

ABB MEASUREMENT & ANALYTICS | DATA SHEET | DS/AWT210-EN REV. G

# **AWT210**

2-wire conductivity, pH/ORP pION transmitter



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## Measurement made easy

The low-power, high-performance transmitter for use in hazardous area applications

### Modular design for strategic flexibility

- common universal design for analog pH, ORP, conductivity and digital EZLink™ pH and ORP sensors
- plug-and-play sensor and communication modules minimize stock holding and maximize operation uptime
- wall, panel, or pipe mountable

### Easy to use

- 'Easy Setup' sensor configuration menus provide step-by-step guidance
- advanced self-diagnostics conforming to NAMUR NE 107 provide harmonized indication of device status
- multilevel security access prevents unauthorized modifications to transmitter configuration and calibration
- One-Button sensor calibration saves time and money spent on routine maintenance

### Robust and reliable

- intrinsically-safe, non-incendive design for hazardous area installation
- available in both corrosion-resistant polycarbonate or durable aluminum enclosures
- cFMus and ATEX/IECEX & UKEX approved
- SIL approved\*

### Advanced digital communications

- available with PROFIBUS® PA, FOUNDATION™ Fieldbus® or HART® communications

\* Conforms to IEC61508. Refer to [SI/AWT210](#)

## The AWT210 2-wire transmitter

The AWT210 2-wire modular transmitter is a single-channel device for the measurement and control of pH, ORP or conductivity in hazardous and non-hazardous area applications across a broad range of industries including chemical, pulp and paper, mining and marine.

### Flexible scalability with the future built-in

Operation simplicity is a key feature of the AWT210 with intuitive software, advanced self-diagnostics and its unique modular design that enables users to achieve increased efficiency through greater user flexibility, reduced process downtime and simplified maintenance.

The unique modular design of the AWT210 allows the same unit to be used with any of the available or future sensor and communication modules, minimizing stock holding and maximizing operational uptime.

Each sensor module is factory-calibrated and can be quickly and securely installed by hand providing the ultimate in transmitter adaptability and allowing the simple future migration from traditional analog sensors to advanced intelligent digital EZLink sensors.

## Communication protocols

The AWT210 transmitter is available with a choice of communication modules enabling simple device integration through 4 to 20 mA (with HART), FOUNDATION Fieldbus and PROFIBUS PA communication protocols.



Figure 1 Plug-and-play AWT210 module design

## Sensor compatibility

### pH and redox (ORP) measurement

The AWT210 pH/ORP module is compatible with ABB's full range of analog pH, redox (ORP) and ion-selective (pION) sensors in addition to most competitors' sensors.

### Conductivity measurement

The AWT210 fully supports ABB's range of 2-electrode, 4-electrode and toroidal (electrode-less) sensors, allowing for installations ranging from ultra-pure water to the harshest chemical applications.

For users that use conductivity to infer liquid concentration, ABB provides preinstalled concentration curves for many common chemicals as well as a user-defined curve for customers to input their own conductivity vs. concentration curve.

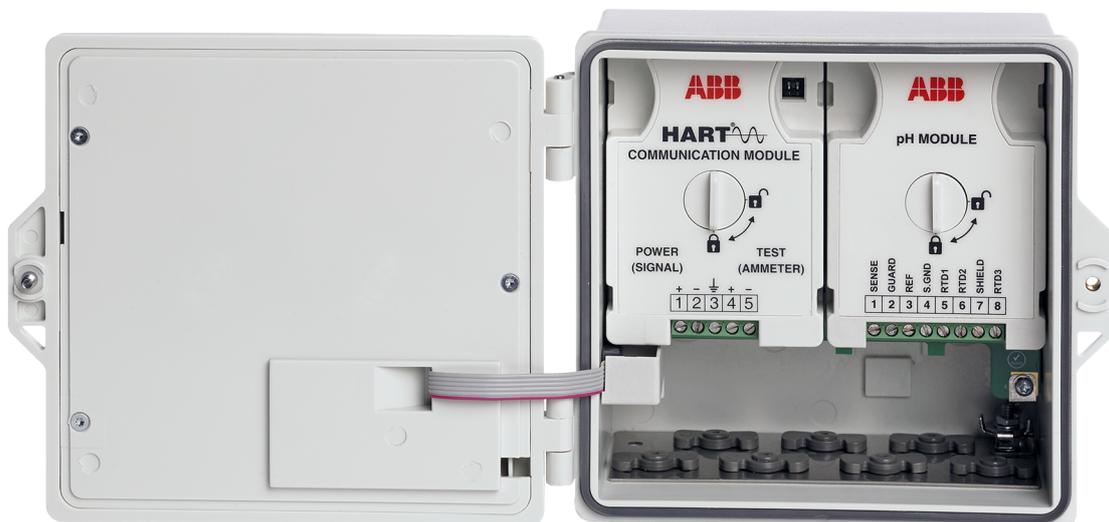


Figure 2 AWT210 communication/sensor modules

## ...Sensor compatibility

### EZLink digital sensors

The AWT210 EZLink module is compatible with ABB's range of EZLink digital pH/ORP sensors providing plug-and-play sensor connectivity, automatic sensor recognition/set-up and advanced predictive diagnostics.

### Compatible EZLink digital sensors

pH/ORP 100 GP-D, 100 ULTRA-D, 500 PRO-D, 700 ULTRA-D. Refer to the sensor's data sheet for further information.

## Intuitive operation

ABB's intuitive HMI is both powerful, yet user-friendly with simple navigation and clear menus presented on the large easy to read display. 'Easy Setup' sensor configuration menus provide step-by-step guidance for commissioning new sensors and the advanced self-diagnostics conforming to NAMUR NE 107 provide harmonized indication of device status.

All settings can be configured directly on the device or through the EDD, FDI or DTM.

### Simplified calibration

With the AWT210 One-Button Calibration feature, sensor calibration can be initiated directly without the need to access the device menu, reducing overall time spent calibrating sensors.

Calibration is simplified further with preprogrammed buffer tables and on-screen step-by-step guidance. In addition to the traditional two-point buffer calibration, the AWT210 provides a simple, single-point process calibration.

The calibration trend stores the last five values of sensor slope and offset with time stamp.

### Automatic temperature compensation

The AWT210 has automatic temperature sensor recognition for both 2- and 3-wire RTD inputs for common inputs such as Pt100, Pt1000, and 3k Balco.

### Secure process control

Multilevel security access prevents unauthorized modification of process control data by allowing separate read-only, calibrate and advanced security access levels to users.



Figure 3 Familiar intuitive design

## Designed for reliable and durable performance

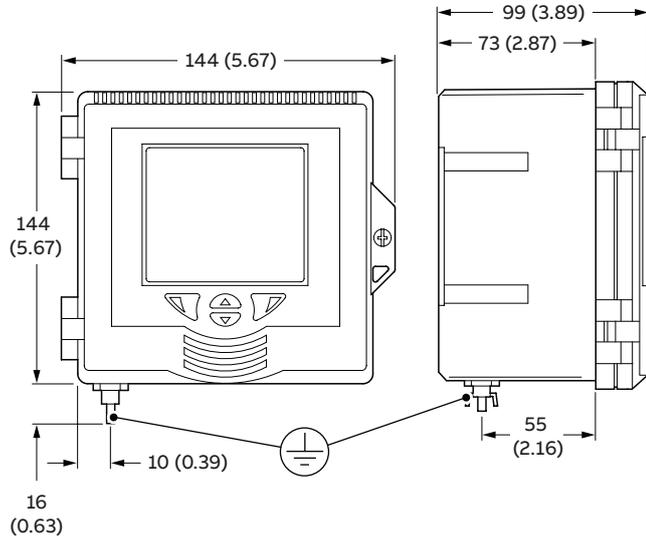
The AWT210 delivers reliability and durability under the harshest of process conditions. The robust IP66 enclosure can be easily wall, pipe, or panel mounted. The hinged door with anti-tamper indication provides unrestricted access to the communication and sensor modules for simplified commissioning and maintenance.

The AWT210 is available in both corrosion-resistant polycarbonate and durable aluminum. In addition to intrinsic safety approvals, the aluminum enclosure has Non-Incendive approval to allow for economical installation in Division 2 areas.

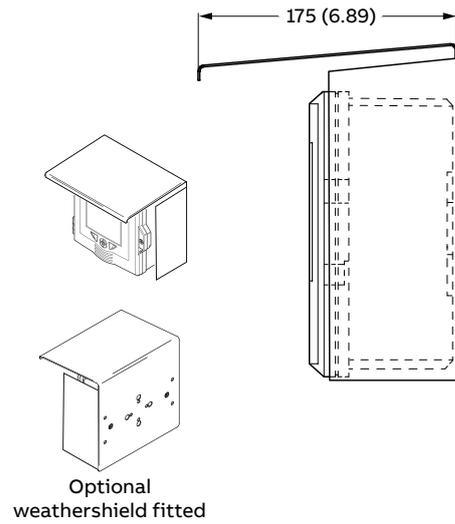
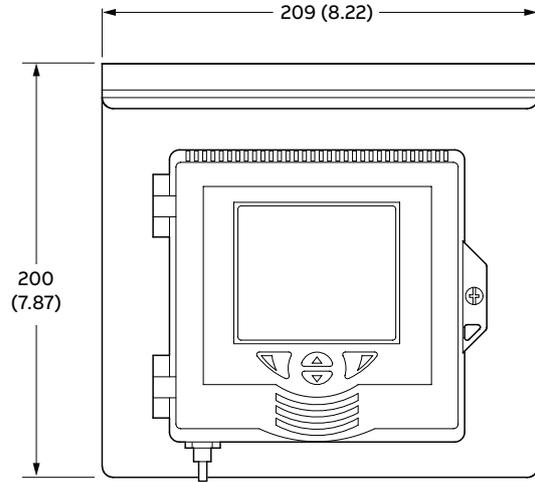
## Dimensions

Dimensions in mm (in)

### Transmitter



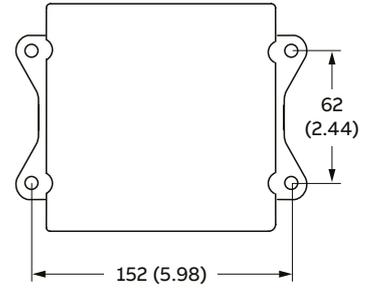
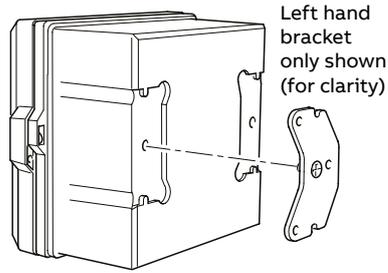
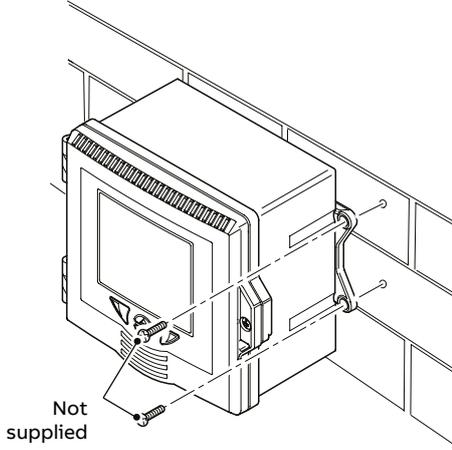
### Optional weathershield



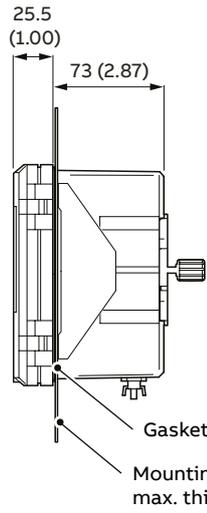
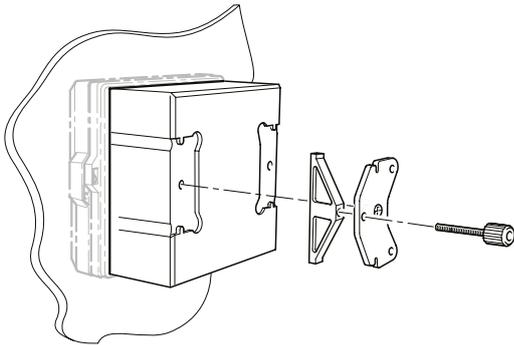
# Mounting options

Dimensions in mm (in)

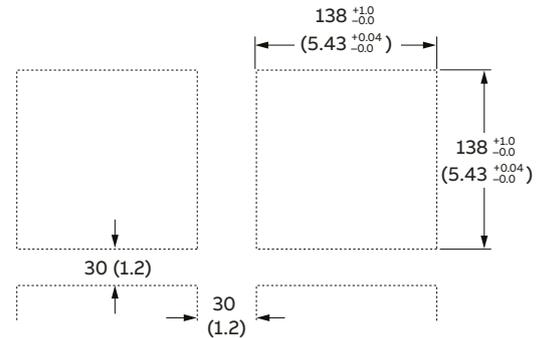
## Wall mounting



## Panel mounting

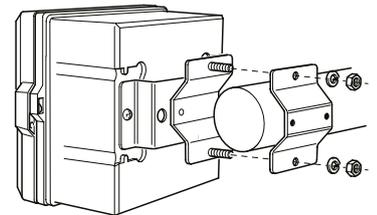
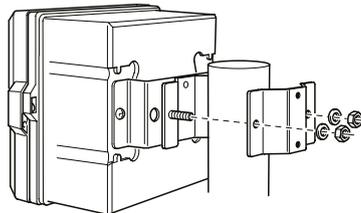
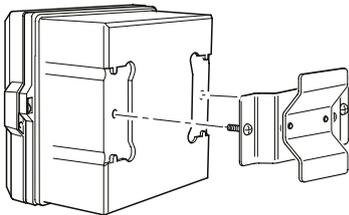


### Panel cut-out dimensions



## Pipe mounting

Pipe diameters: max. 62 (2.44)/min. 45 (1.77)



## Specifications

### Operation

#### Display/LCD (W × H)

75 × 65 mm (3.0 × 2.55 in)

#### Language

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

### Mechanical data

#### Terminal connections

AWG 26 to 14 (0.14 to 2.5 mm<sup>2</sup>)

### Input

#### pH/ORP/pION sensor types

pH: glass, antimony (Sb)

ORP: (Redox): platinum (Pt), gold (Au)

pION: Custom user-programmable

#### Input impedance

>1 × 10<sup>13</sup> Ω

#### 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	

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 <sub>2</sub> SO <sub>4</sub>		✓	✓
Pure water neutral salt		✓	
Pure water trace base		✓	
Pure water trace acid		✓	
User-defined		✓	✓

## ...Specifications

### 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 installations)

#### 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

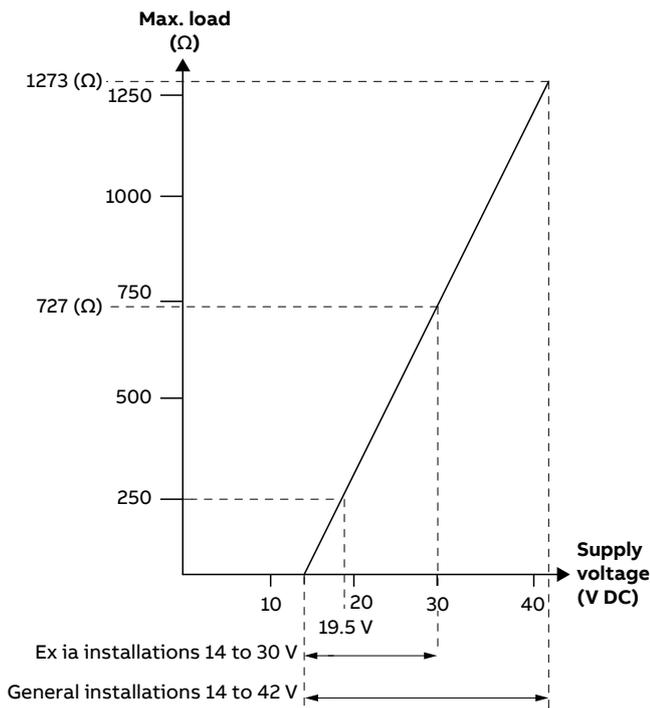
Supply voltage < 12 V DC results in < 3.8 mA

#### 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

### 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 associated apparatus

#### Ingress protection classification

- IP66

#### Ambient temperature range

- -20 °C =< Ta =< 60 °C

### SIL

Conforms to IEC61508. Refer to [SI/AWT210](#)

### EMC

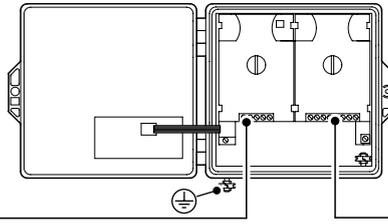
#### Emissions and immunity

Meets requirements of IEC61326 for an industrial environment

\* 4X Hosedown self-assessed not approved by 3<sup>rd</sup> party

# Electrical connections

## Terminal connections



Communication module connections				
HART modules				
Power		Ammeter		
+	-	⏏	+	-
1	2	3	4	5
FOUNDATION Fieldbus and Profibus PA modules				
A	B	⏏	A	B
1	2	3	4	5

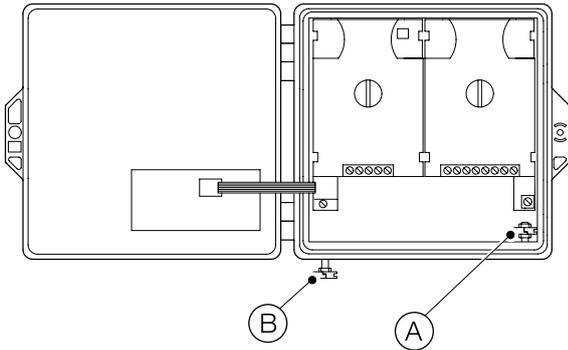
  

Sensor module connections							
pH/ORP/pION modules							
SENSE	GUARD	REF	SOL_GND	RTD 1	RTD 2	SHIELD	RTD 3
1	2	3	4	5	6	7	8
2-electrode conductivity modules							
DRIVE +			DRIVE -	RTD 1	RTD 2	SHIELD	RTD 3
1	2	3	4	5	6	7	8
4-electrode conductivity modules							
DRIVE +	SENSE +	SENSE -	DRIVE -	RTD 1	RTD 2	SHIELD	RTD 3
1	2	3	4	5	6	7	8
Toroidal conductivity modules							
DRIVE +	DRIVE -	SENSE +	SENSE -	RTD 1	RTD 2	SHIELD	RTD 3
1	2	3	4	5	6	7	8

**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.

Referring to the illustration below, ground connections are provided: internally (A) and externally (B):



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.

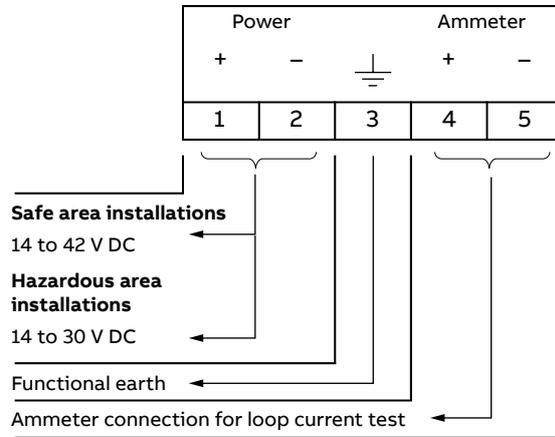
**Note.** HART, Profibus and Fieldbus protocols are not secure. Therefore, the intended application should be assessed before implementation to ensure these protocols are suitable.

**Gland entries**

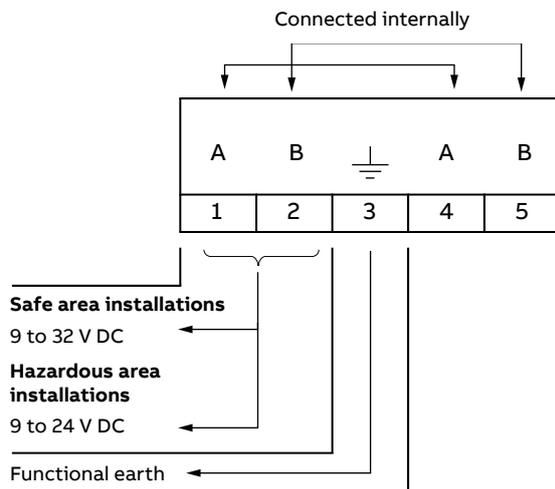
For hazardous area installations, suitable Ex glands and blanking elements must be used to seal the entry holes.

**Communication module connections**

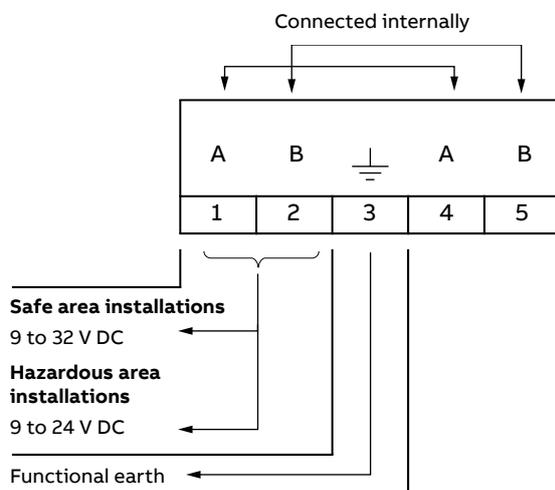
**HART module**



**FOUNDATION Fieldbus module**



**Profibus PA module**



## ...Electrical connections

### pH/ORP/pION sensor module connections

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

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	2-lead*	Blue	Yellow	Black	–	Red	White	–	–
APS5xx									
APS7xx	3-lead	Blue	Yellow	Black	–	Red	White	–	Gray

\* Cut and remove gray wire

### Standard sensors with diagnostic functions

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

**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

**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	–

**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	–

## Ordering information

AWT210 2-wire transmitter	AWT210/	X	X	XX	XX	XX	Option
<b>Build revision</b>							
Reserved	A						
<b>Enclosure type</b>							
Polycarbonate			1				
Aluminum			2				
<b>Sensor input module</b>							
No sensor module (base unit only)				Y0			
Digital EZLink				D1			
pH/ORP (analog sensors)				P1			
Conductivity 2-electrode				C2			
Conductivity 4-electrode				C4			
Conductivity toroidal				C1			
<b>Communications module</b>							
No communications module					Y0		
HART					H1		
Profibus PA					P1		
FOUNDATION Fieldbus					F1		
<b>Agency approvals</b>							
CE only						Y0	
Intrinsic Safety: cFMus and ATEX/IECEX/UKEX							E5
Non-incendive: cFMus + Intrinsic Safety: cFMus and ATEX/IECEX/UKEX*							E6

\* Available only with aluminum enclosure

### Optional ordering code

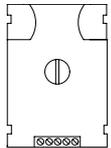
Add 1 or more of the following codes after the standard ordering information to select any additional options if required

Mounting accessories	
Pipe-mount kit	A1
Panel-mount kit	A2
Weathershield	A3
Pipe-mount + weathershield	A4
<b>Cable entry options</b>	
M20 gland pack (containing 2 × M20 cable glands)	U1
M16 gland pack (containing 2 × M16 cable glands)	U2
NPT gland pack (containing 2 × ½ in NPT cable glands)	U3
<b>Documentation language (supplied as standard in English)</b>	
English	M5
German	M1
Italian	M2
Spanish	M3
French	M4
Portuguese	MA
Chinese	M6
Polish	M9
Turkish	MT

## Spare parts

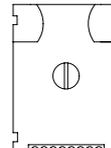
### Communications module assemblies

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



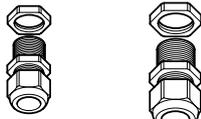
### Sensor module assemblies

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



### Gland packs (packs of 2)

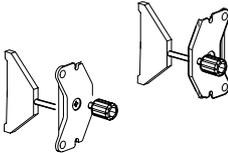
Part number	Description
3KXA877210L0112	M16 standard gland
3KXA877210L0115	M16 Exe gland
3KXA877210L0111	M20 standard gland
3KXA877210L0114	M20 Exe gland
3KXA877210L0113	½ in NPT standard gland
3KXA877210L0116	½ in NPT Exe gland



### Mounting kits

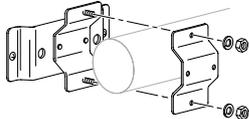
#### Panel-mount kit

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



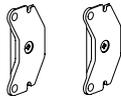
### Pipe-mount kit

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



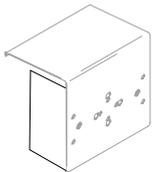
### Wall-mount kit

Part number	Description
3KXA877210L0105	Wall-mount kit



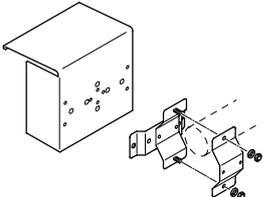
### Weathershield kit

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)



Sales



Service



Software



## Acknowledgements

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