	Default
Language	Selects the language to be displayed on screen: **English/German/French/Spanish/Italian/Polish/Chinese/Russian/Turkish/Portuguese** **Note**. The language options are displayed with localized spelling.	
Sensor Tag	Enter an alphanumeric sensor tag (16 characters max) to identify the sensor.	EZLink sensors only
Measurement Type	Selects a measurement type compatible with the connected sensor: **pH/ORP/Ion Conc/pION**	Read Only for EZLink sensors
pH Sensor Type	Select a measurement type compatible with the connected sensor: **Glass/Antimony/Custom**	Analog pH sensors only
Isopotential Pt.	Isopotential point. Enabled only if **Measurement Type** = **pH** and **pH Sensor Type** = **Custom**.	
Asymmetric Pot.	Asymmetric potential. Enabled only if **Measurement Type = pH** and **pH Sensor Type = Custom.**	
PV Unit	Sets the process value units. Enabled only if **Measurement Type = Ion Conc.** **%/ppm/ppb/µg/l/mg/l**	
Eng Range High	Set the Process value engineering range maximum value.	EZLink sensors only
Eng Range Low	Set the Process value engineering range minimum value.	EZLink sensors only
Filter	Select the signal filtering type: None/Low/Medium/High.	EZLink sensors only
Valence	The ion valence determines the millivolt change per decade of concentration. Enabled only if **Measurement Type = Ion Conc.** **–3/–2/–1/1/2/3**	
Magnitude	The number of magnitudes (ranging from 1 to 3) that define the ion concentration output. Enabled only if **Measurement Type** = **Ion Conc. 1/2/3**	
End Magnitude	The ion concentration state functions by associating an end millivolt value to an end magnitude value. Enabled only if **Measurement Type = Ion Conc.** **10/100/1000**	
End mV	The end millivolt value associated with the end magnitude value. Enabled only if **Measurement Type = Ion Conc**.	
Temp. Unit	Temperature unit displayed and applied to all temperature parameters/values. Not enabled if **Temperature Compensation Type = Manual**. **°F/°C**	
Temp. Comp. Type	Temperature compensation type – see page 59. **Manual/Auto/Auto Solution** **Note**. When **Auto** is selected and a temperature sensor is recognized, the temperature compensation calculation is based on the Nernst equation detailed on page 59. When **Auto Solution** is selected and a temperature sensor is provided with the probe, the calculation is based on the Nernst solution coefficient equation detailed in detailed on page 59. When **Manual** is enabled/selected, the value set in the **Manual Temp.** parameter is used for the referenced temperature compensation.	Auto (if valid temperature sensor recognized)
Manual Temp.	Temperature value used for compensation in **Temp Comp. Type/Manual** compensation mode. Enabled only if **Temperature Compensation Type = Manual.**	
pH Soln. Coeff.	Enabled only if **Measurement Type = pH** and **Temp. Comp. Type = Auto Solution**.	
mV Soln. Coeff.	Enabled only if **Measurement Type = pH** and **Temp. Comp. Type = Auto.**	
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.	EZLink sensors only
Operator Page 1	Selects range of values displayed on **Operator Page 1** – see page 56 for examples of character formats/sizes. **PV/PV + Temperature/PV + Temp + PV%/PV + Temp + O/P**	

2-electrode conductivity



Used to setup standard parameters quickly.

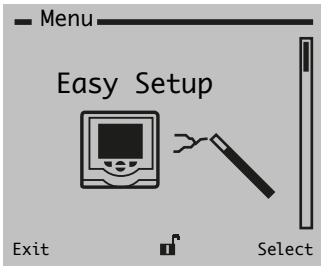
Note. **Easy Setup** menus are sensor-specific – the menus in this section are applicable to transmitters connected to 2-electrode conductivity sensor types.

Menu	Comment	Default
Language	Selects the language to be displayed on screen: **English/German/French/Spanish/Italian/Polish/Chinese/Russian/Turkish/Portuguese** **Note**. The language options are displayed with localized spelling.	
Measurement Type	Selects a measurement type compatible with the connected sensor: **Conductivity/Concentration**	
Cell Constant	**Used to adjust the slope of the calculation graph.** **The design of the conductivity sensor determines the sensor constant (usually k = 1).**	
Conc. Unit	Sets the process value units. Enabled only if **Measurement Type = Concentration**. **%/ppm/ppb/µg/l/mg/l**	
Conc. Curve Name	Enabled only if **Measurement Type = Concentration**.	
Temp. Unit	Temperature unit displayed and applied to all temperature parameters/values. Not enabled if **Temperature Compensation Type = Manual**. **°F/°C**	
Operator Page 1	Selects range of values displayed on **Operator Page 1** – see page 56 for examples of character formats/sizes. **PV/PV + Temperature/PV + Temp + PV%/PV + Temp + O/P**	

…11 Configuration

… Easy Setup

4-electrode conductivity

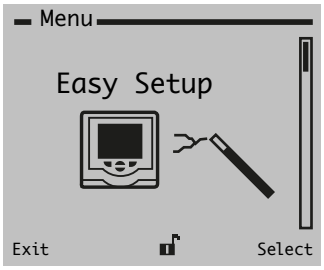


Used to setup standard parameters quickly.

Note. **Easy Setup** menus are sensor-specific – the menus in this section are applicable to transmitters connected to 4-electrode conductivity sensor types.

Menu	Comment	Default
Language	Selects the language to be displayed on screen: **English/German/French/Spanish/Italian/Polish/Chinese/Russian/Turkish/Portuguese** **Note**. The language options are displayed with localized spelling.	
Measurement Type	Selects a measurement type compatible with the connected sensor: **Conductivity/Concentration**	
Sensor Group	**A/B**	
Conc. Solution	Enabled only if **Measurement Type = Concentration**. **0-15% NaOH/0-20% NaCl/0-18% HCl/0-20% H2SO4/User Defined**	
Conc. Unit	Sets the process value units. Enabled only if **Measurement Type = Concentration**. **%/ppm/ppb/µg/l/mg/l**	
Conc. Curve Name	Enabled only if **Measurement Type = Concentration**.	
Temp. Unit	Temperature unit displayed and applied to all temperature parameters/values. Not enabled if **Temperature Compensation Type = Manual**. **°F/°C**	
Operator Page 1	Selects range of values displayed on **Operator Page 1** – see page 56 for examples of character formats/sizes. **PV/PV + Temperature/PV + Temp + PV%/PV + Temp + O/P**	

Toroidal conductivity



Used to setup standard parameters quickly.

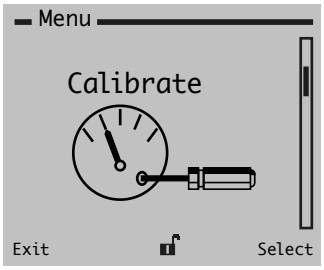
Note. **Easy Setup** menus are sensor-specific – the menus in this section are applicable to transmitters connected to toroidal conductivity sensor types.

Menu	Comment	Default
Language	Selects the language to be displayed on screen: **English/German/French/Spanish/Italian/Polish/Chinese/Russian/Turkish/Portuguese** **Note**. The language options are displayed with localized spelling.	
Measurement Type	Selects a measurement type compatible with the connected sensor: **Conductivity/Concentration**	
Cell Solution	Enabled only if **Measurement Type = Concentration**. **0-15% NaOH/0-20% NaCl/0-18% HCl/0-20% H2SO4/User Defined**	
Conc. Unit	Sets the process value units. Enabled only if **Measurement Type = Concentration**. **%/ppm/ppb/µg/l/mg/l**	
Conc. Curve Name	Enabled only if **Measurement Type = Concentration**.	
Temp. Unit	Temperature unit displayed and applied to all temperature parameters/values. Not enabled if **Temperature Compensation Type = Manual**. **°F/°C**	
Operator Page 1	Selects range of values displayed on **Operator Page 1** – see page 56 for examples of character formats/sizes. **PV/PV + Temperature/PV + Temp + PV%/PV + Temp + O/P**	

…11 Configuration

Calibrate

pH



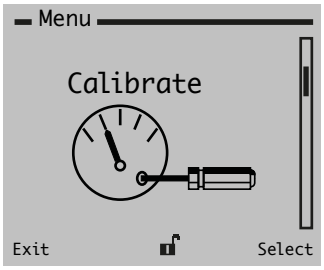
Used to calibrate the sensor.

Note. **Calibrate** menus are sensor-specific – the menus in this section are applicable to transmitters connected to pH sensor types.

Access to the **Calibrate** menu is permitted via the **Calibrate** and **Advanced** levels or directly from an **Operator** page using the **Cal** button.

Menu	Comment	Default
Auto Buffer Cal	Enabled only if **Measurement Type = pH.**	
PV Manual Cal		
1 Point Cal **2 Point Cal**		
Temperature Cal		
Hold Output	HART versions only. Not available if HART in **Multidrop** or **Fixed Output** mode. **Disabled/Enabled.** When **Enabled:** output is held automatically at the beginning of a PV calibration and released automatically at the end. When **Disabled:** output remains active throughout any PV calibration.	
Auto Buffer Setup		
Buffer Type	**User Def/ABB/NIST/DIN 19266/MERCK/US Tech.** **(MERCK Not available for EZLink sensors.)**	
Buffer 1 Value	Enabled only if **Buffer Type = User Def.** Available selections based on **Buffer Type:** **ABB 4.01 pH/ABB 7.00 pH/ABB 9.18 pH/MERCK 4.00 pH/MERCK 7.00 pH/MERCK 9.00 pH/MERCK 10.00 pH/DIN 1.68 pH/DIN 4.01 pH/DIN 6.86 pH/DIN 9.18 pH/US TECH 4.01 pH/US TECH 7.00 pH/US TECH 10.01 pH/NIST 4.01 pH/NIST 6.86 pH/NIST 9.18 pH**	
Buffer 2 Value	Enabled only if **Buffer Type = User Def.** Available selections based on **Buffer Type:** **ABB 4.01 pH/ABB 7.00 pH/ABB 9.18 pH/MERCK 4.00 pH/MERCK 7.00 pH/MERCK 9.00 pH/MERCK 10.00 pH/DIN 1.68 pH/DIN 4.01 pH/DIN 6.86 pH/DIN 9.18 pH/US TECH 4.01 pH/US TECH 7.00 pH/US TECH 10.01 pH/NIST 4.01 pH/NIST 6.86 pH/NIST 9.18 pH**	
User Def Buffer 1	Enabled only if **Buffer Type = User Def.** **X1 Temp./Y1 pH/X2 Temp./Y2 pH/X3 Temp./Y3 pH/X4 Temp./Y4 pH/X5 Temp./Y5 pH/Table Error**	
User Def Buffer 2	Enabled only if **Buffer Type = User Def.** **X1 Temp./Y1 pH/X2 Temp./Y2 pH/X3 Temp./Y3 pH/X4 Temp./Y4 pH/X5 Temp./Y5 pH/Table Error**	
Cal Limits		
Slope High Limit **Slope Low Limit** **Offset Limit +/–**		
Edit Cal		
PV Slope		
PV Offset		
Temp Slope		
Temp Offset		
Restore Defaults		

2-electrode conductivity



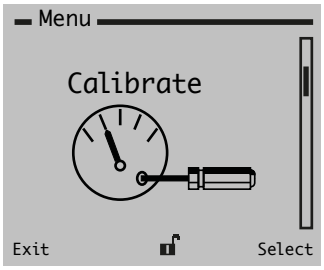
Used to calibrate the sensor.

Note. **Calibrate** menus are sensor-specific – the menus in this section are applicable to transmitters connected to 2-electrode conductivity sensor types.

Access to the **Calibrate** menu is permitted via the **Calibrate** and **Advanced** levels or directly from an **Operator** page using the **Cal** button.

Menu	Comment	Default
Conductivity Cal	Enabled only if **Measurement Type = Conductivity.**	
Concentration Cal	Enabled only if **Measurement Type = Concentration.**	
Temperature Cal		
Hold Output	HART versions only. Not available if HART in **Multidrop** or **Fixed Output** mode. **Disabled/Enabled.** When **Enabled:** output is held automatically at the beginning of a PV calibration and released automatically at the end. When **Disabled:** output remains active throughout any PV calibration.	
Edit Cal		
PV Slope		
PV Offset		
Temp Slope		
Temp Offset		
Restore Defaults		

4-electrode conductivity



Used to calibrate the sensor.

Note. **Calibrate** menus are sensor-specific – the menus in this section are applicable to transmitters connected to 4-electrode conductivity sensor types.

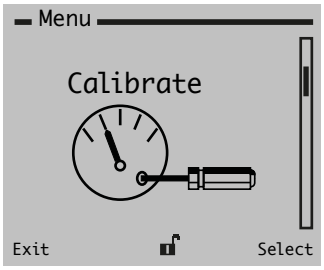
Access to the **Calibrate** menu is permitted via the **Calibrate** and **Advanced** levels or directly from an **Operator** page using the **Cal** button.

Menu	Comment	Default
Conductivity Cal	Enabled only if **Measurement Type = Conductivity.**	
Concentration Cal	Enabled only if **Measurement Type = Concentration.**	
Temperature Cal		
Hold Output	HART versions only. Not available if HART in **Multidrop** or **Fixed Output** mode. **Disabled/Enabled.** When **Enabled:** output is held automatically at the beginning of a PV calibration and released automatically at the end. When **Disabled:** output remains active throughout any PV calibration.	
Edit Cal		
PV Slope		
PV Offset		
Temp Slope		
Temp Offset		
Restore Defaults		

…11 Configuration

… Calibrate

Toroidal conductivity



Used to calibrate the sensor.

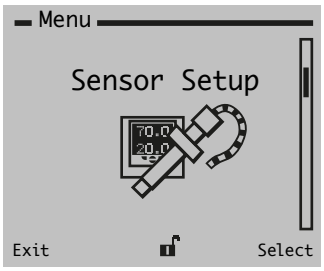
Note. **Calibrate** menus are sensor-specific – the menus in this section are applicable to transmitters connected to toroidal conductivity sensor types.

Access to the **Calibrate** menu is permitted via the **Calibrate** and **Advanced** levels or directly from an **Operator** page using the **Cal** button.

Menu	Comment	Default
PV Zero Cal		
PV Span Cal		
Temperature Cal		
Hold Output	HART versions only. Not available if HART in **Multidrop** or **Fixed Output** mode. **Disabled/Enabled.** When **Enabled:** output is held automatically at the beginning of a PV calibration and released automatically at the end. When **Disabled:** output remains active throughout any PV calibration.	
Edit Cal		
PV Slope **PV Offset** **Temp Slope** **Temp Offset**		
Restore Defaults		

Sensor Setup

pH



Used to access standard setup parameters.

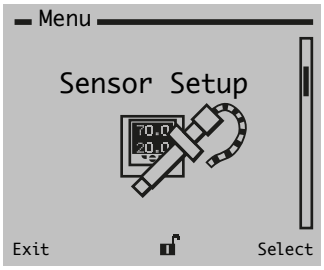
Note. **Sensor Setup** menus are sensor-specific – the menus in this section are applicable to transmitters connected to pH sensor types.

Menu	Comment	Default
Sensor Tag	Enter an alphanumeric sensor tag (16-characters maximum) to identify the sensor. (EZLink sensors only.)	
Measurement Type	Selects a measurement type compatible with the connected sensor, (Read Only for EZLink sensors): **pH/ORP/Ion Conc/pION**	
pH Sensor Type	Enabled only if **Measurement Type = pH**. (Read Only for EZLink sensors). Select a measurement type compatible with the connected sensor: **Glass/Antimony/Custom**	
Filter	Select the signal filtering type (EZLink sensors only). **None/Low/Medium/High**	
PV Unit	Enabled only if **Measurement Type = Ion Conc**. Sets the process value units. **%/ppm/ppb/µg/l/mg/l**	
Isopotential Pt.	Isopotential point. Enabled only if **Measurement Type = pH** and **pH Sensor Type = Custom**.	
Asymmetric Pot.	Asymmetric potential. Enabled only if **Measurement Type = pH** and **pH Sensor Type = Custom**.	
Valence	The ion valence determines the millivolt change per decade of concentration. Enabled only if **Measurement Type = Ion Conc**. **–3/–2/–1/1/2/3**	
Magnitude	The number of magnitudes (ranging from 1 to 3) that define the ion concentration output. Enabled only if **Measurement Type = Ion Conc**. **1/2/3**	
End Magnitude	The ion concentration state functions by associating an end millivolt value to an end magnitude value. Enabled only if **Measurement Type = Ion Conc**. **10/100/1000**	
End mV	The end millivolt value associated with the end magnitude value. Enabled only if **Measurement Type = Ion Conc**.	
Temp. Unit	Temperature unit displayed and applied to all temperature parameters/values. No temperature settings will appear for a digital Redox sensor. **°F/°C**	
Temp. Comp. Type	Temperature compensation type – see page 59. **Manual/Auto/Auto Solution** **Note**. When **Auto** is selected and a temperature sensor is recognized, the temperature compensation calculation is based on the Nernst equation detailed on page 59. When **Auto Solution** is selected and a temperature sensor is provided with the probe, the calculation is based on the Nernst solution coefficient equation detailed in detailed on page 59. When **Manual** is enabled/selected, the value set in the **Manual Temp**. parameter is used for the referenced temperature compensation.	Auto (if valid temperature sensor recognized)
Manual Temp.	Temperature value used for compensation when **Temp Comp. Type = Manual** compensation mode. Enabled only if **Temperature Compensation Type = Manual**.	
pH Soln. Coeff.	Enabled only if **Measurement Type = pH** and **Temp. Comp. Type = Auto Solution.**	
mV Soln. Coeff.	Enabled only if **Measurement Type ≠ pH** and **Temp. Comp. Type = Auto**.	
Temp. Sensor Type	Read-only/analog pH sensors only. **3K Balco 2-wire/3K Balco 3-wire/PT 100 2-wire/PT 100 3-wire/PT 1000 2-wire/PT 1000 3-wire/None**	
Detect TC Type	Analog pH sensors only.	
Reset Configuration	Select to reset all Sensor Setup parameters to their default values. (EZLink sensors only.)	

…11 Configuration

… Sensor Setup

2-electrode conductivity

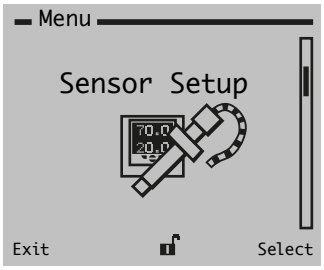


Used to access standard setup parameters.

Note. **Sensor Setup** menus are sensor-specific – the menus in this section are applicable to transmitters connected to 2-electrode conductivity sensor types.

Menu	Comment	Default
Measurement Type	Selects a measurement type compatible with the connected sensor: **Conductivity/Concentration**	
Cell Constant		
Conc. Unit	Sets the process value units. Enabled only if **Measurement Type = Concentration.** **%/ppm/ppb/µg/l/mg/l**	
Conductivity Unit	Enabled only if **Measurement Type = Conductivity.** **Auto/µS/cm/mS/cm**	
Conc. Curve Name	Enabled only if **Measurement Type = Concentration**.	
Conc. Curve Table	Enabled only if **Measurement Type = Concentration.** **X1 Cond/Y1 Conc/X2 Cond/Y2 Conc/X3 Cond/Y3 Conc/** **X4 Cond/Y4 Conc/X5 Cond/Y5 Conc/X6 Cond/Y6 Conc/Table Error**	
None **Not Saved**		
Temp. Unit	Temperature unit displayed and applied to all temperature parameters/values. **°F/°C**	
Temp. Comp. Type	**Manual/Auto**	
Manual Temp.	Enabled only if **Temp. Comp. Type = Manual**.	
Auto TC Option	Enabled only if **Temp. Comp. Type = Auto.** **Standard KCl/TC Coeff./Pure H2O/User Def. TC**	
TC Coeff.	Enabled only if **Temp. Comp. Type** = **Auto** and **Auto TC Option = TC Coeff**.	
Pure H2O Type	Enabled only if **Temp. Comp. Type = Auto** and **Auto TC Option = Pure H2O.** **Neutral/Acid./Base**	
User Def. TC Curve	Enabled only if **Temp. Comp. Type = Auto** and **Auto TC Option = User Def. TC.** **X1 Temp/Y1 K/Kref/X2 Temp/Y2 K/Kref/X3 Temp/Y3 K/Kref/** **X4 Temp/Y4 K/Kref/X5 Temp/Y5 K/Kref/X6 Temp/Y6 K/Kref/Table Error**	
None **Not Saved**		
Reference Temp.		
Temp. Sensor Type	Read-only. **3K Balco 2-wire/3K Balco 3-wire/PT 100 2-wire/PT 100 3-wire/PT 1000 2-wire/PT 1000 3-wire/None**	
Detect TC Type		
TC Detection Status	**Read Only/Not Recognized/Recognized**	

4-electrode conductivity



Used to access standard setup parameters.

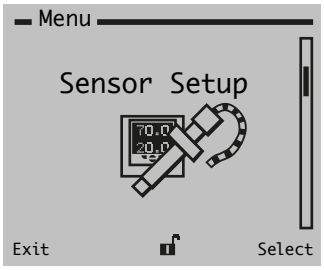
Note. **Sensor Setup** menus are sensor-specific – the menus in this section are applicable to transmitters connected to 4-electrode conductivity sensor types.

Menu	Comment	Default
Measurement Type	Selects a measurement type compatible with the connected sensor: **Conductivity/Concentration**	
Sensor Group	**A/B**	
Conc. Solution	Enabled only if **Measurement Type = Concentration.** **0-15% NaOH/0-20% NaCl/0-18% HCl/0-20% H2SO4/User Defined**	
Conc. Unit	Sets the process value units. Enabled only if **Measurement Type = Concentration.** **%/ppm/ppb/µg/l/mg/l**	
Conductivity Unit	Enabled only if **Measurement Type = Conductivity.** **Auto/µS/cm/mS/cm**	
Conc. Curve Name	Enabled only if **Measurement Type = Concentration.**	
Conc. Curve Table	Enabled only if **Measurement Type = Concentration.** **X1 Cond/Y1 Conc/X2 Cond/Y2 Conc/X3 Cond/Y3 Conc/** **X4 Cond/Y4 Conc/X5 Cond/Y5 Conc/X6 Cond/Y6 Conc/Table Error**	
None **Not Saved**		
Temp. Unit	Temperature unit displayed and applied to all temperature parameters/values. **°F/°C**	
Temp. Comp. Type	**Manual/Auto**	
Manual Temp.	Enabled only if **Temp. Comp. Type = Manual.**	
Auto TC Option	Enabled only if **Temp. Comp. Type = Auto.** **Standard KCl/TC Coeff./NaOH/NaCl/HCl/H2SO4/User Def. TC**	
TC Coeff.	Enabled only if **Temp. Comp. Type** = **Auto** and **Auto TC Option = TC Coeff.**	
User Def. TC Curve	Enabled only if **Temp. Comp. Type = Auto** and **Auto TC Option = User Def. TC.** **X1 Temp/Y1 K/Kref/X2 Temp/Y2 K/Kref/X3 Temp/Y3 K/Kref/** **X4 Temp/Y4 K/Kref/X5 Temp/Y5 K/Kref/X6 Temp/Y6 K/Kref/Table Error**	
None **Not Saved**		
Reference Temp.		
Temp. Sensor Type	Read-only. **3K Balco 2-wire/3K Balco 3-wire/PT 100 2-wire/PT 100 3-wire/PT 1000 2-wire/PT 1000 3-wire/None**	
Detect TC Type		
TC Detection Status	**Read Only/Not Recognized/Recognized**	

…11 Configuration

… Sensor Setup

Toroidal conductivity

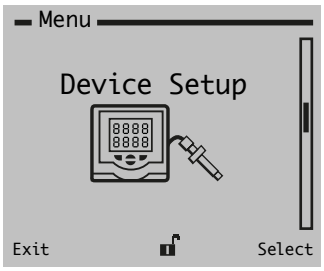


Used to access standard setup parameters.

Note. **Sensor Setup** menus are sensor-specific – the menus in this section are applicable to transmitters connected to toroidal conductivity sensor types.

Menu	Comment	Default
Measurement Type	Selects a measurement type compatible with the connected sensor: **Conductivity/Concentration**	
Conc. Solution	Enabled only if **Measurement Type = Concentration.** **0-15% NaOH/0-20% NaCl/0-18% HCl/0-20% H2SO4/User Defined**	
Conc. Unit	Sets the process value units. Enabled only if **Measurement Type = Concentration.** **%/ppm/ppb/µg/l/mg/l**	
Conductivity Unit	Enabled only if **Measurement Type = Conductivity.** **Auto/µS/cm/mS/cm**	
Conc. Curve Name	Enabled only if **Measurement Type = Concentration.**	
Conc. Curve Table	Enabled only if **Measurement Type = Concentration.** **X1 Cond/Y1 Conc/X2 Cond/Y2 Conc/X3 Cond/Y3 Conc/** **X4 Cond/Y4 Conc/X5 Cond/Y5 Conc/X6 Cond/Y6 Conc/Table Error**	
None **Not Saved**		
Temp. Unit	Temperature unit displayed and applied to all temperature parameters/values. **°F/°C**	
Temp. Comp. Type	**Manual/Auto**	
Manual Temp.	Enabled only if **Temp. Comp. Type = Manual.**	
Auto TC Option	Enabled only if **Temp. Comp. Type = Auto.** **Standard KCl/TC Coeff./NaOH/NaCl/HCl/H2SO4/User Def. TC**	
TC Coeff.	Enabled only if **Temp. Comp. Type** = **Auto** and **Auto TC Option = TC Coeff.**	
User Def. TC Curve	Enabled only if **Temp. Comp. Type = Auto** and **Auto TC Option = User Def. TC.** **X1 Temp/Y1 K/Kref/X2 Temp/Y2 K/Kref/X3 Temp/Y3 K/Kref/** **X4 Temp/Y4 K/Kref/X5 Temp/Y5 K/Kref/X6 Temp/Y6 K/Kref/Table Error**	
None **Not Saved**		
Reference Temp.		
Temp. Sensor Type	Read-only. **3K Balco 2-wire/3K Balco 3-wire/PT 100 2-wire/PT 100 3-wire/PT 1000 2-wire/PT 1000 3-wire/None**	
Detect TC Type		
TC Detection Status	**Read Only/Not Recognized/Recognized**	

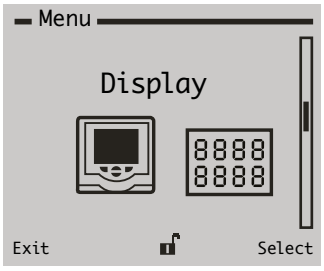
Device Setup



Used to setup security parameters, set PDM compatibility (for HART-enable transmitters) and to reset default (factory-set) parameters.

Menu	Comment	Default
Security Setup		
HW Write Prot.	Read-only. **Disabled/Enabled**	
SW Write Prot.	**Disabled/Enabled**	
Calibrate Password	Available only at **Advanced** access level.	
Advanced Password	Available only at **Advanced** access level.	
HART Login	Enabled for HART versions only. **Disabled/Enabled**	
PDM Compatibility	Available for HART versions only. Enable this option if the device is connected to Siemens Simatic PDM. **Disabled/Enabled**	
Reset To Defaults	Available only at **Advanced** access level.	

Display

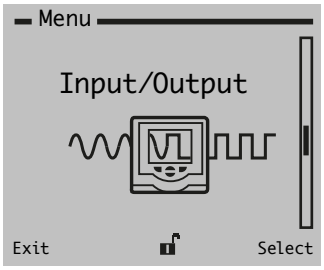


Used to setup **Operator pages (1, 2)**, select the display language and set the display contrast.

Menu	Comment	Default
Operator Page 1	Selects range of values displayed on Operator Page 1 – see page 23 for examples of character formats/sizes. **PV/PV + Temperature/PV + Temp + PV%/PV + Temp + O/P**	
Operator Page 2	Selects range of values displayed on Operator Page 2 – see page 23 for examples of character formats/sizes. **PV/PV + Temperature/PV + Temp + PV%/PV + Temp + O/P**	
Contrast	Adjust contrast of display.	
Language	Selects the language to be displayed on screen: **English/German/French/Spanish/Italian/Polish/Chinese/Russian/Turkish/Portuguese** **Note**. Language options are displayed with localized spelling.	

...11 Configuration

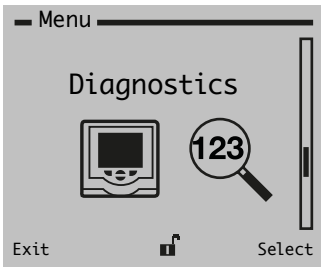
Input/Output



Used to configure input/output values.

Menu	Comment	Default
Eng. Low	pH devices – cannot be edited if **Measurement Type = Ion Concentration**. Conductivity devices cannot be edited if **Measurement Type = Concentration**. See **Easy Setup** (page 36) or **Sensor Setup** (page 43) levels for the associated sensor type.	
Eng. High	pH devices – cannot be edited if **Measurement Type = Ion Concentration**. Conductivity devices cannot be edited if **Measurement Type = Concentration**. See **Easy Setup** (page 36) or **Sensor Setup** (page 43) levels for the associated sensor type.	
Damping		
Fault Current	HART only. **High/Low**	
Output Type	HART only. **Linear/Function-Generator**	
Function-gen Table	HART only. Enabled only if **Output Type = Function-Generator.** **X1/Y1/X2/Y2/X3/Y3/X4/Y4/X5/Y5/Table Error**	
None **Not Saved**		
Trim 4mA	HART only. Not available if HART in multidrop or fixed output mode.	
Trim 20mA	HART only. Not available if HART in multidrop or fixed output mode.	
Loop Test	HART only. Not available if HART in multidrop or fixed output mode.	

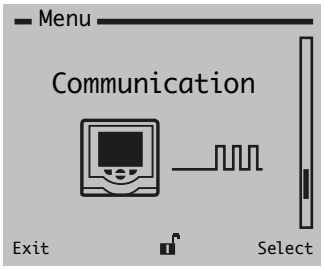
Diagnostics



See page 26 for all diagnostic messages/actions.

Menu	Comment	Default
Sensor Diagnostics	pH, 2-electrode conductivity, 4-electrode conductivity only. **Disabled/Enabled**	
Reference Imp. Limit	pH only. Enabled only if Sensor Diagnostics = **Enabled**. **Disabled/Enabled**	
Diagnosis Status	Read-only. **Actual/Simulated**	

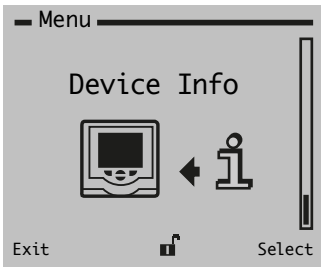
Communication



Communication level menus are enabled only if an optional communications module is fitted.

Refer to the communications supplementary manuals for full details of Profibus, MODBUS and HART connections and configuration together with tables detailing Profibus slot/indexes and MODBUS coils and registers.

Device Info



Displays read-only factory-set details for the transmitter software and connected sensor(s).

Menu	Comment	Default
Sensor type	Analog sensors Only **Read-only** Unknown/pH Probe/4-Wire Cond./2-Wire Cond./Toroidal Cond.	
Software version	**Read-only**	
Hardware version	**Read-only**	
Sensor info	EZLink sensor only	
Sensor type	**Read-only**	
Serial number	**Read-only**	
Comms errors	**Read-only**	
pH sensor model	**Read-only**	
Glass type	**Read-only**	

12 Calibration

pH sensor calibration

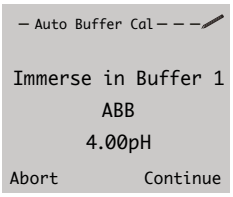
Auto Buffer Cal

Performs a 2 point calibration using 2 pre-defined buffer solutions – see **Auto Buffer Setup**, page 40.

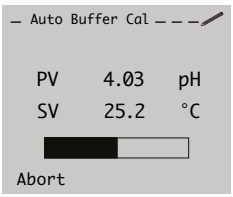
Available only if **Measurement Type = pH**.

1 Immerse in Buffer 1
The details of buffer solution 1 are displayed.

Immerse the sensor in the buffer solution and press ◩ to continue.

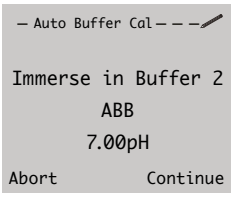


2 Monitoring (Buffer 1)
Live process values are displayed. The progress of the process value stability check is indicated on the progress bar. The procedure moves automatically to the next stage upon completion.



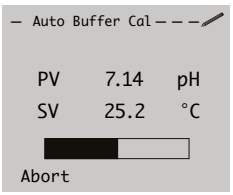
3 Immerse in Buffer 2
The details of buffer solution 2 are displayed.

Immerse the sensor in the buffer solution and press ◩ to continue.



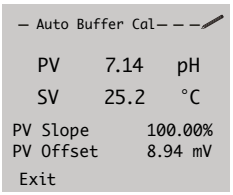
4 Monitoring (Buffer 2)

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.

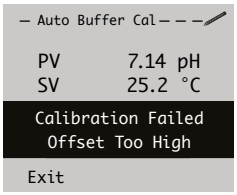


5 Completion

Following a successful calibration the calculated coefficients are displayed.



Following an unsuccessful calibration the reason for failure is displayed.



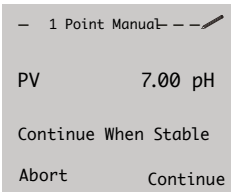
...12 Calibration

...pH sensor calibration

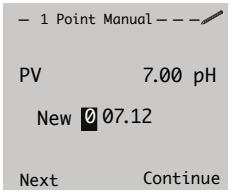
1-point manual calibration

Performs a manual calibration (Offset adjustment) at a single reference point.

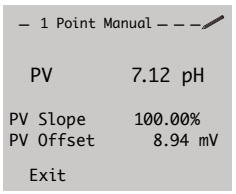
1 Wait for stable reading
Monitor the process value and continue (▽) to the next step once the value has stabilized.



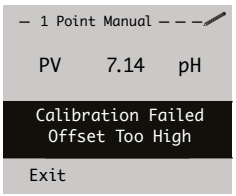
2 Enter the new value
Enter the desired PV value by pressing the ◁ key to move the cursor and the △ ▽ keys to change the value. When the new value has been entered press the ▽ key to continue.



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



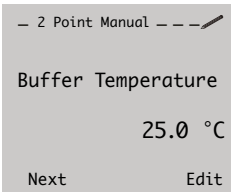
Following an unsuccessful calibration the reason for failure is displayed.



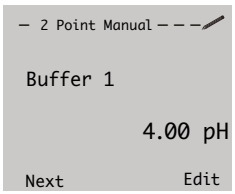
2-point manual calibration

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

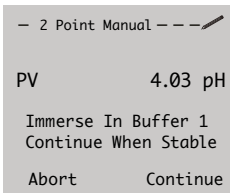
1 Buffer temperature
The temperature of the buffer solutions is displayed. The temperature can be edited by pressing the ▽ key. When the buffer temperature is correct press the ◁ key to continue.



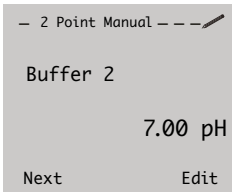
2 Buffer 1 value
The value of the 1st buffer solution is displayed. The value can be edited by pressing the ▽ key. When the buffer value is correct press the ◁ key to continue.



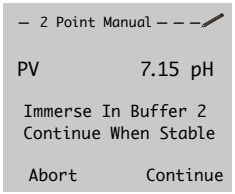
3 Wait for stable reading – 1st buffer solution
Immerse the sensor in the buffer solution, monitor the process value and continue ▽ to the next step once the value has stabilized.



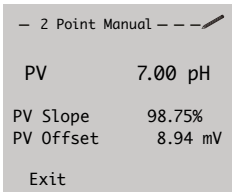
4 Buffer 2 value
The value of the 2nd buffer solution is displayed. The value can be edited by pressing the ▽ key. When the buffer value is correct press the ◁ key to continue.



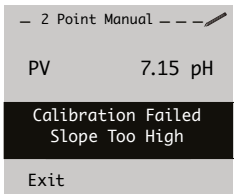
5 Wait for stable reading – 2nd buffer solution
Immerse the sensor in the buffer solution, monitor the process value and continue ▽ to the next step once the value has stabilized.



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



Following an unsuccessful calibration the reason for failure is displayed.



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 µS/cm the **PV Offset** is recalculated.
- If the calibration is performed at a conductivity value ≥0.2 µS/cm the **PV Slope** is recalculated.

For cell constants from 0.055 to 0.299

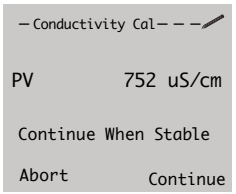
- If the calibration is performed at a conductivity value <1 µS/cm the **PV Offset** is recalculated.
- If the calibration is performed at a conductivity value ≥1 µS/cm the **PV Slope** is recalculated.

For cell constants from 0.3 to 1.999

- 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.

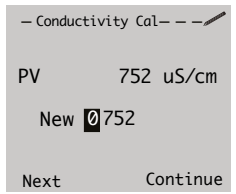
1 Wait for stable reading

Monitor the process value and continue (▽) to the next step once the value has stabilized.



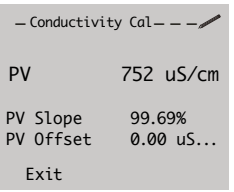
2 Enter the new value

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.

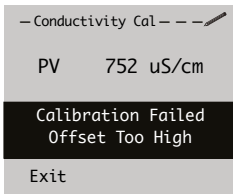


3 Completion

Following a successful calibration the calculated coefficients are displayed.



Following an unsuccessful calibration the reason for failure is displayed.



...12 Calibration

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.

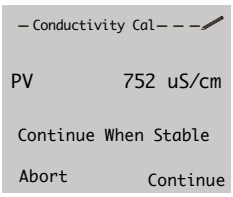
For Group A sensors

- 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.

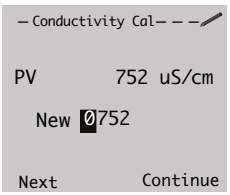
For Group B sensors

- 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 ≥ 5µS/cm the PV Slope is recalculated.

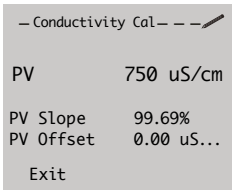
1 Wait for stable reading
Monitor the process value and continue (▽) to the next step once the value has stabilized.



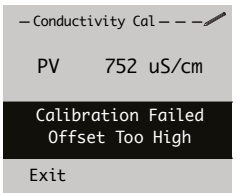
2 Enter the new value
Enter the desired PV value by pressing the ◥ key to move the cursor and the △ ▽ keys to change the value. When the new value has been entered press the ▽ key to continue.



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



Following an unsuccessful calibration the reason for failure is displayed.

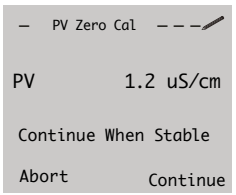


Toroidal conductivity sensor calibration

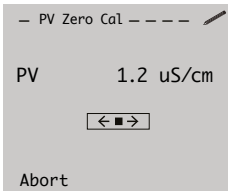
Toroidal conductivity may require wet calibration for the greatest accuracy.

PV Zero calibration

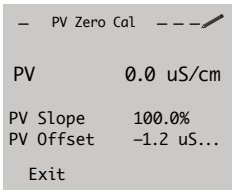
1 Apply zero and wait for stable reading
Ensure that a zero solution is present at the sensor, monitor the process value and continue (▽) to the next step once the value has stabilized.



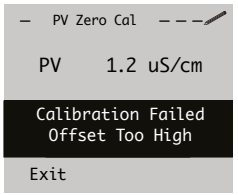
2 Sampling
The procedure moves automatically to the next stage once the PV has been sampled.



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

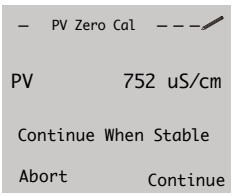


Following an unsuccessful calibration the reason for failure is displayed.

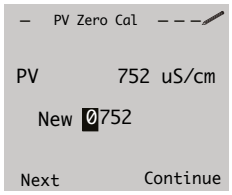


PV Span calibration

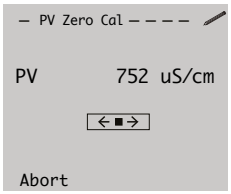
1 **Apply span and wait for stable reading**
Ensure that a span solution is present at the sensor, monitor the process value and continue (▽) to the next step once the value has stabilized.



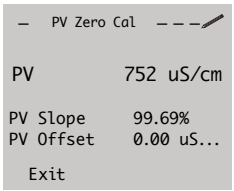
2 **Enter the new value**
Enter the desired PV value by pressing the ◁ key to move the cursor and the △ ▽ keys to change the value. When the new value has been entered press the ▽ key to continue.



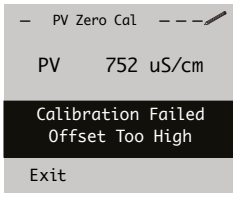
3 **Sampling**
The procedure moves automatically to the next stage once the PV has been sampled.



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



Following an unsuccessful calibration the reason for failure is displayed.



13 Specifications

Operation

Display/LCD (W x H)

75 x 65 mm (3.0 x 2.55 in)

Language

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

Keypad

4 tactile membrane keys

Mechanical data

Protection

IP66/NEMA 4X

Dimensions

Height: 144 mm (5.76 in) min. (excluding glands)
Width: 144 mm (5.76 in) door closed – min.
Depth – 99 mm (3.9 in) door closed – min. (excluding fixing brackets)
Weight: aluminum enclosure 1.15 kg (2.53 lb)
Weight: polycarbonate enclosure 0.75 kg (1.65 lb)

Panel dimensions

Cut-out height: 138 +1.0 –0.0 mm (5.43 +0.04 –0.0 in)
Cut-out width: 138 +1.0 –0.0 mm (5.43 +0.04 –0.0 in)
Thickness: 35 mm (1.38 in) Max.
Depth behind panel: 67 mm (2.7 in) min.
Distance between cut-outs: 40 mm (1.57 in) min.

Materials of construction

Aluminum enclosure: LM20 aluminum
Polycarbonate enclosure: LEXAN 505RU
10 % GF polycarbonate

Cable entries

Aluminum enclosure: 2 holes to accept M20 or ½ in cable glands or conduit hubs and 2 holes to accept M16 cable glands or conduit hubs
Polycarbonate enclosure: 5 holes to accept M20 or ½ in cable glands or conduit hubs and 2 holes to accept M16 cable glands or conduit hubs
Transmitters are supplied with blanking plugs for all of the cable entry holes
Optional cable gland packs are available

Terminal connections

AWG 26 to 14 (0.14 to 2.5 mm^2)

Configuration security

Hardware switch configuration

Access to configuration is enabled only after a hardware switch has been set. This switch is situated behind a tamper-evident seal.

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: factory set password

Input

pH/ORP/pIon sensor types

pH: Glass, Antimony (Sb)
ORP: (Redox): Platinum (Pt), Gold (Au)
pION: Custom user-programmable

Input impedance

>1x$10^{13}\Omega$

pH/ORP/pIon measurement range and resolution

Type	Range	Display resolution	Accuracy repeatability
pH	0 to 14 pH (–2 to 16 over range)	0.01 pH	±0.01 pH
ORP	–1500 to 1500 mV	1 mV	±1 mV
pION	–1500 to 1500 mV	1 mV	±1 mV

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

AWT210 2-electrode conductivity transmitter:

Cell constant	Conductivity range	Display resolution	Accuracy repeatability
0.01	0 to 200 µS/cm	0.001 µS/cm	±1.0 % of measurement range per decade
0.1	0 to 2000 µS/cm	0.01 µS/cm	
1	0 to 20000 µS/cm	0.1 µS/cm	

...Conductivity measurement range and resolution

AWT210 4-electrode conductivity transmitter:

Sensor group	Conductivity range	Display resolution	Accuracy repeatability
A	0 to 2000 mS/cm	0.1 µS/cm	±0.5 % of measurement range per decade
B	0 to 2000 µS/cm	0.01 µS/cm	

AWT210 toroidal conductivity transmitter:

Sensor	Conductivity range	Display resolution	Accuracy repeatability
ABB toroidal	0 to 2000 mS/cm	1.0 µS/cm	±0.5 % of measurement range per decade

EZLink (for digital pH/ORP sensors only)

Power consumption (maximum)

1.5 mA @ 3.3 V DC (5 mW maximum)

Fixed length cable

1 or 10 m (3.28 or 32.8 ft)

Digital sensor connector IP rating

IP67 (when connected)

Extension cable (options)

1, 5, 10, 15, 25, 50 m (3.2, 16.4, 32, 49.2, 82, 164 ft)

Maximum length (including optional extension cable)

Up to 60 m (197 ft)

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

Temperature element	Temperature range	Accuracy Repeatability
Pt100	–20 to 200 °C (–4 to 392 °F)	±0.1 °C (±0.18 °F) after calibration
Pt1000		
3K Balco		
None	User-programmable 20 to 300 °C (–4 to 572°F)	N/A

pH/ORP/pIon temperature compensation modes

Type	Manual	Automatic Nernstian	Nernstian with solution coefficient	Solution compensation coefficient
pH	✓	✓	✓	
ORP	✓			✓
pION	✓			✓

Conductivity temperature compensation modes

Temperature element	AWT210 2-electrode	AWT210 4-electrode	AWT210 toroidal
0 to 15 % NaOH		✓	✓
0 to 20 % NaCl		✓	✓
0 to 18 % HCl		✓	✓
0 to 20 % H_2SO_4		✓	✓
Pure water neutral salt	✓		
Pure water trace base	✓		
Pure water trace acid	✓		
User-defined	✓		✓

Power supply (FF models and PA models)

Supply voltage

9 to 32 V DC (General purpose installations)

9 to 24V 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

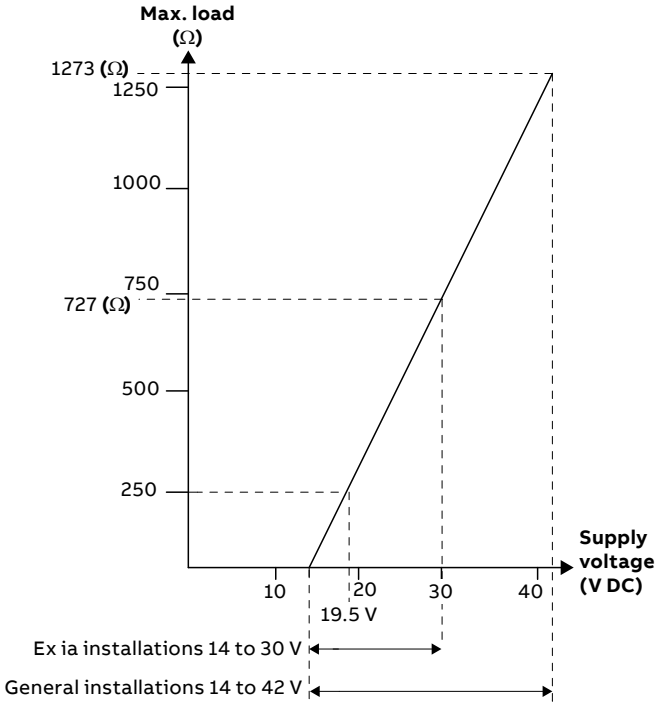
Supply voltage < 12 V DC results in < 3.8 mA

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



With 250 Ω resistor for HART communication min. supply voltage = 19.5 V DC

…13 Specifications

Output (HART models)

Configured range

4 to 20 mA, user-programmable across measurement range. Linear and non-linear.

AWT210 2-electrode pH transmitter:

Type	Min. span	Max. span
pH	1 pH	14 pH
ORP	100 mV	3000 mV
pION	100 mV	3000 mV

AWT210 2-electrode conductivity transmitter:

Cell constant	Min. span	Max. span
0.01	1 µS/cm	200 µS/cm
0.1	10 µS/cm	2000 µS/cm
1	100 µS/cm	20000 µS/cm

AWT210 4-electrode conductivity transmitter:

Sensor group	Min. span	Max. span
A	100 µS/cm	2000 mS/cm
B	10 µS/cm	2000 µS/cm

AWT210 toroidal conductivity transmitter:

Sensor group	Min. span	Max. span
ABB toroidal	100 µS/cm	2000 mS/cm

All conductivity models
– when configured for concentration:

Sensor group	Min. span	Max. span
All	5 % when configured for concentration	2000

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 (cFMus) Intrinsic Safety

Available with polycarbonate & aluminum enclosures

Intrinsic Safety
- CLASS I, DIV 1 GROUPS A, B, C, D; T4
- CLASS II, DIV 1 GROUPS E, F, G; T4
- CLASS I, ZONE 2 AEx/Ex ic IIC T4 Gc

Enclosure type/ingress protection classification
- 4X*/IP66

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

Factory Mutual (cFMus) Non-incendive

Available with aluminum enclosure only

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

Enclosure type/ingress protection classification
- 4X*/IP66

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

ATEX, IECEx & UKEX Intrinsic Safety

Available with polycarbonate & aluminum enclosures

Intrinsic Safety
- II 1 G Ex ia IIC T4 Ga
- II 3 G Ex ic IIC T4 Gc
  When used with appropriate barriers

Ingress protection classification
- IP66

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

SIL

Conforms to IEC61508. Refer to SI/AWT210

EMC

Emissions and immunity

Meets requirements of IEC61326 for an industrial environment.

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

Appendix A – Temperature compensation

NOTICE

- At power up the AWT210 automatically detects if a valid temperature sensor is used within the system. If a temperature sensor is not detected, the **Temperature Comp. Type** defaults to **Manual** (see page 36) and a diagnostic alarm (--S010.047--, see page 27) is displayed.
- The temperature effect on ORP sensors is negligible. The effect of temperature on pION sensors is difficult to characterize, except for specific applications. Therefore, only the solution coefficient option can be used to compensate for electrode and process changes with temperature.

Manual and automatic Nernstian temperature compensation types

When the selected **Temperature Comp. Type** is **Manual** or **Auto** (see page 36), manual and automatic Nernstian temperature compensation types are applied (see below).
These adjust for the thermodynamic properties of electrochemical half sensors. The Nernstian effect is characterized by the mathematical equation:

$$E = E_{reference} + (2.3 \times R \times TK \times LOG[ai]/n \times F)$$

where:

E	Overall sensor output
$E_{reference}$	Reference half sensor output (typically a constant)
R	Constant
TK	Absolute temperature (Kelvin)
n	Ion charge
F	Constant
[ai]	Ion activity

The ion activity is nearly equal to the ion concentration for weak solutions containing that particular ion. The Nernstian equation is used to adjust the output of an electrochemical sensor to a reference temperature that is typically 25 °C (77 °F).

Temperature effects of pH sensors are well behaved and are characterized by the Nernst equation. The AWT210 transmitter applies Nernstian compensation to all three temperature compensation options when the transmitter is configured as a pH analyzer. If interested in the uncompensated value, set the transmitter to manual temperature compensation and calibrate the temperature to 25 °C (77 °F). This enables monitoring of the uncompensated value.

Automatic Nernstian temperature compensation provides the most useful information and is recommended in most cases. Since ion dissociation is affected by temperature, the pH value can also be affected. If these processes behave in a repeatable manner, the dissociation can be characterized and a solution coefficient can be used to compensate for these effects.

Solution coefficient compensation type

When the selected **Temperature Comp. Type** is **Auto Solution** (see page 36), the solution coefficient compensation type is applied.

This compensates the Nernstian value for pH measurements and the raw voltage value for ORP or pION measurements by a fixed value per each 10 °C (50 °F). The temperature compensation factor is derived from the following equations:

$$pH_{indication} = pH_{Nernstian} \pm COEF \times ((T - 25\ °C)/(10\ °C\ [50\ °F]))$$

$$mV_{indication} = mV \pm COEF \times ((T - 25\ °C)/(10\ °C\ [50\ °F]))$$

where:

COEF	pH or mV change per 10 °C (50 °F)
$pH_{Nernstian}$	Nernstian pH value referenced at 25 °C (77 °F) after applying the factory and process calibration values
$pH_{indication}$	pH value indicated on the transmitter and proportional to the current output value
mV	millivolt value of the sensor output after applying the factory and process calibration values
$mV_{indication}$	mV value indicated on the transmitter and proportional to the current output value
T	temperature of the solution in °C after applying the factory and process calibration values

Examples of solution coefficients for pure water applications are:
pure water = +0.18 pH/(10 °C [50 °F])
pure water with 1 ppm ammonia = +0.31 pH/(10 °C [50 °F])

The solution coefficient for the AWT210 transmitter either adds or subtracts a configured amount of the process variable per 10 °C (50 °F) to the Nernstian compensated process variable. Thus, an application with a process liquid that decreases in its pH value as the temperature increases uses a positive solution coefficient correction factor. Conversely, an application with a process liquid that increases in its pH value as the temperature increases uses a negative solution coefficient correction factor.

The solution coefficient affects the uncompensated process variable for ORP and pION analyzer types in the same manner as the pH analyzer type.

Appendix B – Upgrading/Reloading

Factory reset switch

When this switch is set to the ON position and the instrument is powered up, the instrument is reset to the factory default values.

When the switch is in the OFF position the Factory Reset function is disabled.

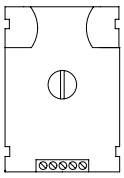
NOTICE

Resetting to factory default values resets all of the instrument configuration parameters including passwords.

Appendix C – Spare parts

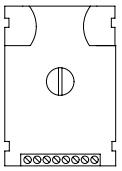
Communications module assemblies

Part number	Description
3KXA877210L0051	HART module
3KXA877210L0052	PA module
3KXA877210L0053	FF module



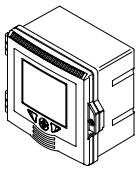
Sensor module assemblies

Part number	Description
3KXA877210L0014	pH/ORP module for use with analog sensors
3KXA877210L0013	2-electrode conductivity module
3KXA877210L0011	4-electrode conductivity module
3KXA877210L0012	Toroidal conductivity module
3KXA877210L0015	EZLink digital module



Main case assemblies

Part number	Description
AWT210A1Y0Y0Y0	Polycarbonate case assembly: CE label
AWT210A1Y0Y0E5	Polycarbonate case assembly: ATEX/IECEx label – FM/CSA label
AWT210A2Y0Y0Y0	Aluminum case assembly: CE label
AWT210A2Y0Y0E6	Aluminum case assembly: ATEX/IECEx label – FM/CSA label



Gland packs

Glands (packs of 2)

Part number	Description
3KXA877210L0112	M16 standard gland
3KXA877210L0115	M16 Exe gland
3KXA877210L0111	M20 standard gland
3KXA877210L0114	M20 Exe gland
3KXA877210L0113	½ in NPT standard gland
3KXA877210L0116	½ in NPT Exe gland

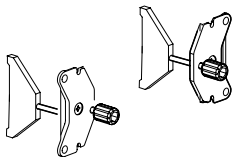
M16

M20 | ½ in

Mounting kits

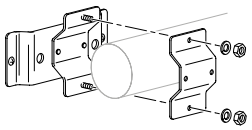
Panel-mount kit

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



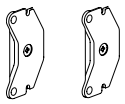
Pipe-mount kit

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



Wall-mount kit

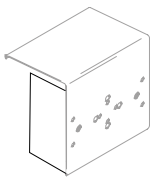
Part number	Description
3KXA877210L0105	Wall-mount kit



Weathershield kit

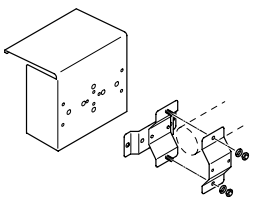
Weathershield kit

Part number	Description
3KXA877210L0103	Weathershield kit (suitable for AWT210/AWT420)



Weathershield and pipe-mount kit

Part number	Description
3KXA877210L0104	Weathershield and pipe-mount kit (suitable for AWT210/AWT420)



Acknowledgements

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- PROFIBUS is a registered trademark of PROFIBUS organization

Notes

ABB Measurement & Analytics

For your local ABB contact, visit:
www.abb.com/contacts

For more product information, visit:
www.abb.com/measurement

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