ABB MEASUREMENT & ANALYTICS | OPERATING INSTRUCTION

AWT420

Universal 4-wire, dual-input transmitter

Measurement made easy

AWT420
Universal 4-wire,
dual-input transmitter

Introduction

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

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

This Operating Instruction provides installation, operation and maintenance procedures for the AWT420 transmitter. For information on the sensors, including installation, commissioning, operation and maintenance procedures, refer to the specific sensor manual.

For more information

Further publications for the AWT420 transmitter are available for free download from:

www.abb.com/measurement

or by scanning this code:

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

	Search for/click on:
AWT420 transmitter – Data Sheet	DS/AWT420-EN
AWT420 transmitter – Commissioning Instruction	CI/AWT420-EN
AWT420 transmitter – HART Communications Supplement	COM/AWT420/HART-EN
AWT420 transmitter – HART FDS Communications Supplement	COM/AWT420/HART/FDS-EN
AWT420 transmitter – PROFIBUS Communications Supplement	COM/AWT420/PROFIBUS-EN
AWT420 transmitter – MODBUS Communications Supplement	COM/AWT420/MODBUS-EN
AWT420 transmitter – Ethernet Communications Supplement	COM/AWT420/ETHERNET-EN

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1 Health & Safety

Document symbols

Symbols that appear in this document are explained below:

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

The signal word '**NOTICE**' indicates potential material damage.

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

Safety precautions

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

⚠ WARNING

Bodily injury

Installation, operation, maintenance and servicing must be performed:

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

Potential safety hazards

AWT420 transmitter – electrical

⚠ WARNING

Bodily injury

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

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

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

Safety standards

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

Product symbols

Symbols that may appear on this product are shown below:


Protective earth (ground) terminal.


Functional earth (ground) terminal.

Alternating current supply only.

Direct current supply only.


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


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


The equipment is protected through double insulation.


Recycle separately from general waste under the WEEE directive.

...1 Health & Safety

Product recycling and disposal (Europe only)

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

NOTICE

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

End-of-life battery disposal

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

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

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

Cleaning

The complete transmitter can be hosed down if it has been installed to IP66/NEMA 4X standards, i.e. cable glands are correctly fitted and all unused cable entry holes are blanked off – see page 13 and page 12.

Warm water and a mild detergent can be used.

2 Cyber security

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

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

Communication protocol specific

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

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

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

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

3 Overview

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

Sensor and communication modules plug directly into their corresponding slot on the transmitter backboard – see page 13 for module locations.

The AWT420 supports both traditional analog and advanced digital EZLink sensors. The transmitter can be wall-, panel- or pipe-mounted – see page 8.

Information from the sensor is sent to the transmitter via a sensor interface board. The process reading is displayed on the main page and can be displayed as a graph in the **Chart View** – refer to page 29 for details of view options.

Diagnostic messages inform the user of the system status and can be logged for review. The system status can also be assessed remotely using optional HART®, MODBUS®, Profibus® or Ethernet communications.

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

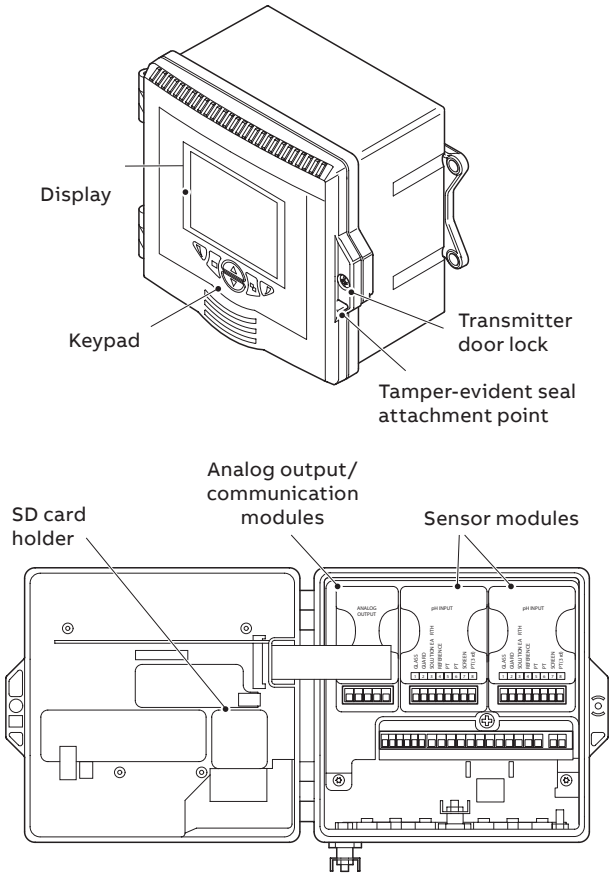


Figure 1 AWT420 transmitter – main components

4 Mechanical installation

Sensor installation

Refer to the associated sensor **Operating Instructions** for installation procedures.

Transmitter installation

Optional accessories

Optional installation accessories:

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

Location

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

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

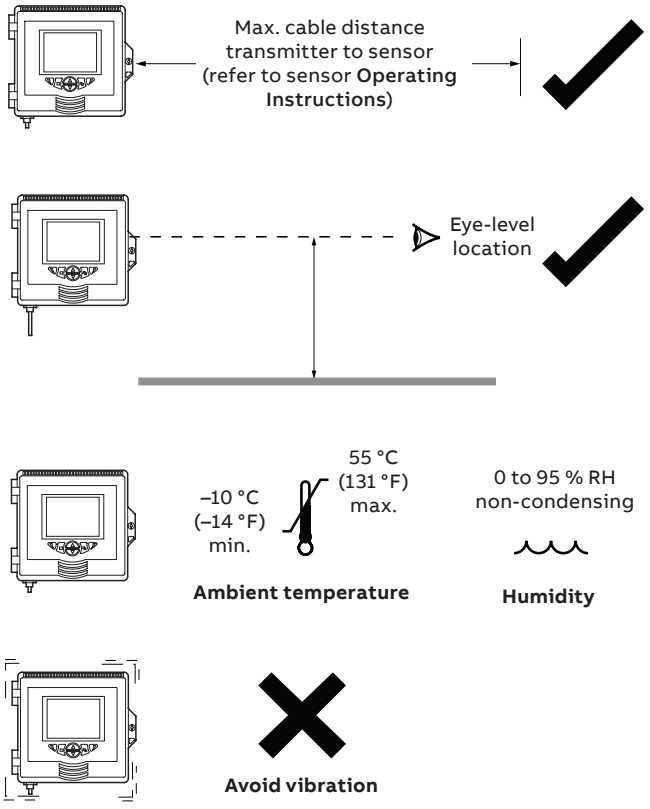


Figure 2 Transmitter location

Transmitter dimensions

Dimensions in mm (in)

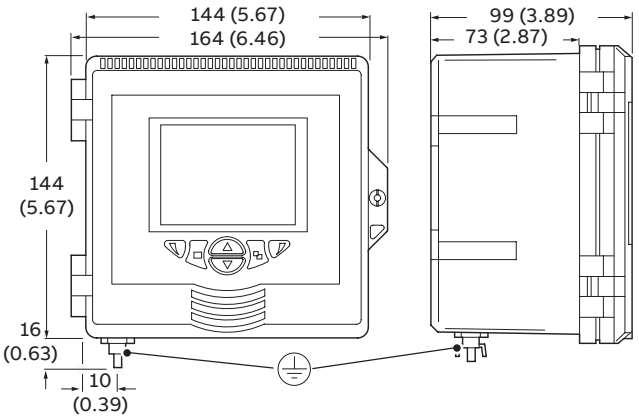


Figure 3 Transmitter dimensions

Optional weathershield dimensions

Dimensions in mm (in)

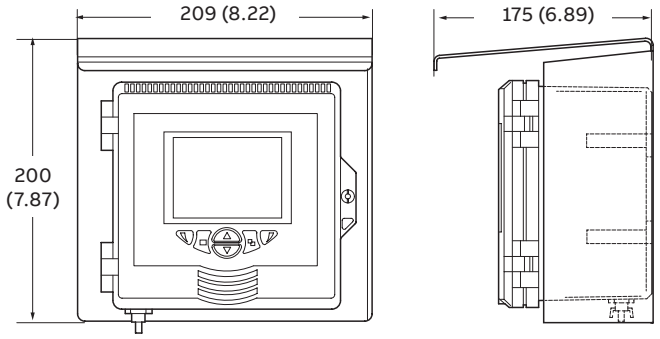


Figure 4 Optional weathershield dimensions

Sensor modules

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

Communication module

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

Wall-mounting

Dimensions in mm (in)

NOTICE

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

Referring to Figure 5:

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

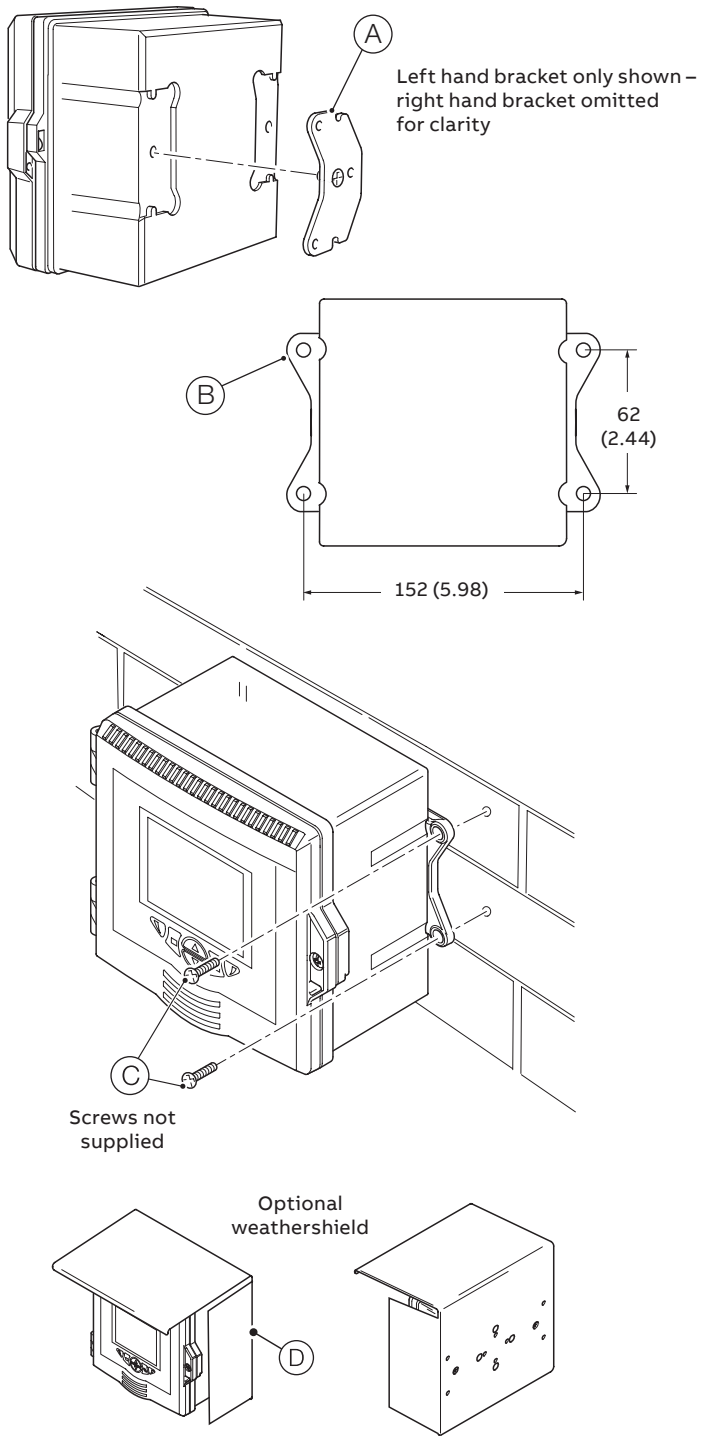


Figure 5 Wall-mounting the transmitter

…4 Mechanical installation

…Transmitter installation

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

Referring to Figure 6:

1 Cut the correct sized hole in panel (A).

2 Insert the transmitter into the panel cut-out (B).

3 Screw one panel clamp anchor screw (C) into the left-hand bracket (D) until 10 to 15 mm (0.39 to 0.59 in) of the thread protrudes from the other side of the bracket and position one clamp (E) over the end of the thread.

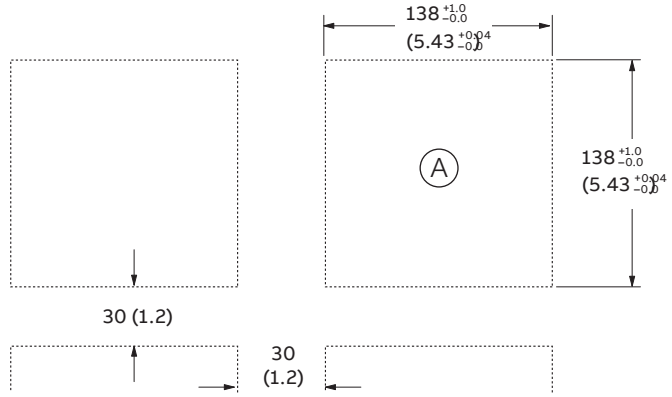
NOTICE

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

4 Holding assembly (F) together, position bracket (D) into the left-hand recess on the rear of the transmitter and secure with bracket securing screw (G). Ensure that the plastic washer remains in the position fitted.

5 Repeat steps 3 and 4 for the right-hand panel clamp assembly.

6 Torque each panel clamp anchor screw to 0.5 to 0.6 Nm (4.42 to 5.31 lbf·in).



Panel cut-out dimensions (glands not fitted)

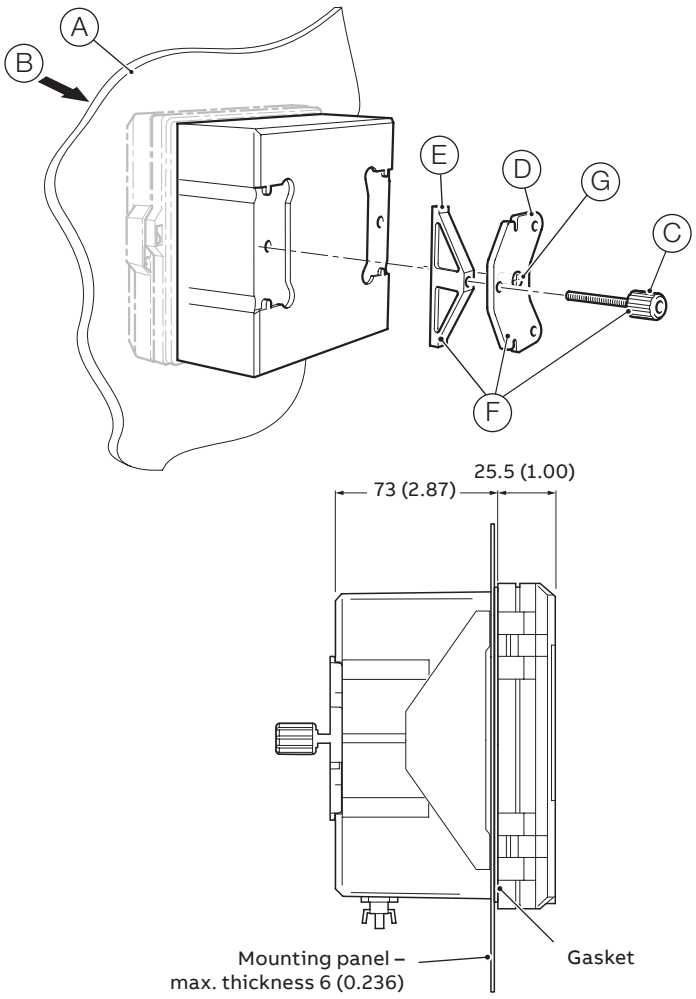


Figure 6 Panel-mounting the transmitter

Pipe-mounting (optional)

Dimensions in mm (in)

NOTICE

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

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

1. Fit two M6 x 50 mm hexagon-head screws (A) through one clamp plate as shown.
2. Using the appropriate holes to suit vertical or horizontal pipe, secure the clamp plate to the pipe-mounting bracket (B) using two M6 x 8 mm hexagon-head screws and spring lock washers (C).
3. Position the pipe-mounting bracket into the recesses on the rear of the transmitter as shown and secure with the two bracket securing screws (D). Ensure the plastic washers remain in the positions fitted.
4. Secure the transmitter to the pipe using the remaining clamp plate, spring lock washers and nuts (E).

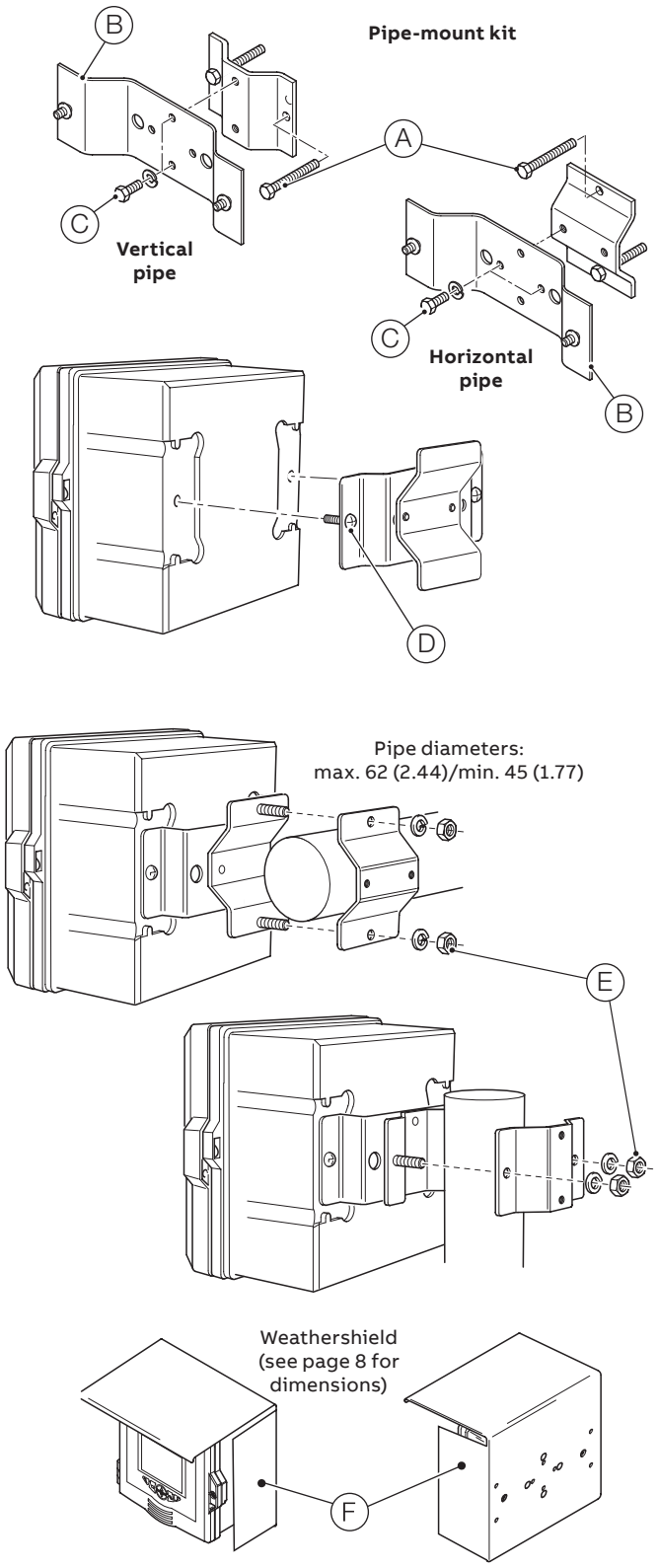


Figure 7 Pipe-mounting the transmitter

5 Electrical installation

⚠ DANGER

Bodily injury

- **Before making any connections**, the external protective earth stud must be connected to the local earth bonding point using suitably sized ground cable – see page 18.
- 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 – see Figure 9, page 13 for fuse details.
- Replacement of the internal battery must be carried out by an approved technician only.
- The transmitter conforms to Installation Category II of IEC 61010.
- All equipment connected to the transmitter's terminals must comply with local safety standards (IEC 60950, EN61010-1).
- The DC power supply and the optional Ethernet and bus interface connectors must be connected to Safety Extra Low Voltage (SELV) circuits.

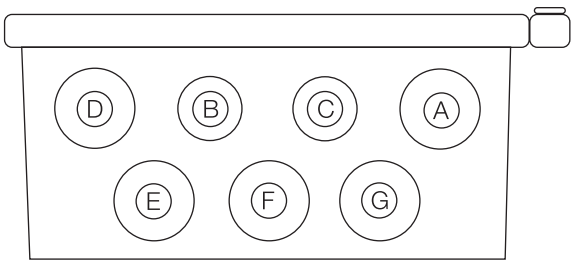
Earth bonding

⚠ WARNING

Before making any electrical connections:

- The external protective earth stud (see Figure 11, page 17) must be connected to the local earth bonding point using suitably sized ground cable. To connect to the protective earth stud, use a closed M4 cable lug.
- **Never** connect the protective earth with an end sleeve or an open cable lug.

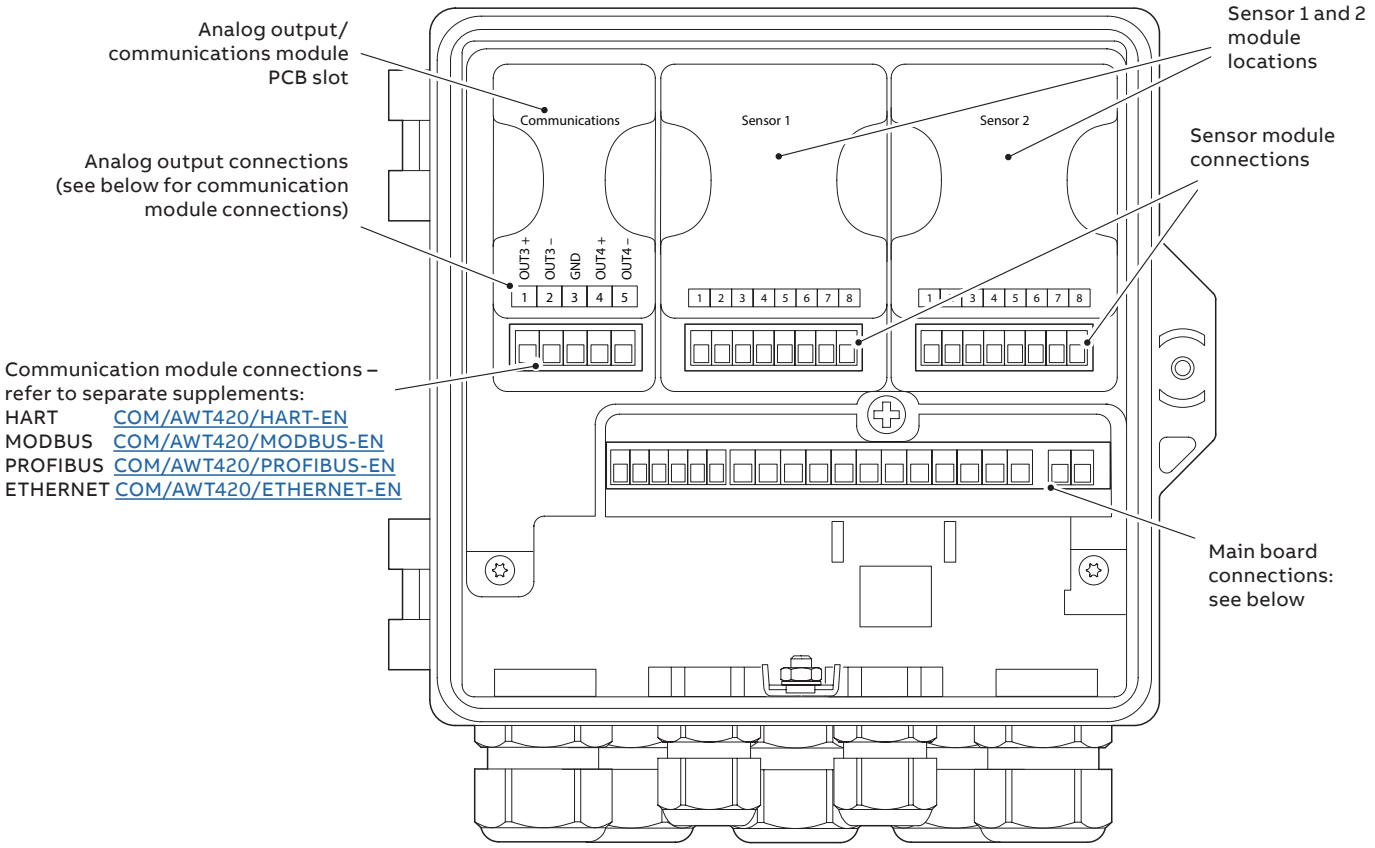
Cable entries

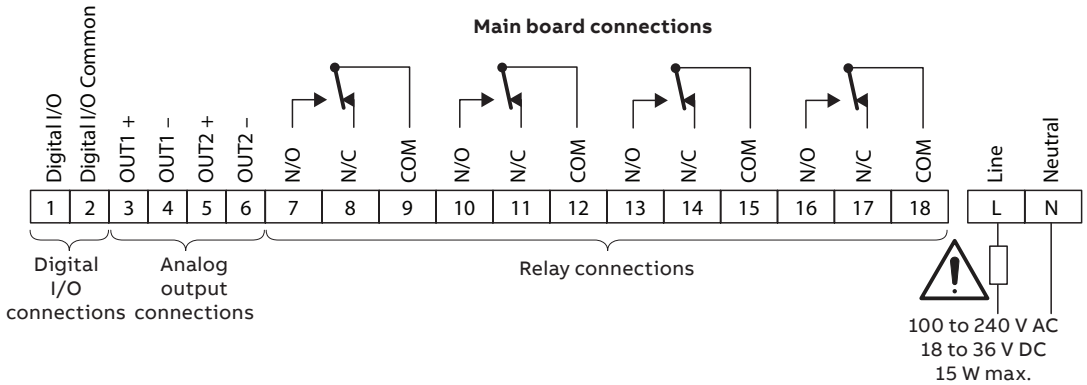


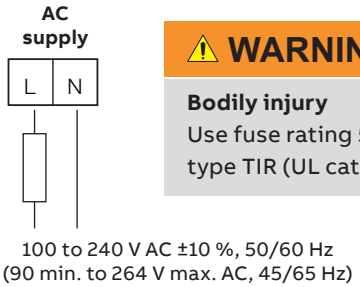
(A) M20 – mains power
(B) M16 – sensor 1
(C) M16 – sensor 2
(D) M20 – communications
(E) M20 – digital I/O
(F) M20 – analog outputs
(G) M20 – relay contacts

Figure 8 Cable entries

Terminal connections

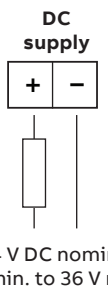






⚠ WARNING

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 9 Electrical connections overview

...5 Electrical installation

Digital I/O, relays and analog output connections

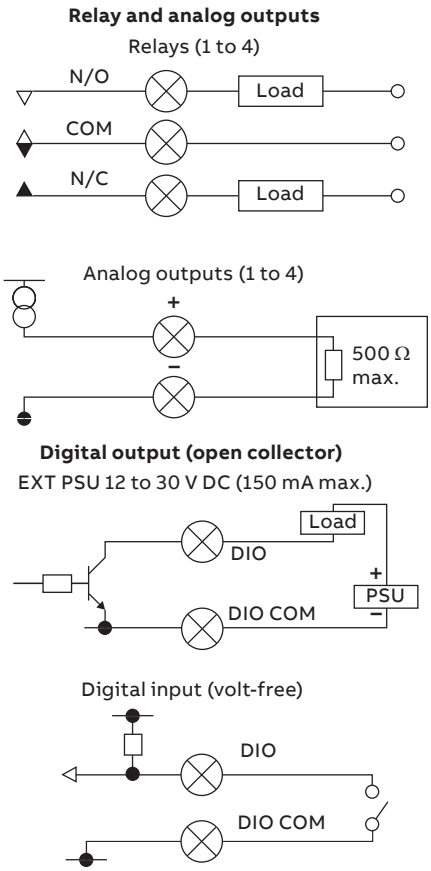


Figure 10 Digital I/O, relays and analog output connections

pH and conductivity connections

pH/ORP/pIon sensor module connections

NOTICE

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

Standard sensors without diagnostic functions

NOTICE

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

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

* Cut and remove grey wire

Standard sensors with diagnostic functions

NOTICE

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

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

* Cut and remove grey wire

Conductivity sensor module connections

2-electrode sensors

Sensor type	RTD wiring	DRIVE + 1	2	3	DRIVE – 4	RTD 1 5	RTD 2 6	SHIELD 7	RTD 3 8
2025, 2045 2077, 2078 2085, 2089	2-lead	Red	–	–	Black	Green/Yellow Blue	Brown	–	–
	3-lead	Red	–	–	Black	Brown	Green/Yellow	–	Blue
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	Dark green	–
	3-lead	Green	–	–	Black	Yellow	Red	Dark green	Blue

*2085 cable **attached** cells

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	–

...5 Electrical installation

Power supply connection

⚠ 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

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 (plastic enclosure) or M5 ring terminals prior to fitting to the earth boss (metal enclosure).
- Only 1 cable per cable gland.

Referring to Figure 11, page 17:

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

NOTICE

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

7. Make connections to the power supply connection terminals (J). Connect earth wire (K) to earth stud (L).
8. Tighten gland cover (H).
9. Refit terminal cover (C) and secure it with retaining screw (B).
10. Close the transmitter door and secure with door retaining screw (A).

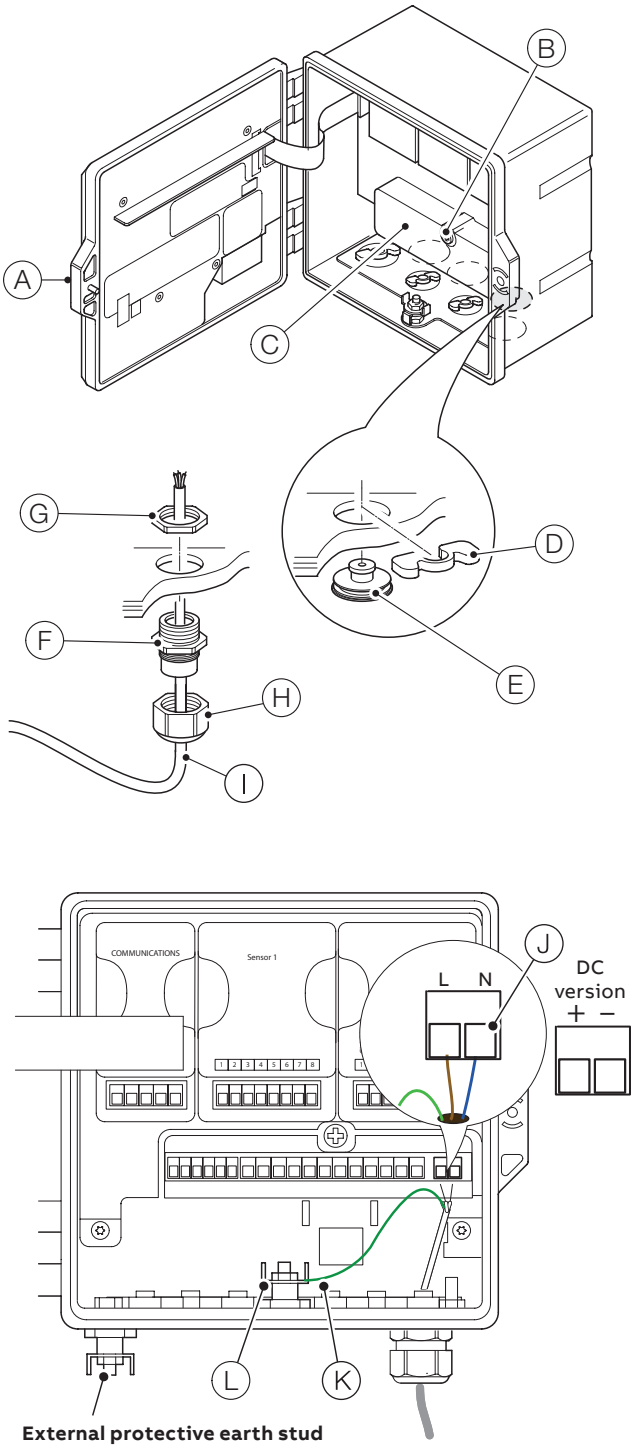


Figure 11 Connecting the transmitter AC mains power supply

…5 Electrical installation

Fitting the EZLink modules

⚠ WARNING

Bodily injury

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

Referring to Figure 12:

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).

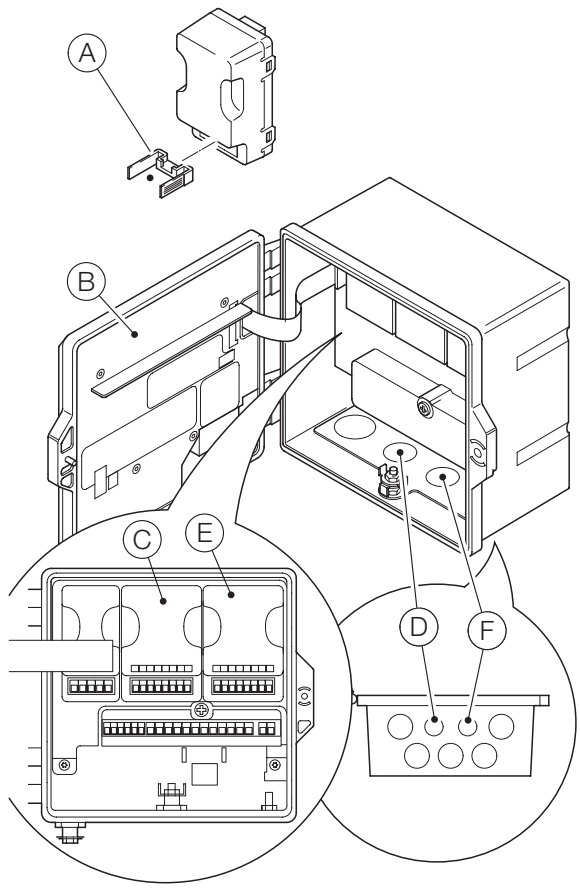


Figure 12 EZLink module positions and EZLink cable entries

Referring to Figure 13:

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 connector cable (G).

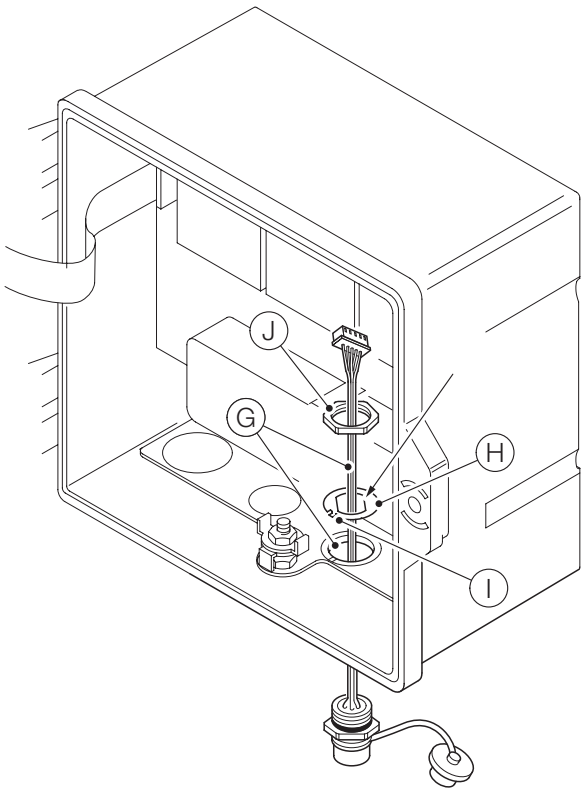


Figure 13 Preparing EZLink connector cable fixings

Referring to Figure 14:

7 Fit alignment tab (I) into gland plate slot (K) (on plastic case variant) or in the casting slot (on metal case variant).

8 Insert EZLink connector body (L) fully into cable entry and align the connector body using the flats on the alignment washer (see Figure 13).

9 Screw back nut (J) onto connector body and tighten using a spanner.

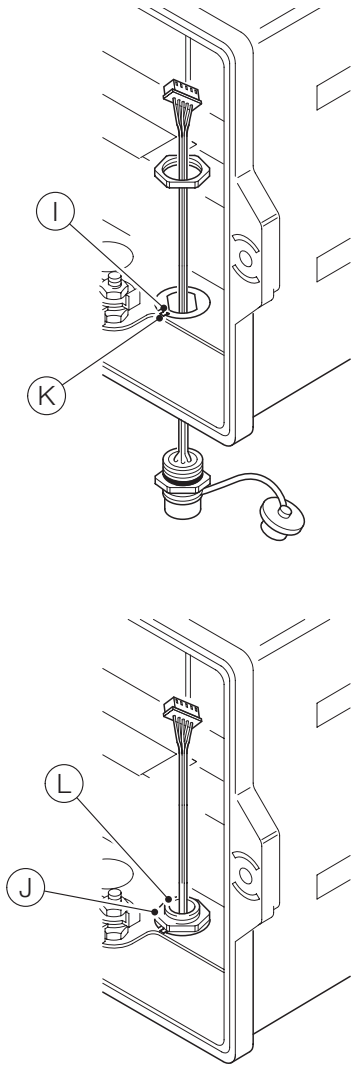


Figure 14 Securing the EZLink connector cable assembly

Referring to Figure 15:

10 Place EZLink cable plug (M) into EZLink connector block cradle (A).

11 Plug connector block cradle (A) into EZLink module (N).

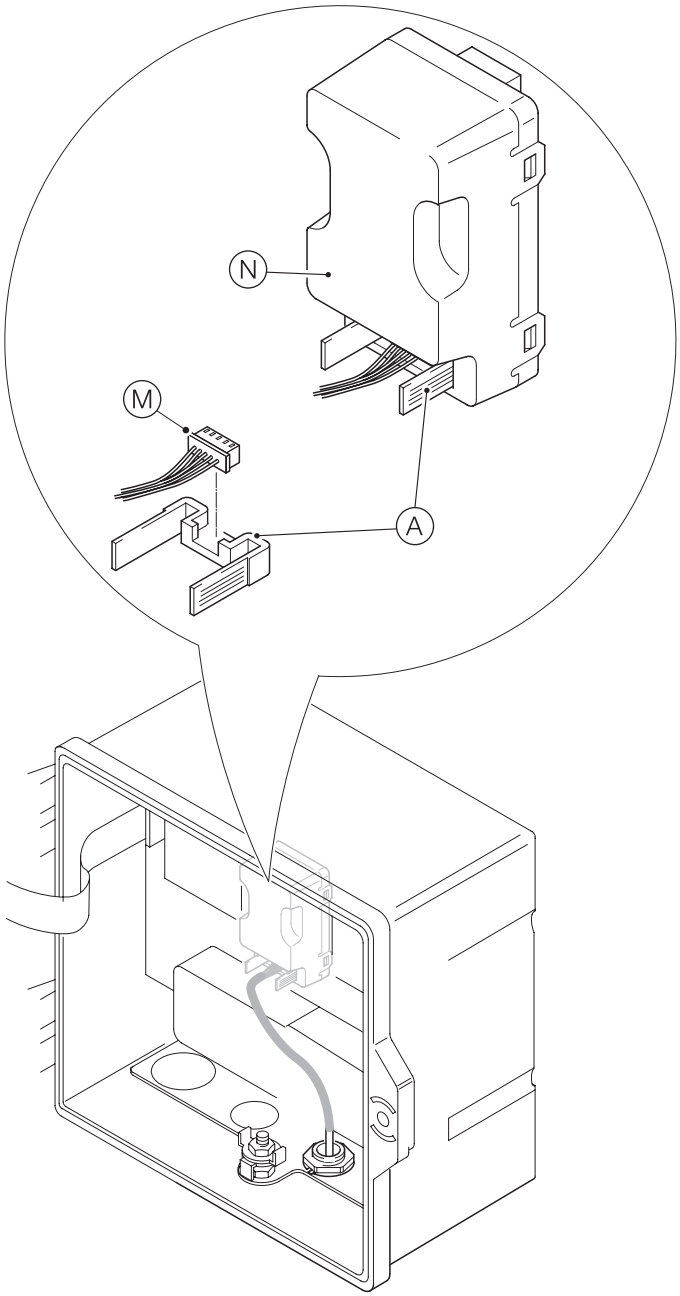


Figure 15 Connecting the EZLink cable assembly

12 If a second EZLink module is required, repeat all steps.

13 Close and lock transmitter door (B).

…5 Electrical installation

Connecting EZLink sensors

NOTICE

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

Referring to Figure 16:

1 Align the pins in sensor cable connector Ⓐ with the holes in EZLink connector Ⓑ and push the connectors together.

2 Turn nut Ⓒ clockwise to secure the connectors together.

The transmitter detects the type of sensor connected automatically.

NOTICE

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

Long cables

If cables are longer than 30 m (94 ft), or they are outside, the following cables must be screened or contained in conductive conduit:

- digital I/O
- analog outputs
- communication

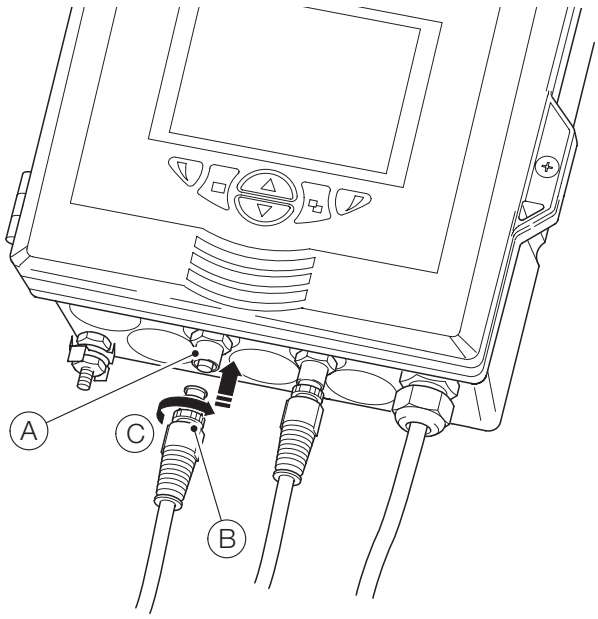
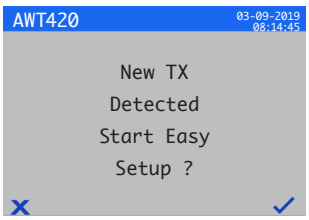


Figure 16 Connecting the sensor EZLink connector(s)

6 Easy Setup

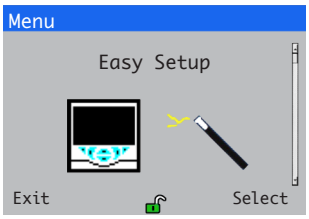
When the transmitter is started up for the first time, or when **Restore defaults** is selected from the **Configuration/Device Setup/Initial Setup** menu (see page 38), the 'Easy Setup' prompt is displayed:



Press the key (✓) to start **Easy Setup** or press the key (✗) to cancel and exit to the main **Operator** page.

Press the key (**Edit**) to change the default value/setting to the required value/selection. Press the key (**Next**) to accept the default or revised value/selection and advance to the next parameter.

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



Press the key (**Select**) to revise/amend the settings just made or press the key (**Exit**) to cancel and exit to the main Operator page.

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

NOTICE

- If **Easy Setup** does not detect a key press within 5 minutes, the display changes automatically to the main **Operator** page.
- Refer to page 25 for details of menu navigation and parameter selection/adjustment.

7 Calibration and sensor setup

⚠ CAUTION

Do not attempt to setup the transmitter unless both the sensor and transmitter are fully installed and ready for operation.

NOTICE

- The menu structure, general operation and menu descriptions are detailed on page 36.
- Refer to page 25 for details of menu navigation and parameter selection/adjustment.

Ensure all electrical connections have been made correctly and switch on the power to the transmitter. If the sensor is being commissioned for the first time, sensor calibration and set-up is recommended for best results.

Refer to the following pages for calibration and setup procedures:

- 2-electrode conductivity sensors – page 55
- 4-electrode conductivity sensors – page 57
- pH/Redox/ORP sensors – page 59
- Turbidity/Suspended solids – page 70
- Dissolved oxygen sensors – page 81

8 Hot plug-in (EZLink sensors only)

Hot plug-in is a feature of the AWT420 transmitter that enables sensors to be added, removed or replaced without the need to power down the transmitter. The EZLink connector enables sensors to be connected and disconnected without tools and without opening the transmitter enclosure. Hot plug-in also enables a sensor to be configured in one location, then installed in a different location without the need to reconfigure the sensor as all the configuration values are stored in the sensor.

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

The **Easy Setup** menu is displayed when a new or replacement sensor is connected to the transmitter.

For the purposes of the remainder of Section 7, the following definitions apply:

Sensor setup parameters

Are those that are sensor-specific and are stored in the sensor (for example, sensor tag, serial number, cleaning interval, units, date of manufacture etc.). For some sensor types, the setup parameters may also include primary variable, measurement units and measurement range. The transmitter maintains a copy of these parameters as long as the sensor is connected.

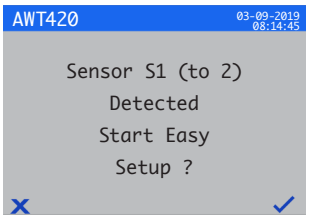
Transmitter configuration parameters

Are those that define transmitter operation (for example, current output assignment and range, relay and alarm assignment). Some sensor types also store sensor setup parameters in the transmitter.

Sensor addition

To add a new sensor to the unused input channel:

1 Connect the sensor to the transmitter EZLink connector – see page 20. The transmitter detects the new sensor automatically and loads the sensor setup parameters stored in the sensor. When upload is complete, the **Easy Setup** prompt is displayed:



2 Press the key (✓) to start **Easy Setup** or press the key (✗) to use the sensor setup parameters stored in the sensor.

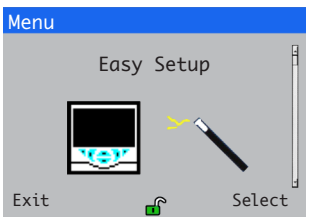
NOTICE

The remaining steps are applicable only if **Easy Setup** is selected.

3 Press the key (**Edit**) to change the default value/setting to the required value/selection. Press the key (**Next**) to accept the default or revised value/selection and advance to the next parameter.

Sensor parameters that can be configured in this way are sensor-specific. Refer to the relevant sensor Operating instruction.

4 On completion of **Easy Setup**, the display returns to the **Easy Setup** start screen:



Sensor replacement

A sensor can be replaced by a sensor of the same type or a different type. If a sensor is replaced by one of the same type, the sensor setup parameters from the sensor being removed can be retained (see page 23) for use with the new sensor, or set to use the values stored in the new sensor.

Replacing the sensor with a sensor of the same type

To replace a sensor of the same type and retain existing sensor setup parameters:

1 Disconnect the old sensor from the EZLink connector – see page 20. The diagnostic message ⊗ **S1 (to 2):Removed** is displayed in the status bar at the bottom of the main **Operator** page.

NOTICE

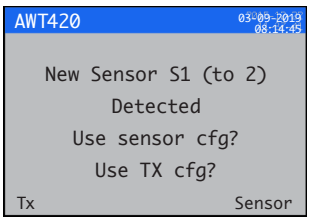
To retain existing transmitter setup parameters for use with the new sensor:

Do not acknowledge sensor removal after the ⊗ **S1 (to 2):Removed** warning is displayed. If sensor removal is acknowledged, the transmitter configuration for the channel is reset to factory defaults.

To maintain the value of analog, digital and relay outputs during sensor replacement, press the key and select **Manual Hold** from the Operator page menu.

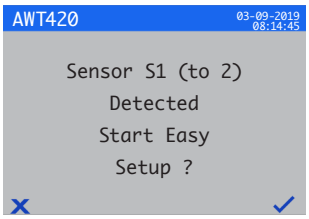
If a failure current has been configured for an analog output, the output's value is not held. Sensor removal is classed as a failure by the diagnostic system and this overrides the existing analog output current.

2 Connect the new sensor to the same EZLink connector –see page 20. A user prompt is displayed asking which configuration to use:



3 Press the key (**TX**) to use the sensor configuration saved in the transmitter (used with the sensor previously connected) or press the key (**Sensor**) to use the sensor configuration stored in the new sensor.

The **Easy Setup** prompt is displayed:



4 Press the key (✕) to cancel **Easy Setup** and start measurement using the sensor immediately, or press the key (✓) to edit the sensor configuration using the **Easy Setup** menu – see page 21.

Replacing a sensor with a sensor of a different type

To replace a sensor with a sensor of a different type:

1 Disconnect the old sensor from the EZLink connector – see page 20. The diagnostic message ⊗ **S1 (to 2):Removed** is displayed in the status bar at the bottom of the main **Operator** page.

2 Press the key and select **Ack Sensor Removed** from the **Operator** page menu to reset the transmitter configuration parameters for this sensor to factory default values.

3 Connect and configure the new sensor as described on page 22.

...8 Hot plug-in (EZLink sensors only)

Sensor removal

When a sensor is disconnected, the diagnostic message ⊗ **S1 (to 2):Removed** is displayed in the status bar at the bottom of the main Operator page.

To remove a sensor permanently, press the key and select **Ack Sensor Removed** from the **Operator** page menu. This clears all the output settings associated with the input (including analog output sources and alarm sources) and disables any associated digital output and relay sources. If one sensor remains connected, the **Operator page** display for the remaining sensor and any diagnostic messages related to the sensor removed are cleared. If no sensors are connected, the **Operator page** is blank.

To remove a sensor temporarily, **DO NOT** acknowledge sensor removal as described above. Sensor setup parameter settings for the input channel are retained.

NOTICE

To maintain the value of analog, digital and relay outputs during temporary sensor removal, press the and select **Manual Hold** from the **Operator** page menu.

If a failure current has been configured for an analog output, the output's value is not held. Sensor removal is classed as a failure by the diagnostic system and this overrides the existing analog output current.

If a sensor is subsequently refitted, reconnection is detected by the transmitter and measurement using the sensor resumes. The diagnostic message is cleared and the state of any analog, digital and relay outputs are restored together with their associated alarm settings.

Device behavior on sensor removal

If a sensor is assigned as the source of an analog output and the sensor is disconnected from the transmitter, the analog output is driven to the configured failure current. If a failure current has not been configured, the analog output is driven to the minimum configurable output current.

If a sensor is assigned as the source of a low process alarm and the sensor is disconnected from the transmitter, the alarm is triggered. All digital outputs and relays assigned to the same alarm source are also set according to their configured polarity.

9 Operation

Front panel keys

The transmitter is operated using the front panel keys.
Prompts associated with active keys are displayed on each screen.
Diagnostic messages are detailed on page 83, display icon descriptions are detailed on page 34.

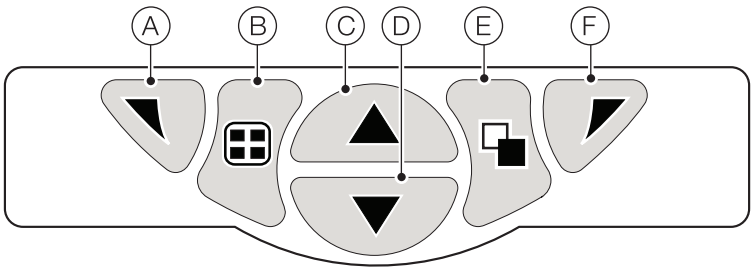


Figure 17 Front panel keys

Key		Function	Description
A		Navigation key – left and Operator menu access key	When any **Operating**, **View** or **Log** page is displayed, opens or closes the **Operator** menu and returns to the previous menu level.
B		View key	Toggles the view between **Operator** pages, **View** screens and **Log** screens – see Figure 18. **Note**. Disabled in **Configuration** mode.
C		Up key	Used to navigate up menu lists, highlight menu items and increase displayed values.
D		Down key	Used to navigate down menu lists, highlight menu items and decrease displayed values.
E		Group key	Toggles between: • **Operator** pages (1 to 5) when an **Operator** page is selected with the **View** key. • View screens (**Diagnostics View, Signals View, Alarms View** and **Outputs View**) when the **Diagnostics View** screen is selected with the **View** key. • Log screens (**Calibration Log, Alarm Log, Audit Log** and **Diagnostics Log**) when the **Calibration Logs** screen is selected with the **View** key. See Figure 18. **Note**. Disabled in **Configuration** mode.
F		Navigation key – right and Cal shortcut key	At menu level, selects the highlighted menu item, operation button or edits a selection. When any **Operator, View** or **Log** page is displayed, used as a shortcut key to access the **Calibrate** level.

Table 1 Key functions

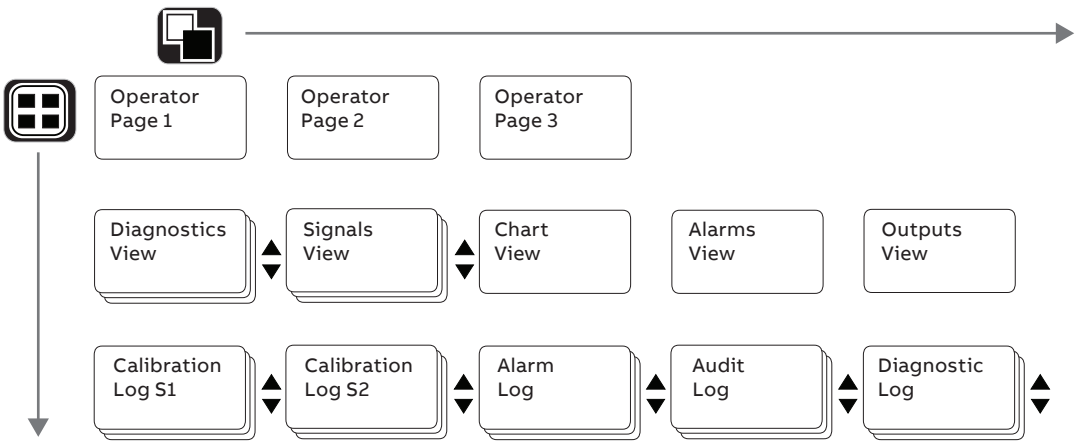


Figure 18 Menu navigation overview

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

…9 Operation

Modes of operation

The transmitter has 4 modes of operation – all modes are accessed from the **Operator** menu – see Figure 19:

- **Operating**: displays real-time sensor values on **Operating Pages** – see page 27.
- **View**: displays diagnostic messages, alarms, output values, signals (including the flow rate where applicable) and (chart) traces – see page 29.
- **Log**: displays recorded diagnostic, calibration and audit events and alarms – see page 30.
- **Configuration**: enables the transmitter to be configured – see page 36.

Operator menus

NOTICE

Operator menus cannot be accessed directly from the **Configuration** level.

Referring to Figure 19:

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

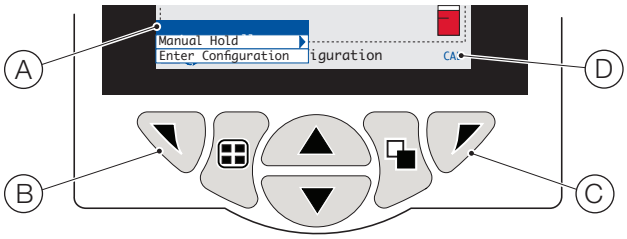


Figure 19 Operator menus

Operator menus comprise:

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

NOTICE

Active values are still indicated on the display.

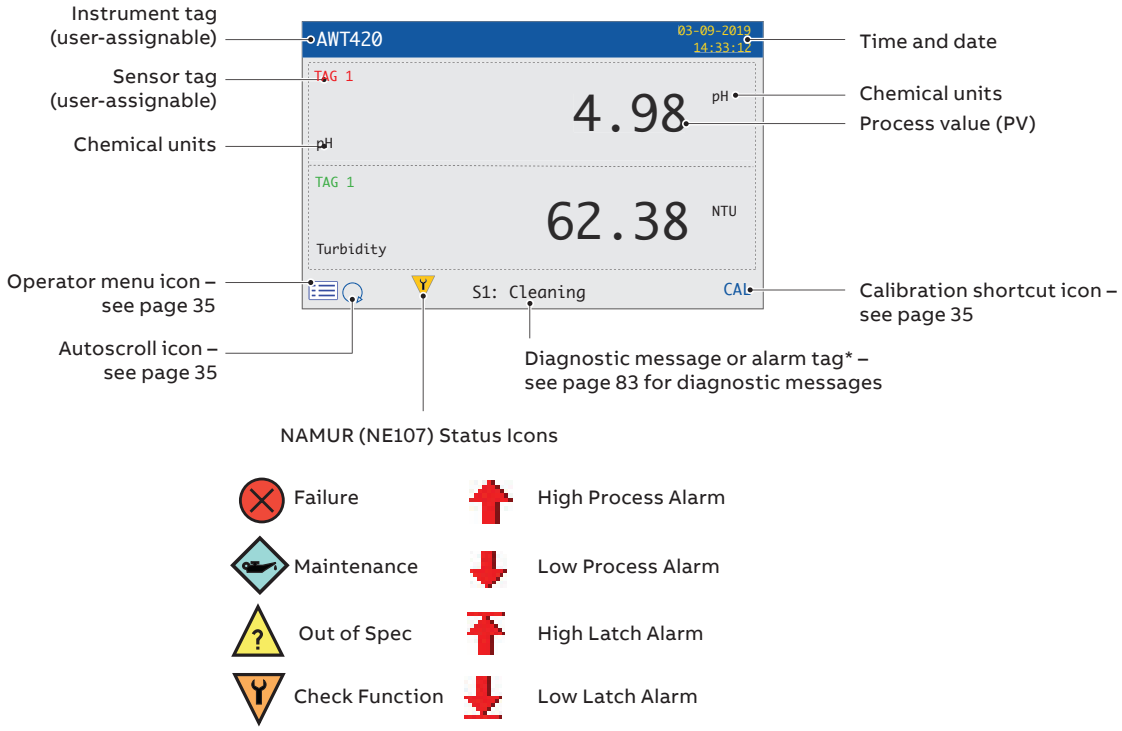
- **Manual Clean**: initiates a sensor cleaning cycle.
- **Ack.Sensor Removed** (displayed only if a sensor is disconnected from the transmitter): confirms permanent sensor removal and resets transmitter configuration settings to factory default for the sensor input.
- **Media Card**: displays the status of the SD card and enables the operator to place the media online/offline.
- **Autoscroll** (enabled on **Operator** pages only): displays **Operator** pages sequentially when multiple sensors are fitted.
- **Enter Configuration** (enabled on all pages): enters **Configuration** parameters via the **Access Level** – see page 33 for access levels and password security options.

Operating modes

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

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

In Figure 20, **Operator** page 1 shows that 2 sensors are connected (pH and turbidity).



*The highest priority diagnostic or alarm is displayed.
Other active diagnostic/alarm states can be viewed on the **Diagnostics View** – see page 22.

Figure 20 Operator Page (multiple sensors)

...9 Operation

Figure 21 shows an overview of **Operator** pages 2 to 3. Each **Operator Page** displays the **PV** and temperature from a single sensor. Fixed, color-coded, user-assignable tags (one for each fitted sensor) and color-coded bargraphs aid identification of each sensor.

The bargraph indicates the PV. Minimum and maximum PVs are configurable in the **Sensor Setup** level. If the measured PV is above the maximum specified range of the sensor (refer to the sensor's **Operating Instruction**), the bargraph flashes to indicate the value is outside the specified range.
When multiple sensors are fitted and **Autoscroll** is selected from the **Operator Menu** (see page 26), the display scrolls through each available **Operator Page** consecutively.

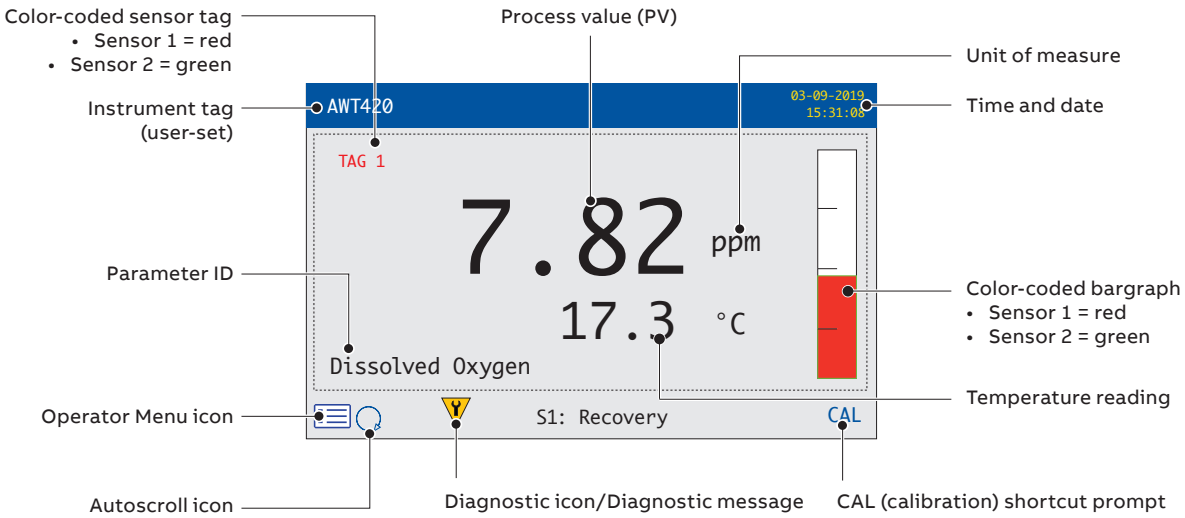


Figure 21 Operator pages – overview

View mode

Pages displayed in View mode comprise:

- **Diagnostics View** – displays a list of active diagnostic messages identified by priority and message – see Figure 22
- **Signals View** – displays a list of active signals and their values (1 page per sensor) – see Figure 23
- **Chart View** – represents the sensor readings as a series of color-coded traces – see Figure 24
- **Alarms View** – displays a list of alarms, source and status – see Figure 25
- **Outputs View** – displays a list of the analog outputs, output value and percentage of output value – see Figure 26

Diagnostics View

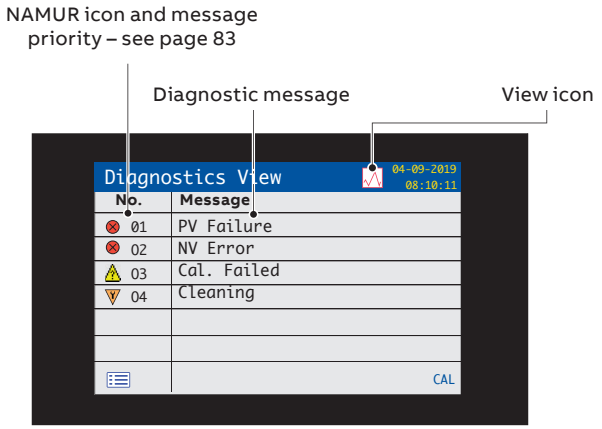


Figure 22 Diagnostics View

Signals View

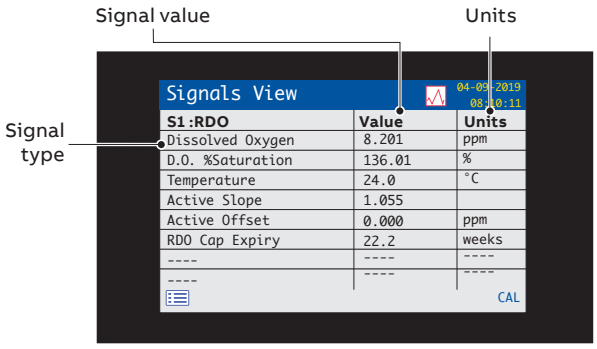


Figure 23 Signals View

Chart View

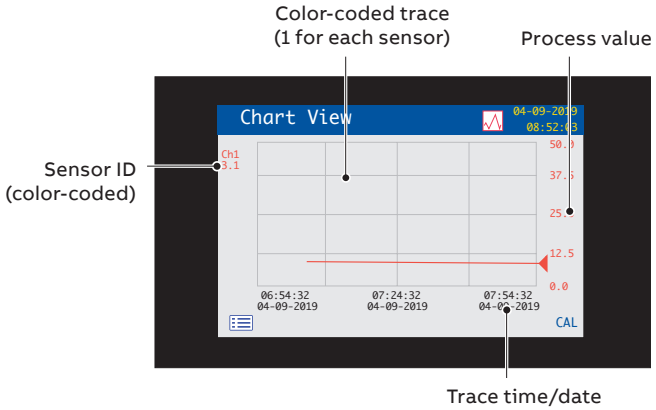


Figure 24 Chart View

Alarms View

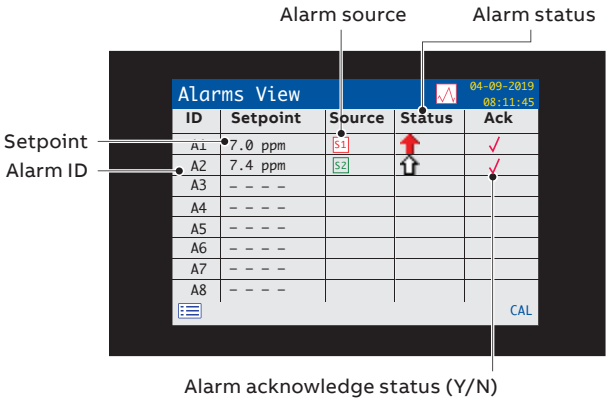


Figure 25 Alarms View

Outputs View

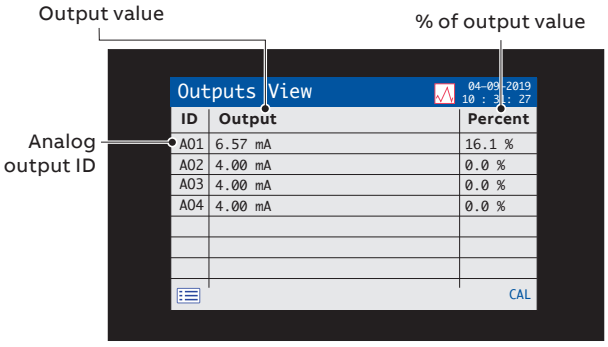


Figure 26 Outputs View

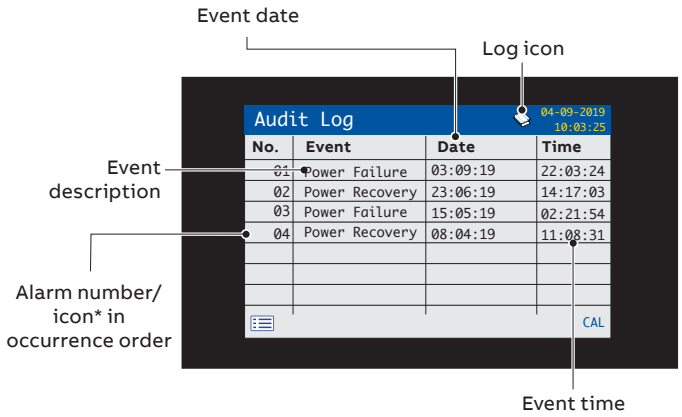
...9 Operation

Log mode

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

Log mode pages comprise:

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



*Icons not displayed on **Alarm Log** or **Calibration Log**

Figure 27 Log page example (Audit Log shown)

Log entries

Example **Calibration Log** entries with descriptions are shown in Table 2. Example **Audit Log** entries together with a description are shown in Table 3. The **Diagnostics Log** shows the history of diagnostic messages that have been displayed in the **Diagnostic View** – see page 29.

Log entry	Description
Cal Failed	Calibration procedure failed due to low slope or sample temperature error.
Cal Aborted	Calibration aborted manually by the user.
Cal Missed	**Note**. Sensor-type specific.

Table 2 Calibration Log entries

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

Table 3 Audit Log entries

10 Data logging

Removable SD card

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

NOTICE

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

Removable media

NOTICE

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

SD card insertion and removal

Referring to Figure 28:

1 Using a suitable screwdriver, release door retaining screw (A).

2 Open the transmitter door and remove media cover (B).

3 Insert removable media (C) by pushing up into slot, then releasing to spring-lock in place. If required, press button (D) to place the media online. LED (E) is lit when the removable media is online.

4 To remove the media, if LED (E) is lit, press button (D) to take the media offline and ensure LED (E) is not lit.

5 Push removable media (C) up to release spring-lock, then pull down and out of the socket.

(The media can then be inserted into an appropriate card reader on a PC and the data downloaded.)

6 Refit media cover (B).

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

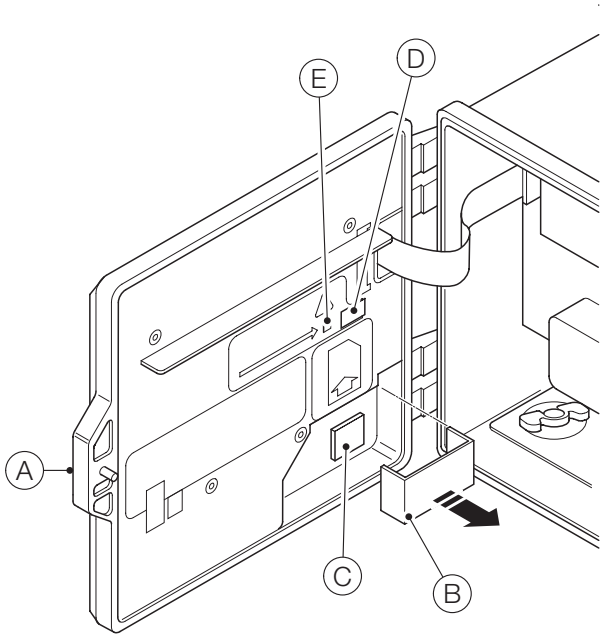


Figure 28 SD card insertion and removal

...10 Data logging

Archive file types

All files created by the transmitter are assigned filenames automatically. Each type of file is assigned a different file extension. Archive files are created as text format, comma-separated data files.

The file type and extension for **Data** text files is '.D00'
<ddmmmyy><hhmmss><instrument tag>.D00

The file type and extension for **Event** log files (containing historical entries from the **Audit, Calibration, Diagnostic** and **Alarm** logs is '.A00'.

<ddmmmyy><hhmmss><instrument tag>.A00

NOTICE

- The 'instrument tag' is set in the **Device Setup** level (see page 31) when the user has access at **Advanced** level – see page 33.
- The time and date are formatted according to the format selected in the **Display** level (**Date & Time**) – see page 39.
- The transmitter's internal clock can be configured to adjust automatically at the start and end of **Daylight Saving** periods – see page 39.

Configuration filenames are preset as Config1 to Config8. The configuration file type and extension is '.CFG'.

Data files

Text format archived data is stored in a comma-separated value (CSV) format and can be imported directly into a standard spreadsheet, for example, Microsoft® Excel®.

Alternatively, detailed graphical analysis of the data can be performed on a PC using ABB's DataManager Pro data analysis software.

New data files are created if:

- the transmitter configuration is changed
- one of the current files exceeds the maximum permissible size (a new file is created at 00:00:00 a.m. on the following day) – data is logged into the existing file continuously until the new file is created
- the daylight saving period starts or ends
- working files cannot be found/are corrupted
- the date and/or time is changed

The filename is formatted as follows:

- Data logs: <ddmmmyy><hhmmss><instrument tag>.D00

Log files

The **Alarm Event, Calibration, Diagnostic** and **Audit** logs are archived into the same file. The filenames are formatted as follows:

- Event logs: <ddmmmyy><hhmmss><instrument tag>.A00

Daylight saving

Files containing data generated during the daylight saving period have '~DS' appended to the filename.

NOTICE

Daily files start at 00:00:00.

Start of daylight saving period
A daily file is started at 00:00:00 on 30th March 2019, filename:
30Mar19_00_00_00_AWT 420.D00

Summertime starts at 2:00am on 30th March 2019 and the clock changes automatically to 3:00am.

The existing file is closed and a new file is created, filename:
30Mar19_03_00_00_AWT 420~DS.D00

The file '30Mar19_00_00_00_AWT 420.D00' contains data generated from 00:00:00 to 01:59:59.

The file '30Mar19_03_00_00_AWT 420~DS.D00' contains data generated from 03:00:00.

End of daylight saving period
A daily file is started at 00:00:00 on 26th October 2019 filename:
26Oct19_00_00_00_AWT 420~DS.D00

Summertime ends at 3:00am on 26th October 2019 and the clock changes automatically to 2:00am.

The existing file is closed and a new file is created, filename:
26Oct19_02_00_00_AWT 420.D00

The file '26Oct19_00_00_00_AWT 420~DS.D00' contains data generated from 00:00:00 to 02:59:59.

The file '26Oct19_02_00_00_AWT 420.D00' contains data generated from 02:00:00.

11 Password security and access level

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

Setting passwords

Passwords can be set to enable secure access at 2 levels: **Calibrate** and **Advanced**. The **Service** level is password protected at the factory and reserved for factory use only. Passwords can contain up to 6 characters and are set, changed or restored to their default settings at the **Device Setup/ Security Setup** parameter – see page 38.

NOTICE

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

Access Level

The **Access Level** is entered via the **Operator** menu/**Enter Configuration** menu option – see page 26.

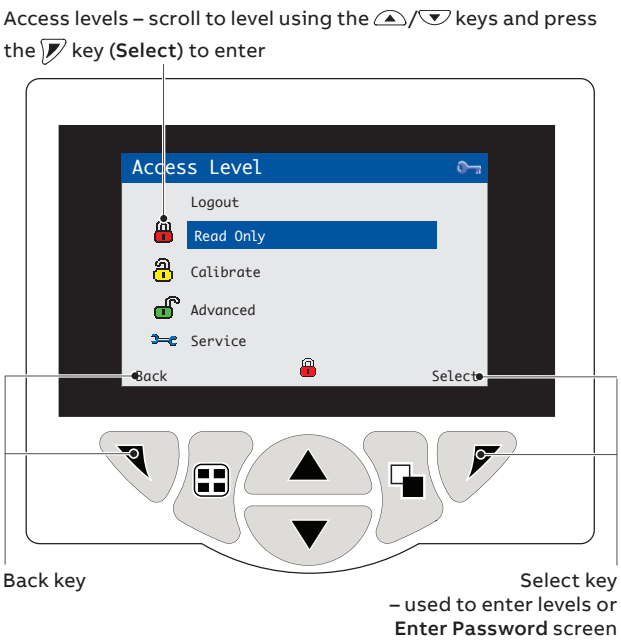


Figure 29 Access level screen

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

Table 4 Access level menu details

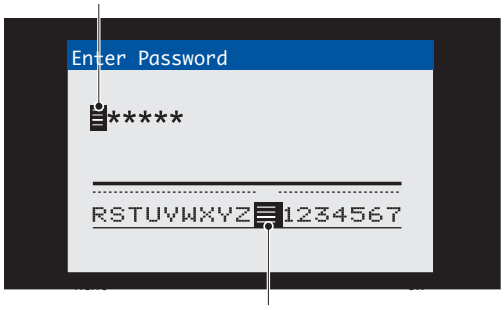


Figure 30 Enter password screen

12 Display icons

Diagnostic icons

NOTICE

- 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 – refer to page 83 for diagnostic messages.
- If the status bar displays a diagnostic message, press the key to see all diagnostic messages.

NAMUR icons

	Diagnostic icon – Out of Specification.
	Diagnostic icon – Maintenance Required.
	Diagnostic icon – Failure.
	Diagnostic icon – Check Function.

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.

Title bar icons

	Media on-line: 0 to <20 % full.
	Media on-line: 20 to <40 % full.
	Media on-line: 40 to <60 % full.
	Media on-line: 60 to <80 % full.
	Media on-line: 80 to <100 % full.
	Media on-line: full (icon toggles when full).
	Media off-line: 0 to <20 % full.
	Media off-line: 20 to <40 % full.
	Media off-line: 40 to <60 % full.
	Media off-line: 60 to <80 % full.
	Media off-line: 80 to <100 % full.
	Media off-line: not inserted (not logging).
	Attempt to datalog/go online with no card fitted.
	Any alarm is active.
	Bluetooth: not connected/connected.

Status bar icons

Note. Refer to page 83 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.

Log icons

	Source: sensor 1 (red) S1 = sensor 1 process value. T1 = sensor 1 temperature.
	Source sensor 2 (green) S2 = sensor 2 process value. T2 = sensor 2 temperature.
	Power failed/power restored.
	Configuration changed.
	System Error.
	File created.
	Media inserted/removed.
	Media on-line/off-line.
	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.

13 Configuration (Advanced access level)

Note. **Service** level menus (not shown) are password-protected at the factory and intended for use by authorized ABB service technicians only.

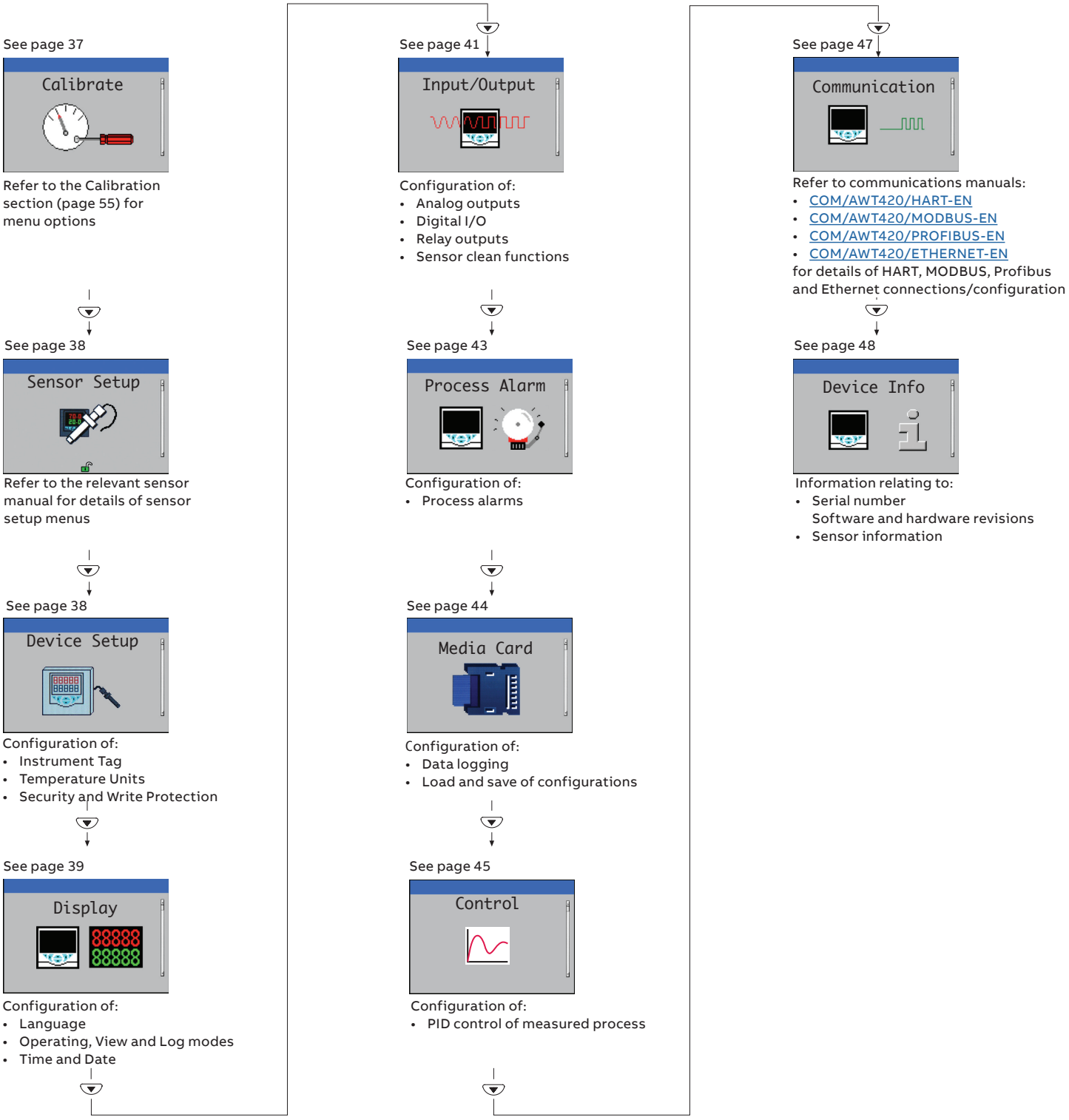
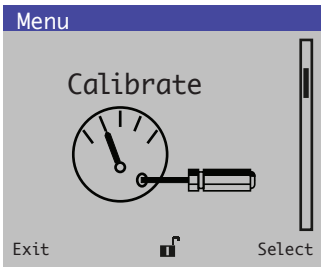


Figure 31 Configuration (Advanced access level) overview

Calibrate



Used to calibrate the sensor.

Note. **Calibrate** menus are sensor-specific – refer to the **Calibration** section (page 55) 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.

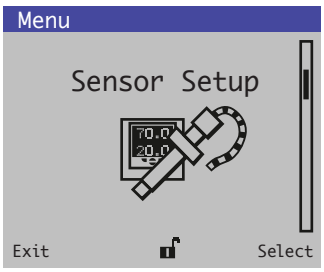
Menu	Comment	Default
S1: <Sensor Type>	**Note**. Displayed only if a sensor is fitted to slot 1.	
S1: <Sensor Tag>	Access the sensor 1 specific calibration pages, refer to the Calibration section (page 55) for specific routines.	
S2: <Sensor Type>	**Note**. Displayed only if a sensor is fitted to slot 1.	
S2: <Sensor Tag>	Access the sensor 1 specific calibration pages, refer to the Calibration section (page 55) 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 below/user-defined.	ABB Capsule 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.	ABB Capsule 9.00pH
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

Buffer solutions

ABB Capsule 4.01pH	AWR126B026EN
ABB Capsule 7.00pH	AWR126B027EN
ABB Capsule 9.00pH	3KXA163000L0201
ABB Capsule 10.00pH	AWR126B028EN
Technical 4.01pH	AWR126B011EN
Technical 7.00pH	AWR126B013EN
Technical 10.01pH	AWR126B015EN
DIN19266 1.679pH	AWR126B017EN
DIN19266 4.005pH	AWR126B018EN
DIN19266 6.865pH	AWR126B019EN
DIN19266 9.180pH	AWR126B020EN
DIN19266 10.012pH	AWR126B021EN
NIST 4.001pH	AWR126B022EN
NIST 6.881pH	AWR126B023EN
NIST 9.225pH	AWR126B024EN
NIST 10.062pH	3KXA163000L0202
Phth. Free 4.00pH	AWR126B025EN
ABB Sachet 4.01pH	0400/110
ABB Sachet 7.00pH	0400/120
ABB Sachet 9.18pH	0400/130
User Defined 1	
User Defined 2	

… 13 Configuration (Advanced access level)

Sensor Setup

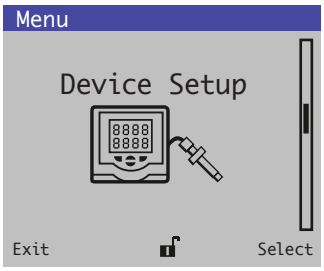


Used to access standard setup parameters.

Note. **Sensor Setup** menus are sensor-specific – refer to the **Calibration** section (page 55) and relevant sensor manual for full details of sensor setup.

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 setup pages, refer to the **Sensor setup** section (page 50).	
S2: <Sensor Type>	**Note.** Displayed only if a sensor is fitted to slot 2.	
S2: <Sensor Tag>	Access the sensor 1 specific setup pages, refer to the **Sensor setup** section (page 50).	
Hold Outputs	**Note.** Displayed only if two 2-electrode conductivity sensors are fitted. Access the **Calculated Values** specific setup pages, refer to the **Sensor setup** section (page 50).	

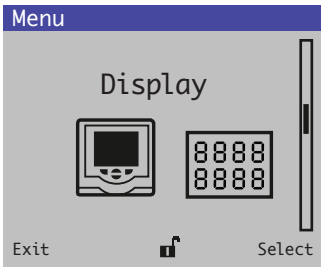
Device Setup



Used to access standard setup parameters.

Menu	Comment	Default
Initial Setup		
Instrument Tag	Enter an alphanumeric transmitter identification tag (16 characters maximum)	AWT420
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.	

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.

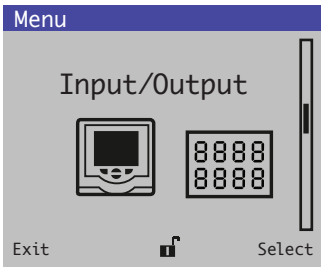
Menu	Comment	Default
Language	Select the display language: English/German/French/Italian/Spanish.	English
Operator Templates		
Page 1 (to 5) Template	Refer to page 27 for **Operator Template** examples. **Note**. **Operator Page** templates are assigned automatically to display all sensors currently connected and cannot be changed – see page 27.	
View/Log Enables	Select to enable/disable the following **Views** and **Logs**.	
Diagnostics View		
Signals View		
Chart View	See page 29 for examples of **Operator pages** in **View** mode.	
Alarm View		
Analog OP View		Enable (all)
Calibration Log		
Alarm Log	See page 30 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

… 13 Configuration (Advanced access level)

… Display

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.	

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/AWT420/HART-EN.	
Analog Output 1 (to 4)	Analog outputs 3 and 4 are available only if an option board is fitted – see page 13.	
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 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 – see page 34.	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 – see page 34.	22.0
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	See page 13 for digital I/O connections.	
Type	Select the **Digital I/O** type: • Off. • Input. • Output.	Off
Source	Select the digital signal to be assigned to the input/output – page 49.	None
Polarity	Sets the polarity of the digital input/output signal – see Table 5, page 42.	Non Inverted
Relays		
Relay 1 (to 4)		
Source	Selects the digital signal to be assigned to the relay – see page 49.	None
Polarity	Sets the polarity of the relay output – see Table 6, page 42.	Non Inverted

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

… 13 Configuration (Advanced access level)

…Input/Output

Menu	Comment	Default
Cleaning 1 (2) – Input/Output		
Sensor To Clean	Set the sensor to be cleaned: • Sensor 1/Sensor 2	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)** x **Number of Pulses + Recovery Time**	N/A
Next Clean	Set the date and time of the next scheduled clean.	N/A

Digital input/output polarity

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

Input status	Output state
Open	Inactive
Closed	Active

Digital input (volt-free): polarity = inverted

Input status	Output state
Open	Active
Closed	Inactive

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

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

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

Table 5 Digital input/output polarity

Relay output polarity

Relay output: polarity = non-inverted

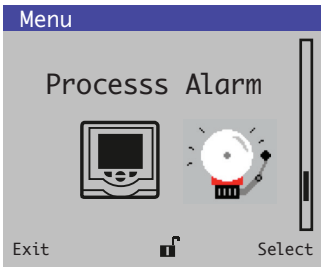
Source status	Relay state	N/C Contact	N/O Contact
Active	Energized	Open	Closed
Inactive	De-energized	Closed	Open

Relay output: polarity = inverted

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

Table 6 Relay output polarity

Process Alarm



Used to configure up to 8 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 – see page 27.	
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 (Figure 32 and Figure 33) below.	
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.	

Process alarm examples

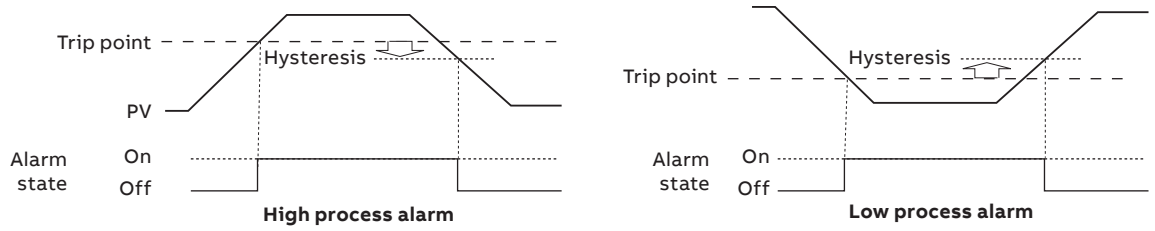


Figure 32 High and low process alarm action

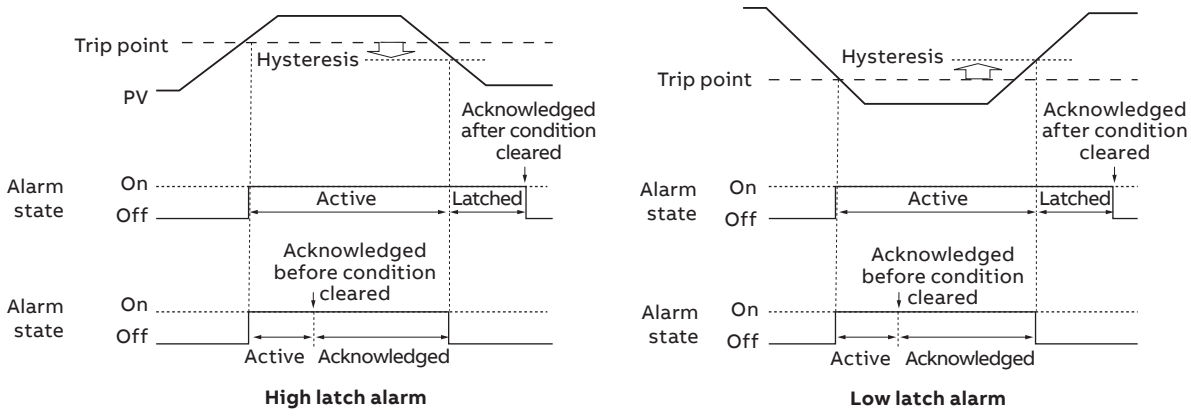
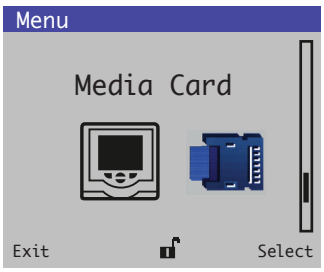


Figure 33 High and low latch alarm action

… 13 Configuration (Advanced access level)

Media Card



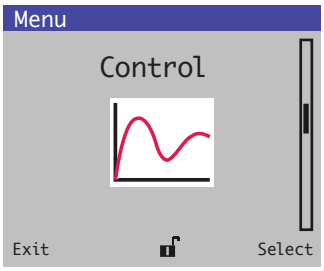
Used to enable/disable data logging, select the source of the data to be logged, save and load configuration files and to format external media.

Menu	Comment	Default
Data Logging		
Channel 1 (to 6)	Select the source of the data to be logged – see page 49 for sources.	
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.	

Control



PID control functionality is available for both channels of the AWT420 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.

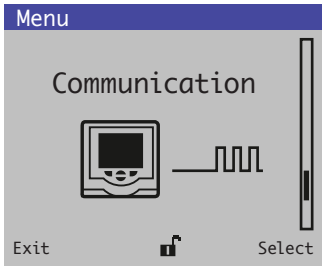
Menu	Comment	Default
PID 1 (2)		
Control Action	Off, Reverse-acting, Direct-Acting, Dual-acting.	Off
Control Mode	Auto, Manual	Auto
Reverse Control **Direct Control**	If **Control Action** = **Reverse** or **Direct-Acting**:	
Setpoint	Numeric value, limited to PV Range.	PV range low
Control Type	P, P+I, 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

… 13 Configuration (Advanced access level)

… Control

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

Communication



Communication level menus for Modbus, Profibus, HART, Ethernet are enabled only if an optional communications module is fitted.

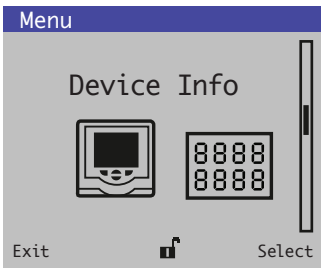
Refer to the communications supplementary manuals for full details of MODBUS, Profibus, HART and Ethernet connections and configuration together with tables detailing Profibus slot/indexes and MODBUS coils and registers:

- Modbus Communications supplement (COM/AWT420/MODBUS-EN)
- Profibus Communications supplement (COM/AWT420/PROFIBUS-EN)
- HART Communications supplement (COM/AWT420/HART-EN)
- Ethernet Communications supplement (COM/AWT420/ETHERNET-EN)

Menu	Comment	Default
Modbus	**Note**. Displayed only if a Modbus communication module is fitted	
Profibus	**Note**. Displayed only if a Profibus communication module is fitted	
HART	**Note**. Displayed only if a HART communication module is fitted	
Ethernet	**Note**. Displayed only if an Ethernet communication module is fitted	
Bluetooth	The AWT420 features a fully certified Bluetooth® 4.2 Low Energy module. This allows users wireless communication with the transmitter using the dedicated CWA mobile application. The mobile application is available for both Android™ and iOS™ operating systems. **Note**. Only mobile devices with support for Bluetooth® 4.2 or newer are compatible.	
Device Enable	Enables or disables power to the Bluetooth module. When disabled the module is no longer advertising and is not connectable.	Enabled
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 within range when scanning for devices to connect to. This Bluetooth **Device Name** is generated automatically from the instrument tag. Therefore, whenever the transmitters instrument tag is changed the Bluetooth **Device Name** changes to reflect it.	
Pairing PIN	The fixed 6-digit PIN number used when pairing the transmitter and mobile device. Once paired the PIN number is no longer required when re-connecting as the bonding information is stored within the module.	
Generate New PIN	Allows the operator to generate a new pairing PIN. The new pairing pin number is generated randomly by the transmitter.	

… 13 Configuration (Advanced access level)

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.	

Analog sources and digital input/output sources

Analog sources

Source name*	Description
S1 (to 2)	Measured concentration value for the associated sensor.
Temperature 1 (to 2)	Measured temperature value 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).
Inferred pH	Calculation based on dual 2-electrode conductivity.
Difference	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.

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 – see Appendix A, page 42 for possible causes.
S1 (to 2) Out of Spec.	The associated sensor is out of specification – see Appendix A, page 42 for possible causes.
S1 (to 2) Maintenance	The associated sensor requires maintenance – see Appendix A, page 42 for possible causes.
S1 (to 2) Function Check	The associated sensor requires checking – see Appendix A, page 42 for possible causes.
Tx Failure	The transmitter is in the failed state – see Appendix A, page 42 for possible causes.
Tx Out of Spec.	The transmitter is out of specification – see Appendix A, page 42 for possible causes.
Tx Maintenance	The transmitter requires maintenance – see Appendix A, page 42 for possible causes.
Tx Function Check	The transmitter requires checking – see Appendix A, page 42 for possible causes.
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).
Inferred pH	Calculation based on dual 2-electrode conductivity.
Difference	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.

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.

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.

14 Sensor setup

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 H20 (Neutral)/ Pure H2O (Acid)/Pure H2O (Base)/NaOH/HCl/NaCl/NH3/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 page 72.	2.00 %/°C
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 1000 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

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 (NH3)/ Inferred pH (NH3+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 (NH3)** 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 **NH3**. **Inferred pH (NH3+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 **NH3**. **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 (NH3) • 0.000 and 25.00 µS/cm Inferred pH (NH3+NaCl)	N/A
After Cation Limit	Set the required before-cation conductivity limit, between: • 1.000 and 100.0 µS/cm Inferred pH (NaOH) • 1.000 and 250.0 µS/cm Inferred pH (NaOH+NaCl) • 0.060 and 10.00 µS/cm Inferred pH (NH3) • 0.060 and 25.00 µS/cm Inferred pH (NH3+NaCl)	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 (NH3) • 7.00 to 10.00 pH Inferred pH (NH3+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

...14 Sensor setup

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 Bw see the relevant conductivity cell manual.	N/A
Conc. Solution	Note. Displayed only if **Sensor Group** = **Group A** Select the Concentration Solution • NaOH/HCl/H2SO4/H3PO4/NaCl/KOH/Custom	N/A
Concentration Unit	**Note**. Displayed only if **Conc. Solution** = **Custom** Select the Concentration Units • None(Blank)/ppm/mg/l/ppb/µg/l/%/Custom	N/A
Custom Units	**Note**. Displayed only if **Concentration Units** = **Custom** Enter an alphanumeric string (6 characters maximum) for the custom (user defined) concentration units.	N/A
Conc. Curve Table	Set the user defined concentration curve using the 6-point linearizer table (concentration against conductivity).	N/A
Range High	View the span value used in **Chart** and **Bargraph** views.	N/A
Range Low	View the zero value used in **Chart** and **Bargraph** views.	N/A
Filter Type	Select the signal filtering type: • None/Low/Medium/High	None
Temp. Comp. Type	Set the type of temperature compensation: • Manual/Automatic/None	Automatic
Manual Temperature	**Note**. Displayed only if **Temp. Comp. Type** = **Manual** Enter the temperature of the sample within the range –10.0 to 120.0 °C.	25.0 °C
TC Curve	**Note**. Not displayed only if **Temp. Comp. Type** = **None** Set the type of automatic temperature compensation required: • TC Coeff./Standard KCl/NaOH/NaCl/HCl/H2SO4/H3PO4/KOH/User Defined	TC Coeff
User Def. TC Curve	**Note**. Displayed only if **TC Curve** = **User Defined.** Set the user defined temperature compensation curve using the six point linearizer table (% against °C).	N/A
TC Coefficient	**Note**. Displayed only if **TC Curve** = **User Defined.** Enter the temperature coefficient (α x 100) of the solution (0.01 to 5.00 %/°C). If unknown, the temperature coefficient (α) of the solution must be calculated – see page 97.	2.00 %/°C
Sensor Diagnostics		
Dirty Sensor	Detect dirty sensor condition: • Enabled/Disabled	Disabled
Out Of Solution	Detect Out Of Solution condition: Enabled/Disabled	Disabled
Reset To Defaults	Select to reset all **Sensor Setup** parameters to their default values	

Sensor group	Conductivity measuring range
A	0 to 2000 mS/cm
B	0 to 2000 µS/cm

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 deg C) of the solution being monitored. See Appendix A, page 97.	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.	

...14 Sensor setup

RDO

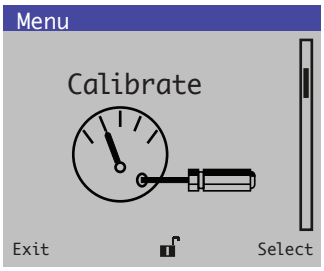
Menu	Comment	Default
Tag	Enter an alphanumeric sensor tag (16 characters maximum) to identify the sensor on the **Operator Pages**.	TAG1
Measurement Type	Select the required probe type: • Dissolved Oxygen/% Saturation **Note**. If a change is made the I/O sources are reset.	Dissolved Oxygen
Units	Select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

Turbidity/Suspended solids

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: • Turbidity/Suspended solids **Note**. If a change is made the I/O sources are reset.	Turbidity
Turbidity Units	Select the turbidity units • NTU/FNU	NTU
TSS Units	Select the total suspended solids units • mg/l/ppm for readings above 1000 mg/l (ppm) the units change automatically to g/l (ppt).	mg/l
Range High	Set the span value used in **Chart** and **Bargraph** views.	4000 NTU
Range Low	Set the zero value used in **Chart** and **Bargraph** views.	0
Filter Type	Select the signal filtering type: • None/Low/Medium/High	None
Note. The following menus are displayed only if the sensor has a wiper fitted.		
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.	

15 Calibration procedures

2-electrode conductivity



The conductivity/concentration/resistivity/temperature calibration is a smart one-point calibration routine that allows for single- or dual-point calibrations. By initiating calibrations at two different conductivity/concentration/resistivity/temperature values having ample separation, the AWT420 transmitter automatically adjusts the offset, slope, or both in order to obtain the best sensor performance. Since this routine only uses the most recent calibration data, calibration can be conducted throughout the sensor's life thus ensuring consistent sensor performance. If an incorrect calibration has been entered, the **Restore Cal Defaults** menu returns transmitter calibration values to factory settings.

The AWT420 transmitter can be configured as a Conductivity, Resistivity or Concentration device, the smart one-point calibration routine automatically uses the same units as the measured process variable.

Note. Access the calibrate menu via the **Calibrate** and **Advanced** levels only.

Menu	Comment	Default
Conductivity Cal	See typical procedure, see page 56.	N/A
Concentration Cal	See typical procedure, see page 56.	N/A
Resistivity Cal	See typical procedure, see page 56.	N/A
Temperature Cal	See Temperature Calibration procedure, see page 69.	N/A
Edit Cal		
PV Slope	Edit the **PV Slope** value. • Valid slope values range from 80 to 120 %	100 %
PV Offset	Edit the sensor **PV Offset**. Valid offset values are: • ±20 µS/cm for cell constants of 1.00 • ±4 µS/cm for cell constants of 0.10 • ±0.8 µS/cm for cell constants of 0.01	0 µS/cm
Temperature Slope	Edit the **Temperature Slope** value. • Valid slope values range from 40 to 160 %	100 %
Temperature Offset	Edit the **Temperature Offset** value. • Valid offset values are ±40 °C.	0 °C
Restore Cal Defaults	Resets slope and offset values to factory default.	N/A

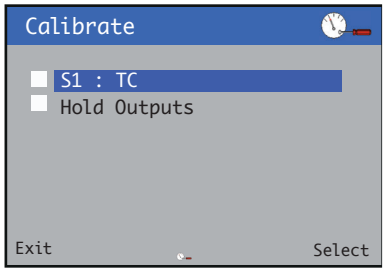
...15 Calibration procedures

2-electrode conductivity, resistivity or concentration calibration

Once the sensor has been installed and has reached the temperature of the process solution, verify the process variable value using a grab sample and an external validation device having the same type of temperature compensation.

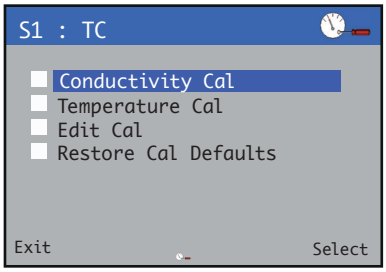
1 At the **Calibrate** level, press the key:

The **Calibrate** menu is displayed:



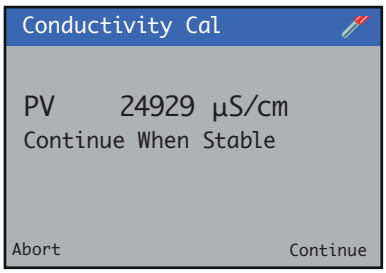
2 Use the ▲/▼ keys to select **S1 : TC** and press the key.

The **S1 : TC** menu is displayed:



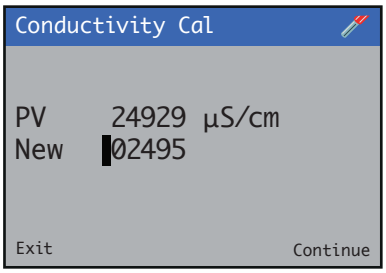
3 Use the ▲/▼ keys to select **Conductivity Cal** and press the .

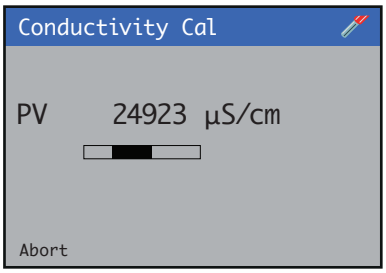
The **Conductivity Cal** menu is displayed:



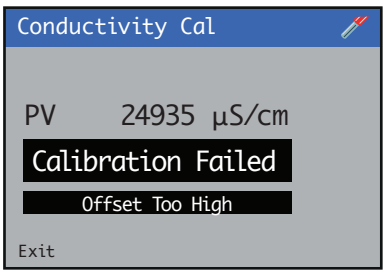
4 Confirm the displayed reading is stable and the key.

5 Press the key to enter a new value (the transmitter takes several seconds to validate the calibration):



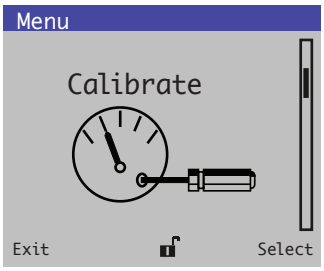


Invalid new calibration values generate an error message and the calibration value is not accepted.



If the new value is valid, **Slope** and **Offset** values are displayed.

4-electrode conductivity



The conductivity/concentration/temperature calibration is a smart one-point calibration routine that allows for single- or dual-point calibrations. By initiating calibrations at two different conductivity/concentration/temperature values having ample separation, the AWT420 transmitter automatically adjusts the offset, slope, or both to obtain the best sensor performance.

Because this routine uses only the most recent calibration data, calibration can be conducted throughout the sensor's life thus ensuring consistent sensor performance. If an incorrect calibration is entered, the **Restore Cal Defaults** option returns the transmitter calibration values to factory settings.

The AWT420 transmitter can be configured as a conductivity or concentration device, the smart one-point calibration routine automatically uses the same units as the measured process variable.

Note. Access to the **Calibrate** menu is via **Calibrate** and **Advanced** levels only.

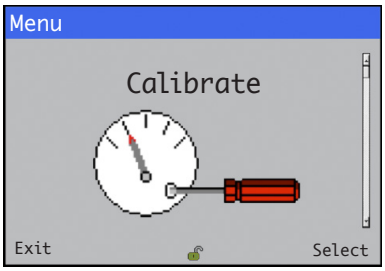
Menu	Comment	Default
Conductivity Cal	See typical procedure, see page 58.	N/A
Concentration Cal	See typical procedure, see page 58.	N/A
Resistivity Cal	See typical procedure, see page 58.	N/A
Temperature Cal	See Temperature Calibration procedure, see page 69.	N/A
Edit Cal		
PV Slope	Edit the **PV Slope** value. Valid slope values range from 80 to 120 %	100 %
PV Offset	Edit the sensor **PV Offset**. Valid offset values are: • ±20 µS/cm for cell constants of 1.00 • ±4 µS/cm for cell constants of 0.10 • ±0.8 µS/cm for cell constants of 0.01	0 µS/cm
Temperature Slope	Edit the **Temperature Slope** value. Valid slope values range from 40 to 160 %	100 %
Temperature Offset	Edit the **Temperature Offset** value. • Valid offset values are ±40 °C.	0 °C
Restore Cal Defaults	Resets slope and offset values to factory default.	N/A

...15 Calibration procedures

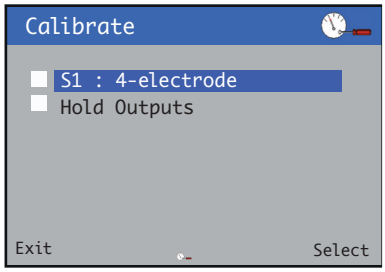
4-electrode conductivity calibration

Once the sensor has been installed and has reached the temperature of the process solution, verify the process variable value using a grab sample and an external validation device having the same type of temperature compensation.

1 At the **Calibrate** level, press the key:

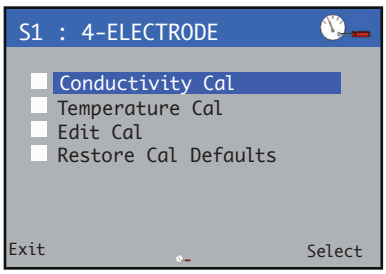


The **Calibrate** menu is displayed:



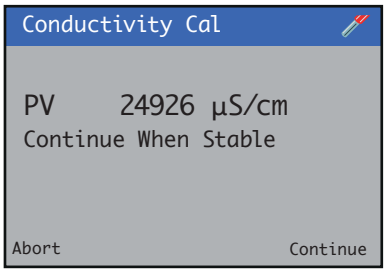
2 Use the ▲/▼ keys to select **S1 : 4-electrode** and press the key.

The **S1 : TC** menu is displayed:



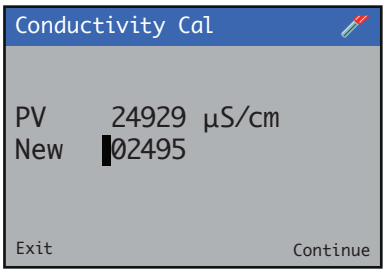
3 Use the ▲/▼ keys to select **Conductivity Cal** and press the key.

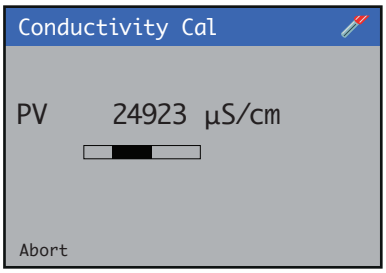
The **Conductivity Cal** menu is displayed:



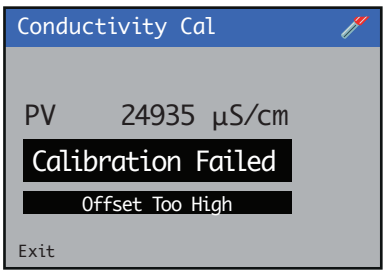
4 Confirm the displayed reading is stable and the key.

5 Press the key to enter a new value (the transmitter takes several seconds to validate the calibration):



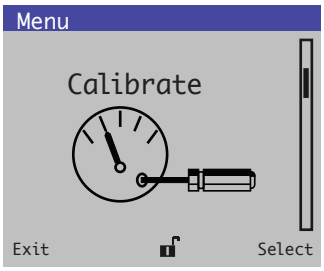


Invalid new calibration values generate an error message and the calibration value is not accepted.



If the new value is valid, the **Slope** and **Offset** values are displayed.

pH/Redox/ORP



This section describes how to calibrate the sensor and involves measuring the sensor's sensitivity to pH and temperature by exposing the sensor to samples of known pH/Temperature values

Notes.

- Access to the **Calibrate** menu is via **Calibrate** and **Advanced** levels only.
- During calibration, current outputs and alarms are set to hold automatically if **Hold Outputs** is enabled – see below.

Menu	Comment	Default
Sensor Cal	See **pH/Redox/ORP calibration**, page 52 There are four possible calibration modes: • 1-point manual calibration (adjusts the calibration check value) • 2-point manual calibration (adjusts the check and slope values) • 1-Point automatic calibration (adjusts the calibration check value) • 2-Point automatic calibration (adjusts the check and slope values) **Note.** Automatic calibrations are not available for Redox/ORP measurements	
Temperature Cal	See **Temperature calibration procedure**, page 69**.**	
Edit Cal		
pH Slope	**Note:** pH sensors only. Edit the slope value: • Valid slope values range from 40 to 150 %	100%
pH Offset	**Note:** pH sensors only. Edit the offset value: • Valid offset values are: 0.00 to 14.00pH	7.00pH
mV Slope	**Note:** Redox/ORP sensors only. Edit the slope value: • Valid slope values range from 40 to 150 %	100%
mV Offset	**Note:** Redox/ORP sensors only. Edit the offset value: • Valid offset values are: ±1000mV	0mV
Temp. Slope	Edit the temperature slope value: • Valid slope values range from 40 to 160 %	100%
Temp. Offset	Edit the temperature offset value: • Valid offset values are ±40 °C	0°C
Sample Collection	**Note:** pH sensors only. See **In process calibrations**, page 79.	
Collection Complete	**Note:** pH sensors only See **In process calibrations**, page 79.	
Restore Cal Defaults	Resets slope and offset values to default values.	

...15 Calibration procedures

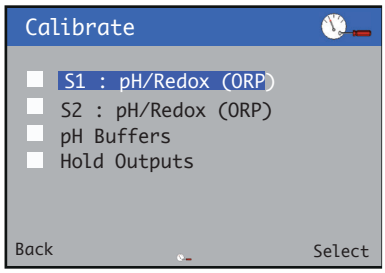
pH/Redox/ORP calibration

Used to calibrate the sensor to measure pH using pH buffers. The automatic calibration provides automatic temperature compensation to the selected buffer.

1-Point calibration

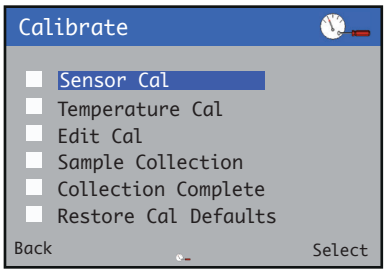
1 At the **Calibrate** level, press the key:

The **Calibrate** menu is displayed:



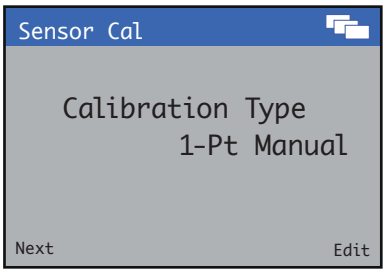
2 Use the ▲/▼ keys to select the sensor to be calibrated, and press the key to confirm selection.

The pH calibration menu is displayed:



3 Use the ▲/▼ keys to select sensor calibration and press the key to confirm selection.

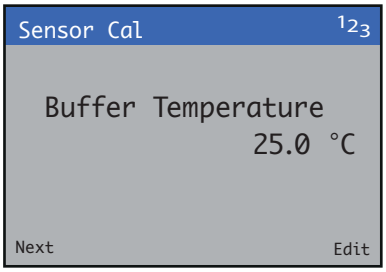
The calibration type is displayed:



4 Use the key to edit the calibration type.
Use the ▲/▼ keys to select the required calibration type and press the key to confirm selection.

Press the key to proceed to the next step.

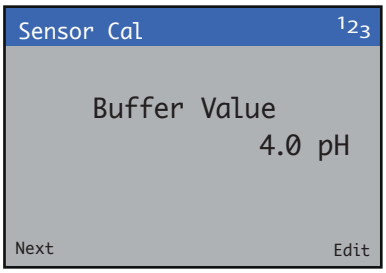
The buffer temperature is displayed:



5 Use the key to edit the buffer temperature.
Use the ▲/▼ keys to set the temperature and press the key to confirm changes.

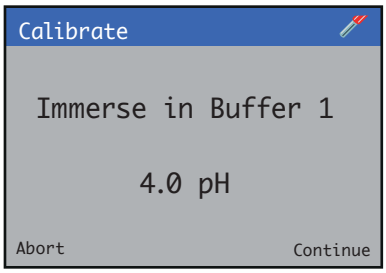
Press the key to proceed to the next step.

The buffer value is displayed:

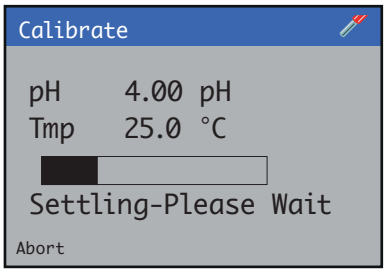


6 Use the key to edit the buffer value. Use the /keys to set the value and press the key to confirm changes.

Press the key to proceed to the next step.



7 Place the sensor into buffer 1 and press the key to perform the calibration. The calibration process screen is displayed.



On completion the result screen is displayed.

- If the calibration passes, the slope and offset values are displayed.
- If the calibration fails, the failure reason is displayed.

Note. The calibration can be canceled at any time during the process by pressing the **Abort** key.

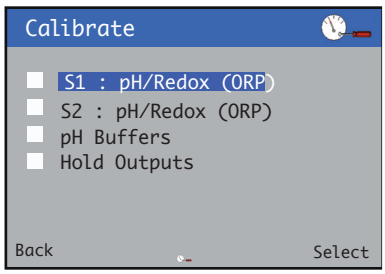
...15 Calibration procedures

...pH/Redox/ORP calibration

2-Point calibration

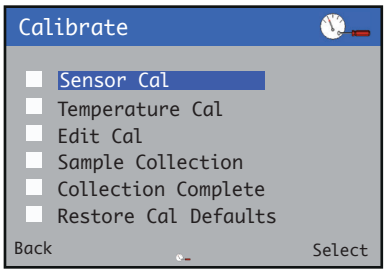
1 At the **Calibrate** level, press the key:

The **Calibrate** menu is displayed:



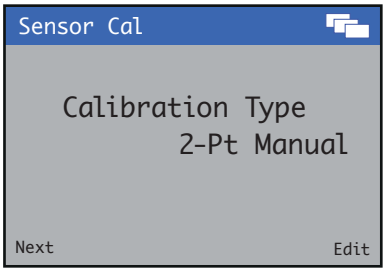
2 Use the ▲/▼ keys to select the sensor to be calibrated, and press the key to confirm selection.

The pH calibration menu is displayed:



3 Use the ▲/▼ keys to select sensor calibration and press the key to confirm selection.

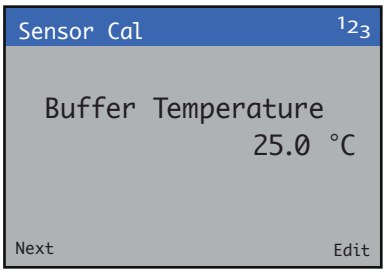
The calibration type is displayed:



4 Use the key to edit the calibration type.
Use the ▲/▼ keys to select the required calibration type and press the key to confirm selection.

Press the key to proceed to the next step.

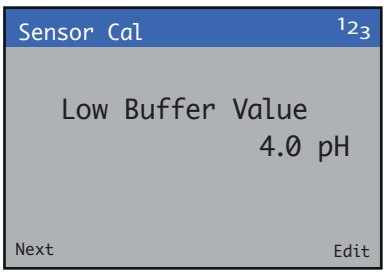
The buffer temperature is displayed:



5 Use the key to edit the buffer temperature.
Use the ▲/▼ keys to set the temperature and press the key to confirm changes.

Press the key to proceed to the next step.

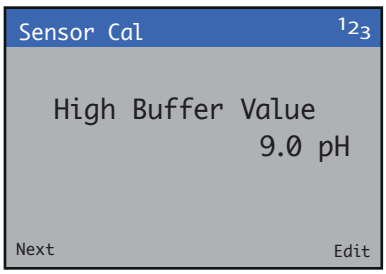
The first buffer value is displayed:



6 Use the key to edit the low buffer value. Use the ▲/▼ keys to set the value and press the key to confirm changes.

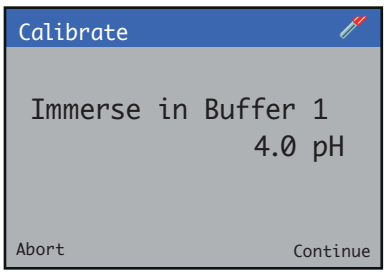
Press the key to proceed to the next step.

The second buffer value is displayed:

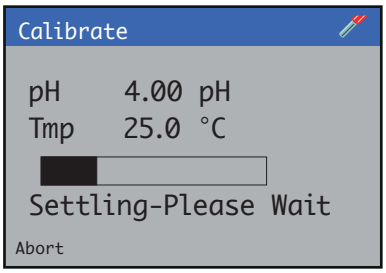


7 Use the key to edit the high buffer value. Use the ▲/▼ keys to set the value and press the key to confirm changes.

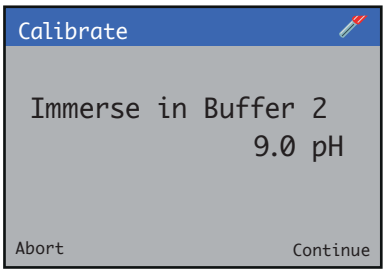
Press the key to proceed to the low buffer calibration:



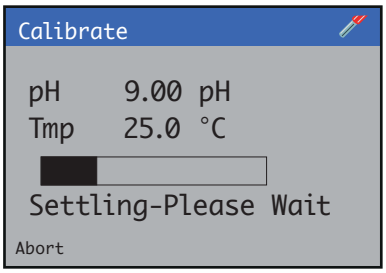
8 Place the sensor into buffer 1 and press the key to perform the low buffer calibration. The calibration process screen is displayed:



- If the calibration fails the result screen is displayed with the reason for failure.
- If the calibration passes the procedure moves automatically to the high buffer calibration.



9 Place the sensor into buffer 2 and press the key to perform the high buffer calibration. The calibration process screen is displayed:



On completion the result screen is displayed.

- If the calibration passes the slope and offset values are displayed.
- If the calibration fails, the failure reason is displayed.

Note. The calibration can be canceled at any time during the process by pressing the **Abort** key.

...15 Calibration procedures

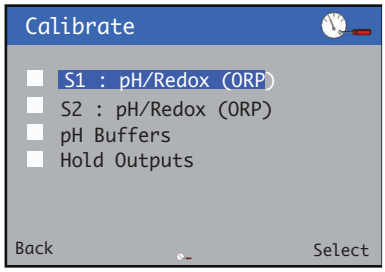
... pH/Redox/ORP calibration

1-Point automatic calibration

Note. Before starting the calibration ensure the pH buffers are set to the correct values.

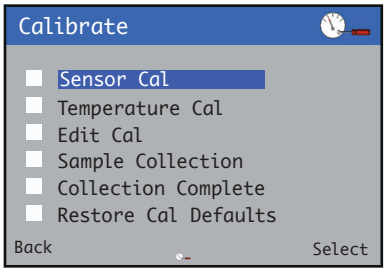
1 At the **Calibrate** level, press the key:

The **Calibrate** menu is displayed:



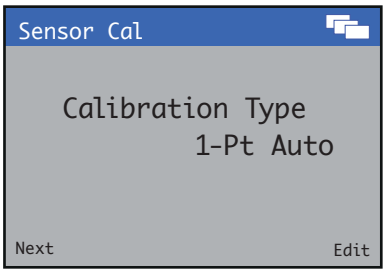
2 Use the / keys to select the sensor to be calibrated, and press the key to confirm selection.

The pH calibration menu is displayed:



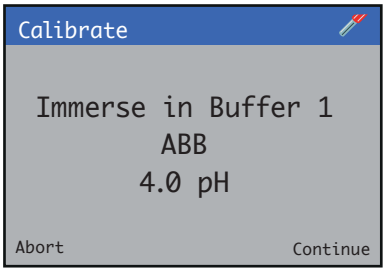
3 Use the / keys to select sensor calibration and press the key to confirm selection.

The calibration type is displayed:

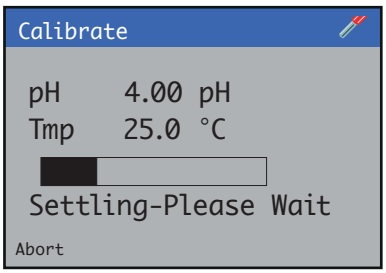


4 Use the key to edit the calibration type.
Use the / keys to select the required calibration type and press the key to confirm selection.

Press the key to proceed to the next step.



5 Place the sensor into buffer 1 and press the key to perform the calibration. The calibration process screen is displayed.



On completion the result screen is displayed.

- If the calibration passes, the slope and offset values are displayed.
- If the calibration fails, the failure reason is displayed.

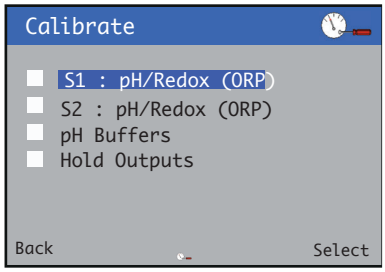
Note. The calibration can be canceled at any time during the process by pressing the **Abort** key.

2-Point automatic calibration

Note. Before starting the calibration ensure the pH buffers are set to the correct values.

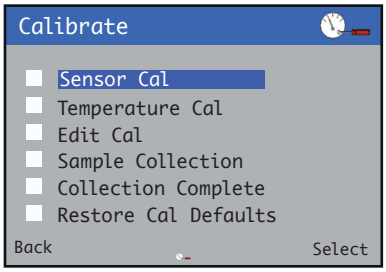
1 At the **Calibrate** level, press the key:

The **Calibrate** menu is displayed:



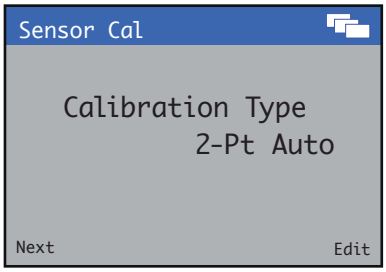
2 Use the ▲/▼ keys to select the sensor to be calibrated, and press the key to confirm selection.

The pH calibration menu is displayed:



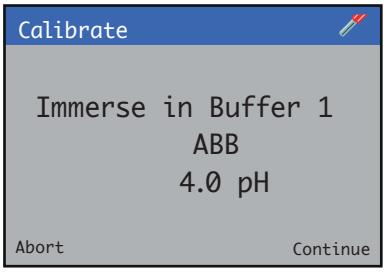
3 Use the ▲/▼ keys to select sensor calibration and press the key to confirm selection.

The calibration type is displayed:

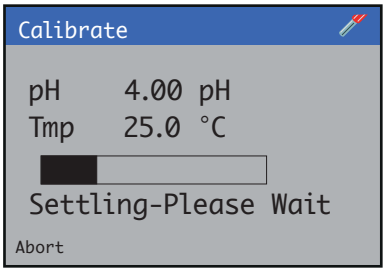


4 Use the key to edit the calibration type.
Use the ▲/▼ keys to select the required calibration type and press the key to confirm selection.

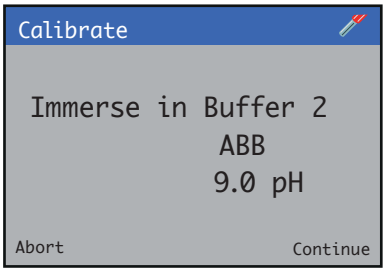
Press the key to proceed to the next step.



5 Place the sensor into buffer 1 and press the key to perform the low buffer calibration. The calibration process screen is displayed:



- If the calibration fails the result screen is displayed with the reason for failure.
- If the calibration passes the procedure moves automatically to the high buffer calibration.

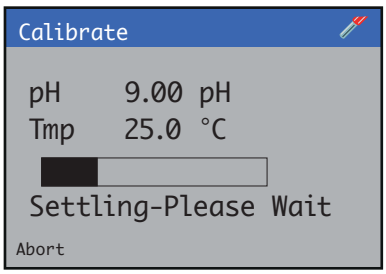


…15 Calibration procedures

… pH/Redox/ORP calibration

…2-Point automatic calibration

6 Place the sensor into buffer 2 and press the key to perform the high buffer calibration. The calibration process screen is displayed:



On completion the result screen is displayed.

- If the calibration passes the slope and offset values are displayed.
- If the calibration fails, the failure reason is displayed.

Note. The calibration can be canceled at any time during the process by pressing the **Abort** key.

In Process calibration (pH)

The **In Process** calibration is used when it is not possible to remove the sensor from the process to perform the calibration. In this calibration mode the actual sample is used to calibrate the sensor.

In Process calibration is performed in two steps:

1 Sample collection
A grab sample is taken from the process and the sensor records the measured value of the sample at that time.

Note. The grab sample should be taken as close to the sensor as possible during the data collection period.

Performing this step erases any sample collections performed previously for the selected sensor. Only the last sample collection is stored in each sensor.

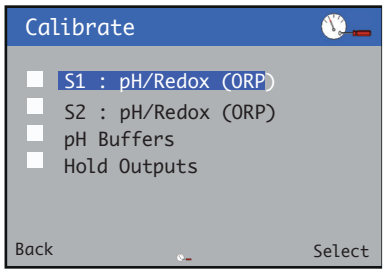
2 Collection complete
The pH of the sample is measured in the laboratory and entered into the transmitter.

This sample must correspond to the last sample collection step performed, or the calibration may not be correct.

Sample collection

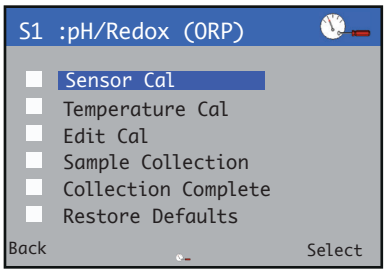
1 At the **Calibrate** level, press the key:

The **Calibrate** menu is displayed:



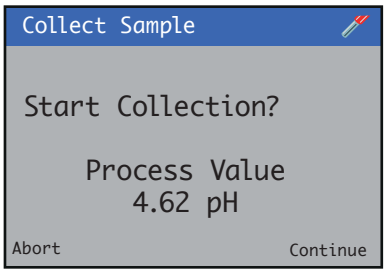
2 Use the ▲/▼ keys to select the sensor to be calibrated, for example, **S1 :pH/Redox (ORP)** and press the key.

The menu options for **S1 :pH/Redox (ORP)** are displayed:



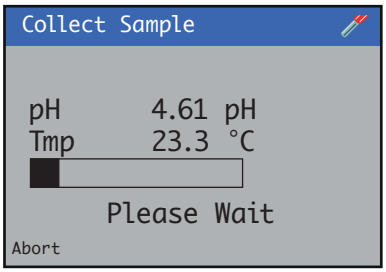
3 Press the ▲/▼ keys to select **Collect Sample** and press the key to confirm selection.

The **Collect Sample** screen is displayed with the prompt **Start Collection?**

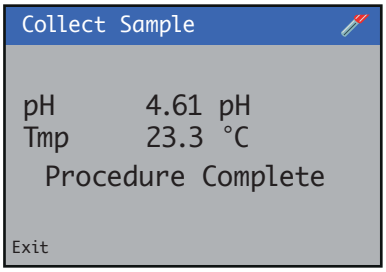


4 Press the key to start the data collection.

The **Collect Sample** progress screen is displayed:



When the procedure is complete, a confirmation screen is displayed:



The value of the acquisition is now stored.

5 Press the key to return to the **Calibrate** level.

6 Continue to the **Sample Complete** section to perform the second step of the procedure.

...15 Calibration procedures

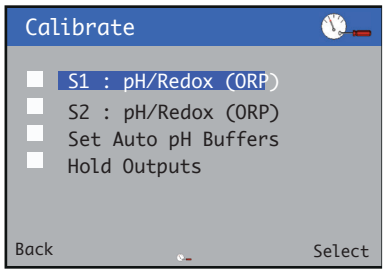
... pH/Redox/ORP calibration

... In Process calibration (pH)

Sample complete

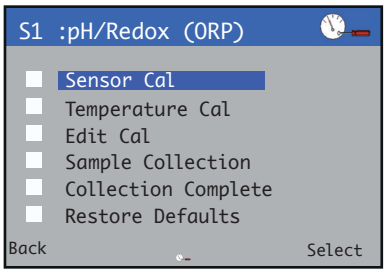
1 At the **Calibrate** level, press the key:

The **Calibrate** menu is displayed:



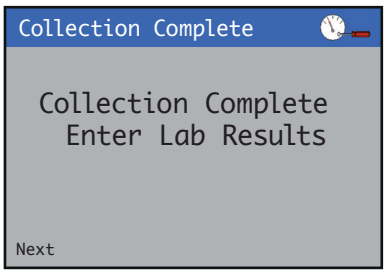
2 Use the / keys to select the sensor to be calibrated, for example, **S1 :pH/Redox (ORP)** and press the key.

The menu options for **S1 :pH/Redox (ORP)** are displayed:



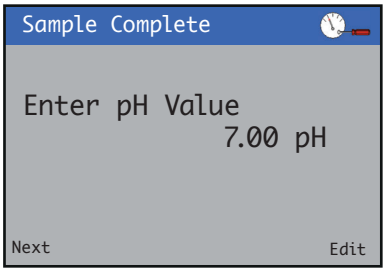
3 Use the / keys to select **Collection Complete** and press the key.

The **Collection Complete** menu is displayed:



4 Press the key.

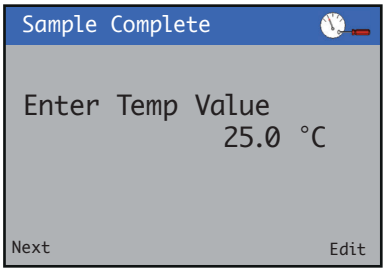
The **Sample Complete** screen is displayed with a prompt to enter a pH value:



5 Press the key and enter the value of the pH sample from the lab.

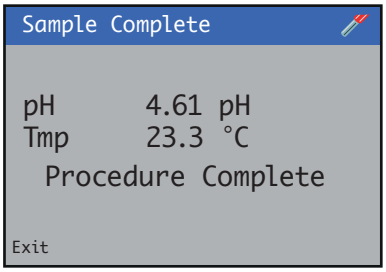
6 Press the key twice.

7 The **Collect Sample** screen is displayed with a prompt to enter a temperature value:



8 Press the key and enter the value of the pH sample from the lab.

When the procedure is complete, a confirmation screen is displayed:



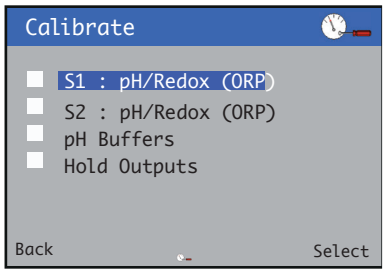
9 Press the key to return to the **Calibrate** level.

In Process calibration is now complete.

Temperature calibration

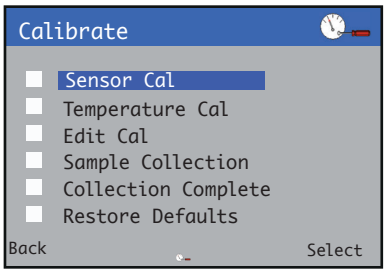
1 At the **Calibrate** level, press the key:

The **Calibrate** menu is displayed:



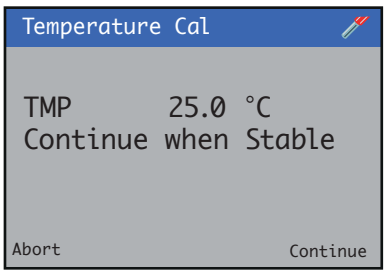
2 Use the ▲/▼ keys to select the sensor to be calibrated, and press the key to confirm selection.

The pH calibration menu is displayed:



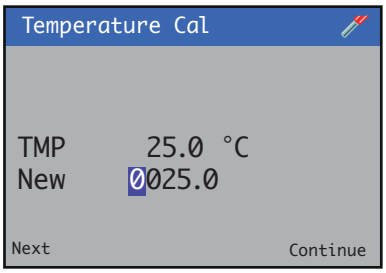
3 Press the ▲/▼ keys to select **Temperature Cal** and press the key to confirm selection.

The temperature calibration screen is displayed:



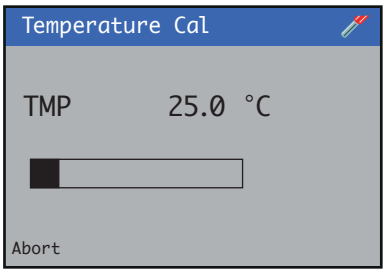
4 Wait for the displayed value to stabilize and press the key to proceed to the next step.

The buffer temperature is displayed:



5 Use the ▲/▼ and keys to set the temperature and press the key to confirm changes.

The temperature calibration process screen is displayed:



On completion the result screen is displayed.

- If the calibration passes the slope and offset values are displayed.
- If the calibration fails the reason for failure is displayed.

Note. The calibration can be canceled at any time during the process by pressing the Abort key ( ).

…15 Calibration procedures

Turbidity Total Suspended Solids (TSS)

This section should be read in conjunction with Operating instruction OI/ATS430-EN.

Menu	Comment	Default
Sensor Verification	See **Turbidity TSS Sensor Verification** – page 71.	
Turbidity Cal	See **Turbidity calibration** – page 72. There are two possible calibration modes: • 1-point • 2-point	
TSS Cal	See **TSS calibration** – page 76. There are two possible calibration modes: • 1-point • 2-point	
TSS Manual Cal	See **TSS manual calibration** – page 78.	
Sample Collection	See **In process calibrations** – page 79.	
Collection Complete	See **In process calibrations** page 79.	
Restore Cal Defaults	Resets slope and offset values to default values.	

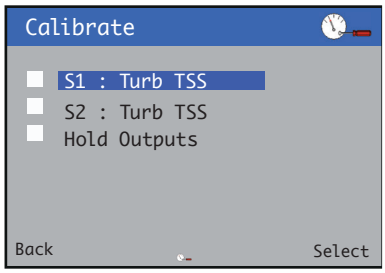
Turbidity TSS sensor verification

Preparing the verification tool and locking the sensor in place

Refer to operating instruction OI/ATS430-EN.

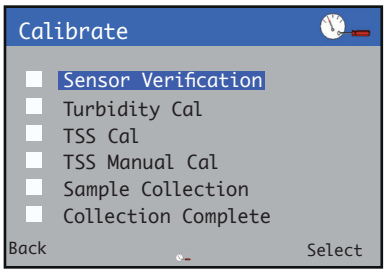
1 At the **Calibrate** level, press the key:

The **Calibrate** menu is displayed:



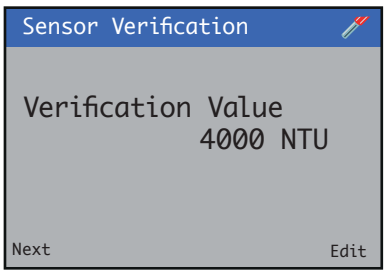
2 Use the ▲/▼ keys to select the sensor to be calibrated, and press the key to confirm selection.

The TSS calibration menu is displayed:



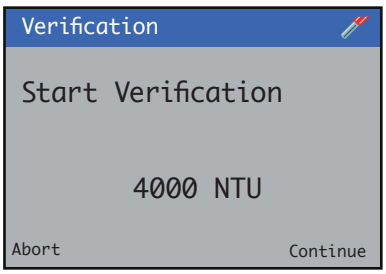
3 Press the ▲/▼ keys to select **Sensor Verification** and press the key to confirm selection.

The Verification Value is displayed:



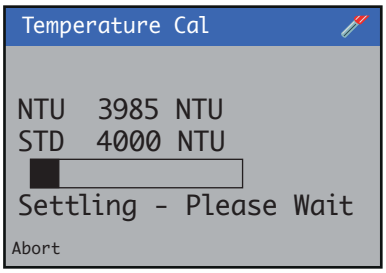
4 Use the key to edit the verification value.
Use the ▲/▼ keys to set the value and press the key to confirm changes.

Press the and key to proceed to the next step.



5 Ensure the sensor is inserted in the verification tool and press the key to start the verification routine.

The verification process screen is displayed:



On completion the result is displayed.

Procedure Pass

or

Procedure Failed

Note. The verification process can be canceled at any time during the process by pressing the **Abort** key ().

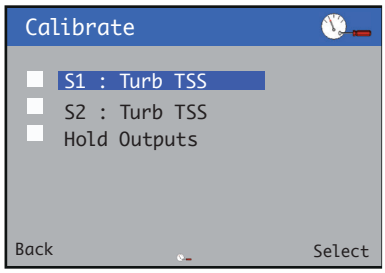
...15 Calibration procedures

Turbidity TSS calibration

1-Point calibration

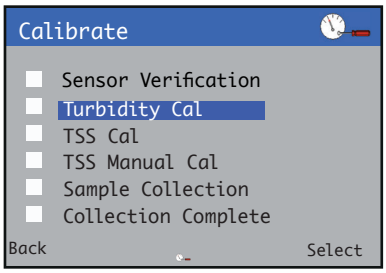
1 At the **Calibrate** level, press the key:

The **Calibrate** menu is displayed:



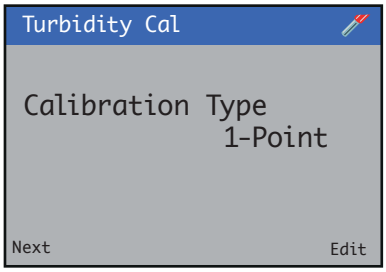
2 Use the /keys to select the sensor to be calibrated, and press the key to confirm selection.

The **Turbidity Cal** menu is displayed:



3 Press the /keys to select **Turbidity Cal** and press the key to confirm selection.

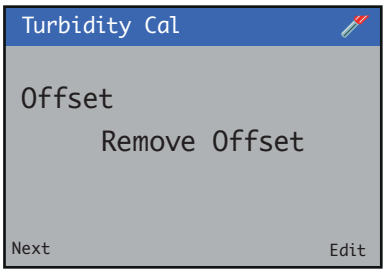
The **Calibration Type** is displayed:



4 Use the key to edit the **Calibration Type** .
Use the /keys to select the required **Calibration Type** and press the key to confirm selection.

Press the and key to proceed to the next step.

The **Offset** setting is displayed:

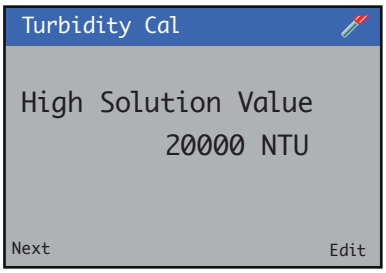


5 For most cases a zero offset is suitable. However, in situations where an offset was previously determined during a 2-point calibration, it is possible to retain the previously measured offset during the 1-point calibration.

Use the key to edit the **Offset** setting.
Use the /keys to select either **Remove Offset** or **Retain Offset** and press the key to confirm changes.

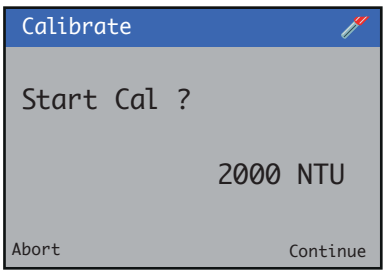
Press the and key to proceed to the next step.

The **High Solution Value** is displayed:



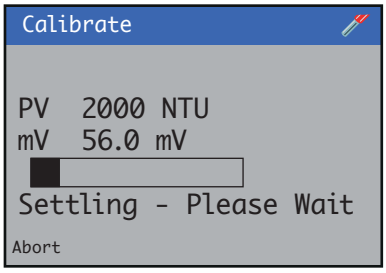
6 Use the key to edit the solution value .
Use the /keys to set the value and press the key to confirm changes.

Press the and key to proceed to the next step.



7 Ensure the sensor is inserted in the solution and press the key to start the verification routine.

The calibration process screen is displayed:



On completion the result screen is displayed.

- If the calibration passes the new settings are displayed.
- If the calibration fails the reason for failure is displayed.

Note. The calibration can be canceled at any time during the process by pressing the **Abort** key ( ).

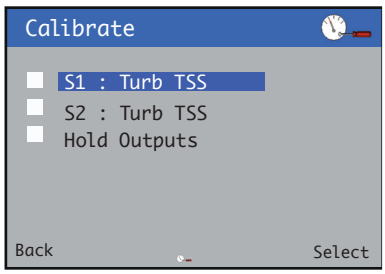
...15 Calibration procedures

...Turbidity TSS calibration

2-Point calibration

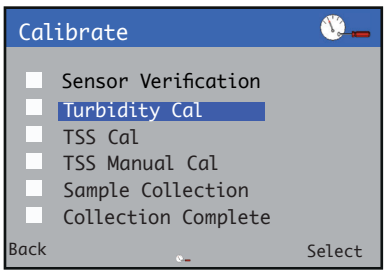
1 At the **Calibrate** level, press the key:

The **Calibrate** menu is displayed:



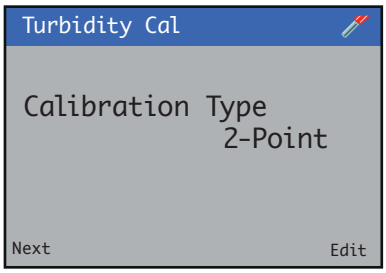
2 Use the ▲/▼ keys to select the sensor to be calibrated, and press the key to confirm selection.

The **Turbidity Cal** menu is displayed:



3 Press the ▲/▼ keys to select **Turbidity Cal** and press the key to confirm selection.

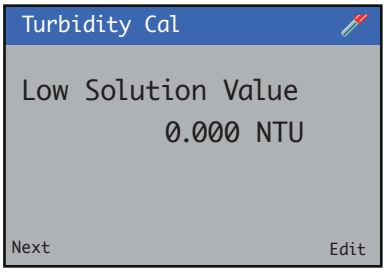
The **Calibration Type** is displayed:



4 Use the key to edit the **Calibration Type** .
Use the ▲/▼ keys to select the required **Calibration Type** and press the key to confirm selection.

Press the and key to proceed to the next step.

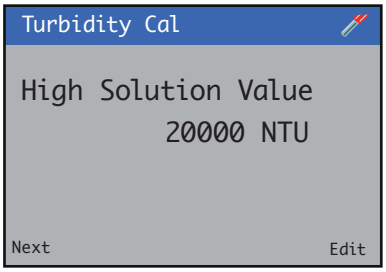
The **Low Solution Value** is displayed:



5 Use the key to edit the **solution value**.
Use the ▲/▼ keys to set the value and press the key to confirm changes.

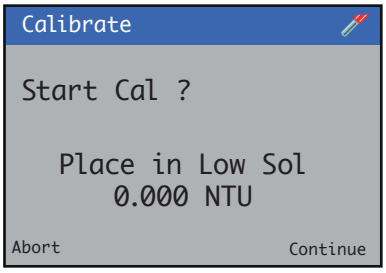
Press the and key to proceed to the next step.

The **High Solution Value** is displayed:



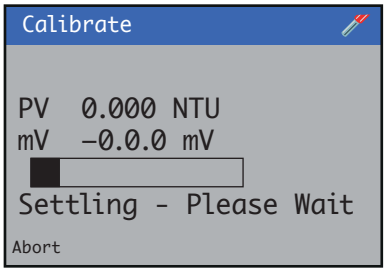
6 Use the key to edit the solution value .
Use the ▲/▼ keys to set the value and press the key to confirm changes.

Press the and key to proceed to the next step.

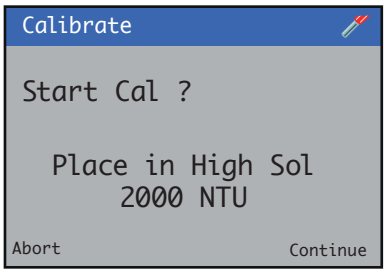


7 Ensure the sensor is inserted in the solution and press the key to start the verification routine.

The calibration process screen is displayed:

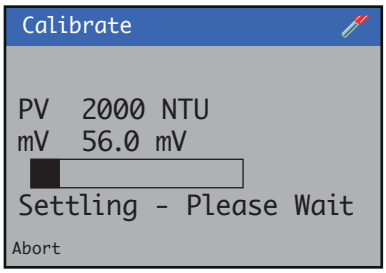


- If the calibration fails the result screen is displayed with the reason for failure.
- If the calibration passes the procedure moves automatically to the high buffer calibration.



8 Ensure the sensor is inserted in the solution and press the key to start the verification routine.

The calibration process screen is displayed:



On completion the result screen is displayed.

- If the calibration passes the new settings are displayed.
- If the calibration fails the reason for failure is displayed.

Note. The calibration can be canceled at any time during the process by pressing the **Abort** key ( ).

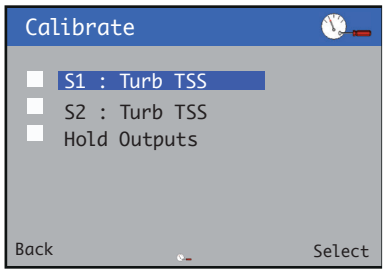
...15 Calibration procedures

TSS calibration

1-Point calibration

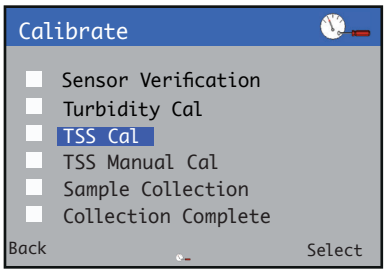
1 At the **Calibrate** level, press the key:

The **Calibrate** menu is displayed:



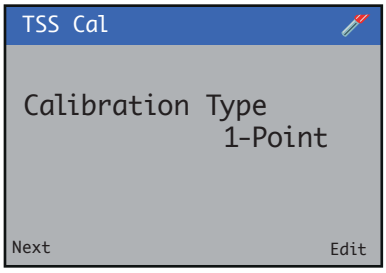
2 Use the ▲/▼ keys to select the sensor to be calibrated, and press the key to confirm selection.

The **TSS Cal** menu is displayed:



3 Press the ▲/▼ keys to select **TSS Cal** and press the key to confirm selection.

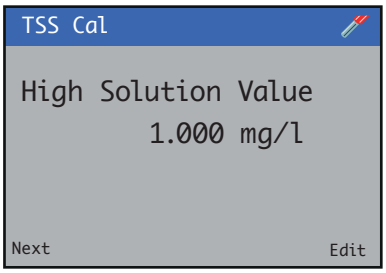
The **Calibration Type** is displayed:



4 Use the key to edit the **Calibration Type** .
Use the ▲/▼ keys to select the required **Calibration Type** and press the key to confirm selection.

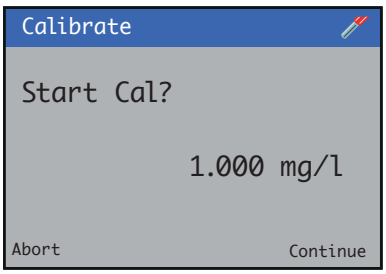
Press the and key to proceed to the next step.

The **High Solution Value** is displayed:



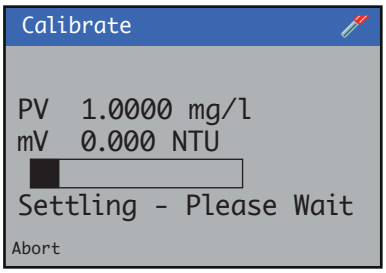
5 Use the key to edit the **High Solution Value**.
Use the ▲/▼ keys to set the value and press the key to confirm changes.

Press the and key to proceed to the next step.



6 Ensure the sensor is inserted in the solution and press the key to start the verification routine.

The calibration process screen is displayed:



On completion the result screen is displayed.

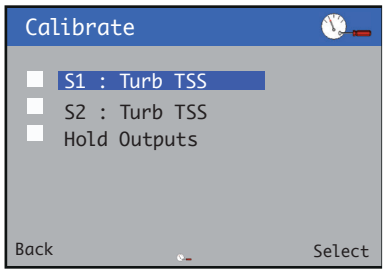
- If the calibration passes the new settings are displayed.
- If the calibration fails the reason for failure is displayed.

Note. The calibration can be canceled at any time during the process by pressing the **Abort** key ( ).

2-Point calibration

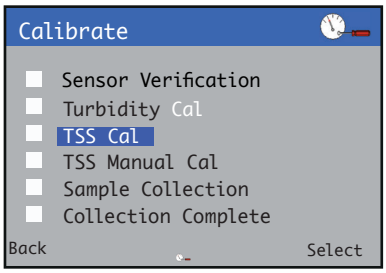
1 At the **Calibrate** level, press the key:

The **Calibrate** menu is displayed:



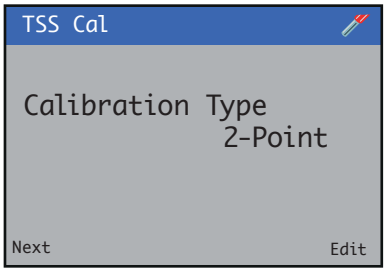
2 Use the ▲/▼ keys to select the sensor to be calibrated, and press the key to confirm selection.

The **Turbidity Cal** menu is displayed:



3 Press the ▲/▼ keys to select **Turbidity Cal** and press the key to confirm selection.

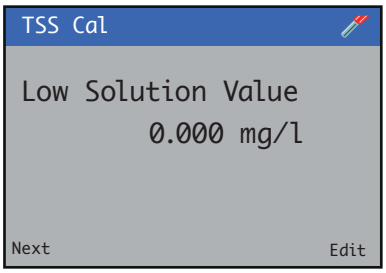
The **Calibration Type** is displayed:



4 Use the key to edit the **Calibration Type** .
Use the ▲/▼ keys to select the required **Calibration Type** and press the key to confirm selection.

Press the and key to proceed to the next step.

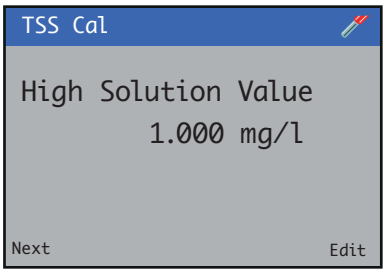
The **Low Solution Value** is displayed:



5 Use the key to edit the **solution value**.
Use the ▲/▼ keys to set the value and press the key to confirm changes.

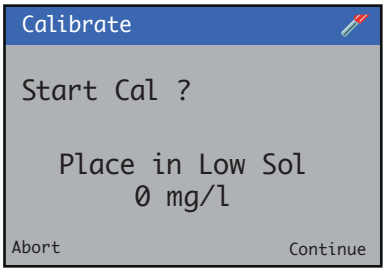
Press the and key to proceed to the next step.

The **High Solution Value** is displayed:



6 Use the key to edit the solution value .
Use the ▲/▼ keys to set the value and press the key to confirm changes.

Press the and key to proceed to the next step.



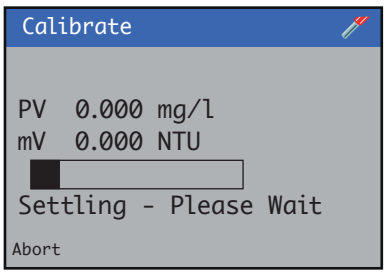
...15 Calibration procedures

...TSS calibration

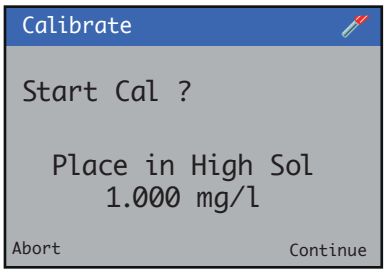
...2-Point calibration

7 Ensure the sensor is inserted in the solution and press the key to start the verification routine.

The calibration process screen is displayed:

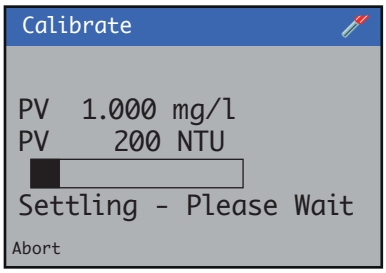


- If the calibration fails the result screen is displayed with the reason for failure.
- If the calibration passes the procedure moves automatically to the high buffer calibration.



8 Ensure the sensor is inserted in the solution and press the key to start the verification routine.

The calibration process screen is displayed:



On completion the result screen is displayed.

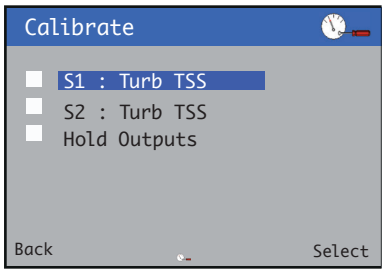
- If the calibration passes the new settings are displayed.
- If the calibration fails the reason for failure is displayed.

Note. The calibration can be canceled at any time during the process by pressing the **Abort** key ( ).

TSS manual calibration

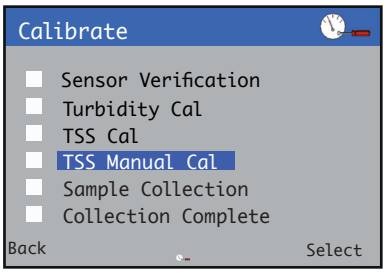
1 At the **Calibrate** level, press the key:

The **Calibrate** menu is displayed:



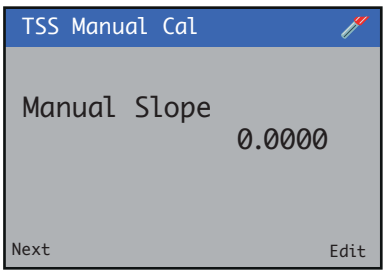
2 Use the / keys to select the sensor to be calibrated, and press the key to confirm selection.

The **TSS Manual Cal** menu is displayed:



3 Press the / keys to select **TSS Manual Cal** and press the key to confirm selection.

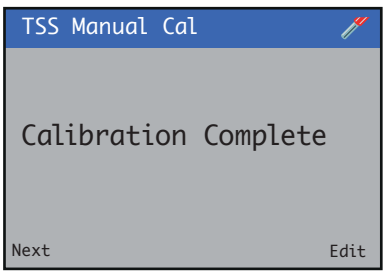
The calibration slope is displayed:



4 Use the key to edit the slope.
Use the / keys to select the required **Calibration Type** and press the key to confirm selection.

Press the and key to proceed to the next step.

The **Calibration Complete** screen is displayed:



In Process calibration

In process calibration is used when it is not possible to remove the sensor from the process to perform the calibration. In this calibration mode the actual sample is used to calibrate the sensor.

The in process calibration takes place in two steps:

- **Sample collection**
  - A grab sample is taken from the process and the sensor records the measured value of the sample at that time.

    Note. The grab sample should be taken as close to the sensor as possible during the data collection period.

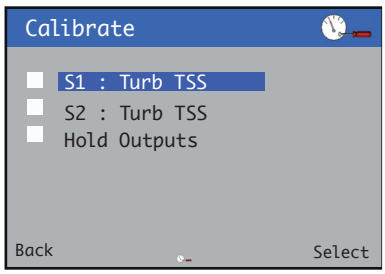
- **Collection complete**
  - The Total suspended solids of the sample is measured in the laboratory and entered into the transmitter.

    This sample must correspond to the last sample collection step performed.

Sample collection

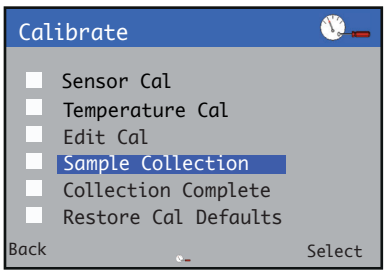
1 At the **Calibrate** level, press the key:

The **Calibrate** menu is displayed:

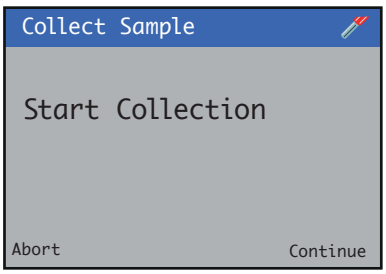


2 Use the / keys to select the sensor to be calibrated, and press the key to confirm selection.

The **Sample Collection** menu is displayed:

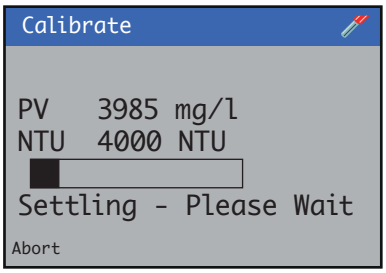


3 Use the / keys to select **Sample Collection** and press the key to proceed to the next step.

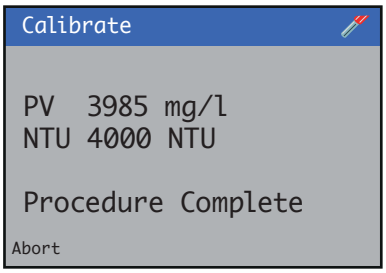


4 Press the and key to proceed to the next step.

The collection process screen is displayed:



On completion the collection complete screen is displayed:



The value of the sample turbidity is now stored.

Note. The calibration can be canceled at any time during the process by pressing the **Abort** key ().

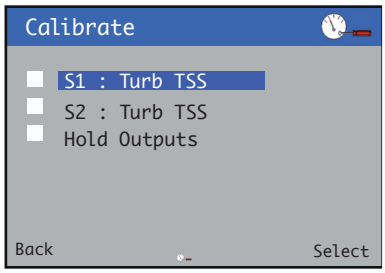
...15 Calibration procedures

...In Process calibration

Collection complete

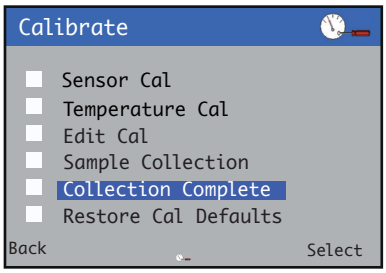
1 At the **Calibrate** level, press the key:

The **Calibrate** menu is displayed:

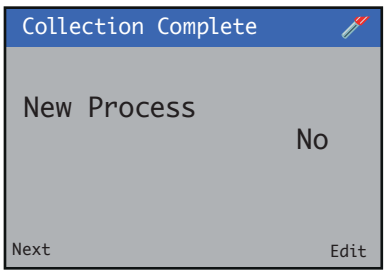


2 Use the ▲/▼ keys to select the sensor to be calibrated, and press the key to confirm selection.

The **Collection Complete** menu is displayed:



3 Use the ▲/▼ keys to select **Collection Complete** and press the key to proceed confirm selection.



4 Use the key to edit the **New Process** setting.

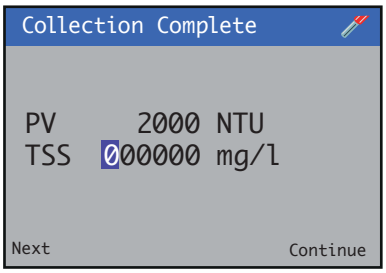
Use the ▲/▼ keys to select **Yes/No** and press the key to confirm selection.

If the sensor is installed in a new process or if the calibration needs to be reset then select **Yes**.

To retain the details of the previous calibrations then select **No** (adaptive calibration to fine tune the existing calibration).

5 Press the key to proceed to the next step.

The **Collection Complete** screen is displayed:



6 The Collection Complete screen shows:

PV: Turbidity recorded when the sample was taken.

TSS: Use the ▲/▼ and keys to enter the suspended solids value measured in the laboratory and press the key to confirm changes.

A new calibration coefficient is calculated.

The calibration is now complete.

RDO

This section should be read in conjunction with Operating instruction OI/ADS430-EN.

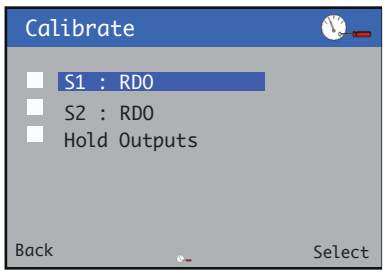
Menu	Comment	Default
Sensor Calibration	See **Dissolved oxygen calibration.** There are two possible calibration modes: • 1-point (water-saturated air) • 2-point (100 % and 0 % saturation)	

Dissolved oxygen calibration

1-Point calibration

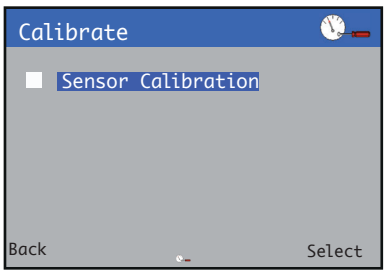
1 At the **Calibrate** level, press the key:

The **Calibrate** menu is displayed:



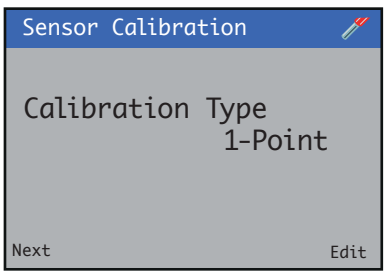
2 Use the /keys to select the sensor to be calibrated, and press the key to confirm selection.

The RDO calibration menu is displayed:



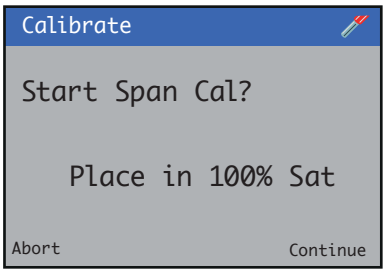
3 Press the key to confirm selection.

The **Calibration Type** is displayed:



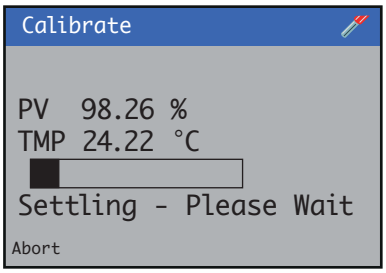
4 Use the key to edit the **Calibration Type** .
Use the /keys to select the required **Calibration Type** and press the key to confirm selection.

Press the and key to proceed to the next step.



5 Ensure the sensor is subjected to 100% saturation and press the key to start the calibration process.

The calibration process screen is displayed:



On completion the result screen is displayed.

- If the calibration passes the new settings are displayed.
- If the calibration fails the reason for failure is displayed.

Note. The calibration can be canceled at any time during the process by pressing the **Abort** key ().

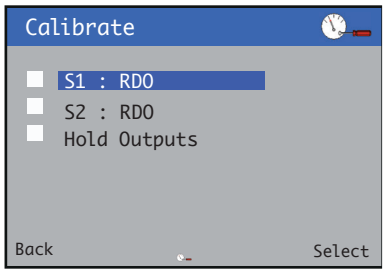
...15 Calibration procedures

...Dissolved oxygen calibration

2-Point calibration

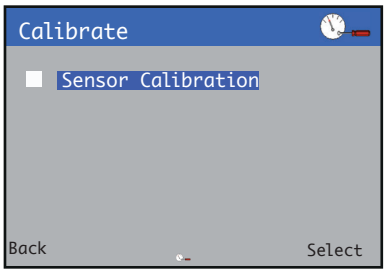
1 At the **Calibrate** level, press the key:

The **Calibrate** menu is displayed:



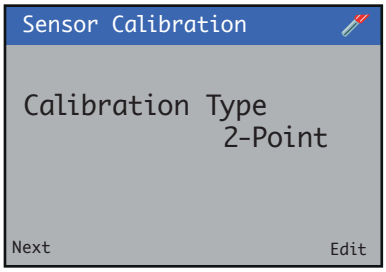
2 Use the / keys to select the sensor to be calibrated, and press the key to confirm selection.

The RDO calibration menu is displayed:



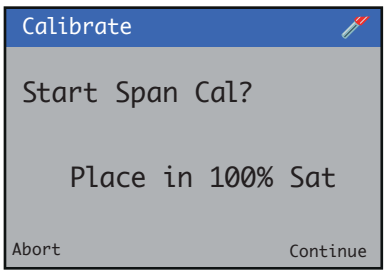
3 Press the key to confirm selection.

The **Calibration Type** is displayed:



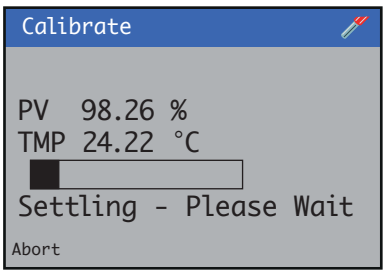
4 Use the key to edit the **Calibration Type** .
Use the / keys to select the required **Calibration Type** and press the key to confirm selection.

Press the and key to proceed to the next step.

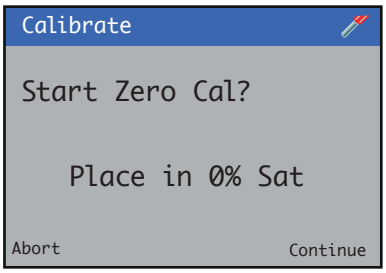


5 Ensure the sensor is subjected to 100 % saturation and press the key to start the calibration process.

The calibration process screen is displayed:

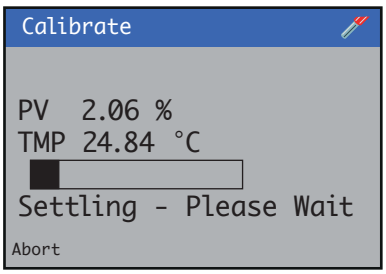


- If the calibration fails the result screen is displayed with the reason for failure.
- If the calibration passes the procedure moves automatically to the high buffer calibration.



6 Ensure the sensor is subjected to 0 % saturation and press the key to start the calibration process.

The calibration process screen is displayed:



On completion the result screen is displayed.

- If the calibration passes the new settings are displayed.
- If the calibration fails the reason for failure is displayed.

Note. The calibration can be canceled at any time during the process by pressing the **Abort** key ( ).

16 Troubleshooting

Diagnostic messages

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.

			
Failure	**Check function**	**Out of specification**	**Maintenance required**
Process value invalid due to malfunction in sensor or transmitter	Process value temporarily invalid due to specified action	Process value unreliable due to sensor operating outside specified range/limits	Process value valid – intervention required to correct operational conditions

Table 7 NAMUR 107 diagnostic icons

AWT420 transmitter diagnostics

NAMUR icon	Diagnostic message	Cause	Recovery action
	S(n): Comms Error	Communications between transmitter and sensor have been lost. The likely cause is a poor/broken connection between the sensor/sensor module and the transmitter or a terminal fault in the sensor.	1. Inspect the transmitter and sensors ensuring that EZLink/Sensor module is fitted correctly in the transmitter. 2. For EZLink sensors, ensure the sensor is connected and the wiring is intact between the transmitter and the sensor housing. 3. Perform a power cycle on the transmitter. 4. If **Comms Error** persists, contact local service organization.
	AO(n): Out of Range	The source assigned to the analog output is outside its programmed engineering range. The output is fixed at its electrical limits of 0 mA (under range) or 22 mA (overrange) until the source is within range.	Check the configuration of the analog output, ensuring that the **Source**, **Eng. High** and **Eng. Low** values are set according to the requirements and adjust if necessary.
	Memory Write Error	Transmitter configuration data is corrupt, or the transmitter's non-volatile memory is faulty. The device setup may be affected and changes to configuration may not be maintained after power cycle.	Cycle power to the transmitter. If **Memory Write Error** persists: 1. Check all configuration parameters and correct any errors. 2. Backup configuration to SD card 3. Reset to defaults via the bootloader. 4. Reload configuration from SD card 5. If **Memory Write Error** persists, contact local service organization
	S(n): PV Out of Range	The primary variable from the sensor is outside the range specified in Sensor Setup.	1. Check the process and adjust if necessary. 2. If the measured value is within the intended range of the process, adjust the **Range High** and **Range Low** in the **Sensor Setup** menu – see page 38.
	Simulation Active	Transmitter is in simulation mode: signal values are generated internally and do not reflect process conditions.	Contact local service organization.
	Inf. pH Invalid	The calculated (inferred) pH value is outside the accurate range for the specified solution. For Calculation Type = NH_3/NH_3 and NaCl the accurate range is 7.00 to 10.00 pH. For Calculation Type = NaOH/NaOH and NaCl the accurate range is 7.00 to 11.00 pH.	Check the process and the measured conductivity before, and after, the cation chamber. Adjust the process if necessary. Ensure that the cell constants and temperature compensation are set correctly for each sensor.
	Before Cat. High	Conductivity measured before the cation exchange chamber is above the user set limit. Inferred pH reading may be inaccurate.	Check the process and make any necessary adjustments. Ensure that the before cation sensor has been correctly setup and if necessary adjust the limit.
	After Cat. High	Conductivity measured after the cation exchange chamber is above the user set limit. Inferred pH reading may be inaccurate.	Check the process and make any necessary adjustments. Ensure that the after cation sensor has been correctly setup and if necessary adjust the limit.

…16 Troubleshooting

…Diagnostic messages

…AWT420 transmitter diagnostics

NAMUR icon	Diagnostic message	Cause	Recovery action
	Clean (n) in progress	Cleaning cycle 1 (2) is in progress.	Diagnostic clears once cleaning cycle is complete.
	S(n): Write Error	Error writing configuration to sensor/sensor module.	1. Repeat previous configuration change. 2. If **Sensor Write Error** persists, cycle power to the transmitter. 3. Check the Sensor Setup and correct if necessary. 4. If **Sensor Write Error** persists, ensure that the sensor and the transmitter are compatible by upgrading the software on both via the bootloader. 5. Check the **Sensor Setup** and correct if necessary– see page 38. 6. If **Sensor Write Error** persists, contact local service organization.
	Alarm Active	One or more of the process alarms (1 to 8) is active.	Check the process and make any adjustments required. If the alarm condition has passed but the diagnostic remains active, acknowledge the alarm via the **Operator** menu.
	SD Nearly Full	SD card at 90% capacity or higher.	Replace the SD card or free up space on current SD card by backing up/ uploading the files.
	SD Card Full	SD card is at capacity.	Replace the SD card or free up space on current SD card by backing up/ uploading the files.

2-electrode conductivity diagnostics

NAMUR icon	Diagnostic message	Cause	Recovery action
	S(n): ADC Failure	Failure of the analog to digital converter in the sensor/sensor module	Cycle power to the transmitter. If **Sensor ADC Failure** persists, contact local service organization.
	S(n): Memory Failure	Sensor configuration data is corrupt, or the sensor's non-volatile memory is faulty. The sensor configuration may be affected and changes may not be maintained after power cycle.	Cycle power to the transmitter. If **Sensor Memory Failure** persists, check all configuration parameters for all sensors and correct any errors. Save the configuration to SD card or via Bluetooth App. Reset the sensor to defaults from the **Sensor Setup** menu and reload the saved configuration. If **Sensor Memory Failure** persists, contact local service organization.
	S(n): PT Failure	The measurement taken from the temperature sensor is invalid indicating that the temperature sensor has failed, or the associated connections are either open-circuit or short-circuit.	Visually inspect the sensor/temperature sensor for signs of damage. A damaged sensor must be replaced. Check wiring to sensor module terminals 5 to 8. If **Process Temperature Failure** persists, contact local service organization.
	S(n): PV Failure	A primary variable reading cannot be obtained from the conductivity sensor.	Check the wiring of the sensor to the sensor module (terminals 1 to 4). Visually inspect the sensor for signs of damage. Cycle power to the transmitter. If **PV Failure** persists, contact local service organization.
	S(n): Calibrating	Sensor calibration is in progress.	Diagnostic clears once calibration is complete.
	S(n): Recovery	Recovery diagnostic is active during the period between completion of a sensor calibration and the sensor being ready to make accurate measurements.	Diagnostic clears once recovery is complete.
	S(n): Cal Failed	The most recent sensor calibration has failed, calibration coefficients have not been updated and the previous values continue to be applied.	Visually inspect sensor for signs of damage or dirt and clean if necessary. Check that sensor is fully submerged in the solution. Repeat calibration, if **Calibration Failed** persists, consider replacing the sensor.
	S(n): PV Out of Limits	Process value (PV) measured is outside the specified limits of the sensor. Refer to the sensor data sheet to determine the operating range.	Check the process and the position of the sensor. If **PV Out of Limits** is consistently active it may be necessary to replace the sensor with an alternative with a wider, or more appropriate operating range. Contact local service organization for potential solutions
	S(n):Process Temp Out of Range	Solution temperature is outside the measurement range of the sensor. Refer to the sensor data sheet to determine the temperature range.	Ensure that the solution temperature is within the sensor measurement limits. Check the process and reduce the effect of any potential heat sources. If **Process Temperature Out of Range** is consistently active it may be necessary to replace the sensor with an alternative with a wider, or more appropriate temperature range. Contact local service organization for potential solutions.
	S(n):Internal Temp Out of Range	The sensor module measurement circuitry is operating at a temperature outside its recommended range. This may cause the measurements to be inaccurate.	Ensure that the ambient temperature of the transmitter containing the sensor module is within its operating range. –10 to 75 °C [14 to 167 °F] If **Internal Temperature Out of Range** persists, contact local service organization.
	S(n): Polarization	Sensor readings indicate that a polarization charge has built up in the 2-electrode conductivity sensor. When a charge builds up in the sensor, the effective area of the electrode is decreased, causing the measurement to be inaccurate.	Check process. Visually inspect the sensor and clean if necessary. Check sensor wiring. If **Sensor Polarization** is a persistent problem, a 4-electrode conductivity sensor may be more suitable for the process, contact local service organization.

…16 Troubleshooting

…Diagnostic messages

4-electrode conductivity diagnostics

NAMUR icon	Diagnostic message	Cause	Recovery action
	S(n): ADC Failure	Failure of the analog to digital converter in the sensor/sensor module.	Cycle power to the transmitter. If **Sensor ADC Failure** persists, contact local service organization.
	S(n): Memory Failure	Sensor configuration data is corrupt, or the sensor's non-volatile memory is faulty. The sensor configuration may be affected and changes may not be maintained after power cycle.	Cycle power to the transmitter. If **Sensor Memory Failure** persists, check all configuration parameters for all sensors and correct any errors. Save the configuration to SD card or via Bluetooth App. Reset the sensor to defaults from the **Sensor Setup** menu and reload the saved configuration. If **Sensor Memory Failure** persists, contact local service organization.
	S(n): PT Failure	The measurement taken from the temperature sensor is invalid indicating that the temperature sensor has failed, or the associated connections are either open-circuit or short-circuit.	Visually inspect the sensor/temperature sensor for signs of damage. A damaged sensor must be replaced. Check wiring to sensor module terminals 5 to 8. If **Process Temperature Failure** persists, contact local service organization.
	S(n): PV Failure	A primary variable reading cannot be obtained from the conductivity sensor.	Check the wiring of the sensor to the sensor module (terminals 1 to 4). Visually inspect the sensor for signs of damage. Cycle power to the transmitter. If **PV Failure** persists, contact local service organization.
	S(n): Calibrating	Sensor calibration is in progress.	Diagnostic clears once calibration is complete.
	S(n): Recovery	Recovery diagnostic is active during the period between completion of a sensor calibration and the sensor being ready to make accurate measurements.	Diagnostic clears once recovery is complete.
	S(n): Cal Failed	The most recent sensor calibration has failed, calibration coefficients have not been updated and the previous values continue to be applied.	Visually inspect sensor for signs of damage or dirt and clean if necessary. Check that sensor is fully submerged in the solution. Repeat calibration, if **Calibration Failed** persists, consider replacing the sensor.
	S(n): PV Out of Limits	Process value (PV) measured is outside the specified limits of the sensor. Refer to the sensor data sheet to determine the operating range.	Check the process and the position of the sensor. If **PV Out of Limits** is consistently active it may be necessary to replace the sensor with an alternative with a wider, or more appropriate operating range. Contact local service organization for potential solutions
	S(n):Process Temp Out of Range	Solution temperature is outside the measurement range of the sensor. Refer to the sensor data sheet to determine the temperature range.	Ensure that the solution temperature is within the sensor measurement limits. Check the process and reduce the effect of any potential heat sources. If **Process Temperature Out of Range** is consistently active it may be necessary to replace the sensor with an alternative with a wider, or more appropriate temperature range. Contact local service organization for potential solutions.
	S(n):Internal Temp Out of Range	The sensor module measurement circuitry is operating at a temperature outside its recommended range. This may cause the measurements to be inaccurate.	Ensure that the ambient temperature of the transmitter containing the sensor module is within its operating range. –10 to 75 °C [14 to 167 °F] If **Internal Temperature Out of Range** persists, contact local service organization.
	S(n): Polarization	Sensor readings indicate that the 4-electrode conductivity sensor is dirty, i.e. foreign material has collected in the sensor. This causes measurement inaccuracy and eventual degradation of the sensor.	Remove the sensor from the process and visually inspect, remove any foreign material and clean with a neutral solution. If **Dirty Sensor** diagnostic persists, contact local service organization.

pH diagnostics

NAMUR icon	Diagnostic message	Cause	Recovery action
	S(n): ADC Failure	Failure of the analog to digital converter in the sensor/sensor module.	Cycle power to the transmitter. If **Sensor ADC Failure** persists, contact local service organization.
	S(n): Memory Failure	Sensor configuration data is corrupt, or the sensor's non-volatile memory is faulty. The sensor configuration may be affected, and changes may not be maintained after power cycle.	Cycle power to the transmitter. If **Sensor Memory Failure** persists, check all configuration parameters for all sensors and correct any errors. Save the configuration to SD card or via Bluetooth App. Reset the sensor to defaults from the **Sensor Setup** menu and reload the saved configuration. If **Sensor Memory Failure** persists, contact local service organization.
	S(n): Broken Glass	Impedance measurement across glass tip of sensor has changed significantly, suggesting a broken glass electrode.	Check the sensor electrode visually for signs of damage. If the sensor appears intact, power cycle the instrument and allow 5 minutes for the signal to settle. If the **Broken Glass** persists then contact local service organization.
	S(n): Reference Failure	The measurement taken from the reference electrode is invalid indicating that the reference electrode in the sensor has failed. The **Reference Failure** diagnostic indicates that the sensor has reached the end of its serviceable life and must be replaced.	Check the sensor electrode visually for signs of damage. If the sensor appears intact, power cycle the instrument and allow 5 minutes for the signal to settle. If the **Reference Failure** persists then the sensor must be replaced, contact local service organization.
	S(n): PT Failure	The measurement taken from the temperature sensor is invalid indicating that the temperature sensor has failed, or the associated connections are either open-circuit or short-circuit.	Visually inspect the sensor/temperature sensor for signs of damage. A damaged sensor must be replaced. EZLink digital sensors: Cycle power to the transmitter. Analog sensors: Check wiring to sensor module terminals 5 to 8. If **Process Temperature Failure** persists, contact local service organization
	S(n): Calibrating	Sensor calibration is in progress.	Diagnostic clears once calibration is complete
	S(n): Cal Failed	The most recent sensor calibration has failed, calibration coefficients have not been updated and the previous values continue to be applied.	Visually inspect sensor tip for signs of damage or dirt and clean if necessary. Check that sensor tip is fully submerged in the solution. Ensure that the correct buffer solutions have been selected in the transmitter. Ensure that the buffer solutions have been correctly made up. Repeat calibration, if **Calibration Failed** persists, this may indicate that the sensor has reached the end of its serviceable life and must be replaced.
	S(n): PV Out of Limits	Process value (PV) measured is outside the specified limits of the sensor. Refer to the sensor data sheet to determine the operating range.	Check the process and the position of the sensor. If **PV Out of Limits** is consistently active it may be necessary to replace the sensor with an alternative with a wider, or more appropriate operating range. Contact local service organization for potential solutions

…16 Troubleshooting

…Diagnostic messages

… pH diagnostics

NAMUR icon	Diagnostic message	Cause	Recovery action
	S(n): Process Temp Out of Range	Solution temperature is outside the measurement range of the sensor. Refer to the sensor data sheet to determine the temperature range.	Ensure that the solution temperature is within the sensor measurement limits. Check the process and reduce the effect of any potential heat sources. If **Process Temperature Out of Range** is consistently active it may be necessary to replace the sensor with an alternative with a wider, or more appropriate temperature range. Contact local service organization for potential solutions.
	S(n): Reference Warning	The measurements taken from the reference electrodes indicate that the reference electrodes are becoming contaminated (Reference Poisoning). This is an early indication that the reference measurement is likely to fail, at which point the sensor has reached the end of its serviceable life and requires replacement.	Visually inspect sensor tip for signs of damage or dirt and clean if necessary. Contact local service organization to order a new sensor.
	S1: Slope Low	The pH sensor is reaching the end of its serviceable life. A pH sensor degrades over time. As this happens the slope calculated by a calibration procedure gradually decreases. A **Low Slope Limit** is configured in **Sensor Setup** – see page 38. If the slope calculated by a calibration procedure is less than **Low Slope Limit,** the calibration fails. If the slope calculated by a calibration procedure is within 20% of the **Low Slope Limit,** the **Low pH Slope** diagnostic is activated indicating that the sensor is reaching the end of its serviceable life and soon requires replacement.	1. Visually inspect sensor tip for signs of damage or dirt and clean if necessary. 2. Check that sensor tip is fully submerged in the solution. 3. Ensure that the buffer solutions have been made up accurately and have been correctly selected in the transmitter. 4. Repeat calibration, if Low pH Slope persists then this indicates that the sensor is reaching the end of its serviceable life.
	S(n): Ambient Temp Out of Range	The electronics in the head of the probe are exposed to temperatures outside the recommended operating range.	Move the sensor to a location where the ambient temperature within the operating range. If **Ambient Temperature Out of Range** is consistently active it may be necessary to replace the sensor with an alternative with a wider, or more appropriate operating range. Contact local service organization for potential solutions.
	S(n): Ref. Blocked	The measurement taken from the reference electrode indicates that the reference electrode is blocked. This warning may also occur if the probe is not properly immersed in solution.	Visually inspect sensor tip for signs of damage or dirt and clean if necessary. Ensure pH probe is submersed in solution. If **Reference Blocked** persists, contact local service organization.
	S(n): Out of Solution	Sensor readings indicate that the sensor is not properly immersed in process solution.	Visually inspect the sensor for signs of damage and clean the tip if necessary. Check that the sensor is properly immersed in the process solution. If **Out of Solution** persists, contact local service organization.
	S(n): Low Electrolyte	The electrolyte level (in the pH sensor) is low.	If compatible, top up the electrolyte reservoir with liquid electrolyte. Otherwise contact local service organization.

RDO diagnostics

NAMUR icon	Diagnostic message	Cause	Recovery action
	S(n): PT Failure	The measurement taken from the temperature sensor is invalid indicating that the temperature sensor has failed, or the associated connections are either open-circuit or short-circuit.	Visually inspect the sensor/temperature sensor for signs of damage. A damaged sensor must be replaced. Cycle power to the transmitter. If **Process Temperature Failure** persists, contact local service organization.
	S(n): D.O Conc Meas Error	The RDO sensor cannot provide a valid dissolved oxygen measurement due to a sensor error.	Power cycle sensor. If **Dissolved Oxygen Concentration Measurement Error** persists, contact local service organization.
	S(n): %Sat Meas Error	The RDO sensor cannot provide a valid % saturation measurement due to a sensor error.	Power cycle sensor. If **% Saturation Measurement Error** persists, contact local service organization.
	S(n): Calibrating	Sensor calibration is in progress.	Diagnostic clears once calibration is complete.
	S(n): Internal Comms Error	The RDO sensor cannot provide a valid dissolved oxygen measurement due to an error in the communication between sensor and sensor cap.	Ensure that the sensor cap is installed and properly seated.
	S(n): Cap Removed	The sensor cap has been removed from the RDO probe or is not being recognized. A valid measurement cannot be made without a sensor cap	Ensure sensor cap is fitted correctly.
	S(n): Cal Failed	The most recent sensor calibration has failed, calibration coefficients have not been updated and the previous values continue to be applied.	Ensure that the sensor is clean and fully submerged in the solution. Repeat calibration, if **Calibration Failed** persists then consider replacing the sensor.
	S(n): User Cal Expired	Recalibration of the RDO sensor is required. The sensor deteriorates over time and recalibration is required to maintain accuracy.	Perform a calibration using ADS430205 RDO probe calibration kit.
	S(n): Factory Cal Expired	Recalibration of the RDO sensor is required. The sensor deteriorates over time and recalibration is required to maintain accuracy.	Perform a calibration using ADS430205 RDO probe calibration kit.
	S(n): Sensor Warm-up	The RDO sensor is warming up and cannot provide a valid dissolved oxygen measurement until the internal electronics have stabilized.	Diagnostic clears once the internal electronics have stabilized. If **Sensor Warm Up** persists, contact local service organization.
	S(n): Sensor Warning	PV measured from the RDO probe but does not meet normal quality criteria. The sensor has sustained moderate damage, or the recommended lifespan has been reached.	Visually inspect the sensor for signs of damage. If the probe appears to be in good condition and is within its recommended lifespan, it may help to clean the sensor and the optical lens. If there are signs of damage or **Sensor Warning** persists, contact local service organization.
	S(n): Cap Expired	The sensor cap within the RDO probe has reached or exceeded its expiry date. The cap may continue to operate but its accuracy degrades and cannot be guaranteed to meet specification.	Replace sensor cap using ADS430204 ABB RDO probe sensor cap replacement kit.
	S(n): Replace Cap	The sensor cap within the RDO probe reaches its expiry date within 4 weeks. After its expiry date the cap may continue to operate but its accuracy degrades and cannot be guaranteed to meet specification.	Replace sensor cap using ADS430204 ABB RDO probe sensor cap replacement kit.

…16 Troubleshooting

…Diagnostic messages

TSS diagnostics

NAMUR icon	Diagnostic message	Cause	Recovery action
	S(n): ADC Failure	Failure of the analog to digital converter in the sensor/sensor module.	Cycle power to the transmitter. If **Sensor ADC Failure** persists, contact local service organization.
	S(n): Memory Failure	Sensor configuration data is corrupt, or the sensor's non-volatile memory is faulty. The sensor configuration may be affected and changes may not be maintained after power cycle.	Cycle power to the transmitter. If **Sensor Memory Failure** persists, check all configuration parameters for all sensors and correct any errors. Save the configuration to SD card or via Bluetooth App. Reset the sensor to defaults from the Sensor Setup menu and reload the saved configuration. If **Sensor Memory Failure** persists, contact local service organization.
	S(n): PV Failure	A primary variable reading cannot be obtained from the turbidity sensor because the LED is not illuminating the sample.	Ensure that the sensor is clean: If available, initiate a **Manual Clean** from the **Operator** menu, otherwise remove the sensor from the process and clean manually. Cycle power to the transmitter. If **PV Failure** persists, contact local service organization.
	S(n): Wiper Failed	The wiper has failed to wipe. Sensor becomes soiled. Measurement quality is affected due to inadequate cleaning.	Visually inspect the sensor and clean any obstructions/blockages.
	S(n): Calibrating	Sensor calibration is in progress.	Diagnostic clears once calibration is complete.
	S(n):Recovery	Recovery diagnostic is active during the period between completion of a sensor calibration and the sensor being ready to make accurate measurements.	Diagnostic clears once recovery is complete.
	S(n): Clean Inhibited	Automatic cleaning with the wiper is inhibited by configuration. The quality of the Turbidity/Suspended Solids measurement is affected and the sensor lifespan may be reduced.	Perform a **Manual Clean** from the operator menu. Set the **Wiper Clean Frequency**.
	S(n): Cal Failed	The most recent sensor calibration has failed, calibration coefficients have not been updated and the previous values continue to be applied.	Ensure that the sensor is clean: If available, initiate a **Manual Clean** from the **Operator** menu, or remove the sensor from the process and clean manually. If using formazine standards, ensure that the solutions have been correctly made up. **Note**: Formazine preparations settle in the solution, shake the solution well prior to the calibration. Repeat calibration, if **Calibration Failed** persists, consider replacing the sensor.

NAMUR icon	Diagnostic message	Cause	Recovery action
	S(n): PV Out of Limits	Process value (PV) measured is outside the specified limits of the sensor. Refer to the sensor data sheet to determine the operating range.	Check the process and the position of the sensor. If **PV Out of Limits** is consistently active it may be necessary to replace the sensor with an alternative with a wider, or more appropriate operating range. Contact local service organization for potential solutions.
	S(n): Internal Temp Out of Range	Internal temperature of the turbidity sensor is outside its recommended operating range. This may cause the measurements to be inaccurate.	Reposition the sensor to avoid extreme temperatures. Ensure that the ambient temperature of the sensor is within its operating range. 0 to 60 °C [32 to 140 °F]. If **Internal Temperature Out of Range** persists, contact local service organization.
	S(n): Excess Light	The turbidity sensor determines turbidity using Nephelometric detection, by measuring the amount of light scattered by the sample at 90° from the direction of illumination. Excessive ambient light can interfere with this and result in inaccurate readings.	Shade the sensor, or if possible move the sensor to a location where it is not affected by ambient light.
	S(n): Service Due	The turbidity sensor requires servicing. The sensor performance degrades over time and servicing is required to maintain accuracy.	Contact local service organization.
	S(n): Replace Wiper	The wiper blade on the turbidity sensor is reaching the end of its expected useful life. Measurement quality may be affected due to inadequate cleaning.	Replace wiper and Reset Sensor Lifetime in **Sensor Setup**.
	S(n): Replace Wiper	The wiper blade on the turbidity sensor has reached the end of its expected useful life. Measurement quality may be affected due to inadequate cleaning.	Replace wiper and **Reset Sensor Lifetime** in **Sensor Setup.**
	S(n): Service Overdue	The turbidity sensor requires servicing. The sensor performance degrades over time and servicing is required to maintain accuracy.	Contact local service organization.
	S(n): LED Expired	This LED in the sensor has reached the end of its expected lifespan, and so is likely to fail.	Contact local service organization.

17 Specification

Operation

Display

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

Language

English, German, French, Italian, Spanish

Keypad

6 tactile membrane keys:

- Group select/Left cursor
- View select/Right cursor
- Menu key
- Up
- Down
- Enter key

No. of inputs

Up to 2 analog or digital sensors

Mechanical data

Protection

IP66/NEMA 4X

Dimensions

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

Panel dimensions

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

Materials of construction

- Aluminium enclosure – LM20 aluminium
- Polycarbonate enclosure – LEXAN 505RU 10 % glass-filled polycarbonate

Cable entries

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

Security

Password protection

Access to configuration levels is enabled only after the user has entered a password:

- Calibrate level: user-assigned password
- Advanced level: user-assigned password
- Service level: service level user-assigned password

Electrical

Supply voltage

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

Power consumption

<15W

Terminal connections rating

- Solid/Flexible wire: AWG 24 to 16 (0.2 to 1.5 mm^2)
- Ferrule with plastic sleeve 0.2 to 0.75 mm^2
- Ferrule without plastic sleeve 0.2 to 1.5 mm^2

Cable specification

Cable glands:

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

Analog outputs

Number

- Two supplied as standard
- Four with module board fitted

Output ranges

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

Accuracy

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

Maximum load resistance

500Ω at 20 mA

Configuration

Can be assigned to either measured variable or either sample temperature

Isolation

500 V DC from any other circuitry but not from each other

Relay outputs

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

Digital input/output

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

Connectivity/Communications (optional)

Ethernet
HTTP, HTTPS, FTP, Secure FTP
PROFIBUS DP
DPV0, DPV1
MODBUS
RTU RS485
HART

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

Data logging

Storage

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

Storage media
SD card, up to 32 GB capacity
Chart view
On local display
Historical review
Of data
Data transfer
SD card interface – Windows-compatible FAT file system, data and log files in Excel and DataManager Pro compatible formats

Environmental data

Ambient operating temperature:
–10 to 55 °C (14 to 131 °F)
Ambient operating humidity:
Up to 95 % RH non-condensing
Storage temperature:
–20 to 70 °C (–4 to 158 °F)
Altitude:
2000 m (6562 ft) max. above sea level

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

2-electrode conductivity

Conductivity input

Measurement range and resolution

Cell constant	Conductivity range	Display resolution	Accuracy repeatability
0.01	0 to 200 µS/cm	0.001 µS/cm	±1.0 % of measurement range per decade
0.05	0 to 1000 µS/cm	0.001 µS/cm	
0.1	0 to 2000 µS/cm	0.01 µS/cm	
1	0 to 20000 µS/cm	0.1 µS/cm	

Dynamic response
<3 s for 90 % step change when damping is Off
Damping
Configurable: Off, Low, Medium and High

Temperature input

Temperature element types

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

Measurement range and resolution

Sensor group	Temperature range	Display resolution	Accuracy repeatability
Pt100	–20 to 200 °C (–4 to 392 °F)	0.1 °C (0.1 °F)	0.1 °C (0.18 °F)
Pt1000			
3K Balco			
None	User-programmable –20 to 300 °C (–4 to 572 °F)		N/A

Temperature compensation modes
Linear, UPW, NaCl, HCl and NH_3
Reference temperature
25 °C (77 °F)

Configured output range

Cell constant	Min. span	Max. span
0.01	1 µS/cm	200 µS/cm
0.05	5 µS/cm	1000 µS/cm
0.1	10 µS/cm	2000 µS/cm
1	100 µS/cm	20000 µS/cm

…17 Specification

4-electrode conductivity

Conductivity input

Measurement range and resolution

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

Dynamic response

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

Damping

Configurable: Off, Low, Medium and High

Temperature input

Temperature element types

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

Measurement range and resolution

Sensor group	Temperature range	Display resolution	Accuracy repeatability
Pt100	–20 to 200 °C	0.1 °C (0.1 °F)	0.1 °C (0.18 °F)
Pt1000	(–4 to 392 °F)		
3K Balco			
None	User-programmable –20 to 300 °C (–4 to 572 °F)		N/A

Temperature compensation modes

- 0 to 15 % NaOH
- 0 to 18 % HCl
- 0 to 20 % H_2SO_4
- 0 to 40 % H_3PO_4
- 0 to 20 % NaCl
- 0 to 50 % KOH
- User-defined table

Reference temperature

25 °C (77 °F)

Configured output range

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

pH/ORP (Redox)

pH/ORP (Redox) input

Sensor types

pH: Glass, Antimony (Sb)

ORP (Redox): Platinum (Pt), Gold (Au)

Input impedance

$>1\times10^{13}\,\Omega$

Measurement range and resolution

Type	Range	Display resolution	Accuracy repeatability
pH	0 to 14 pH	0.01 pH	±0.01 pH
ORP	±2000 mV	1 mV	±1800 MV: ±1 mV ±2000 MV: ±3 MV

Dynamic response

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

Damping

Configurable: Off, Low, Medium and High

Temperature input

Temperature element types

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

Measurement range and resolution

Sensor group	Temperature range	Display resolution	Accuracy repeatability
Pt100	–20 to 200 °C	0.1 °C (0.1 °F)	0.1 °C (0.18 °F)
Pt1000	(–4 to 392 °F)		
3K Balco			
None	User-programmable –20 to 300 °C (–4 to 572 °F)		N/A

Temperature compensation modes

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

Reference temperature

25 °C (77 °F)

Configured output range

Type	Min. span	Max. span
pH	1 pH	14 pH
ORP	100 mV	4000 mV

EZLink

Power consumption (maximum)
150 mA @ 24 V DC (3.75 W max)
Fixed length cable
1 or 10 m (3.28 or 32.8 ft)
Digital sensor connector IP rating
IP67 (when connected)
Extension cable (options)
1, 5, 10, 15, 25, 50 m (3.2, 16.4, 32, 49.2, 82, 164 ft)
Maximum length (including optional extension cable)
Up to 210 m (826 ft)

EMC

Emissions & immunity
Meets requirements of IEC61326 for an industrial environment

Approvals, certification and safety

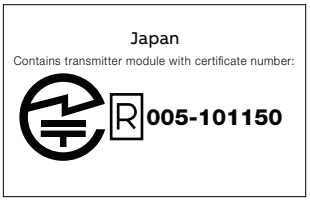
Safety approval
cULus
CE mark
Covers EMC & LV Directives (including latest version IEC 61010)
General safety

- IEC 61010-1
- Pollution degree 2
- Insulation class 1

Bluetooth
The Bluetooth Low Energy Module within the AWT420 transmitter has received the regulatory approval for the following countries:

- Europe/CE

- Japan/MIC: 005-101150



- Korea/KCC: MSIP-CRM-mcp-BM71BLES1FC2

- China/SRRC: CMIIT ID: 2016DJ5890

...17 Specification

...Approvals, certification and safety

...Bluetooth

- United States/FCC ID: A8TBM71S2

U.S.
Contains FCC ID: A8TBM71S2
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference recieved, including interference that may cause undesired operation.

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

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

- Canada/ISED
  - IC: 12246A-BM71S2
  - HVIN: BM71BLES1FC2

Canada
Contains transmitter module
IC: 12246A-BM71S2

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

Operation is subject to the following two conditions:

- This device may not cause interference, and
- This device must accept any interference, including interference that may cause undesired operation of the device.

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

L'exploitation est autorisée aux deux conditions suivantes:

- l'appareil ne doit pas produire de brouillage, et
- l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement

- Taiwan/NCC No: CCAN16LP0011T7

Taiwan
CCAN16LP0011T7

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

Appendix A pH solution coefficient

The solution coefficient compensates the Nernstian value for pH measurements, and the raw voltage value for ORP measurements, by a fixed value per each 10 °C (18 °F).

The temperature compensation factor is derived from the following equations:

$pH_{INDICATION} = pH_{NERNSTIAN} \pm COEF \times ((T - 25\ °C)/(10\ °C\ [18\ °F]))$

$mV_{INDICATION} = mV \pm COEF \times ((T - 25\ °C)/(10\ °C\ [18\ °F]))$

where:

COEF	pH or mV change per 10 °C (18 °F).
$pH_{NERNSTIAN}$	Nernstian pH value referenced at 25 °C (77 °F) after applying the factory and process calibration values.
$pH_{INDICATION}$	pH value indicated on the transmitter and proportional to the current output value.
mV	millivolt value of the sensor output after applying the factory and process calibration values.
$mV_{INDICATION}$	mV value indicated on the transmitter and proportional to the current output value.
T	temperature of the solution in °C after applying the factory and process calibration values.

Examples of solution coefficients for pure water applications are:

pure water = +0.18 pH/(10 °C [18 °F])

pure water with 1 ppm ammonia = +0.31 pH/(10 °C [18 °F])

The solution coefficient for the AWT420 transmitter either adds or subtracts a configured amount of the process variable per 10 °C (18 °F) to the Nernstian compensated process variable. Thus, an application with a process liquid that decreases in its pH value as the temperature increases uses a positive solution coefficient correction factor. Conversely, an application with a process liquid that increases in its pH value as the temperature increases uses a negative solution coefficient correction factor.

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

Appendix B 2-electrode conductivity calculations

Automatic temperature compensation

The conductivities of electrolytic solutions are influenced considerably by temperature variations. Thus, when significant temperature fluctuations occur, it is general practice to correct automatically the measured, prevailing conductivity to the value that would apply if the solution temperature were 25 °C, the internationally accepted standard.

Most commonplace, weak aqueous solutions have temperature coefficients of conductance of the order of 2 % per °C (i.e. the conductivities of the solutions increase progressively by 2 % per °C rise in temperature). At higher concentrations the coefficient tends to become less.

At low conductivity levels, approaching that of ultra-pure water, dissociation of the H_2O molecule takes place and it separates into the ions H+ and OH-. Since conduction occurs only in the presence of ions, there is a theoretical conductivity level for ultra-pure water which can be calculated mathematically. In practice, correlation between the calculated and actual measured conductivity of ultra-pure water is very good.

Figure 34, page 99 shows the relationship between the theoretical conductivity for ultra-pure water and that of high purity water (ultra-pure water with a slight impurity), when plotted against temperature. The figure also illustrates how a small temperature variation considerably changes the conductivity. Subsequently, it is essential that this temperature effect is eliminated at conductivities approaching that of ultra-pure water, in order to ascertain whether a conductivity variation is due to a change in impurity level or in temperature. For conductivity levels above 1 µS cm^{-1}, the generally accepted expression relating conductivity and temperature is:

$$G_t = G_{25}\,[1 + \propto (t - 25)]$$

Where:

G_t	=	conductivity at temperature t °C
G_{25}	=	conductivity at the standard temperature (25 °C)
$\propto$	=	impurity temperature coefficient
$\propto$	=	temperature coefficient per °C

At conductivities between 1 µS cm^{-1} and 1,000 µS cm^{-1}, $\propto$ lies generally between 0.015/°C and 0.025/°C. When making temperature compensated measurements, a conductivity analyzer must carry out the following computation to obtain G_{25}:

$$G_{25} = G_{25} = \frac{G_t}{[1 + \propto (t - 25)]}$$

However, for ultra-pure water conductivity measurement, this form of temperature compensation alone is unacceptable since considerable errors exist at temperatures other than 25 °C.

At high purity water conductivity levels, the conductivity/temperature relationship is made up of two components: the first component, due to the impurities present, generally has a temperature coefficient of approximately 0.02/°C, and the second, which arises from the effect of the H+ and OH- ions, becomes predominant as the ultra-pure water level is approached.

Consequently, to achieve full automatic temperature compensation, the above two components must be compensated for separately according to the following expression:

$$G25 = G_{25} = \frac{G_t - G_{upw}}{[1 + \propto (t - 25)]} + 0.055$$

Where:

G_t	=	conductivity at temperature t °C
G_{upw}	=	ultra-pure water conductivity at temperature t°C
$\propto$	=	impurity temperature coefficient
0.055	=	conductivity in µS cm^{-1} of ultra-pure water at 25 °C

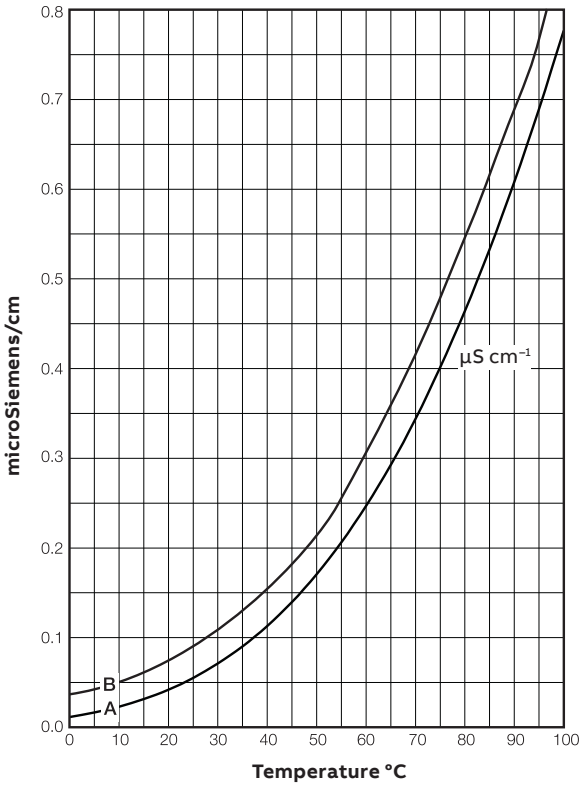
The expression is simplified as follows:

$$G_{25} = G_{25} = \frac{G_{imp}}{[1 + \propto (t - 25)]} + 0.055$$

Where:

G_{imp}	=	impurity conductivity at temperature t °C

The conductivity analyzer utilizes the computational ability of a microprocessor to achieve ultra-pure water temperature compensation using only a single platinum resistance thermometer and mathematically calculating the temperature compensation required to give the correct conductivity at the reference temperature.



Curve A – Theoretical ultra-pure water conductivity
Curve B – High purity water conductivity
(ultra-pure water with slight impurity)

Figure 34 Ultra-pure water temperature compensation

…Appendix B 2-electrode conductivity calculations

…Automatic temperature compensation

Calculation of temperature coefficient

The temperature coefficient of a solution can be obtained experimentally by taking non-temperature compensated conductivity measurements at two temperatures and applying the following expression:

$$\propto = \frac{G_{t2} - G_{t1}}{G_{t1}(t_2 - 25) - G_{t2}(t_1 - 25)}$$

Where:

G_{t2} = conductivity measurement at a temperature of t_2°C

G_{t1} = conductivity measurement at a temperature of t_1°C

One of these measurements could be made at the ambient temperature and the other obtained by heating the sample.

Temperature coefficient (%/°C) = ∝ x 100.

For ultra pure water applications the temperature compensation equation becomes,

$$\frac{G_{imp1} - G_{imp2}}{_{mp2}(t_1 - 25) - G_{imp1}(t_2 - 25)]}$$

Where:

G_{imp1} = $G_{t1} - G_{upw1}$

G_{imp2} = $G_{t2} - G_{upw2}$

Relationship between conductivity and total dissolved solids (TDS) measurement

The TDS factor (i.e. the relationship between conductivity [µS cm^{-1}] and TDS in ppm) is totally dependent on the properties of the solution being measured.

In simple solutions where only one electrolyte is present, the conductivity/TDS ratio can be ascertained easily, e.g., 0.5 in the case of sodium chloride. However, in complex solutions where more than one electrolyte is present, the ratio is not calculated easily and can be reliably determined only by laboratory testing, e.g., precipitation and weighing. The ratio in these cases varies between approximately 0.4 and 0.8, depending on the chemical constituents, (e.g., the ratio for sea water is about 0.6) and is constant only when the chemical ratios remain constant throughout a particular process.

In cases where the TDS factor cannot be determined easily, refer to the supplier of the particular chemical treatment being used.

Appendix C Dual 2-electrode conductivity calculations

Inferred pH derived from differential conductivity

Monitoring on steam-raising plant

For many years, it has been standard practice in power plants to use inferred pH, calculated from before- and after-cation conductivity measurements, to confirm values obtained by direct laboratory or on-line pH measurement.

According to EPRI, IEC and VGB Guidelines, feedwater and boiler water quality can be assessed by measuring the conductivity of samples before and after a cation ion-exchange resin column. Depending on the type of plant and chemical treatment applied, differential conductivity can also give an indication of the pH of the sample.

Both before and after measurements can be made on one dual input conductivity analyzer.

The choice of inferred pH calculation depends on controlled chemical conditions, i.e. whether or not the system is an NH_3, NH_3+NaCl or NaOH dosed system.

NOTICE

- If the analyzer is used with a cation resin column, Sensor A must be installed before the column and Sensor B after the column for the correct calculation of inferred pH.
- Both conductivity inputs must be configured as µS cm^{-1} to calculate inferred pH.

⚠ WARNING

The calculation of inferred pH relies on the strict control of chemical conditions within the NH_3, NH_3+NaCl or NaOH dosed sample. Contamination with chemical substances other than those with which the sample is dosed introduces significant errors in the inferred pH calculated value and, in the worse case, invalidates the calculation completely. Carbon dioxide in particular has a very adverse affect.

Sources of CO_2 contamination include:

- Boiler start-up.
  - CO_2 can be present in the sample for several hours or even days immediately after boiler start-up.

  Note. This also applies to 'two shifting' or 'cycling' boilers, i.e., boilers whose full output is required only during peak demand periods.
- Organic compound contamination.
  - Decomposing organic compounds are a source of CO_2 contamination.
  - Organic compound contamination may be caused by break-through from the water treatment plant or from condenser leaks.
  - Formates are also formed when organic compounds decompose, these further increase errors in inferred pH calculation.
- Carbon compound contamination.
  - The use of carbon compound chemical treatments such as carbohydrazide (used as an oxygen scavenger) can contaminate the sample with CO_2.

Independent pH readings are necessary to confirm that the correct chemical conditions prevail for the accurate calculation of inferred pH.

...Appendix C Dual 2-electrode conductivity calculations

Monitoring on AVT systems

For low conductivity feedwater applications, all volatile chemical treatment (AVT) is often applied.

Where cation resin columns are used to remove the effects on the conductivity measurement of volatile ammonia and hydrazine chemical treatment, it is common practice to measure both before- and after-cation conductivity. The sensitivity of the conductivity measurement to chemical treatments is increased by passing the sample through the cation column.

If it is known that a sample contains only one impurity (e.g., ammonia), the conductivity measurement now becomes an indication of the concentration of that impurity and it is then possible to calculate the pH of the sample from the concentration data. The result is referred to as 'inferred pH'.

The maximum after-cation conductivity value is programmable between 0.060 and 10.00 µS cm^{-1} dependent on local conditions. After-cation values above this level generate an **AFTER CAT. HIGH** error message and before-cation values above 25.00 µS cm^{-1} generate a **BEFORE CAT. HIGH** error message. The inferred pH range is 7 to 10 pH, values above 10pH generate an **Infr. pH** invalid error message.
Refer to page 83 for message descriptions.

The inferred pH feature can be used on AVT systems only in the following circumstances:

1. On steam raising plant.
2. For boiler chemical treatment such as ammonia and/or hydrazine. In this instance, **A: Temp. Comp**. must be set to **NH3** and **B: Temp. Comp.** must be set to **ACID**.
3. Where the after-cation conductivity value is insignificant compared to the before-cation value.

NOTICE

Inferred pH measurement on AVT systems is inappropriate to chemical treatments such as sodium phosphate, sodium hydroxide and morpholine.

Monitoring on AVT systems with impurities

Differential conductivity can also give an indication of sample pH on AVT systems where there are low concentrations of ionic impurities present in addition to the volatile alkaline agent (e.g. sodium chloride + ammonia). In this case, the exchange of ammonium and sodium ions within the cation column releases water and hydrochloric acid. The sodium chloride impurity produces a conductivity after the column that is higher than the conductivity before.

The dual input analyzer, when used to monitor before- and after-cation conductivities, compensates for this increase and calculates the inferred pH of the incoming sample. The user-configurable, after-cation conductivity alarm can be used to detect unacceptably high levels of impurities in the sample and inform the user of the validity of the inferred pH value.

The calculated inferred pH is proportional to:

$$BC - (AC - 0.055)/R$$

Where:

BC	=	the before column reading
AC	=	the after column reading
0.055	=	the conductivity of pure water at 25 °C in µS cm^{-1}
R	=	a ratio factor depending on the BC and AC readings

The maximum after-cation conductivity value is programmable between 0.060 and 25.00 µS cm^{-1} dependent on local conditions. After-cation values above this level generate an **AFTER CAT. HIGH** error message and before-cation values above 25.00 µS cm^{-1} generate a **BEFORE CAT. HIGH** error message. The inferred pH range is 7 to 10 pH, values above 10 pH generate an **Infr. pH invalid** error message. Refer to page 83 for a description of error messages.

The inferred pH feature can be used on AVT systems with impurities only in the following circumstances:

1. On steam raising plant.
2. For boiler chemical treatment such as ammonia and/or hydrazine. In this instance, **A: Temp. Comp**. must be set to NH_3 and **B: Temp. Comp**. must be set to **ACID**.
3. Where the after-cation conductivity value is less than 25.00 µS cm^{-1}.

NOTICE

Inferred pH measurement on AVT systems is inappropriate to chemical treatments such as sodium phosphate, sodium hydroxide and morpholine.

Monitoring on solid alkaline treated systems

Generally, boiler waters treated with solid alkaline chemicals, for example, sodium hydroxide, have relatively high conductivities.

The dual input conductivity analyzer, in conjunction with a cation resin column, can be used to indicate sample pH. If the sample also contains salts (e.g. sodium chloride), the after-cation conductivity reading reflects the acid conductivity released by the salts, the reading is typically 3 times higher than normal owing to the acid. Hence, to derive the concentration and pH of the alkaline agent, ⅓ of the after-cation conductivity increase must be subtracted from the before-column reading. In addition, a factor must be applied for the molar conductivity change of the alkaline agent.

The analyzer software applies the following equation:

$$1 + \frac{\log(BC - \frac{1}{3}AC)}{F}$$

Where:

BC	=	the before column reading
AC	=	the after column reading
F	=	molar conductivity change for the alkaline agent (243 µS cm^{-1} per mmol/l for sodium hydroxide)

The maximum after-cation conductivity value is programmable between 1.00 and 100.0 µS cm^{-1} dependent on local conditions. After-cation values above this level generate an **AFTER CAT. HIGH** error message and before-cation values above 100.0 µS cm^{-1} generate a **BEFORE CAT. HIGH** error message. The inferred pH range is 7 to 11 pH, values above 11 pH generate an **Infr. pH invalid** error message. Refer to page 83 for a description of error messages..

The inferred pH feature can be used on solid alkali treated systems only in the following circumstances:

1. On steam raising plant.
2. For boiler chemical treatment such as sodium hydroxide. In this instance, **A: Temp. Comp**. must be set to **NaOH** and **B: Temp. Comp**. must be set to **ACID**.
3. Where the after-cation conductivity value is less than 100.0 µS cm^{-1}.

NOTICE

Inferred pH measurement on AVT systems is inappropriate to chemical treatments such as sodium phosphate, sodium hydroxide and morpholine.

Appendix D PID control

Enables simple PID control of pH and conductivity sensor channels (control of other signals [turbidity, dissolved oxygen etc.] is not required).

Control functionality is available for both channels of the AWT420 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:

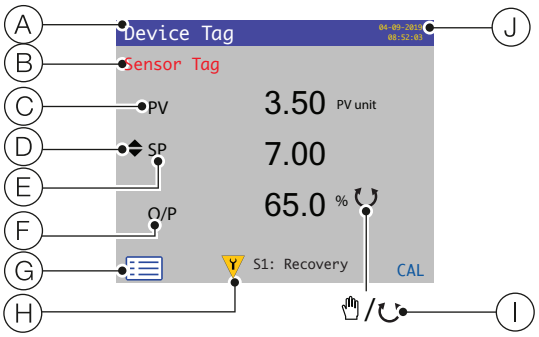
- a reverse-acting controller generates a single control output
- a direct-acting controller generates a single control output
- a dual-acting controller generates 2 control outputs

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.

Operator pages

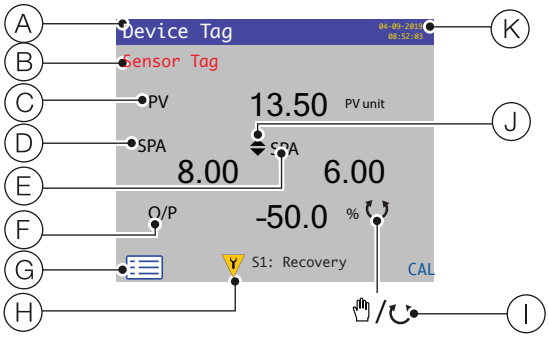
Reverse or direct-acting control



A Instrument tag
B Sensor-specific tag
C Primary value and units
D Adjustable parameter icon (using ▲/▼ keys).
E Setpoint
F Control output percentage
G Status bar icons – see page 35
H Diagnostic icon/diagnostic message – see page 83
I Icon: Auto/Manual control – see page 35
J Time and date

Figure 35 Operator page – reverse or direct-acting control

Dual-acting (Acid and Base) control

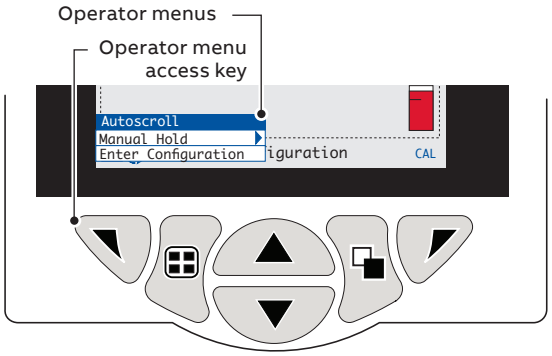


A Instrument tag
B Sensor-specific tag
C Primary Value & units
D SPA: Acid control setpoint.
E SPB: Base control setpoint
F Control output percentage
G Status bar icons – see page 35
H Diagnostic icon/diagnostic message – see page 83
I Icon: Auto/Manual control – see page 35
J Adjustable parameter icon (using ▲/▼ keys).
K Time and date

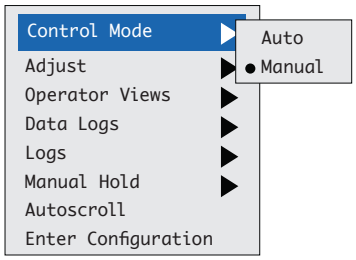
Figure 36 Operator page – dual-acting (Acid and Base) control

Operator menus

The following menu options available from the **Operator page/ Start** menu enable selection of the **Control Mode** and adjustment of **Setpoints** or **Output**:

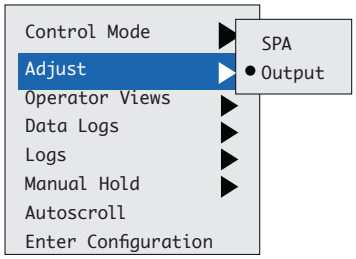


Control Mode



Use the ▲/▼ keys to toggle/select **Auto** or **Manual** mode.

Setpoint/Output adjustment – direct or reverse-acting controller (1 setpoint)

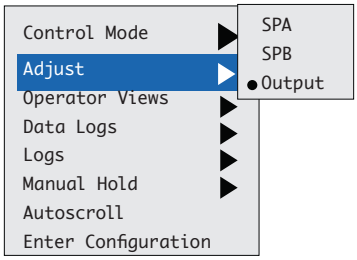


Use the ▲/▼ keys to toggle/select **SPA*** or **Output** mode.

Output mode enabled only if **Control Mode/Manual** is selected.

*SPA = acid setpoint

Setpoint/Output adjustment – dual-acting controller 92 setpoints)



Use the ▲/▼ keys to toggle/select **SPA***, **SPB**** or **Output** mode.

Output mode enabled only if **Control Mode/Manual** is selected.

*SPA = acid setpoint
**SPB = base setpoint

Figure 37 PID control: Control Mode/Setpoint/Output menus

Control action

Reverse-acting control

- Single control output
- P, P+I, P+I+D or P+D
- Output increases as **Process Value** deviates below **Setpoint**
- Output is zero if **Process Value** is greater than **Setpoint***
- Proportional band is positioned below **Setpoint**

*Enabled only if **Control Mode/Manual** is selected – see Figure 37.

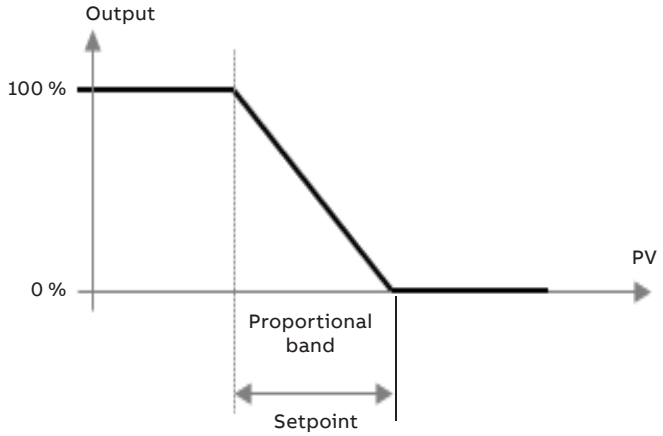


Figure 38 Reverse-acting control

Direct-acting control

- Single control output
- P, P+I, P+I+D or P+D
- Output increases as **Process Value** deviates above **Setpoint**
- Output is zero if **Process Value** is less than **Setpoint***
- Proportional band is positioned above **Setpoint**

*Enabled only if **Control Mode/Manual** is selected – see Figure 37.

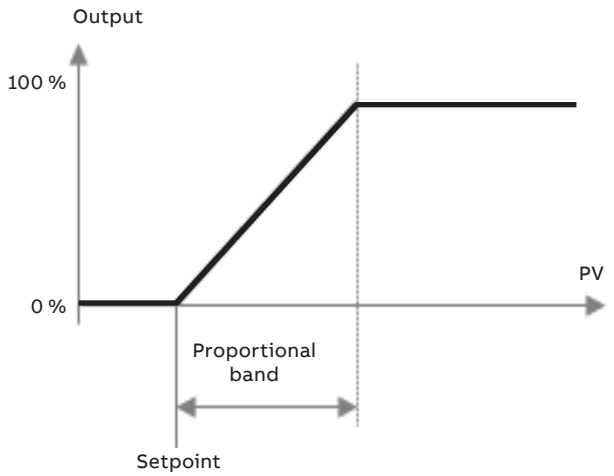


Figure 39 Direct-acting control

…Appendix D PID control

…Control action

Dual-acting control

- Two control outputs (**Base Output** and **Acid Output**)
- P or P+I (Base Controller)
- **Base Output** increases as **Process Value** deviates below **Base Setpoint**
- **Base Output** is zero if **Process Value** is greater than **Base Setpoint**
- **Base** proportional band is positioned below **Base** setpoint
- P or P + I (**Acid Controller**)
- **Acid Output** increases as **Process Value** deviates above **Acid Setpoint**
- **Acid Output** is zero if **Process Value** is less than **Acid Setpoint**
- **Acid** proportional band is positioned above **Acid Setpoint**

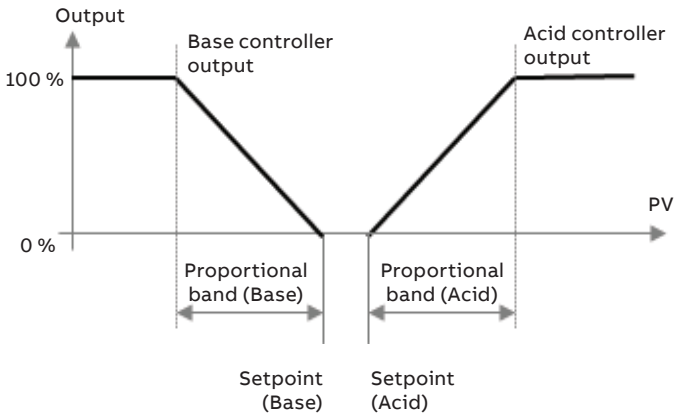


Figure 40 Dual-acting control

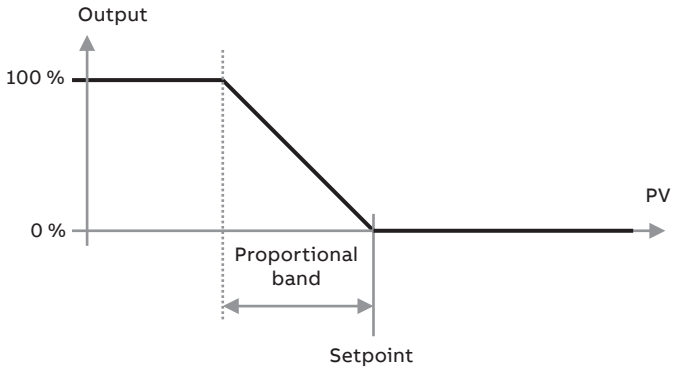
Manual Reset (proportional band offset)

A **Manual Reset** value* is available on **Reverse** or **Direct-acting** controllers when the integral term is disabled (i.e., **Control Type** is configured for **P**, or **P+D**).

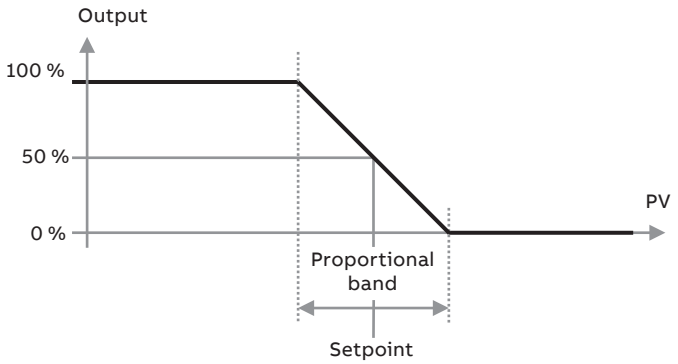
When the process variable is equal to the control setpoint, the output value is equal to the **Manual Reset** value – this effectively changes the position of the proportional band.

* By default the manual reset value is zero.

Manual Reset = 0 %



Manual Reset = 50 %



Manual Reset = 100 %

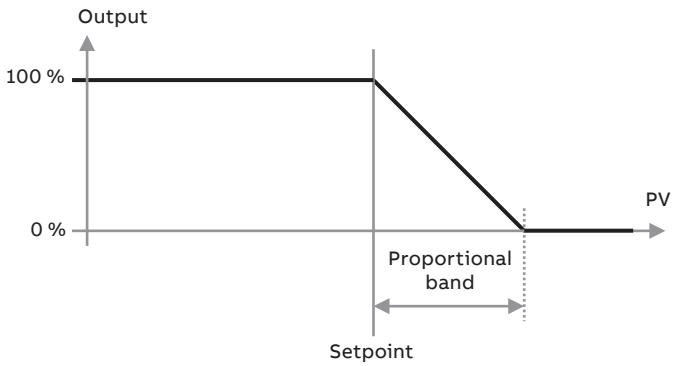


Figure 41 Manual Reset (proportional band offset)

Output type

Analog output

Analog control outputs can be assigned to any of the available analog outputs:

- the control output (0 to 100 %) is scaled linearly between the electrical range low (0.00 to 22.00 mA) and the electrical range high (0.00 to 22.00 mA) to generate a current output level
- electrical range low and electrical range high values can be set in the analog output configuration

Note. **Engineering range**, **Output type** and failure mode configuration parameters normally associated with an analog output are not required when a control output is assigned as the analog output source.

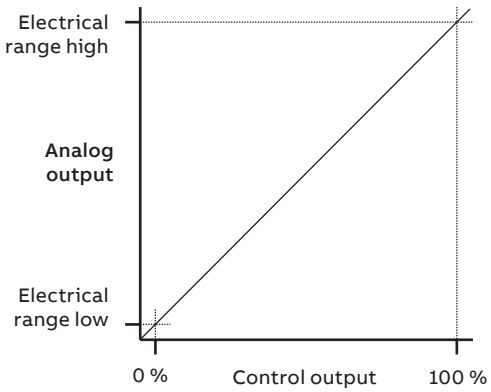


Figure 42 Analog output

Time proportioning output

Time proportioning control outputs can be assigned to any of the available relays or digital outputs:

- the control output (0 to 100 %) is scaled linearly between 0 seconds and the configured cycle time (1.0 to 300.0 s) to generate an ON period
- the relay or digital output is energized for the ON period. The relay or digital output is de-energized for the remainder of the cycle time

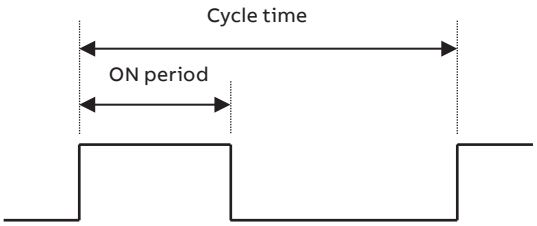


Figure 43 Analog output

Pulse frequency output

Pulse frequency control outputs can be assigned to any of the available relays or digital outputs:

- the control output (0 to 100 %) is scaled linearly between 0 and the configured pulse frequency (1 to 120 pulses per minute) to generate a number of pulses per minute
- the relay or digital output is energized for 300 mS. The 300 mS pulse is repeated at the calculated rate. i.e., the time between pulses is reduced as the output increases
- the calculated rate is recalculated every second

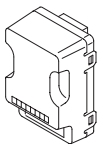
Appendix E Spares

Sensor module assemblies

AWT420 pH/ORP PCB upgrade/spares kit

Part number

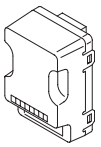
3KXA877420L0014



AWT420 2-electrode conductivity PCB upgrade/spares kit

Part number

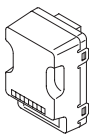
3KXA877420L0013



AWT420 4-electrode conductivity PCB upgrade/spares kit

Part number

3KXA877420L0011

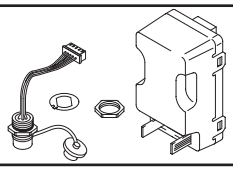


EZLink module assemblies

AWT420 EZLink PCB upgrade/spares kit

Part number

3KXA877420L0015

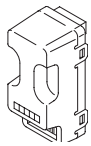


Communications module assemblies

AWT420 HART PCB upgrade/spares kit

Part number

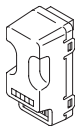
3KXA877420L0051



AWT420 Profibus PCB upgrade/spares kit

Part number

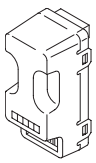
3KXA877420L0052



AWT420 Modbus PCB upgrade/spares kit

Part number

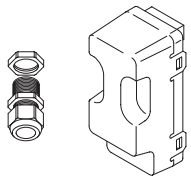
3KXA877420L0054



AWT420 Ethernet PCB upgrade/spares kit

Part number

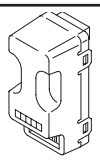
3KXA877420L0065



AWT420 analog output PCB upgrade/spares kit

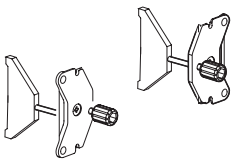
Part number

3KXA877420L0056

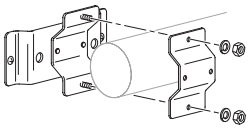


Mounting kits

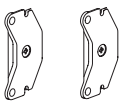
Panel-mount kit

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

Pipe-mount kit

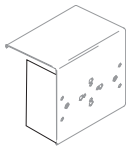
Part number		
3KXA877210L0102	Pipe-mount kit, including pipe-mount adapter plate, brackets and fixings (excludes pipe)	

Wall-mount kit

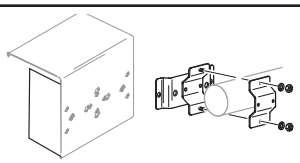
Part number		
3KXA877210L0105	Wall-mount kit	

Weathershield kits

Weathershield kit

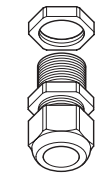
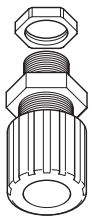
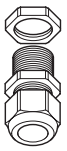
Part number		
3KXA877210L0103		

Weathershield and pipe-mount kit

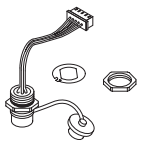
Part number		
3KXA877210L0104		

Gland packs/EZLink connectors

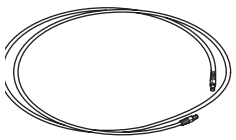
Gland packs

Part number		
3KXA877420L0111	M20 (qty. 5), M16 (qty. 2)	 M20 | ¹/₂ in
3KXA877420L0112	½ in NPT (qty. 5), M16 (qty. 2)	
3KXA877420L0113	M20 (qty. 4), M16 (qty. 2) Ethernet (qty. 1)	 Ethernet
3KXA877420L0114	½ in NPT (qty. 4), M16 (qty. 2) Ethernet (qty. 1)	 M16
3KXA877420L0115	Ethernet gland (qty. 1)	

EZLink connector assembly

Part number	
3KXA877420L0066	

EZLink extension cable assembly

Part number	Description	
AWT4009010	1 m (3.3 ft)	
AWT4009050	5 m (16.4 ft)	
AWT4009100	10 m (32.8 ft)	
AWT4009150	15 m (49.2 ft)	
AWT4009250	25 m (82.0 ft)	
AWT4009500	50 m (164.0 ft)	
AWT4009000	100 m (328.0 ft)	

Acknowledgments

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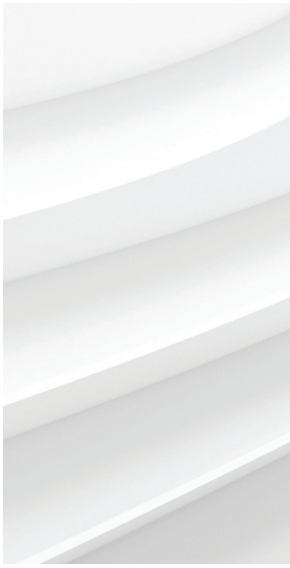

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