ABB MEASUREMENT & ANALYTICS | OPERATING INSTRUCTION | OI/AWT424-EN REV. D

AWT424

Universal 4-wire, multi-input transmitter



Introduction

The AWT424 is a universal 4-wire, multi-input transmitter suitable for the measurement and control of a wide range of parameters including pH/ ORP, conductivity, turbidity/ suspended solids, dissolved oxygen, chlorine, and UIM.

The AWT424 supports both traditional analog and advanced digital EZLink sensors.

This Operating Instruction provides the operation and maintenance procedures for the AWT424 transmitter for use in nonhazardous areas.

For information on the AWT424 transmitter for use in hazardous areas, refer to INF/ANAINST/013.
For information on the sensors, including installation, commissioning, operation and maintenance procedures, refer to the specific sensor manual.

For more information

Further publications are available for free download from: abb.com/measurement or by scanning this code:

AWT424 transmitter – Data Sheet	DS/AWT424
AWT424 transmitter – Commissioning Instruction	CI/AWT424
AWT424 transmitter – Hazardous area information	INF/ANAINST/013
AWT424 transmitter – Communications Supplement	COM/AWT424
AWT424 transmitter – HART Communications Supplement	COM/AWT424/HART
AWT424 transmitter – HART FDS Communications Supplement	COM/AWT424/HART/FDS
AWT424 transmitter – PROFIBUS Communications Supplement	COM/AWT424/PROFIBUS
AWT424 transmitter – Modbus Communications Supplement	COM/AWT424/MODBUS

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1 Health and safety

1.1 Document symbols

Symbols that appear in this document are explained below:

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

Note:
'Note' indicates useful or important information about the product.

1.2 Safety precautions

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

⚠ WARNING

Bodily injury

Installation, operation, maintenance and servicing must be performed:

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

1.3 Potential safety hazards

1.3.1 AWT424 transmitter – electrical

⚠ WARNING

Electricity hazard

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

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

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

1.4 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.

1.5 Product symbols

Symbols that may appear on this product are shown below:


Protective earth (ground) terminal.


Functional earth (ground) terminal.

Alternating current supply only.

Direct current supply only.


This symbol, when noted on a product, indicates a potential hazard which could cause serious personal injury and/or death. The user should reference this instruction manual for operation and/or safety information.


This symbol, when noted on a product enclosure or barrier, indicates that a risk of electrical shock and/or electrocution exists and indicates that only individuals qualified to work with hazardous voltages should open the enclosure or remove the barrier.


The equipment is protected through double insulation.


Recycle separately from general waste under the WEEE directive.

1.6 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.

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

1.6.1 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.

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



ABB, Automation, Measurement & Analytics, UK, fully supports the objectives of the RoHS II directive. All in-scope products placed on the market by Measurement & Analytics 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.

1.8 Cleaning

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

Warm water and a mild detergent can be used.

2 Cyber security

This product and the EZLink™ Connect app 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 EZLink Connect app, 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.

Although ABB provides functionality testing on the products and updates that we release, you should institute your own testing program for any product updates or other major system updates (to include but not limited to code changes, configuration file changes, third-party software updates or patches, hardware change out, etc.) to ensure that the security measures that you have implemented have not been compromised and system functionality in your environment is as expected.

2.1 Communication protocol-specific security

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

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

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

For system hardening information, refer to SA/ANAINST/001.

3 Display icons and keys

An example of an Operator Page is shown in Figure 1.

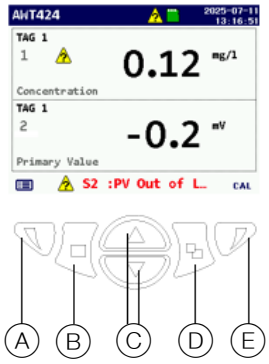


Figure 1 AWT424 Operator Page and keys

Table 1 AWT424 front panel key functions

Item	Description
A	Navigation key – left and Operator Level access key
B	Alarm acknowledge key – acknowledges any active and unacknowledged alarms
C	Up/down keys – navigate up/down menus and increase/ decrease displayed values
D	Scroll key – scrolls through each available operator view
E	Navigation key (right) / programmable soft key

4 Installation

4.1 Siting and dimensions

4.1.1 Location

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

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

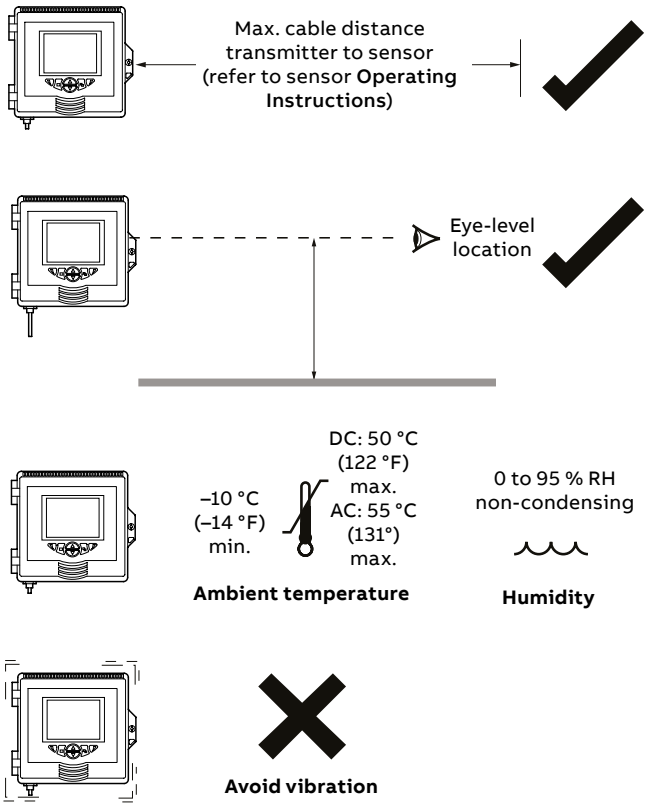


Figure 2 Transmitter location

4.2 Mounting

4.2.1 Wall mounting

Dimensions in mm (in).

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

Referring to Figure 3:

1. Position the left and right mounting brackets (A) into the recesses of the read of the transmitter as shown and secure with the bracket securing screws. Ensure the plastic washers remain in the positions fitted.
2. Mark fixing centers (B) and drill suitable holes in the wall.
3. Secure the transmitter to the wall using 2 screws (C) in each mounting bracket.

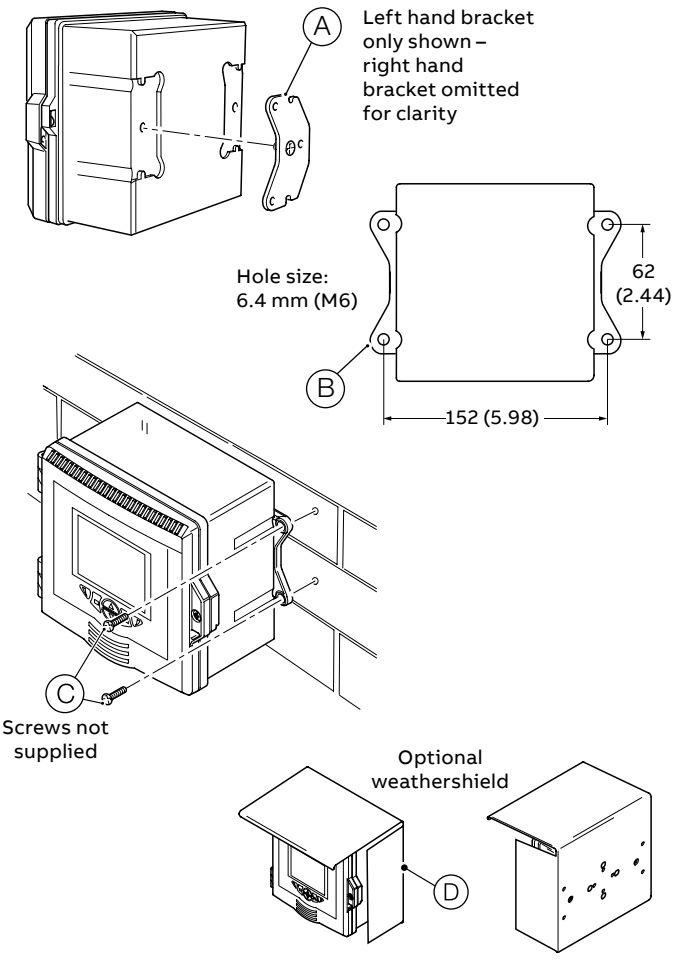


Figure 3 Mount the transmitter to a wall

...4 Installation

...4.2 Mounting

4.2.2 Panel mounting (optional)

Dimensions in mm (in).

Referring to Figure 4:

1. Cut the correct sized hole in panel (A).
2. Insert the transmitter into the panel cutout (B).
3. Screw one panel clamp anchor screw (C) into the left 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.

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

4. Holding assembly (F) together, position bracket (D) into the left 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 panel clamp assembly.
6. Torque each panel clamp anchor screw to 0.5 to 0.6 N·m (4.42 to 5.31 lbf·in).

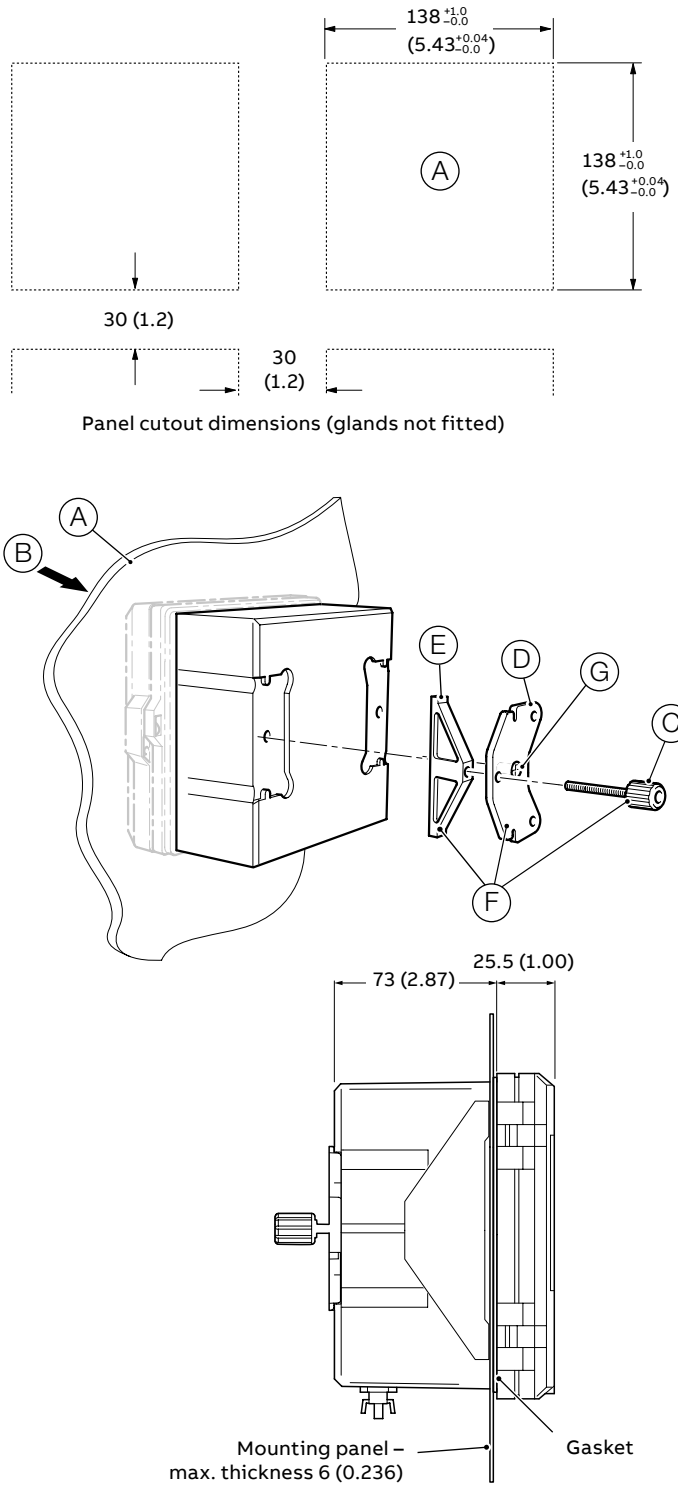


Figure 4 Mount the transmitter to a panel

4.2.3 Pipe mounting (optional)

Dimensions in mm (in).

Note:
If the optional weathershield is used, locate it against the transmitter back panel and attach the pipe mounting kit to the weathershield rear face and transmitter.

Referring to Figure 5:

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).

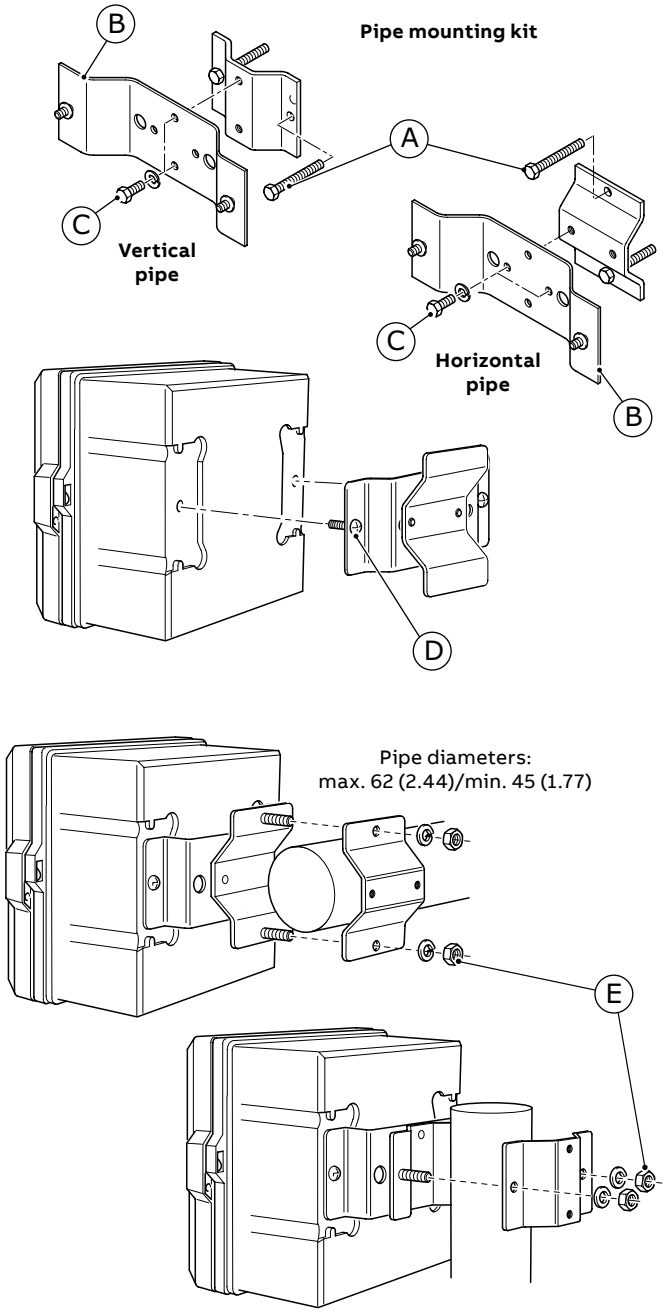


Figure 5 Mount the transmitter to a pipe

4.3 Sensor installation

Refer to the associated sensor Operating Instruction for installation procedures.

5 Electrical connections

⚠ DANGER

Bodily injury

- Before making any connections, either the internal or external protective earth stud must be connected to the local earth bonding point using suitably sized ground cable.
- The transmitter is not fitted with a switch – an isolation device such as a switch or circuit breaker conforming to local safety standards must be fitted to the final installation. It must be fitted in close proximity to the transmitter, within easy reach of the operator and marked clearly as the isolation device for the transmitter.
- Remove all power from supply, relay, any powered control circuits and high common mode voltages before accessing or making any connections. For the mains power, use 3-core cable rated 3A and for the relay connections use cable rated 5A. Use cable rated 105 °C (221 °F) minimum that conforms to either IEC 60227 or IEC 60245, or to the National Electrical Code (NEC) for the US or the Electrical Code for Canada. The terminals accept cables AWG 24 to 16 (0.2 to 1.5 mm^2).
- All connections to secondary circuits must have insulation to required local safety standards. After installation, there must be no access to live parts, for example, terminals. Use screened cable for signal inputs and relay connections. Route signal leads and power cables separately, preferably in an earthed (grounded) flexible metal conduit.

USA and Canada only

- Supplied cable glands are an optional extra and provided for the connection of Modbus, PROFIBUS and Ethernet communication wiring ONLY. A special cable gland is supplied with the Ethernet communications option and should be used only for the Ethernet cable.
- The use of cable glands, cable/flexible cord for connection of the mains power source to the mains input and relay contact output terminals is not permitted in the USA or Canada.
- For connection to mains (the mains input and relay contact outputs), use only suitably rated field wiring insulated copper conductors rated min. 300 V, 16 AWG, 105 °C (221 °F). Route wires through suitably rated flexible conduits and fittings.

⚠ WARNING

Bodily injury

- If the transmitter is used in a manner not specified by the Company, the protection provided by the equipment may be impaired.
- Ensure the correct fuses are fitted.
- Replacement of the internal battery must be carried out by an approved technician only.
- The transmitter conforms to Installation Category II of IEC 61010.
- All equipment connected to the transmitter's terminals must comply with local safety standards (IEC 60950, EN61010-1).
- The DC power supply and the optional Ethernet and bus interface connectors must be connected to Safety Extra Low Voltage (SELV) circuits.

5.1 Earth bonding

⚠ WARNING

Before making any electrical connections:

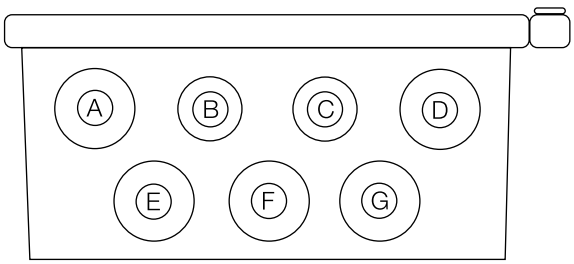
- The external protective earth stud must be connected to the local earth bonding point using suitably sized ground cable. To connect to the protective earth stud, use a closed M4 cable lug.
- **Never** connect the protective earth with an end sleeve or an open cable lug.

5.2 Module installations

NOTICE

Do not insert any modules while the transmitter is powered up.

5.3 Cable entries



(A) M20 – communications
(B) Sensor 1A (Dual EZLink)
(C) Sensor 2A (Dual EZLink)
(D) M20 – mains power
(E) Sensor 1B (Dual EZLink)
(F) M20 – analog outputs
(G) Sensor 2B (Dual EZLink)

Figure 6 Cable entries

6 Fit the EZLink cables

⚠ WARNING

Electricity hazard

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

Referring to Figure 7:

1 Remove connector block cradle (A) from EZLink module(s) and retain for connection.

2 Unlock and open transmitter door (B).

3 Fit EZLink modules as follows:

a if one EZLink module is used, push-fit it into location (C) (sensor 1).
Note. When fitting the cable assembly, the EZLink connector for sensor 1 passes through cable entry (D).

b if two EZLink modules are used, push-fit sensor 1 module into location (C) and sensor 2 module into location (E).
Note. When fitting the cable assemblies, the EZLink connector for sensor 1 passes through cable entry (D) and the EZLink connector for sensor 2 passes through cable entry (F).

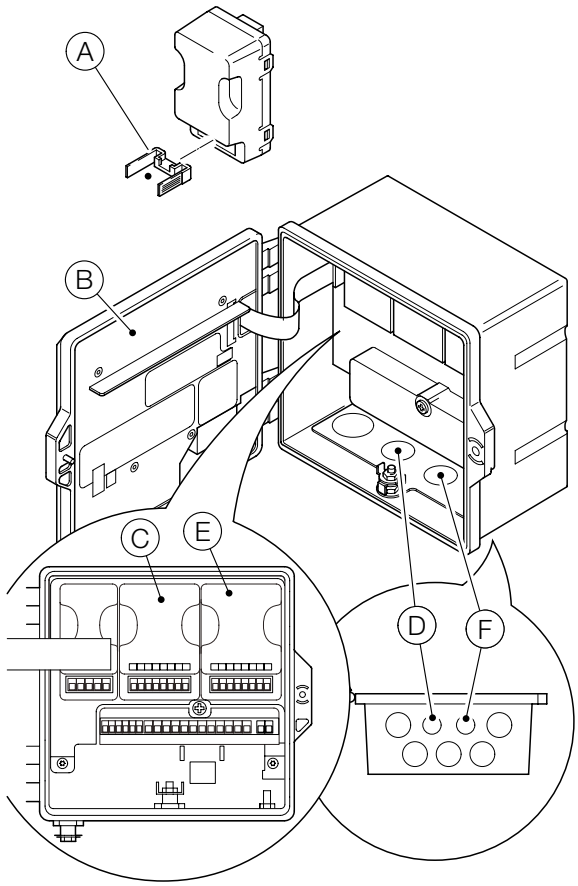


Figure 7 EZLink module positions and EZLink cable entries

Referring to Figure 8:

4 Pass EZLink connector cable (G) through the correct cable entry – see step 3.

5 Pass thread alignment washer (H) over EZLink connector cable (G), ensuring alignment tab (I) is orientated correctly.

6 Pass thread back nut (J) over EZLink correctly connector cable (G).

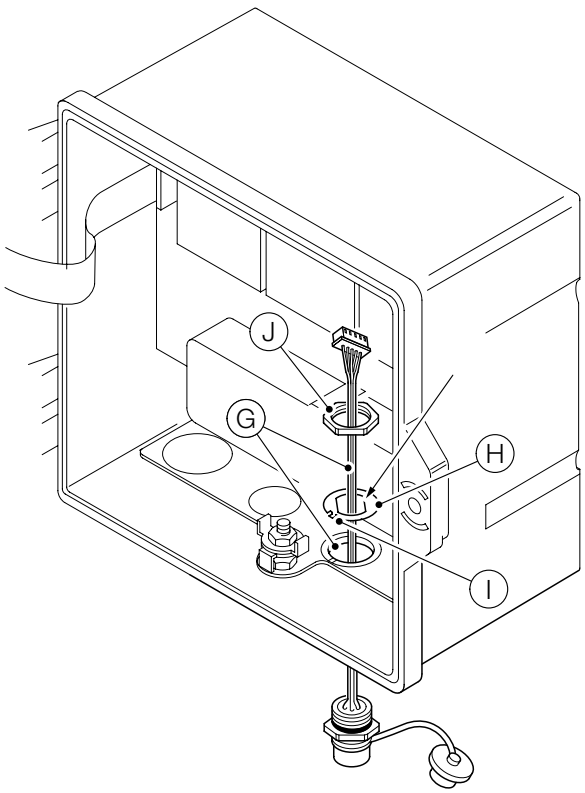


Figure 8 Preparing EZLink connector cable fixings

7 Hot plug-in (EZLink sensors only)

Hot plug-in is a feature of the AWT424 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 and then installed in a different location without the need to reconfigure the sensor.

Hot plug-in recognizes both the connection of a replacement sensor to a previously used input channel and the connection of a sensor to a previously unused input channel.

7.1 Add a sensor

To add a new sensor to an unused input channel:

1 Connect the sensor to the transmitter using the EZLink connector.
The transmitter detects the new sensor automatically and loads the sensor setup parameters stored in the sensor. When upload is complete, the easy set up prompt is displayed.

2 Press the right key to start easy set up or press the left key to use the sensor set up parameters stored in the sensor.

Note:
The following steps only applicable if the easy setup is selected.

3 Press the right key to select 'Edit' to change the default value/setting to the required value/setting. Press the left key to go to the next parameter.

4 On completion of the easy set up, the display returns to the easy set up start screen.

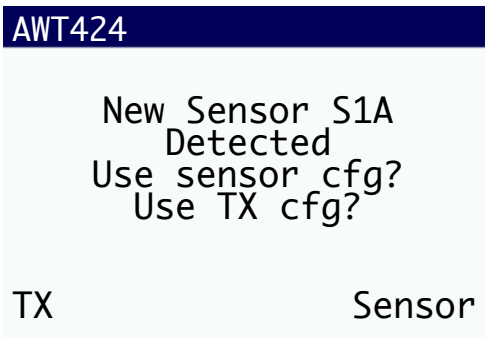
7.2 Replace a sensor

A sensor can be replaced with a sensor of the same or different type. If the sensor is the same type, the sensor setup stored in the sensor can be can be retained for use with the new sensor, or the sensor settings of the new sensor can be used instead.

7.2.1 Replace a sensor of the same type

1 Remove the old sensor from the EZLink connector.

2 Connect new sensor to EZLink connector.
The following message will be displayed:



3 Select **TX** to load the pre-existing transmitter settings, or select **Sensor** to load the settings from the new sensor.

NOTICE

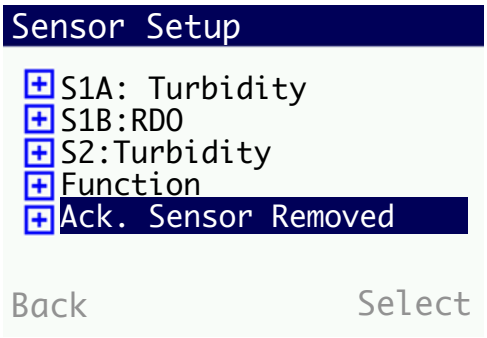
If you load settings from the new sensor, all pre-existing transmitter settings will become invalid and will be deleted.

7.2.2 Replace a sensor of a different type

1 Remove the old sensor from the EZLink connector.

2 Connect the new sensor to the EZLink connector.

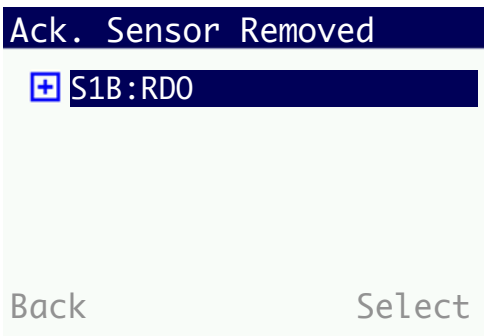
3 Navigate to Sensor set up menu.



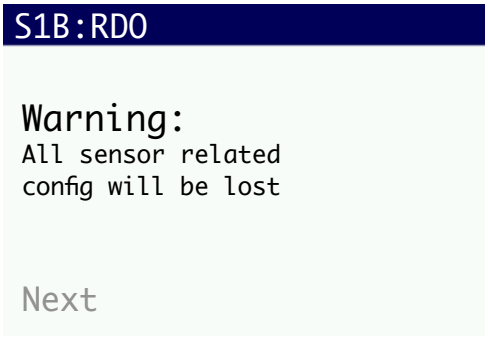
4 Select Ack. Sensor removed.

5 Select sensor which has been removed.



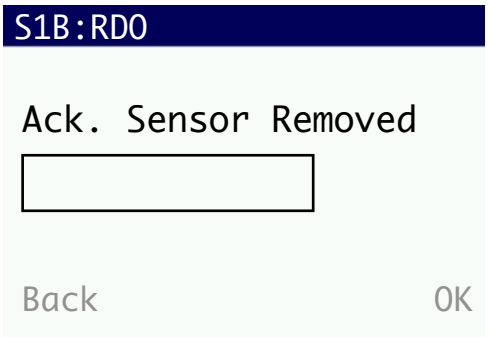


6 The following screen will be displayed.



Note: Only continue if you are connecting a new, different type of sensor to the transmitter.

7 Press Next.



8 Press OK.
The bar graph will fill to show the progress. When complete, the bar graph will go back to empty.

9 Press Back to exit the sensor setup menu.

8 Power supply connection – plastic enclosure

⚠ WARNING

Bodily injury – USA and Canada only

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

NOTICE

For metal enclosure power connections, refer to information sheet INF/ANAINST/013.

NOTICE

Electrical installation – ABB recommendations:

- Ferrules are fitted to all cables.
- Use M4 ring terminals (crimped) on the earth conductor prior to fitting to the earth stud on the gland plate.
- Only 1 cable per cable gland.

8.1 Connecting the transmitter power supply

Referring to 09:

1 Using a suitable screwdriver, release door retaining screw (A) and open the transmitter door.

2 Release terminal cover retaining screw (B) and remove terminal cover plate (C).

3 Slide retaining clip (D) off blanking plug (E) and remove the blanking plug if fitted.

4 Fit cable gland (F) and secure using nut (G).

5 Remove gland cover H and route mains power supply cable (I) through it.

6 Route the cable through cable gland (F) and into the enclosure case.

NOTICE

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

7 Make connections to the power supply connection terminals (J). Connect earth wire K to earth stud (L).

8 Tighten gland cover (H).

9 Refit terminal cover (C) and secure it with retaining screw (B).

10 Close the transmitter door and secure with door retaining screw (A).

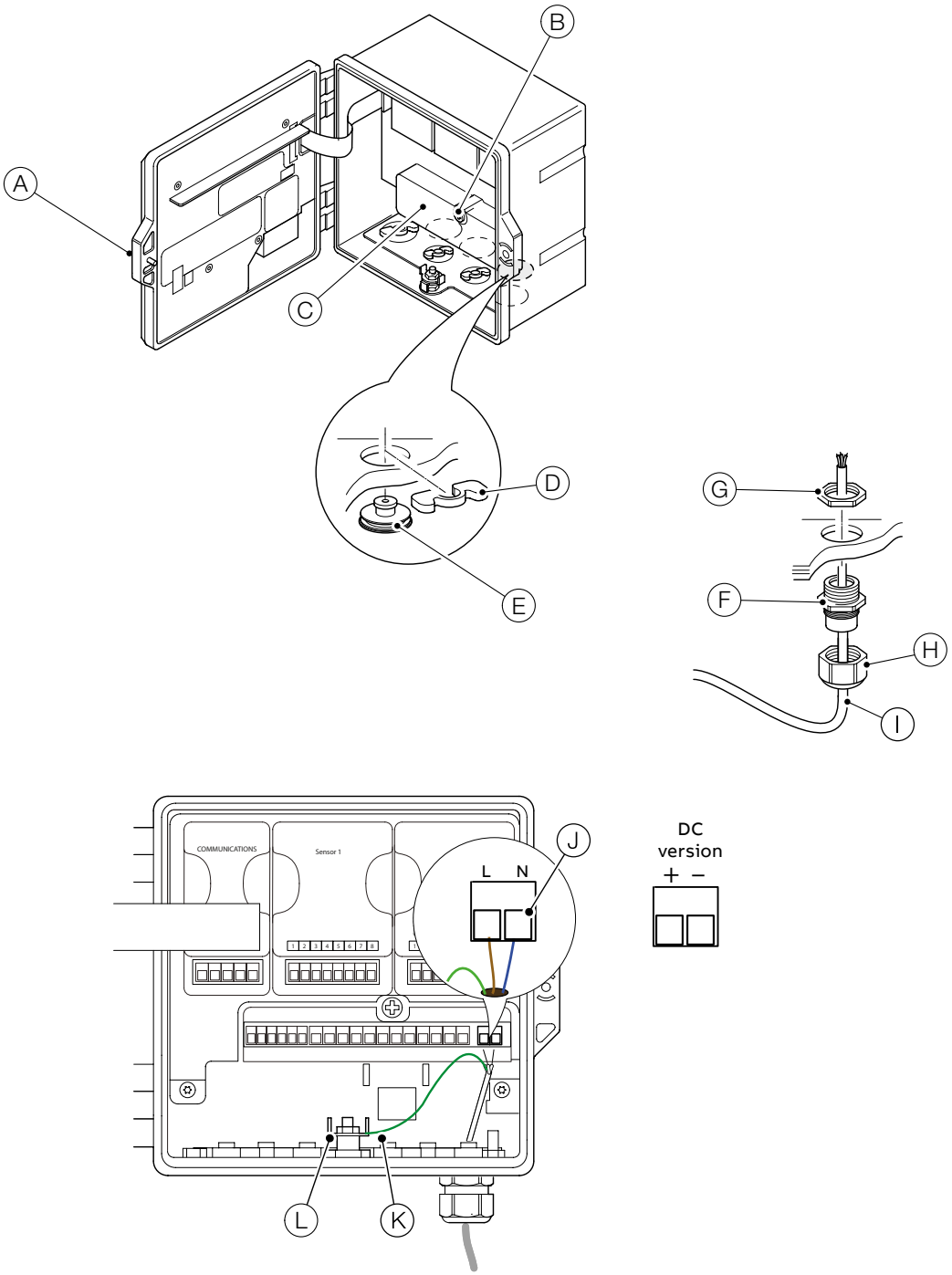
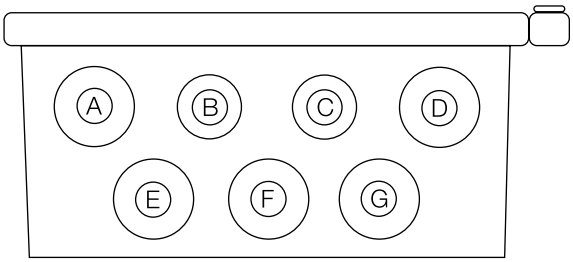


Figure 9 Connecting the transmitter power supply – plastic enclosure

9 Fit the Dual EZLink cable

9.1 Dual EZLink cable entries



10 Cable entries

Table 2 Dual EZLink cable entries

Position	Description
A	M20 – mains power
B	Sensor 1A (Dual EZLink)
C	Sensor 2A (Dual EZLink)
D	M20 – communication
E	Sensor 1B (Dual EZLink)
F	M20 – analog outputs
G	Sensor 2B (Dual EZLink)

We recommend to use these cable entry positions:

- For a sensor unit fitted in sensor position 1:
  – Use cable entry B for EZLink connection 1A,
  – Use cable entry E for EZLink connection 1B.
- For a sensor unit fitted in position 2:
  – Use cable entry C for EZLink connection 2A,
  – Use cable entry G for EZLink connection 2B.

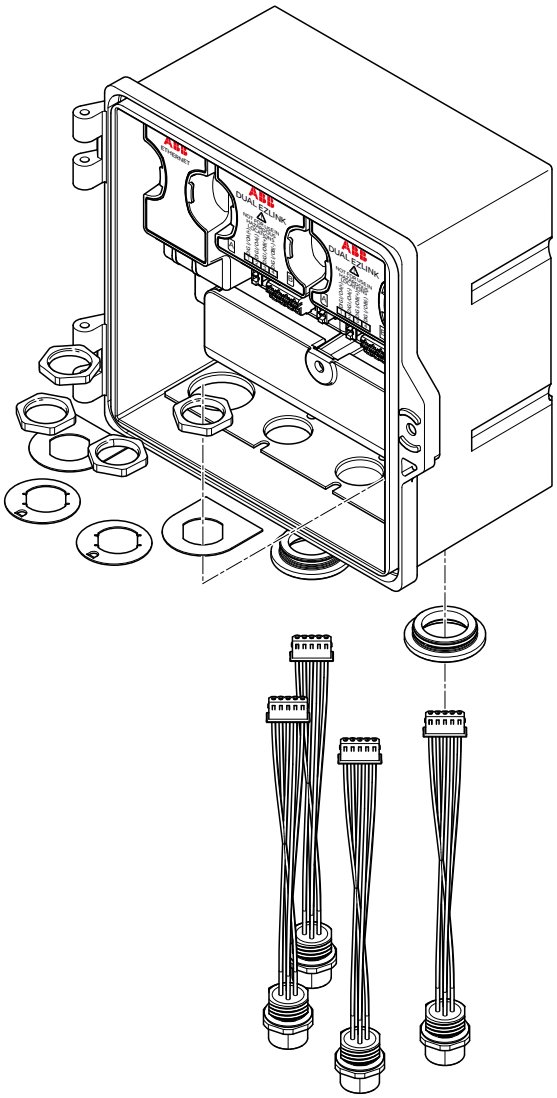
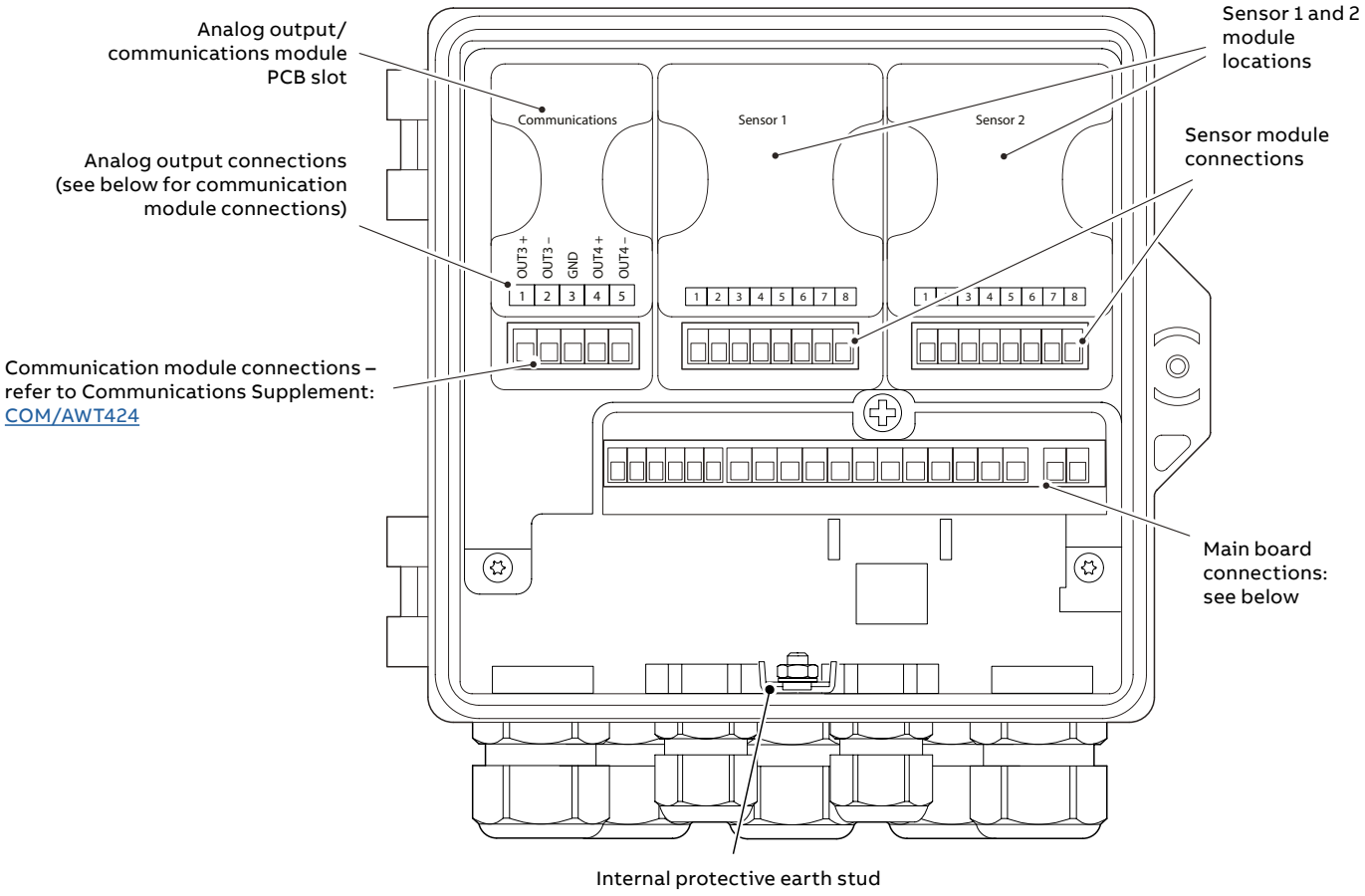


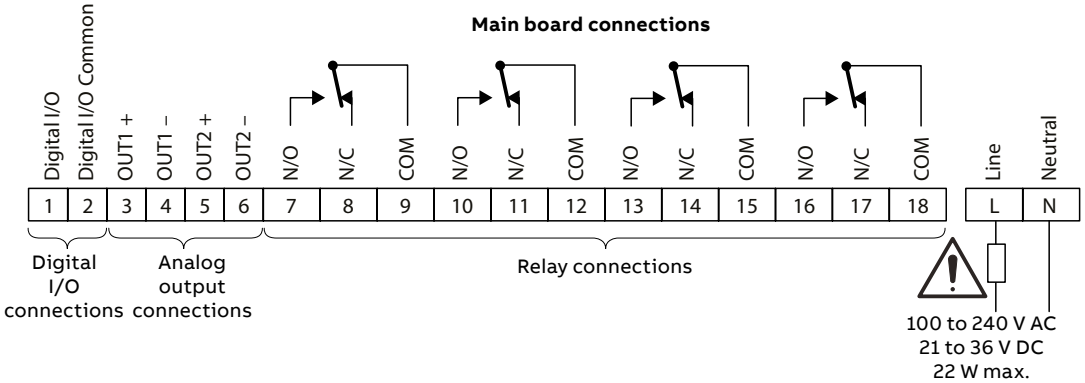
Figure 11 Dual EZLink

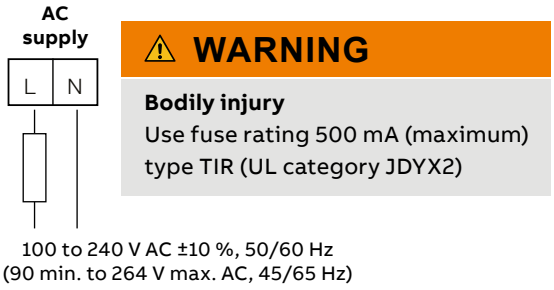
1. It is recommended that the Dual EZLink second cables are fitted into cable entry position E (slot 1 sensor module) and G position (slot 2 sensor module). Refer to 10.
2. Place the adapter Y with the O-ring fitted into the external side of the M20 hole.
3. Pass the EZLink connector cable G through the correct cable entry.
4. Pass the antirotation washer H through the EZLink connector wiring on item G. Make sure that the rear flat I is orientated with the back of the case.
5. Thread the nut J over EZLink connector cable G and secure nut tightly.

10 Electrical installation

10.1 Terminal connections

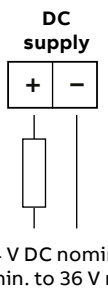






⚠ WARNING

Bodily injury
Use fuse rating 500 mA (maximum) type TIR (UL category JDYX2)



⚠ WARNING

Bodily injury
Use fuse rating 2.5 A (maximum) type T (UL category JDYX or JDYX7)

Figure 12 Electrical connections overview

11 Sensor wiring

11.1 pH/ORP/pIon sensor module connections

Note:
ORP (Redox) and antimony pH sensors do not feature temperature compensation, and therefore, do not have temperature sensors or related wiring.

11.1.1 pH sensor connections – standard sensors without diagnostic functions

Note:
Make sure that the sensor diagnostics are OFF when you use standard sensors without diagnostic functions.

Sensor type	RTD wiring	1	2	3	4	5	6	7	8
TB5	2-lead	Blue	—	—	Black	Red	White	—	—
AP1xx	2-lead	Clear	—	—	Black	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.
Note:
For older sensors, refer to INF/AWT424/007.

11.1.2 pH sensor connections – standard sensors with diagnostic functions

Note:
Make sure that the sensor diagnostics are ON when you use standard sensors with diagnostic functions.

Note:
Ref. block diagnostics are not available with the below wiring:

Sensor type	RTD wiring	1	2	3	4	5	6	7	8
TBX5	2-lead	Blue	Yellow	—	Black	Red	White	—	—
AP2xx	2-lead*	Clear	Red	—	Blue	Green	White	—	—
	3-lead	Clear	Red	—	Blue	Green	White	—	Gray

* Cut and remove gray wire
Note:
For older sensors, refer to INF/AWT424/007.

11.2 Conductivity sensor module connections

Table 3 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	2-lead	Red	—	—	Black	Green/Yellow Blue	Brown	—	—
	3-lead	Red	—	—	Black	Brown	Green/Yellow	—	—
2085*	2-lead	Red	—	—	Blue	Yellow	Dark green	—	—
TB2	2-lead	Green	—	—	Black	Blue	Yellow	Dark green	—
AC2xx	2-lead**	Green	—	—	Black	Blue/Red	Yellow	Shield***	—
	3-lead**	Green	—	—	Black	Yellow	Blue	Shield***	Red

*2085 cable **attached** cells.
**Cut and remove white wire.
***Twist shielding braids from Black and Green cores to form the Shield. Add heat shrink for insulation purposes.

Table 4 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	—

11.3 Turbidity sensor module connections

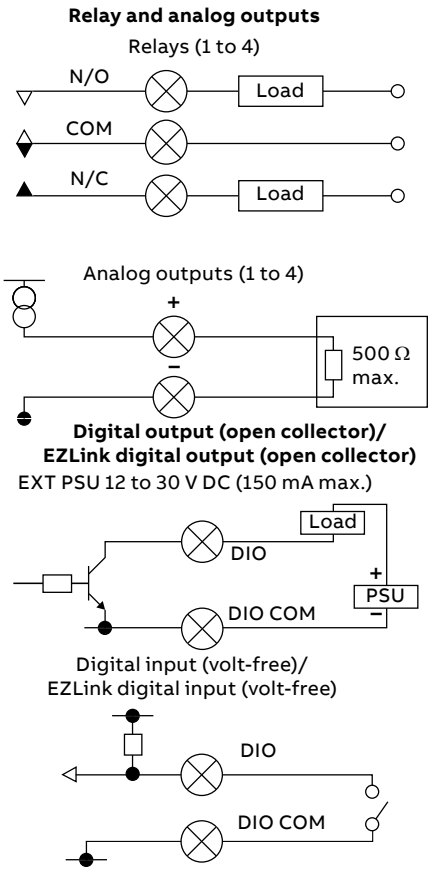
Sensor type	RTD wiring	1 White	2 Yellow	3 Red	4 Green	5 Black	6 Blue	7 Braid	8 —
ATS410	—	Initiate cleaner pulse	+12 V emitter switched power	+12 V cleaner/ receiver power	Turbidity input signal	Wiper acknowledge signal	0 V common	RFI ground	Not used

11.4 Universal Input Module sensor module connections

Sensor type	RTD wiring	1 IN+	2 IN-	3 OUT+	4 OUT-	5 PT	6 PT	7 SCREEN	8 PT (3rd)
ACL410	—	Gold electrode	Copper electrode	—	—	PT	PT	—	—
Custom	—	Signal input +	Signal input -	Voltage output +	Voltage output -	Temp/ resistance input	Temp/ resistance input	RFI ground	Temp/ resistance 3rd wire

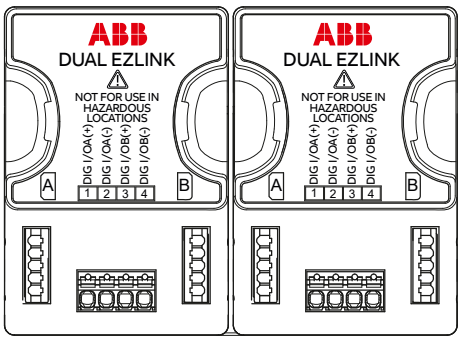
...11 Sensor wiring

11.5 Digital I/O, relays and analog output connections



13 Digital I/O, relays and analog output connections

11.6 Dual EZLink input connections



14 Dual EZLink input connections

12 Operator level menus

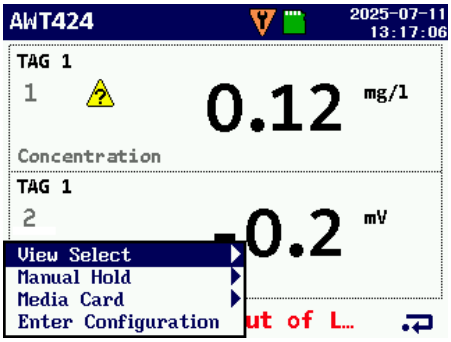


Figure 15 Operator level menus

Operator level menus are used to select operator views, place the sensor into a manual hold, turn the media card online or offline, and enter the configuration level.

Table 5 Operator level menus

Menu	Description
View Select	Switches between the operator pages, diagnostics views and log views
Manual Hold	Freezes the current displayed sensor reading and associated analog outputs, relays, etc. when selected. For example, when removing a sensor from the process for cleaning. When Manual Hold is active, a red hand symbol shows on the screen.
Media Card	Turns the media card online or offline
Enter Configuration	Displays the access level selection views

12.1 Diagnostics status bar



Figure 16 Diagnostics status bar

When a diagnostic condition is detected, the associated NAMUR icon, plus the highest priority diagnostic message, is displayed in the status bar when the transmitter is in Operator View mode.

If the status bar displays a diagnostic message, press the key to see all diagnostic messages.

...12 Operator level menus

12.2 Data views

Pages displayed in View mode comprise:

- **Diagnostics View** – displays a list of active diagnostic messages identified by priority and message – see Figure 17
- **Signals View** – displays a list of active signals and their values (1 page per sensor) – see Figure 18
- **Chart View** – represents the sensor readings as a series of color-coded traces – see Figure 19
- **Alarms View** – displays a list of alarms, source and status – see Figure 20
- **Outputs View** – displays a list of the analog outputs, output value and percentage of output value – see Figure 21

12.2.1 Diagnostics View

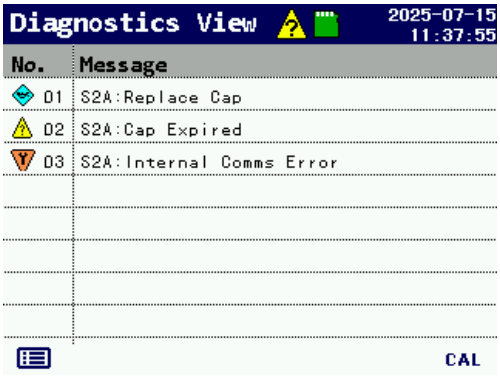


Figure 17 Diagnostics View

12.2.2 Signals View

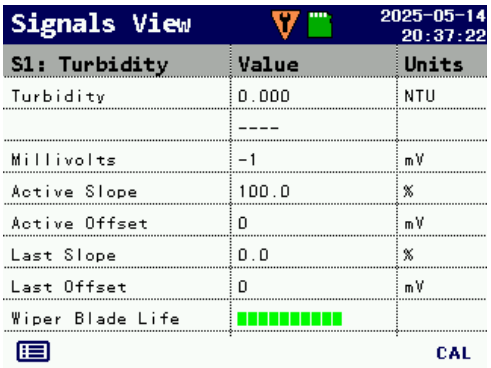


Figure 18 Signals View

12.2.3 Chart View

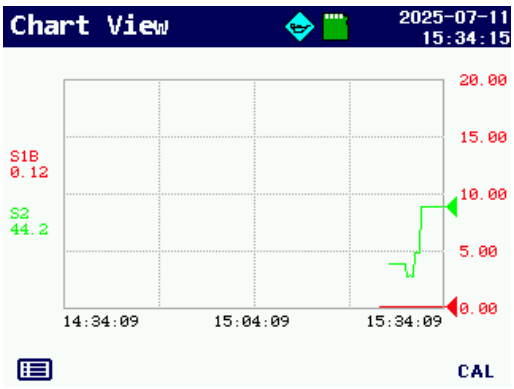


Figure 19 Chart View

12.2.4 Alarms View

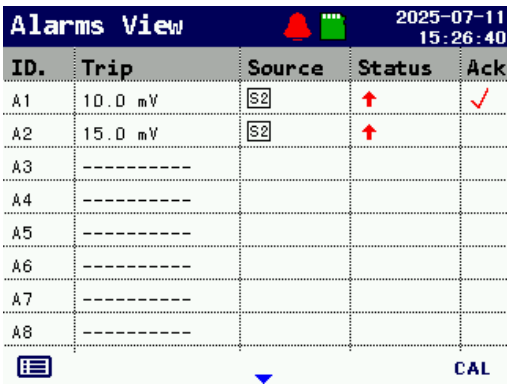


Figure 20 Alarms View

12.2.5 Outputs View

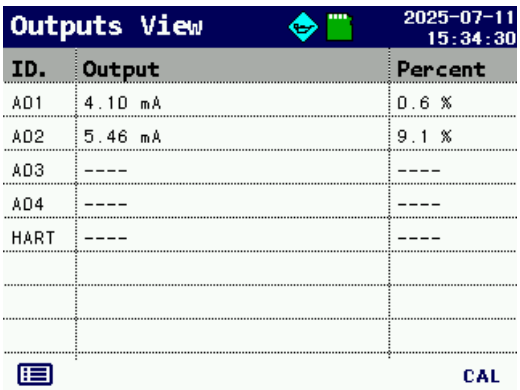


Figure 21 Outputs View

13 Display icons

13.1 Diagnostic icons

When a diagnostic condition is detected, the associated NAMUR icon, plus the highest priority diagnostic message, is displayed in the **Status Bar** when the transmitter is in **Operator View** mode.

If the status bar displays a diagnostic message, press the key to see all diagnostic messages.

Table 6 NAMUR icons

	Diagnostic icon – Out of specification
	Diagnostic icon – Maintenance required
	Diagnostic icon – Failure
	Diagnostic icon – Check function

Table 7 Alarm, hold, and clean icons

	Alarm – indicates a user-defined alarm condition (20-character) and flashes intermittently with an associated NAMUR diagnostic icon.
	Hold – indicates that alarms/analog outputs are in a manual hold state.
	Cleaning – indicates that a manual or automatic clean is in progress.

Table 8 Title bar icons

	Media online: 0 to <20 % full.
	Media online: 20 to <40 % full.
	Media online: 40 to <60 % full.
	Media online: 60 to <80 % full.
	Media online: 80 to <100 % full.
	Media online: full (icon toggles when full).
	Media offline: 0 to <20 % full.
	Media offline: 20 to <40 % full.
	Media offline: 40 to <60 % full.
	Media offline: 60 to <80 % full.
	Media offline: 80 to <100 % full.
	Media offline: not inserted (not logging).
	Any alarm is active.
	Bluetooth: not connected/connected.

...13 Display icons

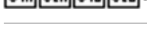
13.2 Status bar icons

Refer to page 21 for diagnostic (NAMUR) icons and descriptions.

	Operator menu – displays the Operator menu when the key is pressed.
	Autoscroll – indicates that Operator pages are displayed sequentially. Displayed only when Autoscroll enabled from the Operator menu. Disabled if 1 Operator page only is configured for display.
CAL	Calibration – shortcut access to the Calibration page when the key is pressed.
	Enter – selects the highlighted option from the Operator menus when the key is pressed.
	Service Level*
	Advanced Level* – indicates that Advanced Level parameters are enabled for the current user.
	Calibrate Level* – indicates that the Calibration Level parameters are enabled for the current user.
	Read Only Level* – indicates that the transmitter is in Read Only mode. All parameters are locked and cannot be configured.
	High process alarm active/inactive
	Low process alarm – active/inactive
	High latch alarm – active/inactive
	Low latch alarm – active/inactive

*Not displayed at **Operator** levels.

13.3 Log icons

	Source sensor – Sensor 1 process value
	Source sensor – Sensor 1A/2A/1B/2B process value
	Power failed/power restored
	Configuration changed
	System Error
	File created/deleted
	Media inserted/removed
	Media online/offline
	Media full
	Date/time or daylight saving start/end changed
	High process alarm active/inactive
	Low process alarm – active/inactive
	High latch alarm – active/inactive
	Low latch alarm – active/inactive
	Alarm acknowledged

14 Security options

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

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.

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

14.1 Access Level

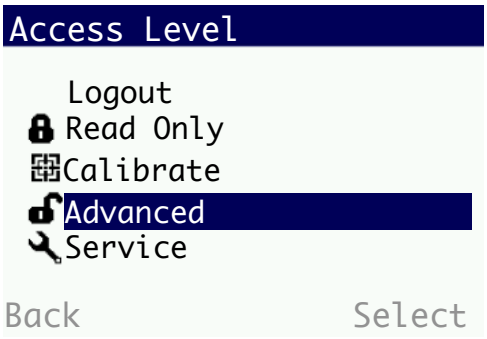


Figure 22 Access Level menus

Table 9 Access Level functions

Menu	Description
Logout	Displayed after Basic or advance level are accessed. If passwords are set, a password must be used to access these levels after selecting log out
Read only	Enables all parameter settings to be viewed
Calibrate	Enables access to and adjustment of all calibrate parameters. Calibration is sensor-specific. Refer to the sensor operating instructions for calibration details.
Advanced	Enables configuration access to all parameters
Service	Reserved for use by authorized service personnel

Note:
A 5 minute time-out period enables a user to return to the **Operator** view and access the previous menu (displayed at exit) without re-entering the password.
For periods more than 5 minutes (or if **Logout** is selected), a password must be entered to access protected levels.
Service level is reserved for factory use only, and is not enabled for end users.

15 Calibrate

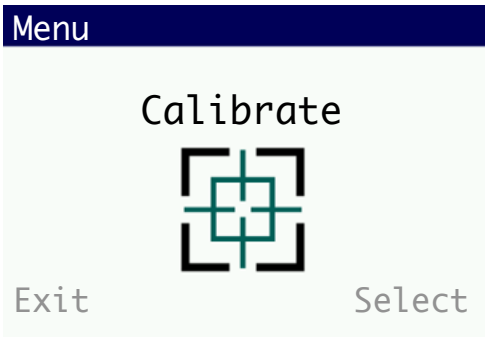


Figure 23 Calibrate menu

Provides a shortcut to the calibrate parameter in the advanced level. See "Calibrate" on page 27 for further details.

16 Advanced

16.1 Easy Setup

On first power up after inserting a new sensor module or connection of a new EZLink probe, the Easy Setup menu will be displayed.

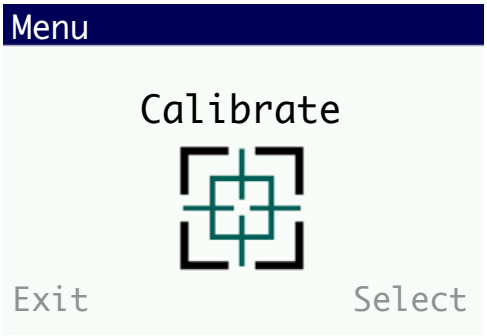


Figure 24 Easy Setup menu

Table 10 Menu functions

Menu	Description
Language	Selects the language on the transmitter's display
Instrument Tag	A 16-character alphanumeric tag, displayed in the title bar on operator pages
Temperature Unit	Select the units in which all temperatures are displayed
Diagnostics View	Enables the diagnostics view
Signals View	Enables the signals view
Chart View	Enables the chart view
Alarm View	Enables the alarm view
Analog OP View	Enables the analog output view
Calibration Log	Enables the calibration log display
Alarm Log	Enables the alarm log display
Audit Log	Enables the audit log display
Diagnostics Log	Enables the diagnostics log display
Date & Time	Sets the transmitter's date and time
Date Format	Sets the transmitter's date format

17 Calibrate



Used to calibrate the sensor.

Note. **Calibrate** menus are sensor-specific – refer to the **Calibration** section for specific routines.

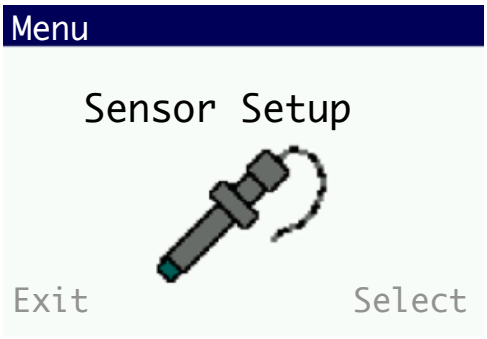
Access to the **Calibrate** menu is permitted via the **Calibrate** and **Advanced** levels or directly from an **Operator** page using the **Cal** button.

Menu	Comment	Default
S1: <Sensor Type>	**Note**. Displayed only if a sensor is fitted to slot 1.	
S1: <Sensor Tag>	Access the sensor 1 specific calibration pages, refer to the Calibration section for specific routines.	
S2: <Sensor Type>	**Note**. Displayed only if a sensor is fitted to slot 2.	
S2: <Sensor Tag>	Access the sensor 2 specific calibration pages, refer to the Calibration section for specific routines.	
pH Buffers	**Note**. Displayed only if at least one pH sensor is fitted and **Measurement Type** = pH.	
Buffer 1	Set the type/value of buffer solution 1. • Supported buffer solutions from Table 11/user-defined.	Technical 4.01pH
Used Buffer 1	**Note**. Displayed only if **Buffer 1 Type** = **User Defined**. Set the user defined buffer characteristic curve using the five point linearizer table (pH against °C).	N/A
Buffer 2	Set the type/value of buffer solution 2. • Supported buffer solutions from table below/user-defined.	Technical 7.00pH
Used Buffer 2	**Note**. Displayed only if **Buffer 2 Type** = **User Defined**. Set the user defined buffer characteristic curve using the five point linearizer table (pH against °C).	N/A
Hold Outputs	Set to automatically hold current outputs and alarms whilst a calibration is being performed. • **Disabled/Enabled**.	Disabled

Table 11 Buffer solutions

Technical 4.01 pH
Technical 7.00 pH
Technical 10.01 pH
DIN19266 1.679 pH
DIN19266 4.005 pH
DIN19266 6.865 pH
DIN19266 9.180 pH
DIN19266 10.012 pH
NIST 4.001 pH
NIST 6.881 pH
NIST 9.225 pH
NIST 10.062 pH
Phth. Free 4.00 pH
ABB Sachet 4.01 pH
ABB Sachet 7.00 pH
ABB Sachet 9.18 pH
User Defined 1
User Defined 2

18 Sensor Setup



Used to access standard setup parameters.

Sensor Setup menus are sensor-specific – refer to the **Calibration** section and relevant sensor manual for full details of sensor setup.

Menu	Comment	Default
S1 (A): , sensor type>: <sensor tag>	**Note:** only displayed if sensor is fitted to slot 1(A) Access the sensor 1 specific set up pages, refer to sensor setup section	
S1B: , sensor type>: <sensor tag>	**Note:** only displayed if sensor is fitted to slot 1B Access the sensor 1B specific set up pages, refer to sensor setup section	
S2 (A): , sensor type>: <sensor tag>	**Note:** only displayed if sensor is fitted to slot 2 (A) Access the sensor 2 (A) specific set up pages, refer to sensor setup section	
S2B: , sensor type>: <sensor tag>	**Note:** only displayed if sensor is fitted to slot 2B Access the sensor 2 (A) specific set up pages, refer to sensor setup section	
Function	Sensor verification menu (page 40)	
Sensor failure	Required action in event of sensor failure	

For sensor setup/calibration information, refer to the related sensor manual.

18.1 2-electrode conductivity

Menu	Comment	Default
Tag	Enter an alphanumeric sensor tag (16 characters maximum) to identify the sensor on the **Operator Pages.**	TAG1
Measurement Type	Select measurement type: • Conductivity/Concentration/Resistivity **Note**. If a change is made the I/O sources are reset.	Conductivity
Note. The following menus are displayed only if measurement type = **Conductivity**		
Conductivity Unit	Select the conductivity units: • mS/cm/µS/cm	µS/cm
Cell Constant	Enter the cell constant of the measuring cell used – see the relevant conductivity cell manual.	1.00
Range High	Set the span value used in **Chart** and **Bargraph** views.	Cell constant dependent – see table below
Range Low	Set the zero value used in **Chart** and **Bargraph** views.	0
Note. The following menus are displayed only if measurement type = **Concentration**		
Cell Constant	Enter the cell constant of the measuring cell used – see the relevant conductivity cell manual.	N/A
Concentration Unit	Select the concentration units: • None(Blank)/ppm/mg/l/ppb/µg/l/%/Custom	N/A
Custom Units	**Note**. Displayed only if concentration units = **Custom** Enter an alphanumeric string (6 characters maximum) for the custom (user defined) concentration units.	N/A
Conc. Curve Table	Set the user defined concentration curve using the 6-point linearizer table (concentration against conductivity).	N/A
Range High	View the span value used in **Chart** and **Bargraph** views.	N/A
Range Low	View the zero value used in **Chart** and **Bargraph** views.	N/A
Filter Type	Select the signal filtering type: • None/Low/Medium/High	None
Temp. Comp. Type	Set the type of temperature compensation: • Manual/Automatic/None	Automatic
Manual Temperature	**Note.** Displayed only if temperature compensation type = **Manual** Enter the temperature of the sample within the range –10.0 to 120.0 °C.	25.0 °C
TC Curve	**Note.** Not displayed only if temperature compensation type = **None** Set the temperature compensation characteristic required: • TC Coeff./Standard KCl/UPW (Low TC)/UPW (High TC)/Pure H_20 (Neutral)/ Pure H_2O (Acid)/Pure H2O (Base)/NaOH/HCl/NaCl/NH_3/User Defined	TC Coeff
User Def. TC Curve	**Note.** Displayed only if temperature compensation curve = **User Defined** Set the user defined temperature compensation curve using the six point linearizer table (% against °C).	N/A
TC Coefficient	**Note.** Displayed only if temperature compensation curve = **User Defined** Enter the temperature coefficient (α x 100) of the solution (0.01 to 5.00 %/°C). If unknown, the temperature coefficient (α) of the solution must be calculated – see INF/AWT424/009.	2.00 %/°C
Reference Temperature	**Note**. Displayed only if TC Curve = TC Coeff. (Supported with software version ACS200/P2/00.01.03, hardware 2 onwards) Set the reference temperature compensation: • 25 °C (77 °F) / 20 °C (68 °F)	25 °C (77 °F)
Sensor Diagnostics		
Polarisation	Detect excessive polarisation condition: • Enabled/Disabled	Disabled
Out Of Solution	Detect **Out Of Solution** condition: • Enabled/Disabled	Disabled
Reset To Defaults	Select to reset all **Sensor Setup** parameters to their default values.	

Conductivity cell constant	Conductivity measuring range
0.01	0 to 200 µS/cm
0.05	0 to 1,000 µS/cm 0 to 1 mS/cm
0.10	0 to 2,000 µS/cm 0 to 2 mS/cm
1.00	0 to 20,000 µS/cm 0 to 20 mS/cm

...18 Sensor setup

18.2 2-electrode conductivity – Dual-input calculated values setup

Menu	Comment	Default
Calculation Type	Calculations are performed using the inputs from both sensors. Select the required calculation from the following options: No Calculation/Inferred pH (NaOH)/Inferred pH (NaOH+NaCl)/Inferred pH (NH_3)/ Inferred pH (NH_3+NaCl)/Difference/Ratio/% Passage/% Rejection **Inferred pH (NaOH)** Calculates a pH value in the range 7.00 to 11.00 pH based on the type of chemical dosing and the conductivity readings. **Note:** The temperature compensation characteristic **TC Curve** for signal B should be set to **NaOH**. **Inferred pH (NaOH+NaCl)** Calculates a pH value in the range 7.00 to 11.00 pH based on the type of chemical dosing and the conductivity readings. **Note:** The temperature compensation characteristic **TC Curve** for signal A should be set to **NaCl**. **Note:** The temperature compensation characteristic **TC Curve** for signal B should be set to **NaOH**. **Inferred pH (NH_3)** Calculates a pH value in the range 7.00 to 10.00 pH based on the type of chemical dosing and the conductivity readings. **Note:** The temperature compensation characteristic **TC Curve** for signal B should be set to **NH_3**. **Inferred pH (NH_3+NaCl)** Calculates a pH value in the range 7.00 to 10.00 pH based on the type of chemical dosing and the conductivity readings. **Note:** The temperature compensation characteristic **TC Curve** for signal A should be set to **NaCl**. **Note:** The temperature compensation characteristic **TC Curve** for signal B should be set to **NH_3**. **Difference** Calculates the difference between the two conductivity inputs: Difference = B − A **Ratio** Calculates the ratio of the two conductivity inputs: $\text{Ratio} = \frac{B}{A}$ **% Passage** Calculates the amount of conductivity as a percentage that passes through the cation exchange unit: $\%\text{Passage} = \frac{A}{B} \times 100$ **% Rejection** Calculates the amount of conductivity as a percentage that is absorbed in the cation exchange unit: $\%\text{Rejection} = \left(1 - \frac{A}{B}\right) \times 100$	No Calculation
Note. The following menus are displayed only if Calculation Type = Inferred pH.		
Before Cation Limit	Set the required before-cation conductivity limit, between: • 0.000 and 100.0 µS/cm Inferred pH (NaOH) • 0.000 and 100.0 µS/cm Inferred pH (NaOH+NaCl) • 0.000 and 25.00 µS/cm Inferred pH (NH_3) • 0.000 and 25.00 µS/cm Inferred pH (NH_3+NaCl)	N/A
After Cation Limit	Set the required after-cation conductivity limit, between: • 1.000 and 100.0 µS/cm Inferred pH (NaOH) • 1.000 and 250.0 µS/cm Inferred pH (NaOH+NaCl) • 0.060 and 10.00 µS/cm Inferred pH (NH_3) • 0.060 and 25.00 µS/cm Inferred pH (NH_3+NaCl)	N/A
pH Range	View the measuring range for the selected Inferred pH calculation • 7.00 to 11.00 pH Inferred pH (NaOH) • 7.00 to 11.00 pH Inferred pH (NaOH+NaCl) • 7.00 to 10.00 pH Inferred pH (NH_3) • 7.00 to 10.00 pH Inferred pH (NH_3+NaCl)	N/A
Signal Arrangement	Set the signal arrangement: • A = S1, B = S2/A = S2, B = S1 **Note:** For inferred pH: • A = Conductivity measurement **A**fter cation column. • B = Conductivity measurement **B**efore cation column.	N/A

18.3 4-electrode conductivity

Menu	Comment	Default
Tag	Enter an alphanumeric sensor tag (16 characters maximum) to identify the sensor on the **Operator Pages**.	TAG1
Measurement Type	Select measurement type: • Conductivity/Concentration **Note**. If a change is made the I/O sources are reset.	Conductivity
Note. The following menus are displayed only if **Measurement Type** = **Conductivity**		
Conductivity Unit	Select the conductivity units: • mS/cm/µS/cm	mS/cm
Sensor Group	Enter the sensor group for the measuring cell used – • Group A/Group B see the relevant conductivity cell manual.	Group A
Range High	Set the span value used in **Chart** and **Bargraph** views.	Sensor Group dependent – see table below
Range Low	Set the zero value used in **Chart** and **Bargraph** views.	0
Note. The following menus are displayed only if **Measurement Type** = **Concentration**		
Sensor Group	Enter the sensor group for the measuring cell used – • Group A/Group B see the relevant conductivity cell manual.	N/A
Conc. Solution	Note. Displayed only if **Sensor Group** = **Group A** Select the Concentration Solution • NaOH/HCl/H_2SO_4/H_3PO_4/NaCl/KOH/Custom	N/A
Concentration Unit	**Note**. Displayed only if **Conc. Solution** = **Custom** Select the Concentration Units • None(Blank)/ppm/mg/l/ppb/µg/l/%/Custom	N/A
Custom Units	**Note**. Displayed only if **Concentration Units** = **Custom** Enter an alphanumeric string (6 characters maximum) for the custom (user defined) concentration units.	N/A
Conc. Curve Table	Set the user defined concentration curve using the 6-point linearizer table (concentration against conductivity).	N/A
Range High	View the span value used in **Chart** and **Bargraph** views.	N/A
Range Low	View the zero value used in **Chart** and **Bargraph** views.	N/A
Filter Type	Select the signal filtering type: • None/Low/Medium/High	None
Temp. Comp. Type	Set the type of temperature compensation: • Manual/Automatic/None	Automatic
Manual Temperature	**Note**. Displayed only if **Temp. Comp. Type** = **Manual** Enter the temperature of the sample within the range –10.0 to 120.0 °C.	25.0 °C
TC Curve	**Note**. Not displayed only if **Temp. Comp. Type** = **None** Set the type of automatic temperature compensation required: • TC Coeff./Standard KCl/NaOH/NaCl/HCl/H_2SO_4/H_3PO_4/KOH/User Defined	TC Coeff
User Def. TC Curve	**Note**. Displayed only if **TC Curve** = **User Defined.** Set the user defined temperature compensation curve using the six point linearizer table (% against °C).	N/A
TC Coefficient	**Note**. Displayed only if **TC Curve** = **User Defined.** Enter the temperature coefficient (α x 100) of the solution (0.01 to 5.00 %/°C). If unknown, the temperature coefficient (α) of the solution must be calculated.	2.00 %/°C
Reference Temperature	**Note**. Displayed only if TC Curve = TC Coeff. (Supported with software version ACS400/P2/00.01.03, hardware 2 onwards) Set the reference temperature compensation: • 25 °C (77 °F) / 20 °C (68 °F)	25 °C (77 °F)
Sensor Diagnostics		
Dirty Sensor	Detect dirty sensor condition: • Enabled/Disabled	Disabled
Out Of Solution	Detect Out Of Solution condition: Enabled/Disabled	Disabled
Reset To Defaults	Select to reset all **Sensor Setup** parameters to their default values	

Sensor group	Conductivity measuring range
A	0 to 2,000 mS/cm
B	0 to 2,000 µS/cm

...18 Sensor setup

18.4 pH/Redox ORP

Menu	Comment	Default
Tag	Enter an alphanumeric sensor tag (16 characters maximum) to identify the sensor on the **Operator Pages.**	TAG1
Measurement Type	Select measurement type: • pH/Redox/ORP **Note**. If a change is made the I/O sources are reset.	pH
Range High	Set the span value used in **Chart** and **Bargraph** views.	14.00
Range Low	Set the zero value used in **Chart** and **Bargraph** views.	0.00
Filter Type	Select the signal filtering type: • None/Low/Medium/High	None
Note. The following menus are displayed only if **Measurement Type** = **pH.**		
Temp. Compensation	Set the type of temperature compensation: • Manual/Automatic/Auto solution	Automatic
Solution Coeff.	**Note**. Displayed only if **Temp. Compensation** type = **Auto solution.** Set the solution coefficient (pH or mV change per 10 °C) of the solution being monitored. For temperature coefficient calculations see INF/AWT424/008.	N/A
Manual Temperature	**Note.** Displayed only if **Temp. Compensation** type = **Manual.** Enter the temperature of the sample within the range –10.0 to 120.0 °C.	N/A
Note. The following menus are displayed only if **Measurement Type** = **Redox/ORP.**		
Temperature Sensor	Set the type of temperature measurement: • Manual/Automatic **Note.** If **Temperature Sensor** type = **Manual**, the temperature value is not displayed in the associated **Operator page** or **Signals View**.	N/A
Low Slope Limit	A pH probe degrades over time. As this happens the slope calculated by a calibration procedure gradually decreases. Set the slope value below which a calibration fails. The low slope warning diagnostic is activated if the calibration calculates a slope less than 20 % above this value.	40 %
Sensor Diagnostics		
Broken Glass	**Note:** Displayed only if **Measurement Type** = **pH.** Detect broken glass condition: • Enabled/Disabled	Disabled
Out Of Solution	Detect Out Of Solution condition: • Enabled/Disabled	Disabled
Ref. Poisoning	**Note:** Displayed only if a digital (EZLink) sensor is connected. Detect a contaminated reference electrode: • Enabled/Disabled	Disabled
Ref. Failure	**Note:** Displayed only if a digital (EZLink) sensor is connected. Detect a failed reference electrode: • Enabled/Disabled	Disabled
Ref. Blocked	Detect a blocked reference electrode: • Enabled/Disabled	Disabled
Ref. Alarm Limit	**Note:** Displayed only if **Ref. Blocked** sensor diagnostic is **Enabled.** A blocked reference electrode is detected when the impedance of the reference electrode exceeds a given limit. Set the impedance value above which the reference blocked diagnostic is activated.	N/A
Reset To Defaults	Select to reset all **Sensor Setup** parameters to their default values.	

18.5 Turbidity

Menu	Comment	Default
Tag	Enter an alphanumeric sensor tag (16 characters maximum) to identify the sensor on the **Operator Pages.**	TAG1
Sensor Type	Select the sensor type: • 7998 011/7998 012/7998 016	N/A
Turbidity Units	Select the turbidity units: • NTU/FNU	NTU
Range High	Set the span value used in **Chart** and **Bargraph** views.	40.00 NTU (sensor types: 7998 011, 7998 016) 400.0 NTU (sensor type: 7998 012)
Range Low	Fixed at 0.0 NTU.	0.0
Filter Type	Select the signal filtering type: • None/Low/Medium/High	None
Bubble Rejection	Select the bubble rejection filtering type: • None/Low/Medium/High	None
Note. The following menus are displayed only if the sensor has a wiper fitted. Validity sensor type: 7998 011 or 7998 012		
Wiper Clean Freq.	Set the interval between cleans: • Off/15 mins/30 mins/45 mins/1 to 24 hours	Off
Next Clean	**Note**. Displayed only if a wiper clean frequency has been configured Set the time for the next wiper clean to occur.	N/A
Reset Wiper Lifetime	Use to restart the wiper lifetime counter after wiper replacement.	N/A
Reset To Defaults	Select to reset all **Sensor Setup** parameters to their default values.	

...18 Sensor setup

18.6 Optical low-level dissolved oxygen

Menu	Comment	Default
Tag	16 character alphanumeric tag	TAG1
DO units	Select the DO units: • ppm / ppb / mg/L / µg/L / %sat / %vol	ppm (AeroStar Ultra) ppb (AeroStar Ultra Trace)
Range high	Set the span value used in **Chart** and **Bargraph** views.	25 ppm (AeroStar Ultra) 2,000 ppb (AeroStar Ultra Trace)
Range low	Set the zero value in **Chart** and **Bargraph** views.	0.0 ppb (AeroStar Ultra) 0 ppb (AeroStar Ultra Trace)
Filter type	Select the signal filtering type: • None / Low / Medium / High	None
Salinity	Enter the salinity measurement • 0 to 50 mS/cm	0 mS/cm
Pressure	Enter the local barometric pressure • 10 to 1,200 mbar If you do not know the barometric pressure, leave the default sea level value of 1,013 mbar.	1,013 mbar
Meas. interval	Select the measurement interval 3 to 300 s Increasing the interval will increase the life of the sensor cap but will also provide a slower reaction time for an oxygen change. **Note:** During a zero or span calibration if the measurement interval is greater than 3 s, the measurement interval is temporarily set to 3 s and is restored to its configured value 10 minutes after calibration is completed or after a power up. When a grab sample calibration is performed, the measurement interval is not changed.	3 s
Num sub samples	Select the number of sub samples. • AeroStar Ultra 1 to 16 if Measurement interval is 3 or greater • AeroStar Ultra Trace 8 to 16 The measured value in each measurement interval is an average of a number of samples. The advantage of using a smaller amount of sub-measurements is a shorter exposure of the luminophore in the sensor cap to the excitation light reducing photo bleaching. The disadvantage is a reduced signal quality.	3 (AeroStar Ultra) 8 (AeroStar Ultra Trace)
Temp compensation	Select the automatic temperature compensation • Automatic/Manual	Automatic
Manual temperature	Select the manual temperature **Note:** Only displayed if temperature compensation is set to Manual	25.0 °C 77 °F
Sensor failure action	Select the action to be applied to the measured value (PV) if a sensor failure is detected • Do nothing / Hold / Custom	Custom
Custom value	Enter the Custom Value the measured value (PV) will be set to when a sensor failure occurs **Note:** Only displayed if action set to Custom	0.0000
Replace cap	Displays the cap part number that is installed on the sensor	C3 (AeroStar Ultra) U1 (AeroStar Ultra Trace)
Cap serial number	Enter the serial number etched on the cap (6 characters max.) After the serial number is entered, a cap replaced audit log entry is created.	—
Reset To Defaults	Select to reset sensor setup to default values. **Note:** The sensor calibration data is not reset by this function.	—

18.7 Universal Input Module (UIM)

The Universal Input Module provides support for a wide range of bespoke or non standard sensors measuring current, voltage, frequency, resistance and temperature inputs. It can also directly support ABB's ACL410 chlorine sensor.

Note:
When using with an ACL410 sensor, select ACL410 as the sensor type in the sensor setup menu and then refer to the ACL410 operating instruction (OI/ACL410) for details on how to configure.

...18 Sensor setup

18.8 Universal Input Module – custom sensor type

Menu	Comment	Default
Tag	Enter an alphanumeric sensor tag (16 characters maximum) to identify the sensor on the **Operator Pages.**	TAG1
Sensor Type	Select sensor type: • Custom / ACL410 **Note**. If a change is made, the I/O sources are reset.	Custom
PV Options		
Type	Select PV type: • Current / Voltage / Frequency / Resistance / Temperature	Current
Electrical Units	Select the electrical units. Selectable units are in Table 15 on page 38	
Electrical Range High **Electrical Range Low**	Configure the electrical ranges. Available ranges are outlined in Table 15 on page 38 **Note.** Range electrical range configuration not displayed if PV Type = Temperature	Table 15 on page 38
Measurement Type	Refer to Table 15 on page 38	Custom
Unit	Select the PV units. Available options are limited based on the measurement type selected. **Note**. Not displayed if PV Type = Temperature. Temperature units may be configured in Device Setup	
Custom Unit	**Note**. Only displayed if Unit = Custom. Enter an alphanumeric string (6 characters maximum) for the custom (user defined) units	
Decimal Places	Select the decimal places. This sets the maximum decimal places shown in **Operator** and **Signals** view: • X / X.X / X.XX / X.XXX	X.X
Range High	Limited to 99999 to -9999	100
Range Low	Limited to 99999 to -9999	0
Filter Duration	Limited from 0 to 900 seconds	0 s
Linearizer	Set the linearizer curve using the 6-point linearizer table.	• Input 0, 20, 40, 60, 80, 100 • Output 1, 1, 1, 1, 1, 1
Note. The following menu is displayed only if PV type is not temperature or resistance.		
Temp. Compensation	Select temp. compensation to be applied: • None / Manual / Auto	None
Note. The following menu is displayed only if Temp. Compensation is Manual		
Manual Temperature	Limited to –40 to 200.0 °C	25.0 °C
Temp. Comp. Curve	Set the temperature compensation curve using the 6-point table	• Input 0, 20, 40, 60, 80, 100 • Output 1, 1, 1, 1, 1, 1
SV Options		
Type	The SV type shall be configurable to the following options: • None / Voltage / Current / Frequency / Resistance / Temperature. If PV is configured to current, voltage, or frequency, it shall only be possible to set SV Type as None, Resistance, or Temperature. If PV is configured to Resistance or Temperature, it shall only be possible to set SV as None, Current, Voltage, or Frequency. If Temp. Comp. Type is set to Manual or Auto, SV shall be set to Temperature.	Temperature
Note. The following menus are displayed only if Type is not None		
Electrical Units	• Select the electrical units. Selectable units are in Table 15 on page 38	µA
Electrical Range High **Electrical Range Low**	Configure the electrical ranges. Available ranges are in Table 15 on page 38 **Note**. Range electrical range configuration not displayed if SV Type = Temperature	Table 15 on page 38
Unit	Select the SV units. Available options are limited based on the measurement type selected. See Table 15 on page 38 **Note**. Not displayed if SV Type = Temperature. Temperature units may be configured in Device Setup	
Custom Unit	**Note**. Only displayed if Unit = Custom. Enter an alphanumeric string (6 characters maximum) for the custom (user defined) units	
Decimal Places	• Select decimal places. This sets the maximum decimal places shown in **Operator** and **Signals** view: • X / X.X / X.XX / X.XXX	X.X

Range High	Limited to 99999 to -9999	100
Range Low	Limited to 99999 to −9999	0
Filter Duration	Limited from 0 to 900 seconds	0 s
Linearizer	Set the linearizer curve using the 6-point linearizer table	• Input 0, 20, 40, 60, 80, 100 • Output 1, 1, 1, 1, 1, 1
Voltage Output Sel.	Select voltage output: • Disabled / mV / 5 V / 12 V / 24 V	Disabled
Note. The following menu is displayed only if Voltage Output Sel. = mV		
Millivolt Output	Select the millivolt output bias voltage. Limited from 0 to 1,000 mV	0 mV
Reset to Defaults	Reset all sensor values to defaults	

Table 12 Electrical Range High & Electrical Range Low

Type	Voltage	Current	Frequency	Resistance	Temperature
Electrical Range High	0 mV	0 µA	1 Hz	50 Ω	−40 °C
Electrical Range Low	1,000 mV	50,000 µA	6,000 Hz	10,000 Ω	200 °C
Units	mV	nA, µA, mA	Hz	Ω	°C or °F

Table 13 Default values

PV Type	Voltage	Current	Frequency	Resistance	Temperature
Electrical Range Low	0 mV	4,000 µA	1 Hz	50 Ω	−40 °C
Electrical Range High	1,000 mV	20,000 µA	6,000 Hz	10,000 Ω	200 °C

...18 Sensor setup

18.9 Configuring the linearizers

Table 14 Available engineering units

Unit
None
NTU
FNU
FTU
FAU
ppm
mg/L
ppb
µg/L
µg/kg
mg/kg
Nm3/h
Bar
°C
°F
µS/cm
µS/m
mS/cm
mS/m
TDS
MΩ
Ω
pH
mV
SAT
%
mA
mL/s
µA
mL/m
PSU
PPT
mbar
mmHg
Weeks
Days
g/L
ppt
MΩ-cm
Custom S1 PV Unit*
Custom S2 PV Unit*
nA
PSI
Hz
Custom S1 SV Unit*
Custom S2 SV Unit*

*Custom units are defined in sensor setup. See UIM menus above.

Table 15 Measurement types and allowable units

Measurement type	Allowable units
Custom	All
pH	pH, User1, User2
Redox	mV, User1, User2
Temperature	N/A (use device units)
Conductivity	µS/cm, mS/cm, µS/m, User1, User2
Concentration	None, %, ppm, ppb, ppt, g/L, mg/L, µg/L, User1, User2
Resistivity	MΩ-cm, User1, User2
Dissolved oxygen	ppm, ppt, mg/L, g/L, User1, User2
%Sat	%Sat, User1, User2
Turbidity	NTU, FNU, FAU, FTU, User1, User2
Suspended solids	ppm, ppt, mg/L, g/L, User1, User2
Chlorine	ppm, ppb, mg/L, µg/L, User1, User2
Chlorine dioxide	ppm, ppb, mg/L, µg/L, User1, User2
Ozone	ppm, mg/L, User1, User2
Flow	mL/s, mL/h, m3/h, User1, User2
Pressure	PSI, mbar, barA, mmHg, User1, User2
Millivolts	mV, User1, User2
Current	mA, µA, nA, User1, User2
Resistance	Ω, MΩ, User1, User2

18.10 Universal Input Module calculations

The UIM can be configured to read a number of different types of input. This section describes how to configure the UIM to read an input which requires a non linear engineering range. A standard input configuration without a custom linearizer provides a linear signal across the configured engineering range as shown in Figure 25:

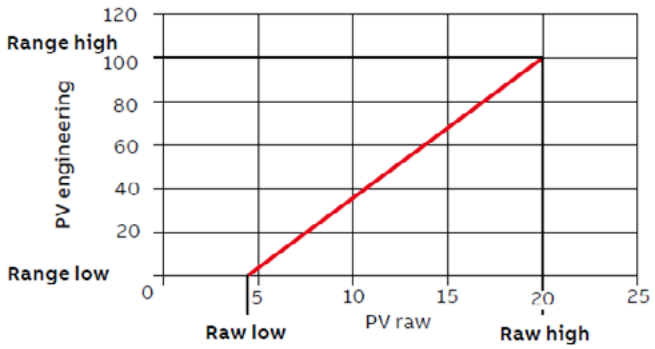


Figure 25 Linear signal

The UIM custom linearizer allows for up to 6 custom points to be plotted internally in order to get the required displayed engineering range across the electrical input signal range.

18.11 Configuring the linearizer

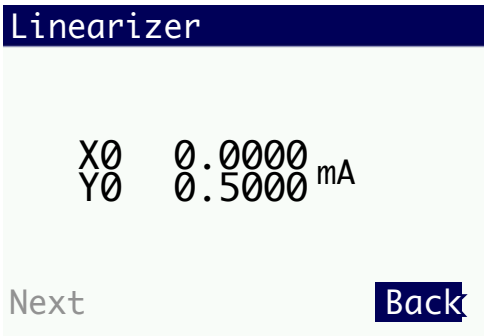


Figure 26 Linearizer

X = Engineering range in engineering units
Y = the ratio applied to the engineering units to give desired reading

For example an engineering range value of X = 100 with a ratio Y = 0.5000 will give a displayed reading after linearization of 50.

An example linearizer is shown in Figure 27:

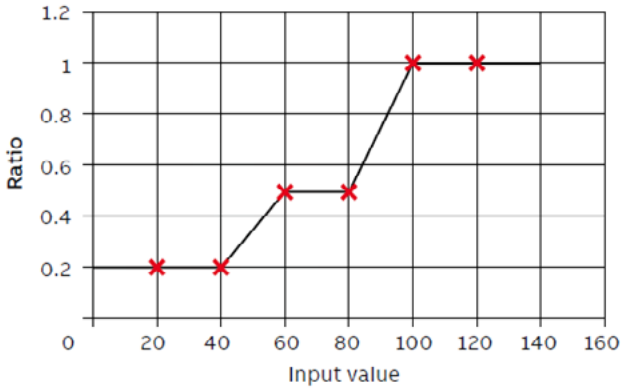


Figure 27 Example linearizer

Note:
The software will automatically extrapolate between input value points.

Note:
If the input value is less than the lower pair, then the ratio used will be the value defined in the lowest pair.

Note:
If the input value is more than the highest pair, then the ration used will be the value defined in the highest pair.

A temperature can also be used in conjunction with a linearizer and is configured the same way.

...18 Sensor setup

18.12 Sensor setup menu – Function

Menu	Comment	Default
Calculation type	Select the sensor verification calculation type: • None / Average / Difference / Maximum / Minimum	None
Source selection	Select which sensor will be Sensor A, Sensor B or Sensor C	—
Alarm trip delta	The pre-configured value by which the sensor readings deviate and are removed from the verification calculation • -999999 to 999999	0.00000
Function failure	If all sources are in a failure condition, the transmitter can return a pre-configured result	—
Function failure action	Custom value • None	Custom value
Custom value	The pre-configured value returned if all sensors are in a failure condition • -9999 to 9999	0.000

18.13 Triple verification

When triple verification is used, three sensors are placed in the same measuring point and the readings can be used to provide additional information.

The AWT424 allows for the following calculations to be performed:

- Difference:
  This reports the difference between the measured values. Ideally, this value will be returned as 0. Any large deviation from 0 can be used to indicate that one of the sensors is malfunctioning (the difference is calculated between the highest reading and the lowest reading across the three sensors and uses the following calculation:

$$PV_{difference} = abs(PV_{max} - PV_{min})$$

- Average:
  This can be used to obtain a more stable result than may be possible with a single sensor. The average of the values is obtained by the following calculation:

$$PV_{average} = (PV_{S^1} + PV_{S^2} + PV_{S^3})/3$$

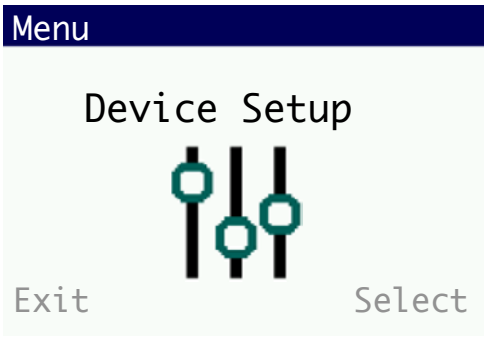
If a sensor reading falls outside of the alarm delta value, it is removed from the calculation. The calculation result will be displayed in as a flashing red value indicator and the unit will automatically switch to dual verification.

18.14 Sensor fail action

Menu	Comment	Default
Action	Select the desired action in the event of a sensor failure: • None / Hold / Custom value	Custom value
Custom value	Set desired value to be displayed in event of a sensor failure: • -999999 to 999999	0.0000

19 Device setup

19.1 Device Setup

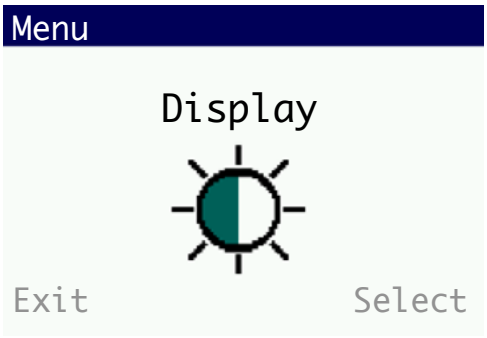


Used to access standard setup parameters.

Menu	Comment	Default
Initial Setup		
Instrument Tag	Enter an alphanumeric transmitter identification tag (16 characters maximum)	AWT424
Temperature Units	Select the units in which all temperatures are displayed: **°C/°F**	°C
Security Setup		
Calibrate Password	Set the password to enable access at **Calibrate** level.	Not factory-set
Advanced Password	Available only at **Advanced** access level.	Not factory-set
Service Access		
Service Password	Reserved for use by authorized ABB service technicians	Set at factory
Write Protection		
Restore Defaults	Select to restore ALL transmitter configuration parameters to their default values and restart the transmitter.	

...19 Device Setup

19.2 Display



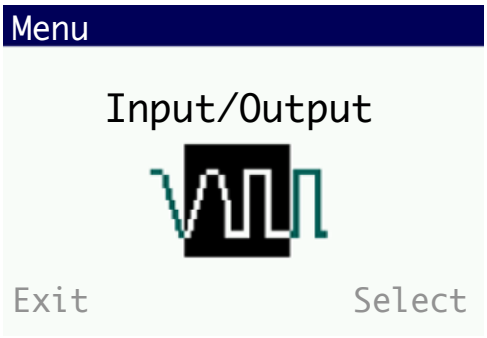
Used to select the display language, setup **Operator** page templates (1 to 3), enable diagnostic, view and log functions, set the device's display brightness/contrast and set the time and date.

Menu	Comment	Default
Language	Select the display language: English, German, French, Italian, Spanish, Portuguese, Turkish, Chinese, Polish	English
Operator Templates		
Page 1 (to 5) Template	**Note**. **Operator Page** templates are assigned automatically to display all sensors currently connected and cannot be changed.	
View/Log Enables	Select to enable/disable the following **Views** and **Logs**.	
Diagnostics View		
Signals View		
Chart View	See page 22 for examples of **Operator pages** in **View** mode.	
Alarm View		
Analog OP View		Enable (all)
Calibration Log		
Alarm Log	See page 22 for examples of **Operator pages** in **Log** mode.	
Audit Log		
Diagnostics Log		
Chart View	**Note.** **Chart View** menus displayed only when **Chart View** is enabled. The chart displays the primary analog value from the sensor.	
Channel S1 (to S2)		
Source	**Chart View** channel sources are assigned automatically and cannot be changed.	
Tag	Enter an alphanumeric tag (3 characters maximum) to identify the sensor signal on the chart.	TAG1
Chart Duration	Select a chart duration: 1, 2, 4, 8, 12, 16, 20, 24 hours	1 h

Menu	Comment	Default
Date & Time	Select to set the transmitter's date, local time and daylight saving start/end times:	
Date Format	Select the date format required: • DD–MM–YYYY/MM–DD–YYYY/YYYY–MM–DD.	YYYY-MM-DD
Date & Time	Set the date in the format selected at Date Format above and the time in the fixed format: • HR:MINS:SEC.	
Daylight Saving	Select to set the daylight saving parameters.	
DS Region	Select the geographical region to base the daylight saving hours on: • Off – select to disable daylight saving. • Europe – select to set European-standard daylight saving start and end times automatically. • USA – select to set USA-standard daylight saving start and end times automatically. • Custom – select to set daylight saving start and end times manually for regions other than Europe or USA. **Note**. The **DS Start Time/Occurrence/Day/Month** and **Time** menus (below) are displayed only when **Custom** is selected.	Off
DS Start Hour	Set the daylight saving start hour in 1-hour increments.	1 2
DS Start Occurrence	Select the day within the month to start daylight saving. For example, to set daylight saving to start on the second Sunday of the selected month, select **Second**.	Last Last
DS Start Day	Select the day of the month on which daylight saving is to start. **Note**. The **DS Start Occurrence** parameter must be valid within the month for the selected day.	Sunday Sunday
DS Start Month	Select the month on which daylight saving is to start. **Note**. The **DS Start Occurrence** parameter must be valid within the month for the selected day.	Sunday Sunday
DS End Hour	Set the daylight saving end time in1-hour increments.	1 2
DS End Occurrence	Select the day within the month to end daylight saving. For example, to set daylight saving to end on the second Sunday of the selected month, select **Second**.	Last Last
DS End Day	Select the day of the month on which daylight saving is to end. **Note**. The **DS End Occurrence** parameter must be valid within the month for the selected day.	Sunday Sunday
DS End Month	Select the day of the month on which daylight saving is to end. **Note**. The **DS End Occurrence** parameter must be valid within the month for the selected day.	Sunday Sunday
Brightness	Sets the display brightness.	

...19 Device Setup

19.3 Input/Output



Used to enable configuration of analog outputs, digital inputs and outputs and relays.

Menu	Comment	Default
Analog Outputs	The analog outputs can be configured to retransmit the process variable and temperature values and have a configurable range from 0 to 22 mA.	
HART Curr. Out		
PV Range Hi **PV Range Lo** **Output Value** **Failure Current**	See Communications Supplement COM/AWT424.	
Analog Output 1 (to 4)	Analog outputs 3 and 4 are available only if an option board is fitted.	
Source	Select the sensor signal to be assigned to the output.	None
Output Type	Select the **Analog Output** 1 (to 4) type: • Linear • Log 2 Decade • Log 3 Decade • Log 4 Decade • Bi-linear Bi-linear is only available if sensor fitted is 2-electrode conductivity and measurement type = conductivity The output characteristic is selectable dependent on sensor type.	Linear
Elec High * **Elec Low ***	Set the minimum and maximum electrical range output values within the range 0.00 to 22.00 mA.	
Eng High * **Eng Low ***	Set the minimum and maximum engineering range output values within the range of measurement permitted by the sensor selected as the source.	
Output Failure *	Select to enable/disable the output failure function. When Enabled, the current output can be driven to a preset value if a **Failure** category diagnostic state occurs for the selected source.	Enabled
Failure Current**	Set a value within the range 0 to 22 mA that the current output is driven when a **Failure** category diagnostic state is present.	22.0
The following menus are displayed only if sensor fitted is 2-electrode conductivity and measurement type = Bi-linear		
X Breakpoint	Set input breakpoint in Engineering units of source	0.0
Y Breakpoint	Set output breakpoint in Electrical range output units	12.0

Calibrate		
AOP1(4) Trim 4 mA	Adjust 4 mA (use the ▲/▼ keys to set the mA reading to 4 mA).	
AOP1(4) Trim 20 mA	Adjust 20 mA (use the ▲/▼ keys to set the mA reading to 20 mA).	
Digital I/O		
Type	Select the **Digital I/O** type: • Off • Input • Output	Off
Source	Select the digital signal to be assigned to the input/output.	None
Polarity	Sets the polarity of the digital input/output signal.	Non Inverted
Relays		
Relay 1 (to 4)		
Source	Selects the digital signal to be assigned to the relay.	None
Polarity	Sets the polarity of the relay output.	Non Inverted

* Displayed only if **Source** is NOT set to **None**
** Displayed only if **Output Failure** is set to **Enabled**

Menu	Comment	Default
Cleaning 1 (2) – Input/Output		
Sensor To Clean	Set the sensor to be cleaned: • Sensor 1/Sensor 2/Sensor 1B/Sensor 2B	Sensor 1
O/P Assignment	Set the assignment of the cleaner to an output: • Not Assigned/Relay 1/Relay 2/Relay 3/Relay 4/Digital O/P	Not Assigned
Clean Interval	Set the interval between cleans: • Off/15 mins/30 mins/45 mins/1 to 24 hours	Off
Clean Type	Set the clean type: • Continuous/Pulsed.	Continuous
Clean On Time	Set the duration of the clean: • 1 to 60 s	30 s
Clean Off Time	Set the duration between cleans: • 1 to 60 s **Clean Type = Pulsed**	30 s
Number Of Pulses	Set the number of pulses: • 1 to 10 pulses **Clean Type = Pulsed**	1 pulse
Recovery Time	Set the time delay between the completion of cleaning and the display of a new reading on the operator page: • 1 to 10 min	1 min
Clean Duration	Displays the total duration of the clean: • **Clean Type** set to **Continuous** = **Clean on Time + Recovery Time** • Clean Type set to **Pulsed** = **(Clean on Time + Clean Off Time) × Number of Pulses + Recovery Time**	N/A
Next Clean	Set the date and time of the next scheduled clean.	N/A

...19 Device Setup

19.3.1 Digital input/output polarity

Table 16 Digital input (volt-free): polarity = non-inverted

Input status	Output state
Open	Inactive
Closed	Active

Table 17 Digital input (volt-free): polarity = inverted

Input status	Output state
Open	Active
Closed	Inactive

Table 18 Digital output (open collector): polarity = non-inverted

Source status	Output state	Logic voltage*
Active	On	0 V
Inactive	Off	3.3 V

Table 19 Digital output (open collector): polarity = inverted

Source status	Output state	Logic voltage*
Active	Off	3.3 V
Inactive	On	0 V

* The measured voltage across digital I/O connections with no auxiliary devices fitted

19.3.2 Relay output polarity

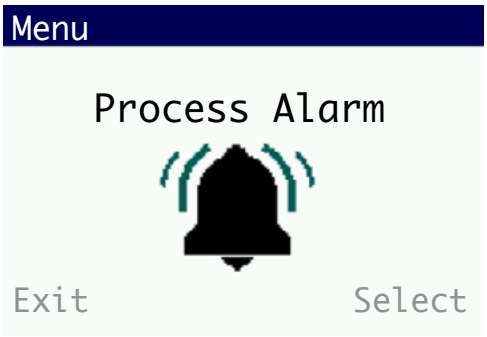
Table 20 Relay output: polarity = non-inverted

Source status	Relay state	N/C Contact	N/O Contact
Active	Energized	Open	Closed
Inactive	De-energized	Closed	Open

Table 21 Relay output: polarity = inverted

Source status	Relay state	N/C Contact	N/O Contact
Active	De-energized	Closed	Open
Inactive	Energized	Open	Closed

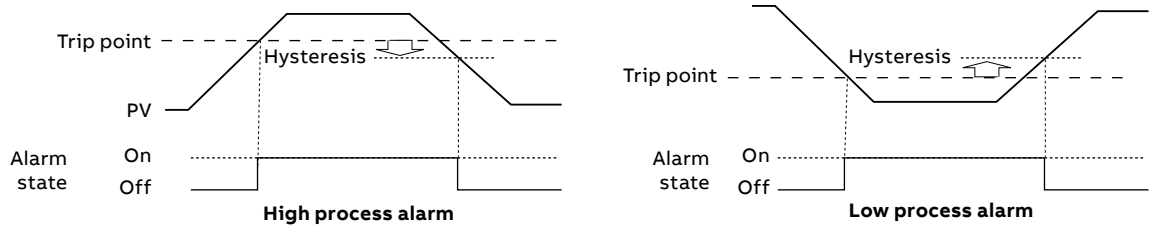
19.4 Process Alarm



Used to configure up to 12 independent process alarms.

Menu	Comment	Default
Alarm 1 (to 8)		
Source	Select the sensor signal for the process alarm source.	
Type	Select the alarm type: • High Process/Low Process/High Latch/Low Latch	
Tag	Enter an alphanumeric alarm identification tag (16 characters maximum). The tag is displayed as a diagnostic message and appears in the **Diagnostic Status Bar** and on the **Diagnostic View** page at **Operator** level.	
Trip	Set a trip value in engineering units.	
Hysteresis	Set a hysteresis trip value in engineering units. The alarm is activated at the alarm trip level but deactivated only when the process variable has moved into the safe region by an amount equal to the hysteresis value – see Process alarm examples (28 and Figure 29).	
Time Hysteresis	Set a time hysteresis trip value between 0.0000 and 9999.0 seconds. If the alarm trip value is exceeded, the alarm is not activated until the **Time Hysteresis** value has expired. If the signal goes out of the alarm condition before the **Time Hysteresis** has expired, the hysteresis timer is reset.	

19.4.1 Process alarm examples



28 High and low process alarm action

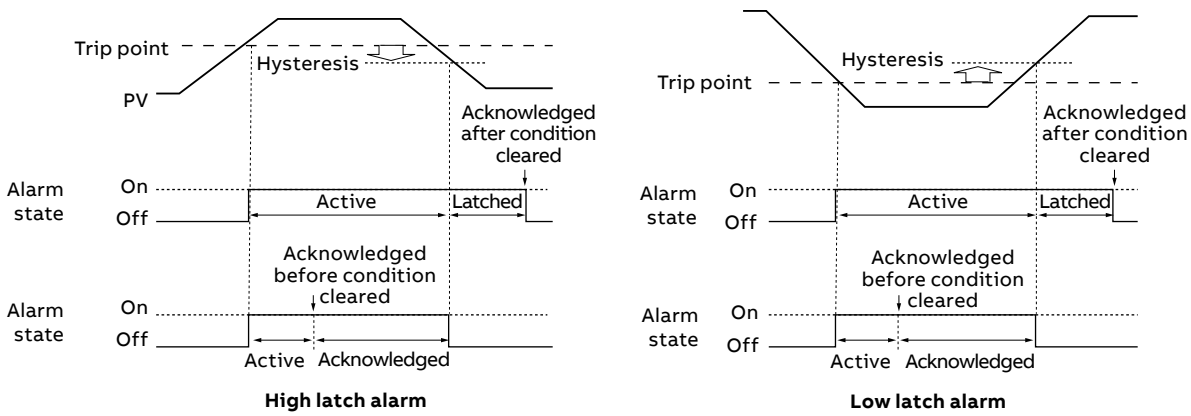
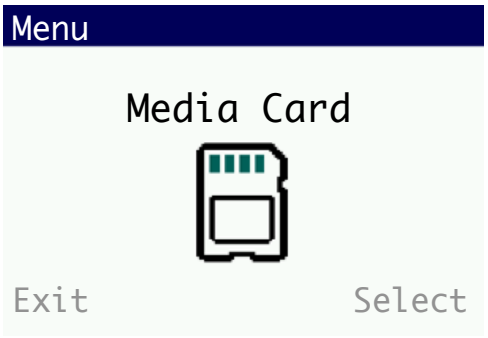


Figure 29 High and low latch alarm action

...19 Device Setup

19.5 Media Card



Used to enable/disable data logging, select the source of the data to be logged, save and load configuration files and to format external media.

Menu	Comment	Default
Data Logging		
Channel 1 (to 6)	Select the source of the data to be logged.	
Sampling Time	Select the sampling duration time: • 5/10/30 seconds • 1/5/10/30 minutes • 1 hour	5 s

Note:
The following menus are displayed only if an SD card is inserted and has been placed online.

Save Configuration		
Select File		
Config1 (to 8)	Select a position in which to create and save a configuration file containing user-defined sensor parameters to external media. Up to 8 files can be created. If a file exists in a position, it is displayed as **Config1(Overwrite)**. Either overwrite the existing file or select a new position in which to save it. **Note**. Wait until the progress bar is complete and the **OK** soft key prompt reappears before pressing the key. Pressing during a save operation cancels it prematurely resulting in an unusable configuration file.	
Load Configuration		
Select File		
Config1 (to 8)	Select a position from which to load a configuration file containing user-defined sensor parameters from external media. The most recently saved file is displayed. Press the key to display a list of other positions containing configuration files. Only positions containing configuration files are displayed.	
Format Card	Press the key (**Yes**) to format the SD card if required. **Note**. Formatting erases all data currently on the SD card.	

19.6 Data logging

Data and log files can be recorded to the SD card in a text format file. Refer to "Display icons" on page 23 for icon explanations.

NOTICE

To avoid loss of archive data, always put the media card offline before you remove it. To remove the media card:

- Select Offline from the logging menu, or,
- Open the transmitter door, and push the recessed button to the right of the Archiving Online LED next to the media card slot on the back of the door.

NOTICE

Electrostatic precautions for media cards.

To avoid potential damage or corruption of data recorded on the media card, take care when handling and storing the card. Do not expose the card to static electricity, electrical noise, or magnetic fields. When handling the card, take care not to touch any exposed metal contacts.

Files are archived in a text (comma separated variable .csv) format. The filename format is as follows:
<ddmmmyy><hhmmss><instrument tag>. D00
These are saved alongside a digital signature file to allow import into the ABB Datamanager Pro data review software to ensure a valid data integrity. The digital signature file name is as follows:
<ddmmmyy><hhmmss><instrument tag>.S00

Data logging only occurs when the media card is inserted and on line. The media card will go online automatically when inserted.

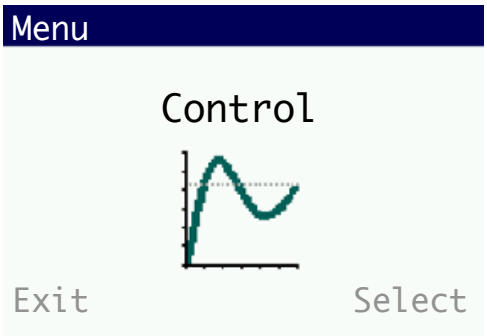
The media card should only be removed when offline. This can be done by selecting the **Media card** option in the **Operator** menu and selecting offline or by pressing the button located above the media card slot inside the door. The icon will turn from green to gray, then the card can be safely removed.

Note:
Configurations created on newer versions of software are not compatible with older transmitter software versions. The transmitter software would need to be updated to the latest version. See Section "20 Upgrade the software" on page 56.

Note:
SD card sizes up to 32 GB are supported.

...19 Device Setup

19.7 Control



PID control functionality is available for both channels of the AWT424 transmitter. Conductivity channels are configurable for reverse or direct-acting control. pH channels are configurable for reverse-acting, direct-acting or dual (Acid/Base) control.

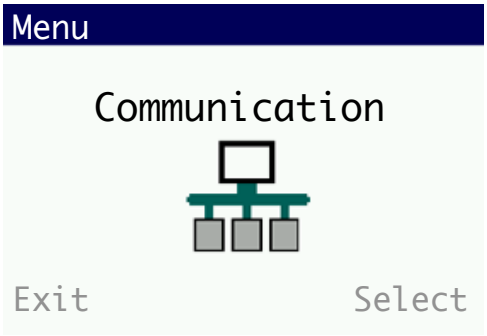
Control outputs are configurable for Analog, Time Proportioning or Pulse Frequency output. Analog control outputs can be assigned to any of the available analog outputs. Time proportioning control outputs can be assigned to any of the available relays or digital outputs and pulse frequency control outputs can be assigned to any of the available relays or digital outputs.

Menu	Comment	Default
PID 1 (2)		
Control Action	Off, Reverse-acting, Direct-Acting, Dual-acting.	Off
Control Mode	Auto, Manual	Auto
Reverse Control **Direct Control**	If **Control Action** = **Reverse** or **Direct-Acting**:	
Setpoint	Numeric value, limited to PV Range.	PV range low
Control Type	P, P+I, P+I+D, P+D.	P
Proportional Band	Numeric value: 0.1 to 999.9 %.	100 %
Integral Action Time	If **Control Type** = **P+I** or **P+I+D**: • Numeric value: 1 to 7200 s.	1 sec
Derivative Action Time	If **Control Type** = **P+I+D** or **P+D**: • Numeric value: 0.1 to 999.9 s.	999.9 sec
Manual Reset	If **Control Type** = **P** or **P+D**: • Numeric value: 0.0 to 100.0 %	0.0 %
Output Type	Analog, Time Proportioning, Pulse Frequency.	Analog
Cycle Time	If **Output Type** = **Time Proportioning**: • Numeric value: 1.0 to 300.0 s.	10 sec
Pulse Frequency	If **Output Type** = **Pulse Frequency**: • Numeric value: 1 to 120 pulses per minute	60 pulses/min
Acid Controller	Acid = Dual-acting.	
Setpoint (SPA)	Numeric value: SPB + 0.5 to 16.0.	PV range high
Control Type	P, P+I.	P
Proportional Band	Numeric value: 0.1 to 999.9 %.	100 %
Integral Action Time	Enabled if **Control Type** = **P+I**: • Numeric value: 1 to 7200 s.	1 sec
Output Type	Analog, Time Proportioning, Pulse Frequency.	Analog
Cycle Time	If **Output Type** = **Time Proportioning**: • Numeric value: 1.0 to 300.0 s.	10 sec
Pulse Frequency	If **Output Type** = **Pulse Frequency**: • Numeric value: 1 to 120 pulses per minute	60 pulses/min

Menu	Comment	Default
...Sensor 1 (2)		
Base Controller	If **Control Action** = **Dual-acting**.	
Setpoint (SPB)	Numeric value: −2.0 to SPB – 0.5.	PV range low
Control Type	P, P+I.	P
Proportional Band	Numeric value: 0.1 to 999.9 %.	100 %
Integral Action Time	If **Control Type** = **P+I**: • Numeric value: 1 to 7200 s.	1 sec
Output Type	Analog, Time Proportioning, Pulse Frequency.	Analog
Cycle Time	If **Output Type** = **Time Proportioning**: • Numeric value: 1.0 to 300.0 s.	10 sec
Pulse Frequency	If **Output Type** = **Pulse Frequency**: • Numeric value: 1 to 120 pulses per minute	60 pulses/min
Power Recovery		
Recovery Mode	Auto, Manual, Last.	Auto
Default Output	If **Recovery Mode** = **Manual**: • Numeric value If **Control Action** = **Reverse-** or **Direct-Acting**: • 0.0 to 100.0 % If **Control Action** = **Dual**: • −100.0 to 100.0 %	0.0 %
Sensor Failure		
Action	None, Hold, Default Output.	None
Default Output	If **Sensor Failure Action** = **Default Output**: • Numeric value If **Control Action** = **Reverse-** or **Direct-Acting**: • 0.0 to 100.0 % If **Control Action** = **Dual**: • −100.0 to 100.0 %	0.0 %
PID 2	As PID 1 menus.	
Operator Control	Enabled, Disabled	Enabled

...19 Device Setup

19.8 Communication



Used to set up communications parameters for the Modbus/HART/PROFIBUS and Ethernet communication protocols – see COM/AWT424.

Note:
Only 1 communications option can be fitted per transmitter.

19.9 Bluetooth menus

Table 22 Bluetooth menu descriptions

Menu	Description
Device Enable	Enables or disables power to the Bluetooth module. When disabled, the module no longer advertises and is not connectable.
Device Name	Read-only device name. This device name forms part of the advertising data used by the module, allowing the user to differentiate between other Bluetooth devices in range when scanning for devices to connect to. This Bluetooth device name is generated automatically from the instrument tag. Therefore, whenever the transmitter's instrument tag is changed, the Bluetooth device name changes to reflect it.
Pairing PIN	The fixed 6-digit PIN is used when pairing the transmitter and mobile device. When paired, the PIN is no longer required when reconnecting, because the pairing information is stored in the module.
Generate New PIN	Lets you generate a new pairing PIN. The transmitter randomly generates the new PIN.

The AWT424 transmitter supports Bluetooth 5.4. You can connect to AWT424 transmitters that are in range (one at a time) using the EZLink Connect app.

19.10 EZLink Connect app

19.10.1 Download EZLink Connect for Android

For the Android™ version of EZLink Connect, download from:

19.10.2 Download EZLink Connect for iOS

For the iOS® version of EZLink Connect, download from:

EZLink Connect lets you read live values and diagnostics from a paired AWT424 transmitter, and view the calibration log, the diagnostics log, and the audit log.



In the app, you can also see the related documentation for the AWT424 transmitter, and other CWA products from ABB.

19.10.3 Pair your mobile device to a transmitter

To pair the EZLink Connect app with an AWT424 transmitter, use a pairing PIN that is available from:
Communication > **Bluetooth** > **Pairing PIN menu**.

19.10.4 Operating system requirements

ABB recommends Android 10.0 or later, or iOS 12.0 or later to install the EZLink Connect app.

For the cyber security requirements, refer to page 5.

...19 Device Setup

19.11 Device Info



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

Menu	Comment	Default
Transmitter		
Serial Number	The transmitter's serial number.	
Software Revision	The transmitter's software version number.	
Hardware Revision	The transmitter's hardware version number.	
Date of Manufacture	The date of manufacture of the transmitter.	
PROFIBUS DP	Displayed only if an PROFIBUS communications module is fitted.	
Hardware Revision	The hardware revision of the PROFIBUS DP module.	
Software Revision	The software revision of the PROFIBUS DP module.	
Ethernet	Displayed only if an Ethernet communications module is fitted.	
MAC Address	The Ethernet module's physical address.	
Bluetooth	Bluetooth menus always displayed.	
MAC Address	Read only Media Access Control Address (MAC) of the Bluetooth module. The hardware identification number that uniquely identifies each device. This is fixed by the manufacturer and cannot be changed.	
Firmware Revision	The revision number of the firmware within the Bluetooth module.	
eLabel	The regulatory approval information for the Bluetooth module.	
S1 (to S2)		
Sensor Type	The type of sensor connected.	
Model type	Displayed only if a pH sensor is connected. The type of pH/Redox (ORP) digital sensor.	
Glass type	Displayed only if a pH sensor is connected. The type of glass for the pH digital sensor.	
Temp Range Low	Displayed only if a pH sensor is connected. The lowest temperature value set.	
Temp Range High	Displayed only if a pH sensor is connected. The highest temperature value set.	
Product Code	Displayed only if a pH sensor is connected. The sensor product code.	
Wiper Fitted	Displayed only if a turbidity sensor is connected.	
Serial Number	Displayed only if a digital sensor is connected. The sensor serial number.	
Cap Serial Number	Displayed only if an optical dissolved oxygen sensor is connected. The serial number of the cap fitted to the sensor.	
Software Revision	The software version number of the sensor.	
Hardware Revision	The hardware version number of the sensor.	
Date of Manufacture	The date of manufacture of the sensor.	
QR Code	Use My Measurement Assistant to scan the QR codes generated to provide detailed diagnostic information. https://my-measurement-assistant.abb.com	

19.12 Analog sources and digital input/output sources

Table 23 Analog sources

Source name*	Description
S1 (to 2) primary value	Measured primary value for associated sensor.
S1 (to 2) secondary value	Measured secondary value for associated sensor.
S1 (to 2) tertiary value	TSS only – temperature
S1 (to 2) control O/P	Control output – single
S1 (to 2) control O/P (A)	Control output – dual (acid)
S1 (to 2) control O/P (B)	Control output - dual (base)
Inferred pH	Calculation based on dual 2-electrode conductivity.
Ratio	Calculation based on dual 2-electrode conductivity.
% Passage	Calculation based on dual 2-electrode conductivity.
% Rejection	Calculation based on dual 2-electrode conductivity.
Average	Dual verification.
Difference	Dual verification.
Maximum	Dual verification.
Minimum	Dual verification.

Table 24 Digital output sources

Source name*	Description
Alarm 1 (to 8) State	Process alarm state (alarm 1 to 8).
S1 (to 2) Failure	The associated sensor is in the failed state
S1 (to 2) Out of Spec.	The associated sensor is out of specification
S1 (to 2) Maintenance	The associated sensor requires maintenance
S1 (to 2) Function Check	The associated sensor requires checking
Tx Failure	The transmitter is in the failed state
Tx Out of Spec.	The transmitter is out of specification
Tx Maintenance	The transmitter requires maintenance
Tx Function Check	The transmitter requires checking
S1 (to 2) Cal in Progress	A calibration is in progress for the associated sensor.
S1 (to 2) Cal Failed	The last calibration has failed for the associated sensor.
S1 (to 2) Clean	A clean is in progress for the associated sensor.
S1 (to 2) control O/P	Control output – single.
S1 (to 2) control O/P (A)	Control output – dual (acid).
S1 (to 2) control O/P (B)	Control output – dual (base).
S1 (to 2) Calibration filter inlet	Scheduled calibration filter/valve control.
S1 (to 2) Calibration filter outlet	Scheduled calibration filter/valve control.
Dual calibration filter inlet	Scheduled calibration filter/valve control.
Dual calibration filter outlet	Scheduled calibration filter/valve control.
S1 (to 2) Buffer pump	Chlorine buffer pump control.

Table 25 Digital input sources

Source name*	Description
S1 (to 2) Hold	The measured concentration for the associated sensor can be held via the digital input.
S1 (to 2) Clean Sequence	**Note**: Applicable only to some sensor types. Initiates an automated cleaning sequence.
Low flow sensor	An external flow sensor can be connected to prompt flow.

Note. It is recommended that a momentary switch is used to start or abort digital input operations and a toggle switch is used for the hold functionality.
To start a digital input operation – hold the momentary switch for a minimum of two seconds; release the switch when the digital input operation starts.
To abort a digital input operation – hold the momentary switch for a minimum of two seconds; release the switch when the digital input operation aborts.

*(2) = maximum number of sensors if multiple sensors are connected.

20 Upgrade the software

The AWT424 software may periodically require a software update to provide support for new features.

Updates can be installed from the media card via the bootloader.

Note:
Use only an approved media card formatted to FAT16/FAT32, and no larger than 32 GB in capacity.

You can upload the software to the media card via the EZLink Connect app, or via your PC/laptop.

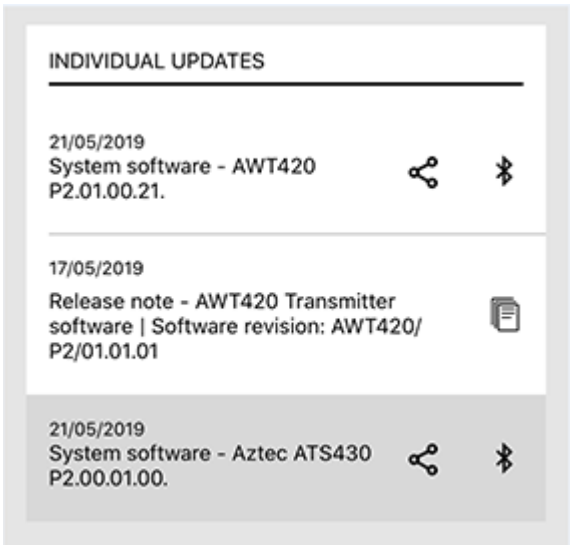
20.1 Software upgrade via EZLink Connect

This procedure requires an Internet connection on your smartphone or tablet, and can take up to 30 minutes.

Install the media card and set it online before you start.

1 Make sure that your smartphone or tablet is part with the correct AWT424 transmitter.

2 From **Firmware upgrades**, tap to download the latest software from the ABB Library.



3 Tap the Bluetooth icon to view the available devices in the Device List.

4 Select the device you want to upgrade.

5 When prompted, enter the Service password and upload to transfer the downloaded firmware file to the AWT424 transmitter media card via Bluetooth.

20.2 Software upgrade via PC/laptop

1 Download the firmware (an Internet connection is necessary) from the ABB Library.
The zip folder should have this folder structure:

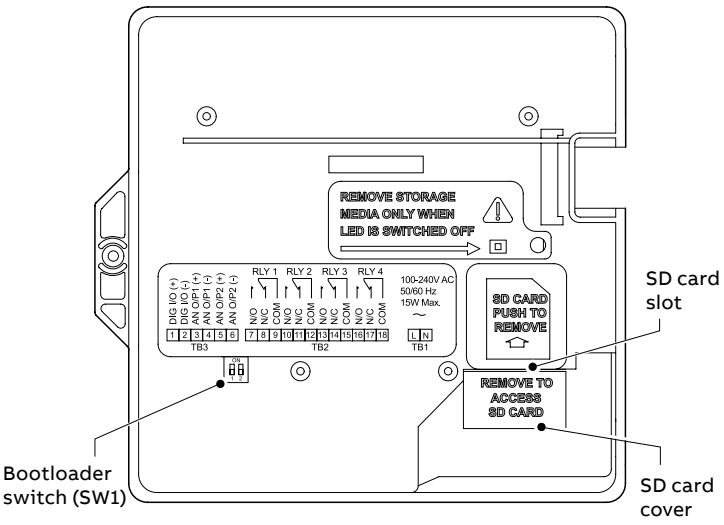
`\UPGRADE\AWT424\XX_YY_ZZ.`

2 On the media card, create a folder called `UPGRADE`. Inside should be a folder called `AWT424`.

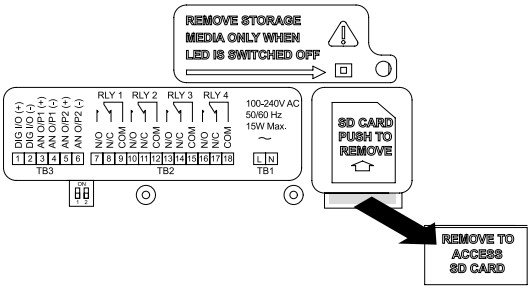
3 Unzip the file into the AWT424 folder.

20.3 Transmitter/sensor upgrade via Bootloader

1 Open the door of the unit to access the Bootloader switch and SD card slot.

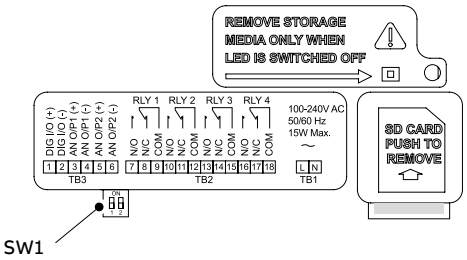


2 Remove the SD card cover by pulling it out towards you.

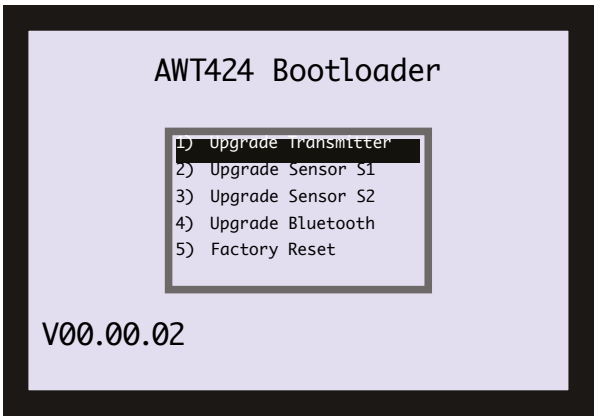


If an SD card is fitted for recording data, remove it first, then insert the upgrade SD card and push in until it clicks into place.

3 Set the Bootloader switch **SW1** to **ON** (up).



4 Close and secure the door and power up the unit. The Bootloader is displayed within 10 to 15 seconds.



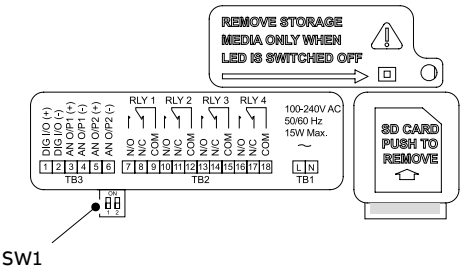
Note:
If the Bootloader does not load, ensure you are using a compatible SD card with the correct files and folder structure.

5 Transmitter/sensor software upgrade:

- Transmitter software upgrade:
  Select **Upgrade Transmitter** and press the ◤ key.
- Sensor software upgrade:
  Select **Upgrade Sensor Sx** and press the ◤ key.

The upgrade takes approximately 60 seconds and displays **Transmitter upgraded successfully** on completion.
Note. If the software is incorrect, the transmitter displays the message **Firmware verification failed**.

6 Power down the transmitter.
Open the door and switch Bootloader switch **SW1** to **OFF** (down).



7 Remove the upgrade SD card, re-fit recording SD card (if necessary) and replace the SD card cover.

8 Close and secure the door and power up the transmitter. You can check the software revision of transmitter/sensors from the **Device Info** menu.

21 Diagnostics

The transmitter is programmed to display NAMUR 107 diagnostic icons and messages to provide information on servicing requirements and any other conditions that develop during operation.

All diagnostic messages displayed on the transmitter are added to the transmitter's audit log. The following Tables show Icon types, diagnostic messages and possible causes/ suggested remedial action.

Refer to "13.1 Diagnostic icons" on page 23 for a description of the icons.

21.1 NV error

Diagnostic message


NV Error

Cause

Transmitter configuration data is corrupt or non volatile memory is faulty. Changes to the configuration may not be saved after a power cycle.

Recovery action

1. Note configuration.
2. Reset to defaults via bootloader.
3. Reprogram transmitter.
4. Cycle transmitter power.
5. Confirm error has resolved.
6. If error persists contact local service organization.

21.2 Alarm active

Diagnostic message


Alarm active

Cause

One or more process alarms is active.

Recovery action

1. Check the process and make any adjustments required
2. If the alarm condition has passed but diagnostic remains active, acknowledge the alarm via the operator menu.

21.3 Memory write error

Diagnostic message


Memory write error

Cause

Write to NV memory has failed.

Recovery action

1. Perform last configuration change again.
2. Power cycle unit and confirm configuration change is accepted.
3. If problem persists contact local service organization.

21.4 AO(n) out of range

Diagnostic message


AO(n) out of range

Cause

The source assigned to the analog output is outside of the programmed engineering range. Output is fixed and electrical limits of 0 mA (under range) or 22 mA (over range) until the source is within range.

Recovery action

1. Check the configuration of the analog outputs, ensuring the source Eng Hi and Eng Low values are set according to requirements.

21.5 Function failure

Diagnostic message


Function failure

Cause

Function calculation has failed because one or more of the source signals has failed or the Delta (difference) exceeds the configured limits.

Recovery action

1. Check source sensors for failure diagnostics, perform calibration if necessary

21.6 Config upload failed

Diagnostic message


Low pH slope warning

Cause

Configuration load from EZLink connect app has failed.

Recovery action

1 Ensure smartphone is within range of AWT424 and restart configuration load.

21.7 SD card nearly full

Diagnostic message


SD card nearly full

Cause

SD card is at 90 % of capacity.

Recovery action

1 Replace the SD card or transfer data files to your PC before formatting and replacing the card.

21.8 SD card full

Diagnostic message


SD card full

Cause

SD card is at capacity.

Recovery action

1 Replace the SD card or transfer data files to your PC, before formatting and replacing the card.

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OI/AWT424-EN Rev. D 07.2026