

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 use in non-hazardous areas.

For information on the AWT420 transmitter for use in hazardous areas, refer to [INF/ANAINST/012-EN](#).

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 – Hazardous area information	INF/ANAINST/012-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.

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.

Warm water and a mild detergent can be used.

2 Cybersecurity

This product and the EZLink Connect™ app is designed to be connected to and to communicate information and data via a digital communication interface.

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

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

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

Communication protocol-specific security

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

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

The PROFIBUS 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.

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

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 14 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.

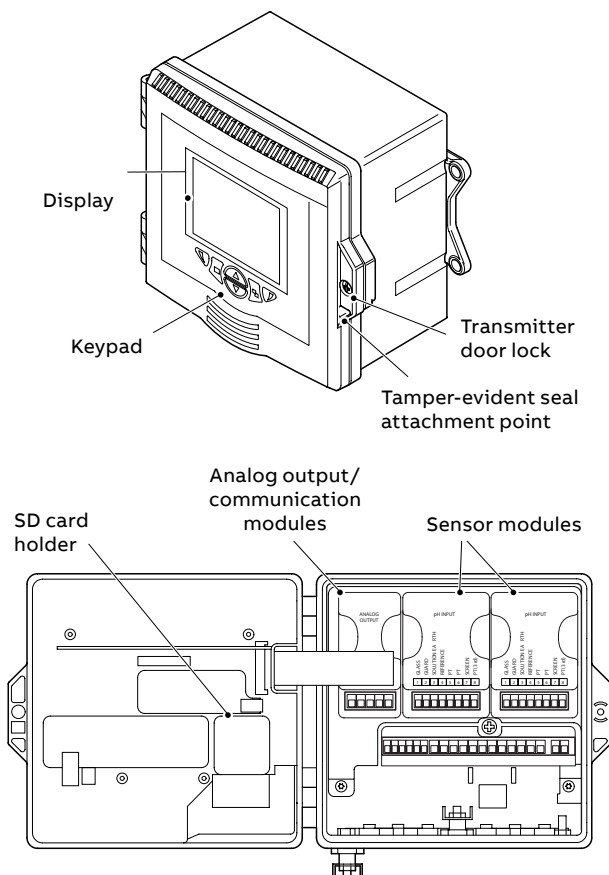


Figure 1 AWT420 transmitter – main components

4 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 22.
- Refer to page 10 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 43
- 4-electrode conductivity sensors – page 46
- pH/Redox/ORP sensors – page 48
- Turbidity/Suspended solids – page 59
- Dissolved oxygen sensors – page 81

5 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

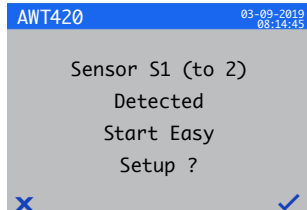
Are those that define transmitter operation (for example, current output assignment and range, relay and alarm assignment). Some sensor types also store sensor setup parameters in the transmitter.

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

Sensor addition

To add a new sensor to the unused input channel:

- 1 Connect the sensor to the transmitter EZLink connector. The transmitter detects the new sensor automatically and loads the sensor setup parameters stored in the sensor. When upload is complete, the **Easy 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.

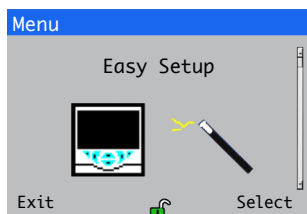
NOTICE

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 8) 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. The diagnostic message **S1 (to 2):Removed** is displayed in the status bar at the bottom of the main **Operator** page.

NOTICE

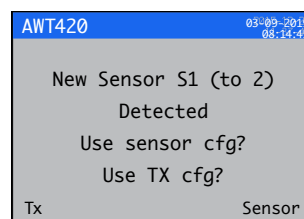
To retain existing transmitter setup parameters for use with the new sensor:



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. A user prompt is displayed asking which configuration to use:



- 3 Press the  (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 (X) 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.


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. 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 8.


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.

6 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 20.

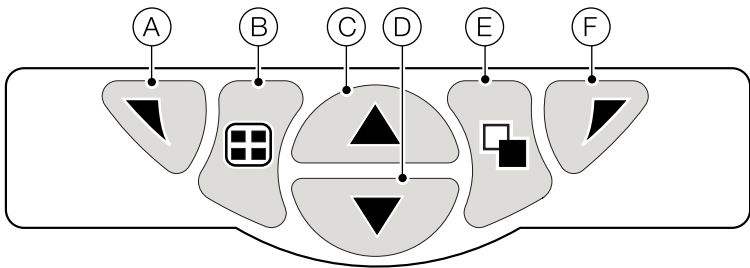


Figure 2 Front panel keys

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 3. 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: <ul style="list-style-type: none">• 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 3. 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

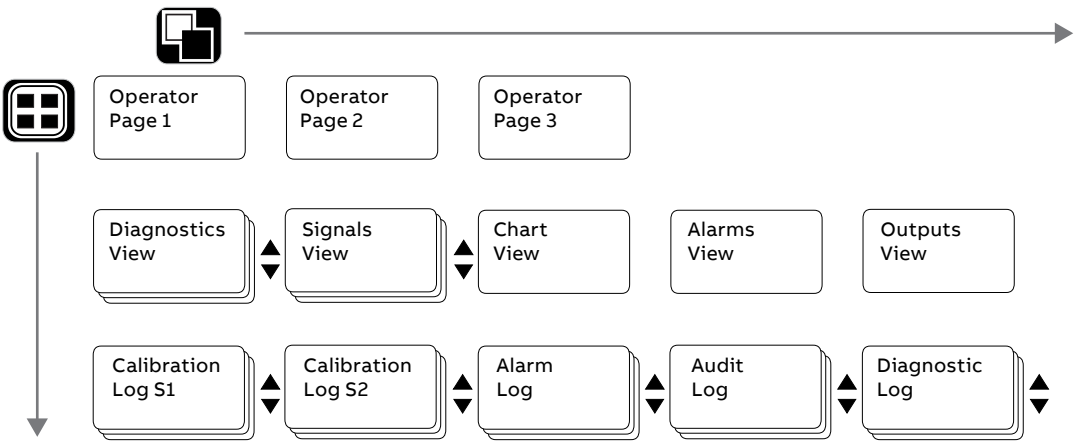


Figure 3 Menu navigation overview

Note.

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

Modes of operation

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

- **Operating:** displays real-time sensor values on **Operating Pages** – see page 12.
- **View:** displays diagnostic messages, alarms, output values, signals (including the flow rate where applicable) and (chart) traces – see page 14.
- **Log:** displays recorded diagnostic, calibration and audit events and alarms – see page 15.
- **Configuration:** enables the transmitter to be configured – see page 22.

Operator menus

NOTICE

Operator menu cannot be accessed directly from the Configuration level.

Referring to Figure 4:

- **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).

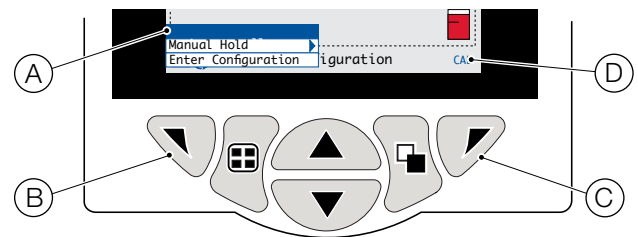


Figure 4 Operator menu

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 18 for access levels and password security options.

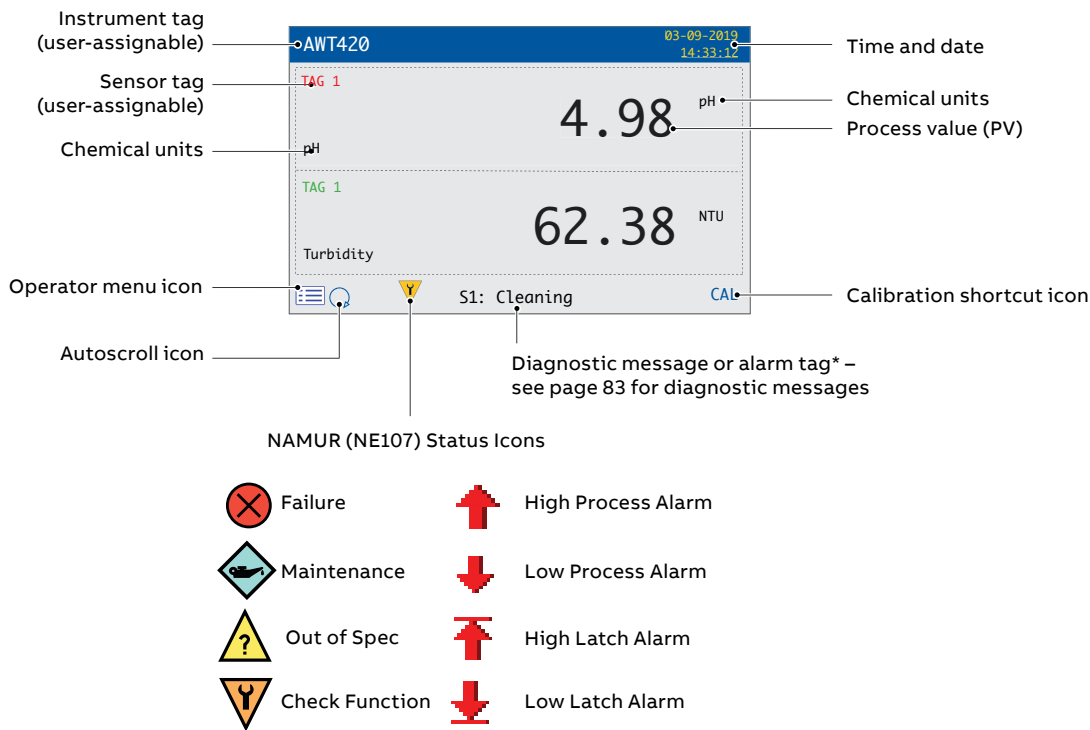
...6 Operation

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 5, **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 5 Operator Page (multiple sensors)

Figure 6 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 11), the display scrolls through each available **Operator Page** consecutively.

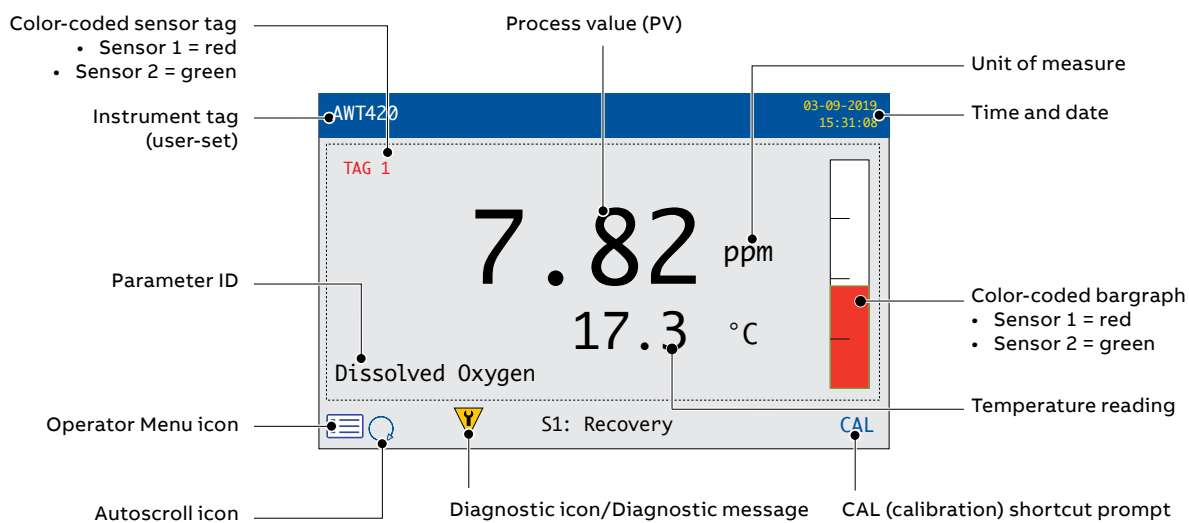


Figure 6 Operator pages – overview

...6 Operation

View mode

Pages displayed in View mode comprise:

- **Diagnostics View** – displays a list of active diagnostic messages identified by priority and message – see Figure 7
- **Signals View** – displays a list of active signals and their values (1 page per sensor) – see Figure 8
- **Chart View** – represents the sensor readings as a series of color-coded traces – see Figure 9
- **Alarms View** – displays a list of alarms, source and status – see Figure 10
- **Outputs View** – displays a list of the analog outputs, output value and percentage of output value – see Figure 11

Diagnostics View

NAMUR icon and message priority – see page 83

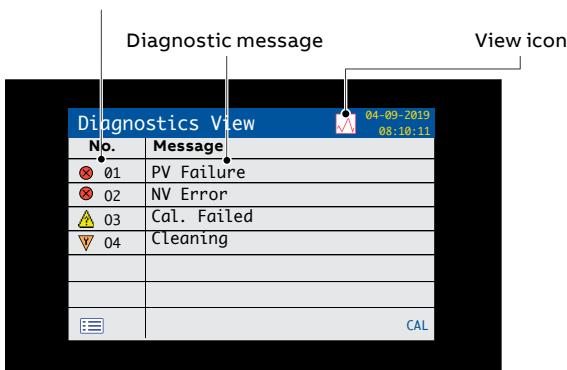


Figure 7 Diagnostics View

Signals View

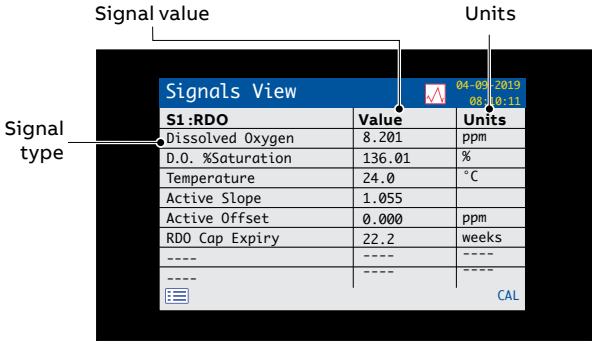


Figure 8 Signals View

Chart View

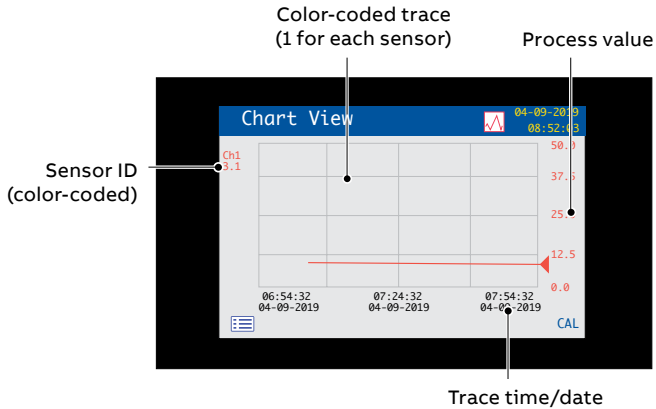


Figure 9 Chart View

Alarms View

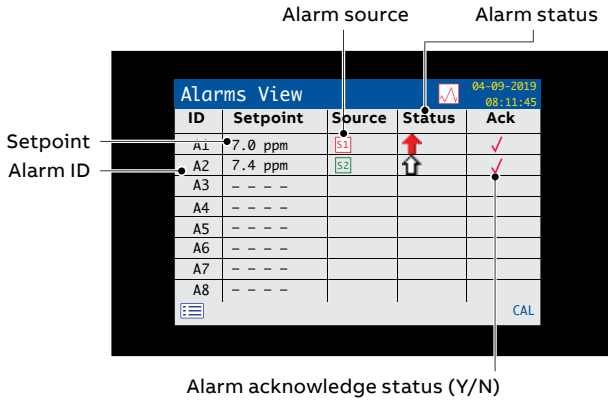


Figure 10 Alarms View

Outputs View

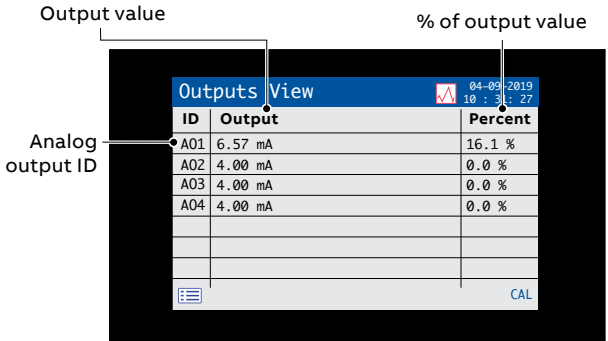


Figure 11 Outputs View

Figure 12 Log page example (Audit Log shown)

7 Data logging

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.

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 13:

- 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).

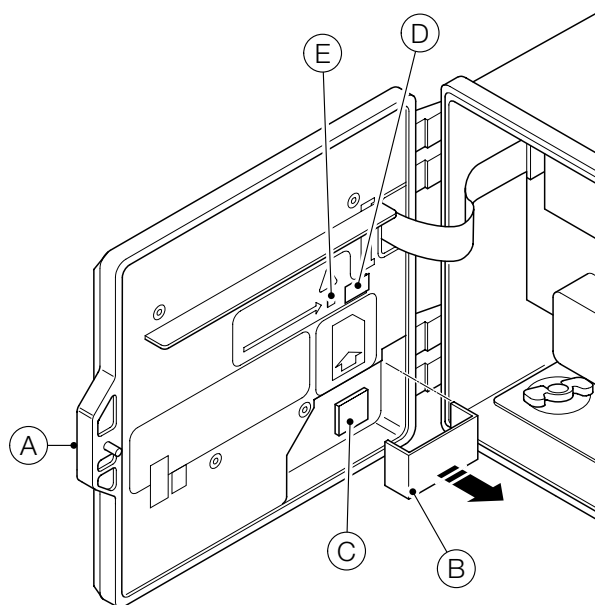


Figure 13 SD card insertion and removal

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 18.
- The time and date are formatted according to the format selected in the **Display** level (**Date & Time**).
- The transmitter's internal clock can be configured to adjust automatically at the start and end of **Daylight Saving** periods – see "Daylight saving" on page 17.

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.

8 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 24.

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 11.

Access levels – scroll to level using the / keys and press the key (Select) to enter

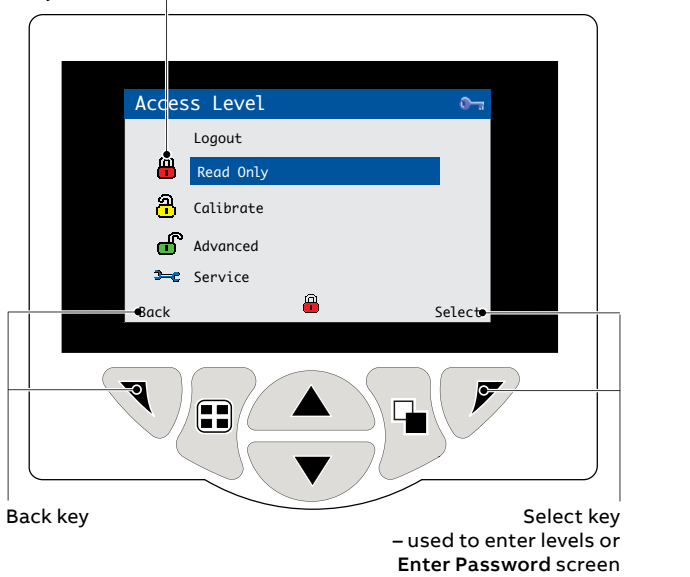


Figure 14 Access level screen

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

Cursor/Password character indicator (maximum 6 characters)

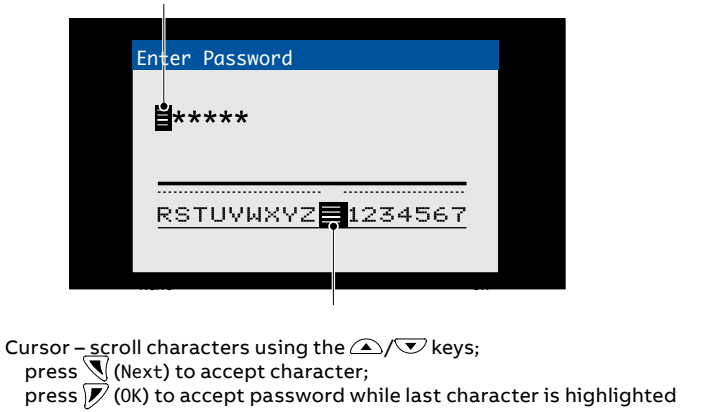


Figure 15 Enter password screen

9 Bluetooth capability and the EZLink Connect app

The AWT420 supports Bluetooth® Low Energy (BLE) version 4.2 as standard.

You can connect to AWT420 transmitters that are in range (one device at a time, a limit of the Bluetooth technology using the EZLink Connect™ app).

Download the EZLink Connect app only from the Google Play™ store or the Apple® App Store®.

Download EZLink Connect for Android™

For the Android version of EZLink Connect, download from:



Download EZLink Connect for iOS®

For the iOS version of EZLink Connect, download from:



EZLink Connect lets you read live values and diagnostics from a paired AWT420 transmitter, and view the calibration log, the diagnostics log, and the audit log.



In the app, you can also see the related documentation for the AWT420 transmitter, and other CWA products from ABB.

Pair your mobile device to a transmitter

To pair the EZLink Connect app with an AWT420 transmitter, use a pairing PIN that is available from:

Communication > Bluetooth > Pairing PIN menu.

Bluetooth menus

Table 5 Bluetooth menu descriptions

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

Operating system requirements


ABB recommends Android 7.0 or later, or iOS 9.0 or later to install the EZLink Connect app.

For the cybersecurity requirements, refer to page 4.





10 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.
	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.

11 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.

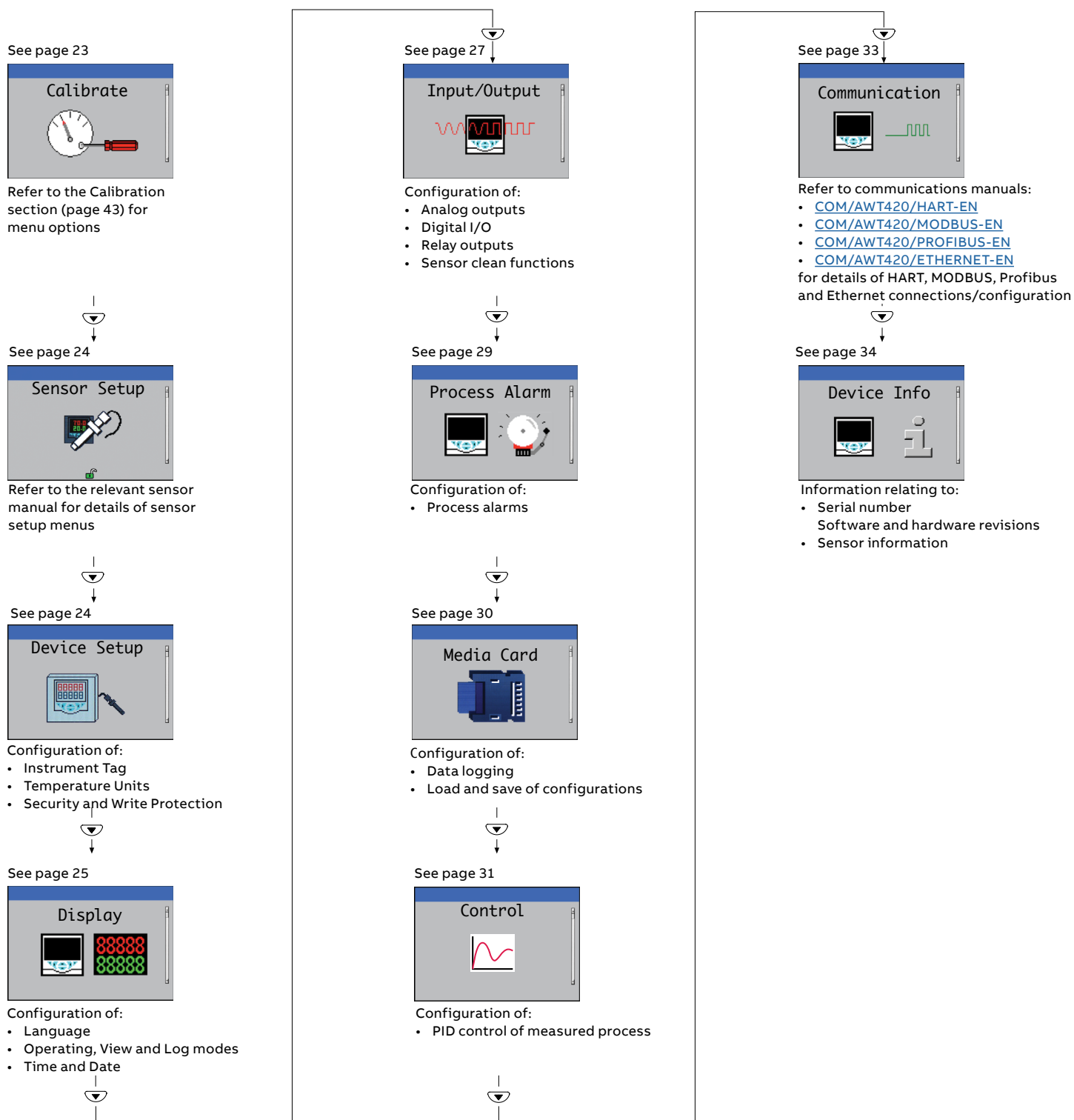
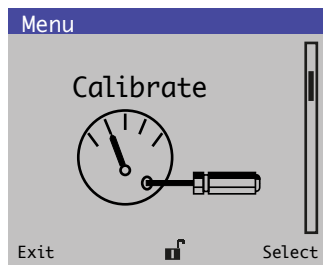


Figure 16 Configuration (Advanced access level) overview

Calibrate



Used to calibrate the sensor.

Note. Calibrate menus are sensor-specific – refer to the Calibration section (page 43) 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.

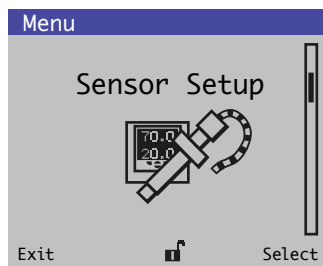
Menu	Comment	Default
S1: <Sensor Type>	Note. Displayed only if a sensor is fitted to slot 1.	
S1: <Sensor Tag>	Access the sensor 1 specific calibration pages, refer to the Calibration section (page 43) for specific routines.	
S2: <Sensor Type>	Note. Displayed only if a sensor is fitted to slot 1.	
S2: <Sensor Tag>	Access the sensor 1 specific calibration pages, refer to the Calibration section (page 43) 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	

...11 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 43) 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 36).	
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 36).	
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 36).	

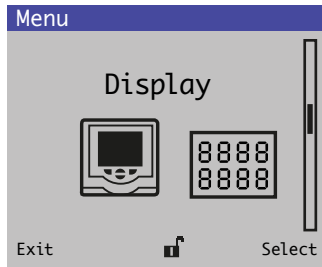
Device Setup



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.

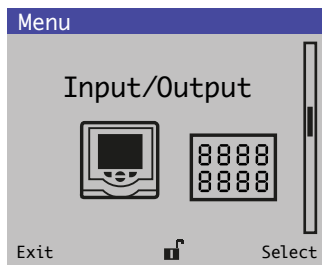
Menu	Comment	Default
Language	Select the display language: English/German/French/Italian/Spanish.	English
Operator Templates		
Page 1 (to 5) Template	Refer to page 12 for Operator Template examples. Note. Operator Page templates are assigned automatically to display all sensors currently connected and cannot be changed – see page 12.	
View/Log Enables	Select to enable/disable the following Views and Logs .	
Diagnostics View		
Signals View		
Chart View	See page 14 for examples of Operator pages in View mode.	
Alarm View		
Analog OP View		Enable (all)
Calibration Log		
Alarm Log		
Audit Log	See page 15 for examples of Operator pages in Log mode.	
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

...11 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 in 1-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.	
Source	Select the sensor signal to be assigned to the output.	None
Output Type	Select the Analog Output 1 (to 4) type: <ul style="list-style-type: none"> • 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 20.	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 20.	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		
Type	Select the Digital I/O type: <ul style="list-style-type: none"> • Off • Input • Output 	Off
Source	Select the digital signal to be assigned to the input/output – see page 35.	None
Polarity	Sets the polarity of the digital input/output signal – see Table 6, page 28.	Non Inverted
Relays		
Relay 1 (to 4)		
Source	Selects the digital signal to be assigned to the relay – see page 35.	None
Polarity	Sets the polarity of the relay output – see Table 7, page 28.	Non Inverted

* Displayed only if **Source** is NOT set to **None**

** Displayed only if **Output Failure** is set to **Enabled**

...11 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 6 Digital input/output polarity

Relay output polarity

Relay output: polarity = non-inverted

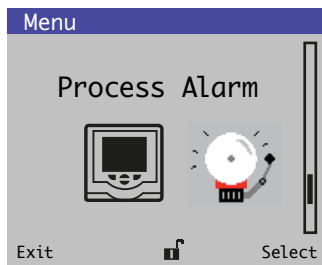
Source status	Relay state	N/C Contact	N/O Contact
Active	Energized	Open	Closed
Inactive	De-energized	Closed	Open

Relay output: polarity = inverted

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

Table 7 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: <ul style="list-style-type: none"> 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 12.	
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 17 and Figure 18) 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

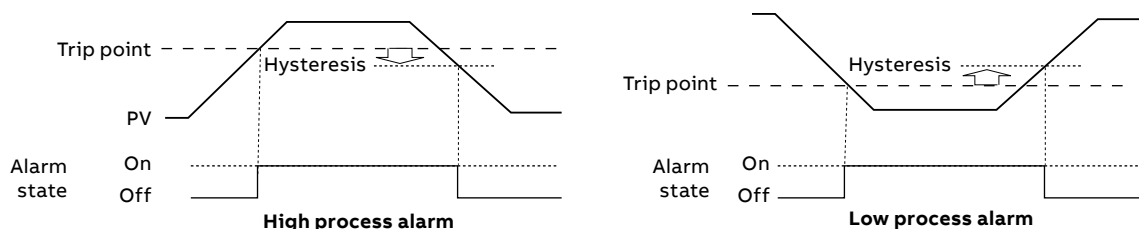


Figure 17 High and low process alarm action

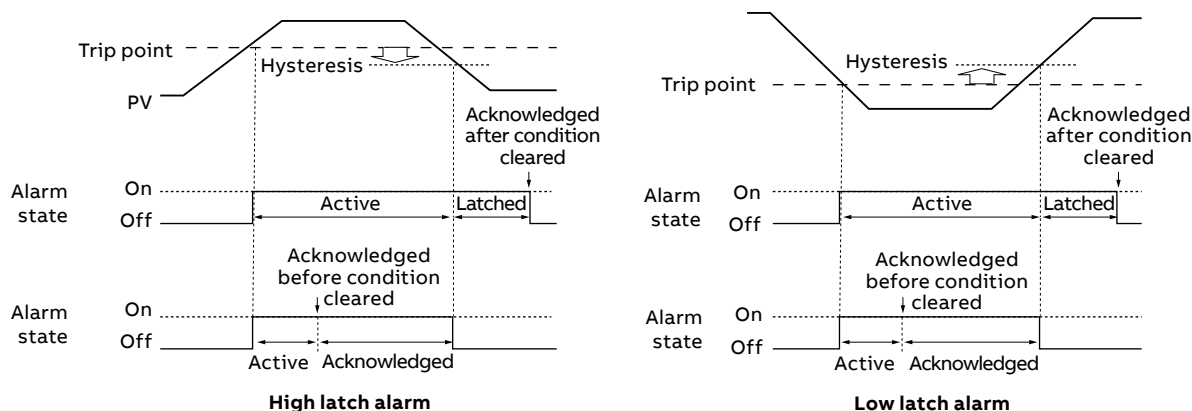
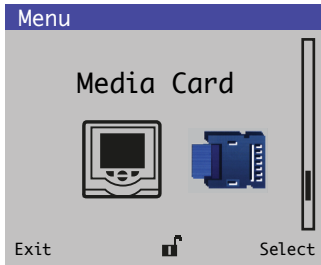






Figure 18 High and low latch alarm action

...11 Configuration (Advanced access level)

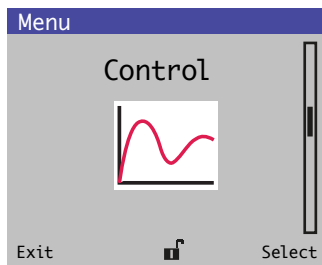
Media Card



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 35 for sources.	
Sampling Time	Select the sampling duration time: <ul style="list-style-type: none">• 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)	<p>Select a position in which to create and save a configuration file containing user-defined sensor parameters to external media.</p> <p>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.</p> <p>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.</p>	
Load Configuration		
Select File		
Config1 (to 8)	<p>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.</p> <p>Press the  key to display a list of other positions containing configuration files. Only positions containing configuration files are displayed.</p>	
Format Card	<p>Press the  key (Yes) to format the SD card if required.</p> <p>Note. Formatting erases all data currently on the SD card.</p>	

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.

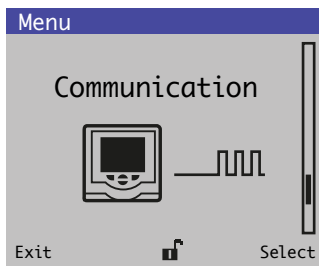
Menu	Comment	Default
PID 1 (2)		
Control Action	Off, Reverse-acting, Direct-Acting, Dual-acting.	Off
Control Mode	Auto, Manual	Auto
Reverse Control Direct Control	If Control Action = Reverse or Direct-Acting:	
Setpoint	Numeric value, limited to PV Range.	PV range low
Control Type	P, P+I, P+I+D, P+D.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

...11 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.

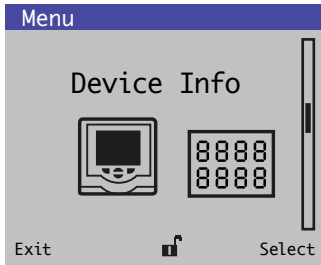
Refer to the communications supplementary manuals for full details of MODBUS, Profibus, HART and Ethernet connections and configuration together with tables detailing Profibus slot/indexes and MODBUS coils and registers:

- 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	<p>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.</p> <p>The mobile application is available for both Android™ and iOS™ operating systems.</p> <p>Note. Only mobile devices with support for Bluetooth® 4.2 or newer are compatible.</p>	
Device Enable	Enables or disables power to the Bluetooth module. When disabled the module is no longer advertising and is not connectible.	Enabled
Device Name	<p>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.</p> <p>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.</p>	
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.	

...11 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 'Troubleshooting' page 83 for possible causes.
S1 (to 2) Out of Spec.	The associated sensor is out of specification – see 'Troubleshooting' page 83 for possible causes.
S1 (to 2) Maintenance	The associated sensor requires maintenance – see 'Troubleshooting' page 83 for possible causes.
S1 (to 2) Function Check	The associated sensor requires checking – see 'Troubleshooting' page 83 for possible causes.
Tx Failure	The transmitter is in the failed state – see 'Troubleshooting' page 83 for possible causes.
Tx Out of Spec.	The transmitter is out of specification – see 'Troubleshooting' page 83 for possible causes.
Tx Maintenance	The transmitter requires maintenance – see 'Troubleshooting' page 83 for possible causes.
Tx Function Check	The transmitter requires checking – see 'Troubleshooting' page 83 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.

12 Sensor setup menus

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 H2O (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	<p>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</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>Difference Calculates the difference between the two conductivity inputs: Difference = B — A</p> <p>Ratio Calculates the ratio of the two conductivity inputs: $\text{Ratio} = \frac{B}{A}$</p> <p>% Passage Calculates the amount of conductivity as a percentage that passes through the cation exchange unit: $\% \text{Passage} = \frac{A}{B} \times 100$</p> <p>% Rejection Calculates the amount of conductivity as a percentage that is absorbed in the cation exchange unit: $\% \text{Rejection} = \left(1 - \frac{A}{B}\right) \times 100$</p>	No Calculation
Note. The following menus are displayed only if Calculation Type = Inferred pH.		
Before Cation Limit	<p>Set the required before-cation conductivity limit, between:</p> <ul style="list-style-type: none"> 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	<p>Set the required after-cation conductivity limit, between:</p> <ul style="list-style-type: none"> 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	<p>View the measuring range for the selected Inferred pH calculation</p> <ul style="list-style-type: none"> 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	<p>Set the signal arrangement:</p> <ul style="list-style-type: none"> A = S1, B = S2/A = S2, B = S1 <p>Note: For inferred pH:</p> <ul style="list-style-type: none"> A = Conductivity measurement After cation column. B = Conductivity measurement Before cation column. 	N/A

...12 Sensor setup menus

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: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> mS/cm/μS/cm 	mS/cm
Sensor Group	Enter the sensor group for the measuring cell used – <ul style="list-style-type: none"> 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 – <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> NaOH/HCl/H2SO4/H3PO4/NaCl/KOH/Custom 	N/A
Concentration Unit	Note. Displayed only if Conc. Solution = Custom Select the Concentration Units <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> None/Low/Medium/High 	None
Temp. Comp. Type	Set the type of temperature compensation: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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.	2.00 %/°C
Sensor Diagnostics		
Dirty Sensor	Detect dirty sensor condition: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> None/Low/Medium/High 	None
Note. The following menus are displayed only if Measurement Type = pH.		
Temp. Compensation	Set the type of temperature compensation: <ul style="list-style-type: none"> 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. Refer to INF/ANALYST/017-EN for pH solution coefficients.	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: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> Enabled/Disabled 	Disabled
Out Of Solution	Detect Out Of Solution condition: <ul style="list-style-type: none"> Enabled/Disabled 	Disabled
Ref. Poisoning	Note: Displayed only if a digital (EZLink) sensor is connected. Detect a contaminated reference electrode: <ul style="list-style-type: none"> Enabled/Disabled 	Disabled
Ref. Failure	Note: Displayed only if a digital (EZLink) sensor is connected. Detect a failed reference electrode: <ul style="list-style-type: none"> Enabled/Disabled 	Disabled
Ref. Blocked	Detect a blocked reference electrode: <ul style="list-style-type: none"> 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.	

...12 Sensor setup menus

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: <ul style="list-style-type: none"> Dissolved Oxygen/% Saturation Note. If a change is made the I/O sources are reset.	Dissolved Oxygen
Units	Select the measurement units: <ul style="list-style-type: none"> mg/l/ppm 	ppm
PV Resolution	Select the PV Resolution: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> None/Low/Medium/High 	None
Salinity Unit	Select the required salinity units: <ul style="list-style-type: none"> PSU (Practical Salinity Units) or ppt (parts-per-thousand). 	PSU
Salinity Correction	Required when monitoring water containing high quantities of dissolved salts: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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

Menu	Comment	Default
Tag	Enter an alphanumeric sensor tag (16 characters maximum) to identify the sensor on the Operator Pages.	TAG1
Sensor Type	Select the sensor type: <ul style="list-style-type: none"> • 7998 011/7998 012/7998 016 	N/A
Turbidity Units	Select the turbidity units: <ul style="list-style-type: none"> • NTU/FNU 	NTU
Range High	Set the span value used in Chart and Bargraph views.	40.00 NTU (sensor types: 7998 011, 7998 016) 400.0 NTU (sensor type: 7998 012)
Range Low	Fixed at 0.0 NTU.	0.0
Filter Type	Select the signal filtering type: <ul style="list-style-type: none"> • None/Low/Medium/High 	None
Bubble Rejection	Select the bubble rejection filtering type: <ul style="list-style-type: none"> • None/Low/Medium/High 	None
Note. The following menus are displayed only if the sensor has a wiper fitted. Validity sensor type: 7998 011 or 7998 012		
Wiper Clean Freq.	Set the interval between cleans: <ul style="list-style-type: none"> • 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.	

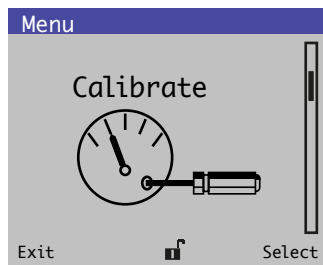
...12 Sensor setup menus

Turbidity/Suspended solids

Menu	Comment	Default
Tag	Enter an alphanumeric sensor tag (16 characters maximum) to identify the sensor on the Operator Pages.	TAG1
Sensor Type	Select measurement type: <ul style="list-style-type: none"> • Turbidity/Suspended solids Note. If a change is made the I/O sources are reset.	Turbidity
Turbidity Units	Select the turbidity units <ul style="list-style-type: none"> • NTU/FNU 	NTU
TSS Units	Select the total suspended solids units <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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.	

13 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 44.	N/A
Concentration Cal	See typical procedure, see page 44.	N/A
Resistivity Cal	See typical procedure, see page 44.	N/A
Temperature Cal	See Temperature Calibration procedure, see page 58.	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: • $\pm 20 \mu\text{S/cm}$ for cell constants of 1.00 • $\pm 4 \mu\text{S/cm}$ for cell constants of 0.10 • $\pm 0.8 \mu\text{S/cm}$ for cell constants of 0.01	0 $\mu\text{S/cm}$
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 $\pm 40 ^\circ\text{C}$.	0 $^\circ\text{C}$
Restore Cal Defaults	Resets slope and offset values to factory default.	N/A

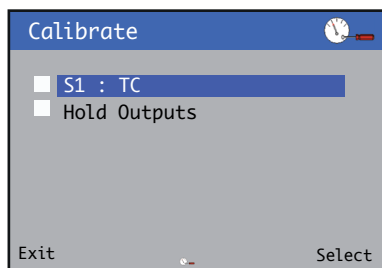
...13 Calibration procedures




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.

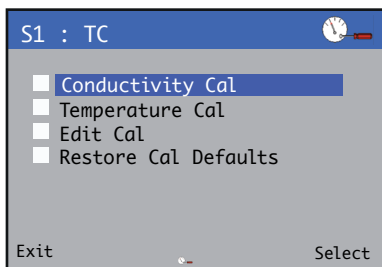
- 1 At the Calibrate level, press the  key:




The Calibrate menu is displayed:



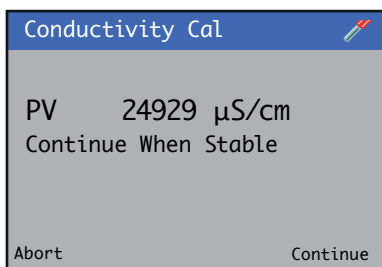
- 2 Use the / keys to select S1 : TC and press the  key.



The S1 : TC menu is displayed:

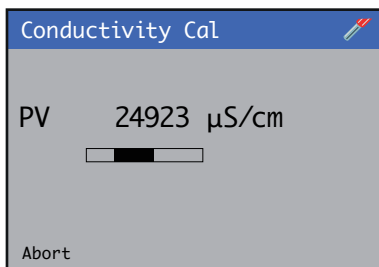
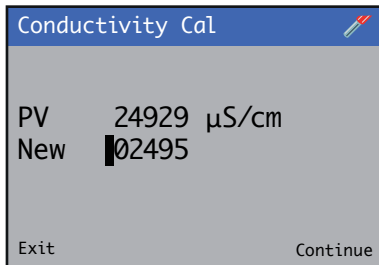


- 3 Use the / keys to select Conductivity Cal and press the .

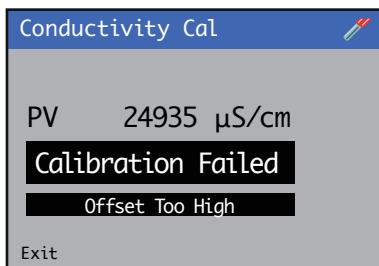
The Conductivity Cal menu is displayed:



- 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):



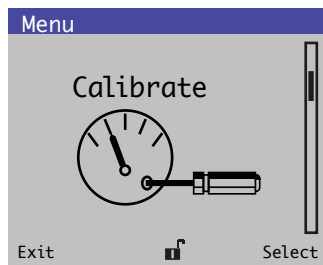
Invalid new calibration values generate an error message and the calibration value is not accepted.



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

...13 Calibration procedures

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.

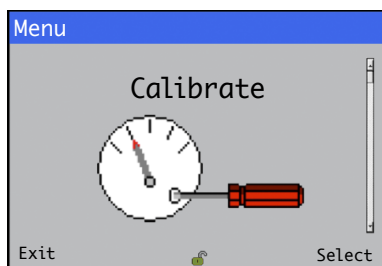
Note. Access to the **Calibrate** menu is via **Calibrate** and **Advanced** levels only.

Menu	Comment	Default
Conductivity Cal	See typical procedure, see page 47.	N/A
Concentration Cal	See typical procedure, see page 47.	N/A
Resistivity Cal	See typical procedure, see page 47.	N/A
Temperature Cal	See Temperature Calibration procedure, see page 58.	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: <ul style="list-style-type: none"> • $\pm 20 \mu\text{S/cm}$ for cell constants of 1.00 • $\pm 4 \mu\text{S/cm}$ for cell constants of 0.10 • $\pm 0.8 \mu\text{S/cm}$ for cell constants of 0.01 	0 $\mu\text{S/cm}$
Temperature Slope	Edit the Temperature Slope value. Valid slope values range from 40 to 160 %	100 %
Temperature Offset	Edit the Temperature Offset value. <ul style="list-style-type: none"> • Valid offset values are $\pm 40^\circ\text{C}$. 	0 $^\circ\text{C}$
Restore Cal Defaults	Resets slope and offset values to factory default.	N/A

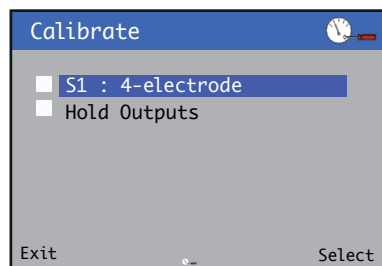
4-electrode conductivity calibration



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:

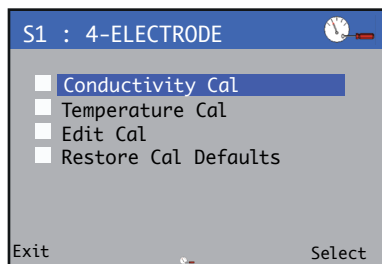





The Calibrate menu is displayed:



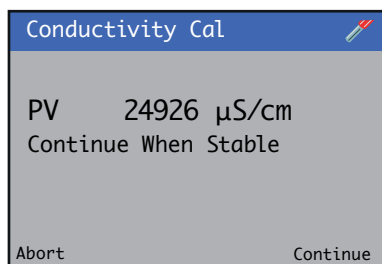
- 2 Use the / keys to select S1 : 4-electrode and press the  key.



The S1 : TC menu is displayed:

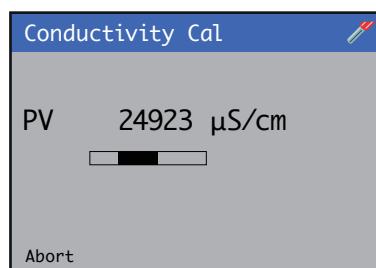
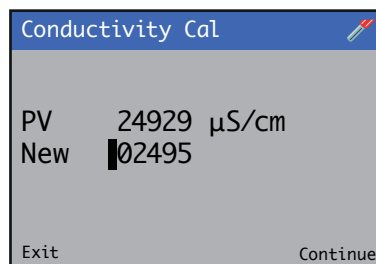


- 3 Use the / keys to select Conductivity Cal and press the  key.

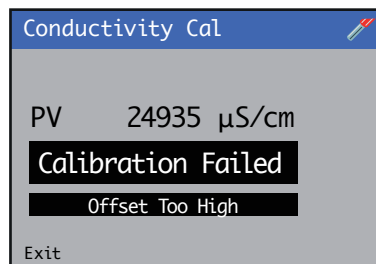
The Conductivity Cal menu is displayed:



- 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):



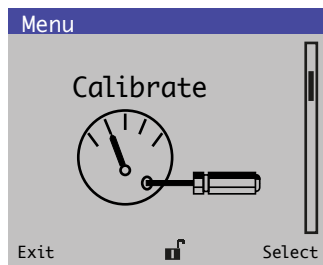
Invalid new calibration values generate an error message and the calibration value is not accepted.



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

...13 Calibration procedures

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 38 There are four possible calibration modes: <ul style="list-style-type: none"> • 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 58.	
Edit Cal		
pH Slope	Note: pH sensors only. Edit the slope value: <ul style="list-style-type: none"> • Valid slope values range from 40 to 150 % 	100%
pH Offset	Note: pH sensors only. Edit the offset value: <ul style="list-style-type: none"> • Valid offset values are: 0.00 to 14.00pH 	7.00pH
mV Slope	Note: Redox/ORP sensors only. Edit the slope value: <ul style="list-style-type: none"> • Valid slope values range from 40 to 150 % 	100%
mV Offset	Note: Redox/ORP sensors only. Edit the offset value: <ul style="list-style-type: none"> • Valid offset values are: ± 1000mV 	0mV
Temp. Slope	Edit the temperature slope value: <ul style="list-style-type: none"> • Valid slope values range from 40 to 160 % 	100%
Temp. Offset	Edit the temperature offset value: <ul style="list-style-type: none"> • Valid offset values are ± 40 °C 	0°C
Sample Collection	Note: pH sensors only. See In process calibrations , page 78.	
Collection Complete	Note: pH sensors only See In process calibrations , page 78.	
Restore Cal Defaults	Resets slope and offset values to default values.	

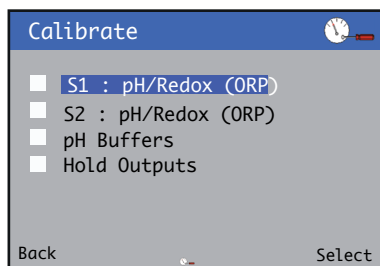
pH/Redox/ORP calibration




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

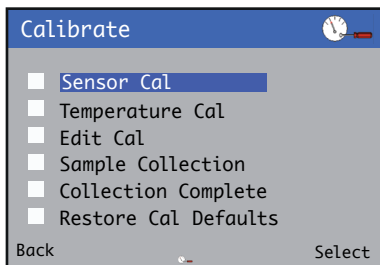
- 1 At the Calibrate level, press the  key:




The Calibrate menu is displayed:



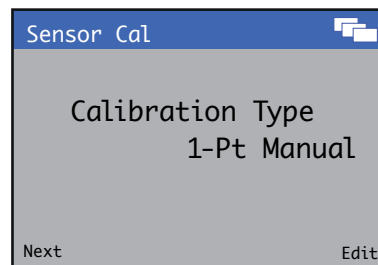
- 2 Use the / keys to select the sensor to be calibrated, and press the  key to confirm selection.





The pH calibration menu is displayed:



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

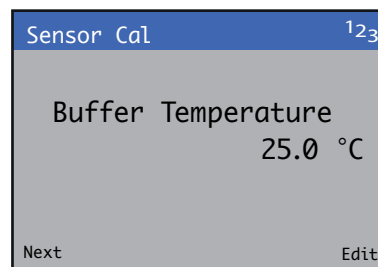
The calibration type is displayed:







- 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.

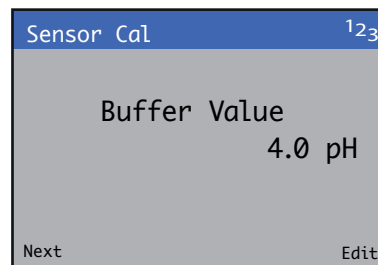
The buffer temperature is displayed:



- 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:

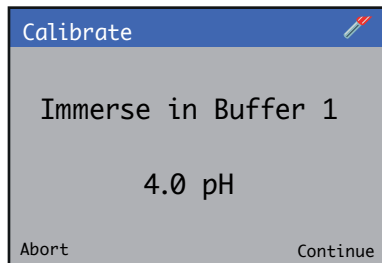



...13 Calibration procedures

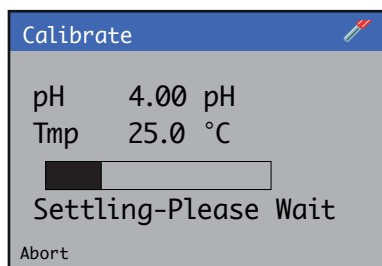
...pH/Redox/ORP calibration

- 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.

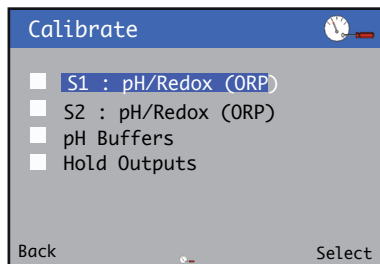
- If the calibration passes, the slope and offset values are displayed.
- If the calibration fails, the failure reason is displayed.




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

2-Point calibration

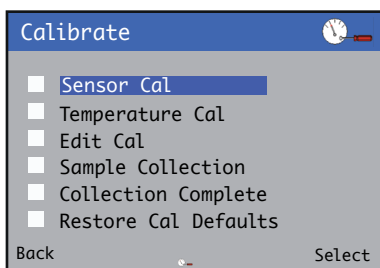
- 1 At the Calibrate level, press the  key:




The Calibrate menu is displayed:



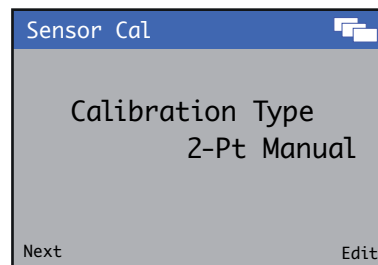
- 2 Use the / keys to select the sensor to be calibrated, and press the  key to confirm selection.





The pH calibration menu is displayed:



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

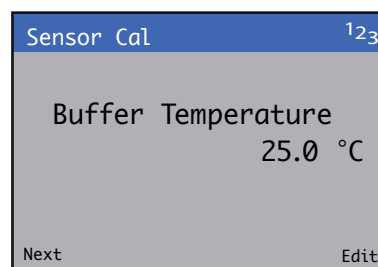
The calibration type is displayed:







- 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.

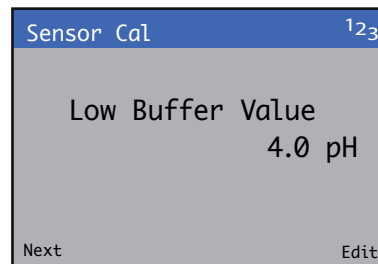
The buffer temperature is displayed:



- 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:



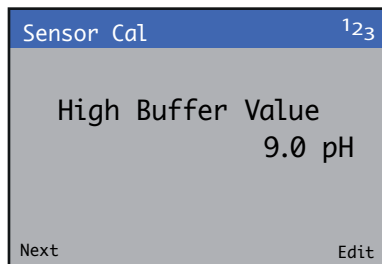
...13 Calibration procedures





...pH/Redox/ORP calibration

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

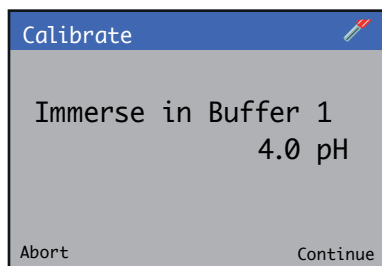
Press the  key to proceed to the next step.


The second buffer value is displayed:

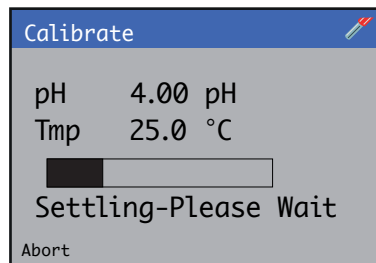


- 7 Use the  key to edit the high buffer value.
Use the / keys to set the value and press the  key to confirm changes.

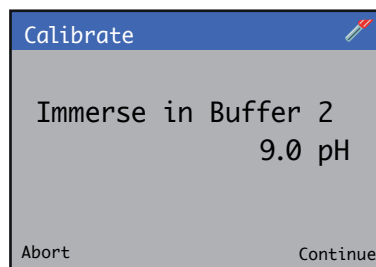
Press the  key to proceed to the low buffer calibration:




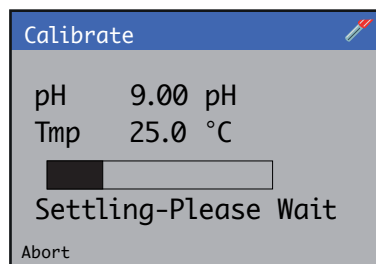
- 8 Place the sensor into buffer 1 and press the  key to perform the low buffer calibration. The calibration process screen is displayed:



- 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.

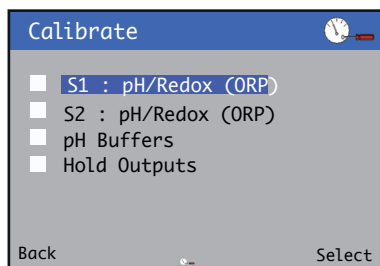
Note. The calibration can be canceled at any time during the process by pressing the **Abort**  key.




1-Point automatic calibration

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

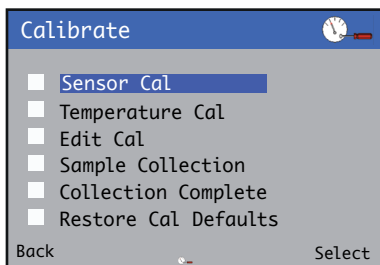
- 1 At the **Calibrate** level, press the  key:




The **Calibrate** menu is displayed:



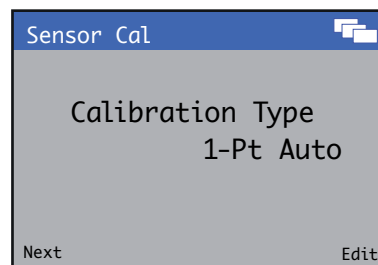
- 2 Use the / keys to select the sensor to be calibrated, and press the  key to confirm selection.





The pH calibration menu is displayed:



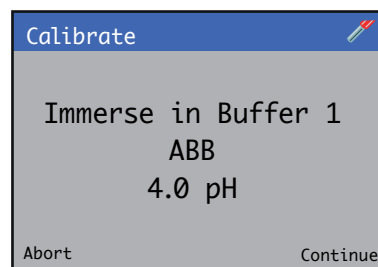
- 3 Use the / keys to select sensor calibration and press the  key to confirm selection.


The calibration type is displayed:

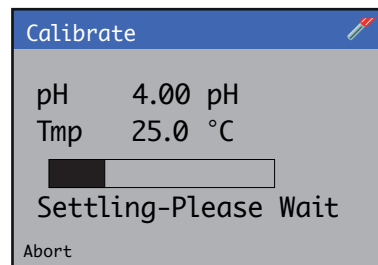


- 4 Use the  key to edit the calibration type. Use the / keys to select the required calibration type and press the  key to confirm selection.

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.

...13 Calibration procedures

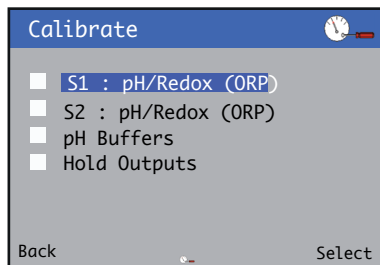
...pH/Redox/ORP calibration




2-Point automatic calibration

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

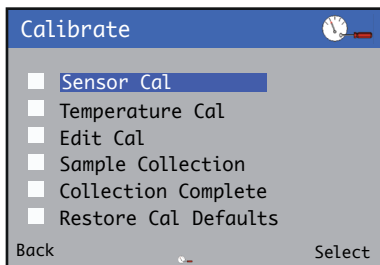
- 1 At the Calibrate level, press the  key:




The Calibrate menu is displayed:



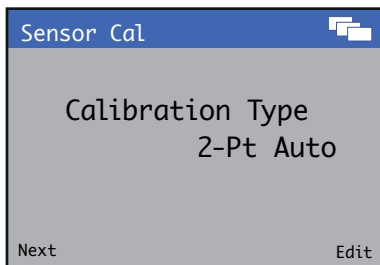
- 2 Use the / keys to select the sensor to be calibrated, and press the  key to confirm selection.





The pH calibration menu is displayed:



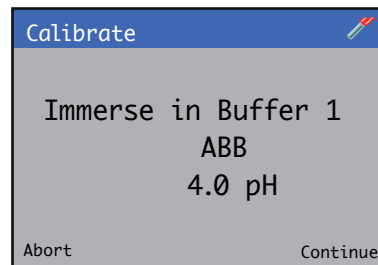
- 3 Use the / keys to select sensor calibration and press the  key to confirm selection.


The calibration type is displayed:

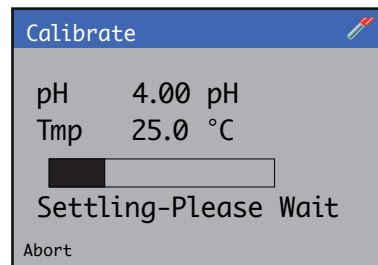


- 4 Use the  key to edit the calibration type. Use the / keys to select the required calibration type and press the  key to confirm selection.

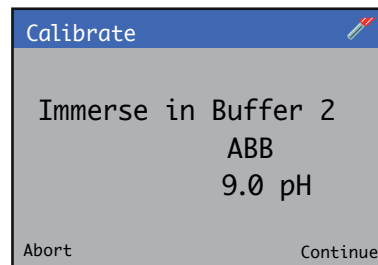
Press the  key to proceed to the next step.




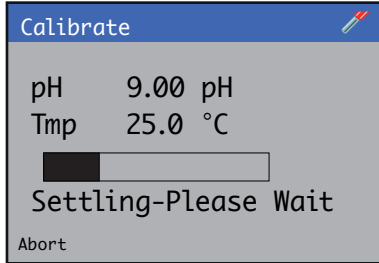
- 5 Place the sensor into buffer 1 and press the  key to perform the low buffer calibration. The calibration process screen is displayed:



- 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.




- 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.

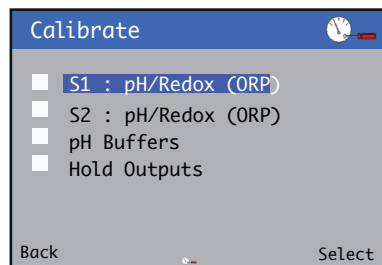
...13 Calibration procedures




...pH/Redox/ORP calibration

Sample collection

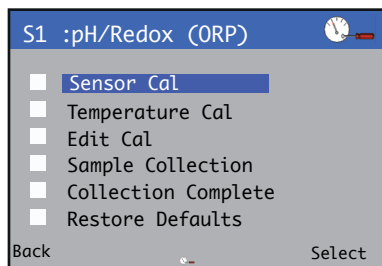
- At the Calibrate level, press the  key:




The Calibrate menu is displayed:



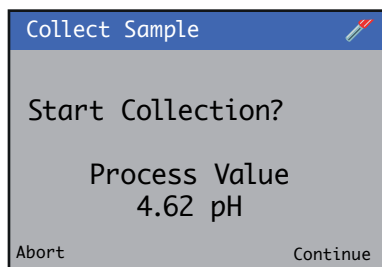
- Use the / keys to select the sensor to be calibrated, for example, S1 :pH/Redox (ORP) and press the  key.


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



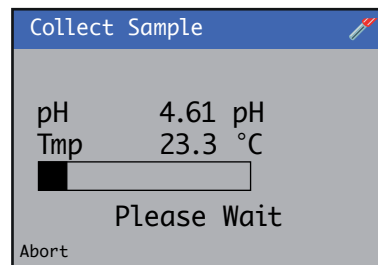
- Press the / keys to select **Collect Sample** and press the  key to confirm selection.

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

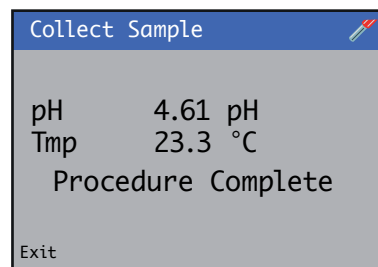


- Press the  key to start the data collection.


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



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



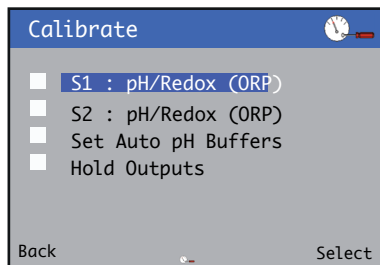
The value of the acquisition is now stored.




- Press the  key to return to the **Calibrate** level.
- Continue to the **Sample Complete** section to perform the second step of the procedure.

Sample complete

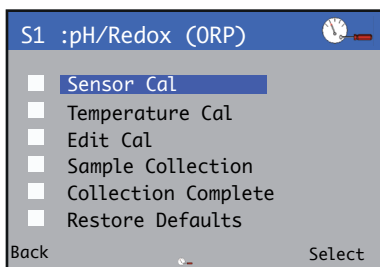
- 1 At the **Calibrate** level, press the  key:




The **Calibrate** menu is displayed:



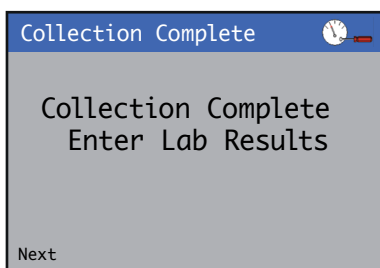
- 2 Use the / keys to select the sensor to be calibrated, for example, **S1 :pH/Redox (ORP)** and press the  key.


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



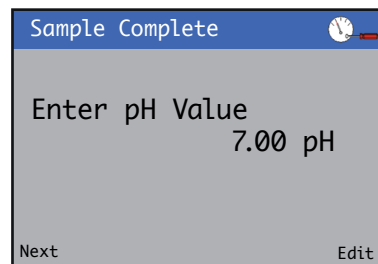
- 3 Use the / keys to select **Collection Complete** and press the  key.



The **Collection Complete** menu is displayed:

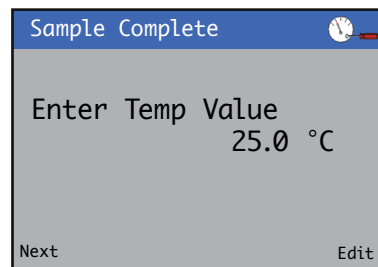



- 4 Press the  key.

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

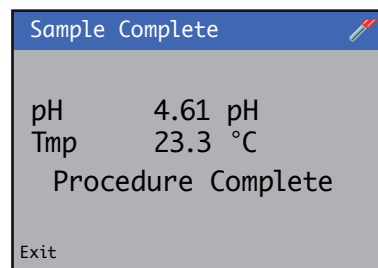



- 5 Press the  key and enter the value of the pH sample from the lab.
- 6 Press the  key twice.
- 7 The **Collect Sample** screen is displayed with a prompt to enter a temperature value:



- 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.

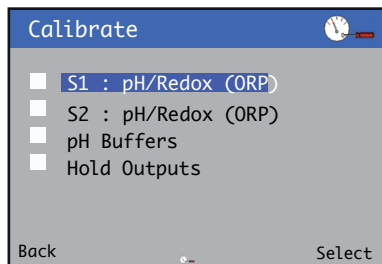
In Process calibration is now complete.




...13 Calibration procedures

Temperature calibration

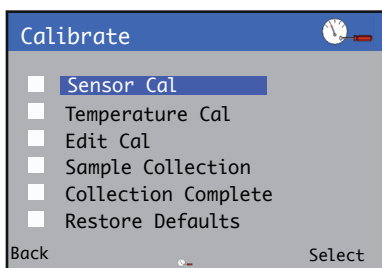
- At the Calibrate level, press the  key:




The Calibrate menu is displayed:



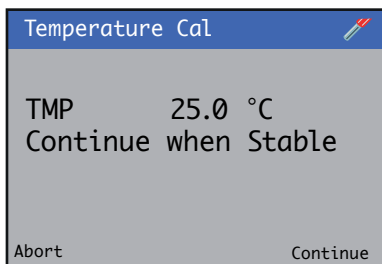
- Use the / keys to select the sensor to be calibrated, and press the  key to confirm selection.


The pH calibration menu is displayed:



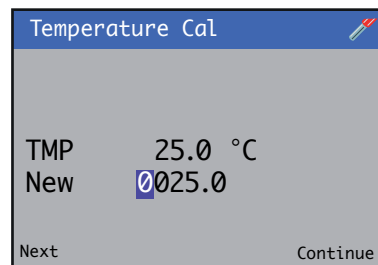
- Press the / keys to select Temperature Cal and press the  key to confirm selection.





The temperature calibration screen is displayed:



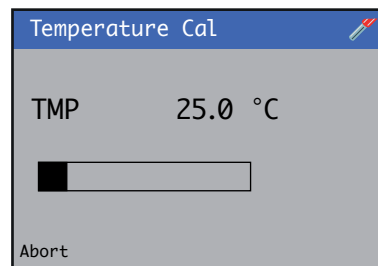
- Wait for the displayed value to stabilize and press the  key to proceed to the next step.

The buffer temperature is displayed:




- 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 ().

Turbidity

Menu	Comment	Default
Sensor Verification	Performed using the span DRY Standard.	
Turbidity Cal	There are four calibration modes: <ul style="list-style-type: none"> • 1-Pt Formazine • 1-Pt Dry Standard • 2-Pt Formazine • 2-Pt Dry Standard 	
Span Standard	Formazine Standard value DRY Standard value	
Turbidity Offset	Manual adjustment of the turbidity reading.	
Restore Cal Defaults	Resets slope and offset values to default values.	

Sensor Verification

A sensor verification is performed using the DRY STANDARD as follows:

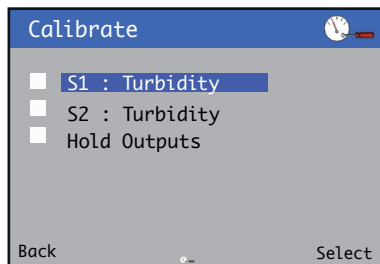
- Close the isolating valve installed upstream of the sensor.
- Close the sensor inlet valve and open the drain valve. Allow the sensor to drain.
- Carefully remove the wiper unit (7998 011 and 012) or the wiper plug (7998 016) to aid complete drainage of the system. When the system is empty, close the drain valve.
- Thoroughly dry the flow chamber internally using clean tissue.
- Thoroughly clean and dry the emitter and receiver lenses using clean tissue.
- Insert the dry calibration standard ensuring the NTU value indication faces the receiver and the locating lug engages correctly.
- Start the verification
- Remove the dry standard and place it in its storage container.
- Refit the wiper unit (7998 011 and 012) or wiper plug (7998 016). Close the drain valve.
- Open the inlet valve and ensure that the flow through the sensor is 0.5 to 1.5 l/min




...13 Calibration procedures

...Turbidity

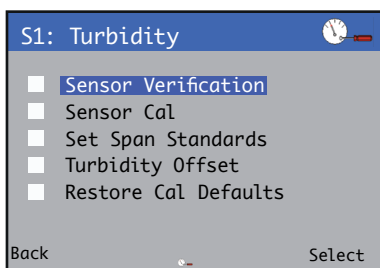
- At the Calibrate level, press the  key:




The Calibrate menu is displayed:







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

The Sensor calibration menu is displayed:

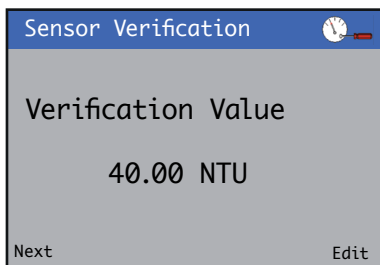


- Use the / keys to select Sensor Verification and press the  key to confirm selection.


The Verification Standard value is displayed.


- Use the  key to edit the Calibration Standard Value. Use the / keys to set the Calibration Standard Value and press the  key to confirm selection.

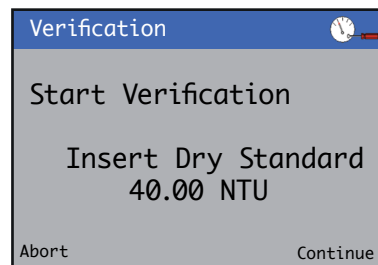
Press the  key to proceed to the next step.



The Start Verification prompt is displayed.


- Use the  key to start the calibration and proceed to the next step.

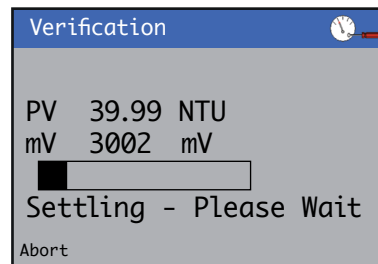
(Press the  key to abort the calibration.)



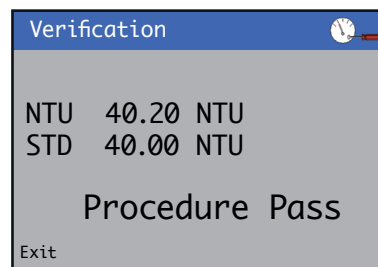
The verification progress is displayed.


The Turbidity and probe mV values are shown and after approximately 1 minute will automatically move onto the next step.


(Press the  key to abort the calibration.)



The verification results are displayed:



- Press the  key to exit the verification.

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

1-Point calibration


To perform a 1-point calibration using formazine span solution:

- Close the isolating valve installed upstream of the sensor.
- Close the sensor inlet valve and open the drain valve; allow the sensor to drain.
- Carefully remove the wiper unit (7998 011 and 012) or the wiper plug (7998 016) to aid complete drainage of the system. When the system is empty, close the drain valve.
- Thoroughly dry the flow chamber internally using clean tissue.
- Thoroughly clean and dry the emitter and receiver lenses using clean tissue.
- Fill the flow chamber with the formazine span solution and refit the wiper unit (7998 011 and 012) or wiper plug (7998 016).
- Start the calibration; a wipe is performed.
- When the calibration is complete open the drain valve.
- Allow the sensor to drain; ensure all the formazine span solution is removed.
- When the system is empty, close the drain valve.
- Open the inlet valve and ensure that the flow through the sensor is 0.5 to 1.5 l/min.

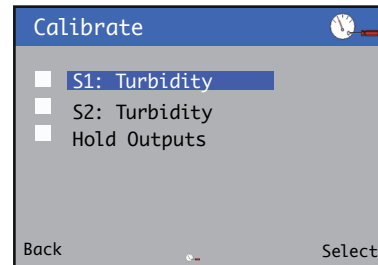
To perform a 1-point calibration using dry span standard:




- Close the isolating valve installed upstream of the sensor.
- Close the sensor inlet valve and open the drain valve; allow the sensor to drain.
- Carefully remove the wiper unit (7998 011 and 012) or the wiper plug (7998 016) to aid complete drainage of the system.
- When the system is empty close the drain valve.
- Thoroughly dry the flow chamber internally using clean tissue.
- Thoroughly clean and dry the emitter and receiver lenses using clean tissue.
- Insert the dry calibration standard with the NTU value indication facing the optical receiver ensuring the lug engages correctly.
- Start the calibration.
- When the calibration is complete, remove the dry standard and place it in its storage container.
- Refit the wiper unit (7998 011 and 012) or wiper plug (7998 016).
- Close the drain valve.
- Open the inlet valve and ensure that the flow through the sensor is 0.5 to 1.5 l/min.

1-Point calibration (manual)

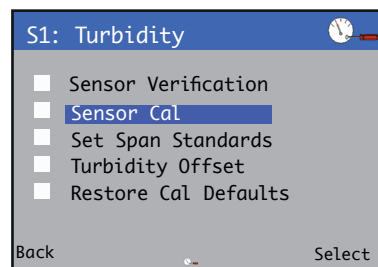
- 1 At the Calibrate level, press the  key:




The Calibrate menu is displayed:







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

The Sensor calibration menu is displayed:

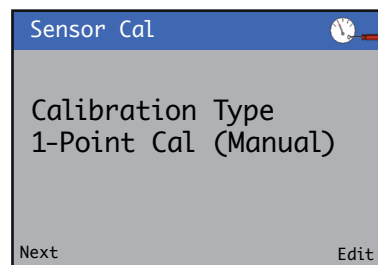


- 3 Use the / keys to select Sensor Cal and press the  key to confirm selection.

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  key to proceed to the next step.



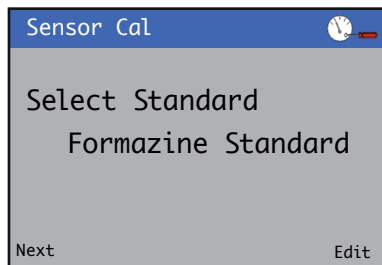
The Select Standard is displayed.

...13 Calibration procedures

...Turbidity

- 5 Use the  key to edit the Calibration Standard. Use the  keys to select the required Calibration Standard and press the  key to confirm selection.

Press the  key to proceed to the next step.



Sensor Cal

Select Standard

Formazine Standard

Next Edit

OR






Sensor Cal

Select Standard

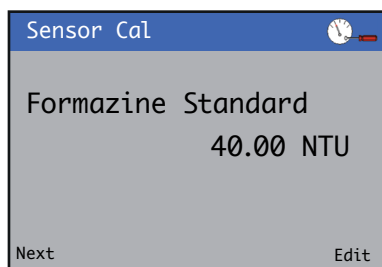
DRY Standard

Next Edit

The Calibration Standard value is displayed.

- 6 Use the  key to edit the Calibration Standard value. Use the  keys to set the Calibration Standard value and press the  key to confirm selection.

Press the  key to proceed to the next step.



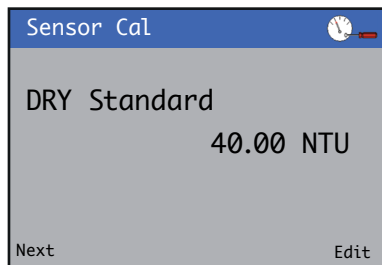
Sensor Cal

Formazine Standard

40.00 NTU

Next Edit

OR




Sensor Cal


DRY Standard

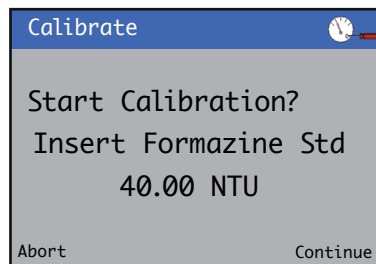
40.00 NTU

Next Edit

The Start Calibration prompt is displayed.

- 7 Use the  key to start the calibration and proceed to the next step.

(Press the  key to abort the calibration.)



Calibrate

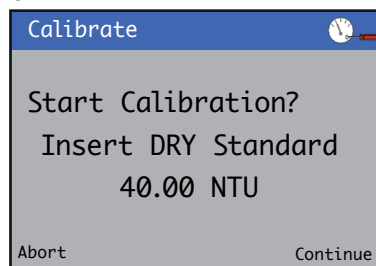
Start Calibration?

Insert Formazine Std

40.00 NTU

Abort Continue

OR



Calibrate

Start Calibration?


Insert DRY Standard

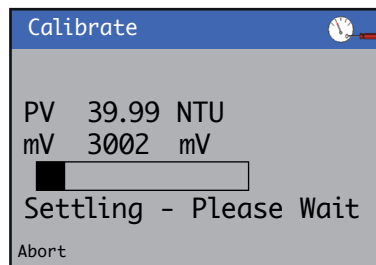
40.00 NTU

Abort Continue

The calibration progress is displayed.

The Turbidity and probe mV values are shown and after approximately 1 minute automatically move on to the next step.

(Press the  key to abort the calibration.)



Calibrate


PV 39.99 NTU

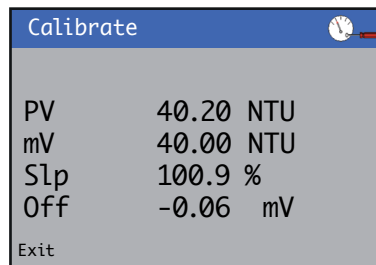
mV 3002 mV

Settling - Please Wait

Abort

The calibration results are displayed.

(Press the  key to exit the calibration.)



Calibrate

PV 40.20 NTU

mV 40.00 NTU


Slp 100.9 %

Off -0.06 mV


Exit

On completion the result screen is displayed.

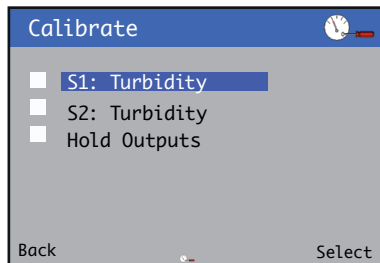
- If the calibration passes the new settings are displayed.
- If the calibration fails the reason for failure is displayed.




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

1-Point calibration (automatic)

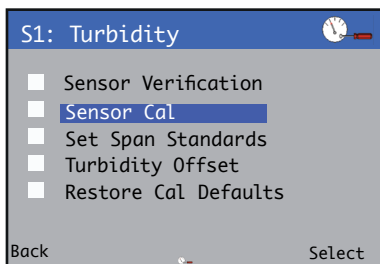
- 1 At the Calibrate level, press the  key:




The Calibrate menu is displayed:







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

The Sensor calibration menu is displayed:

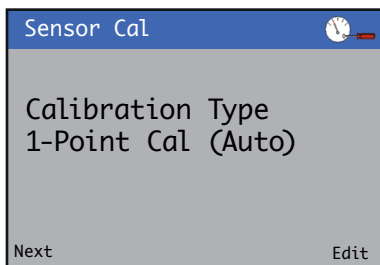


- 3 Use the / keys to select Sensor Cal and press the  key to confirm selection.





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.

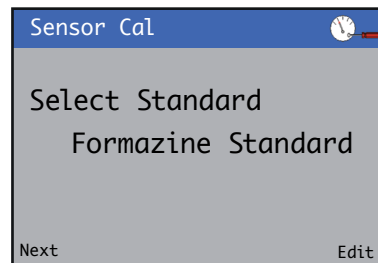
Press the  key to proceed to the next step.



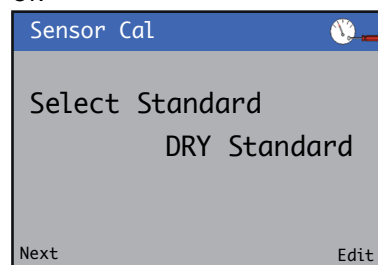
The Select Standard is displayed.

- 5 Use the  key to edit the Calibration Standard. Use the / keys to select the required Calibration Standard and press the  key to confirm selection.


Press the  key to proceed to the next step.




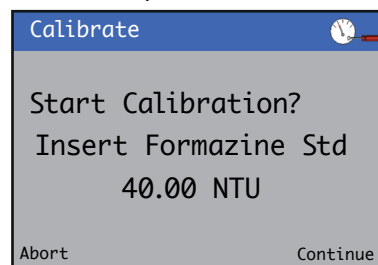
OR



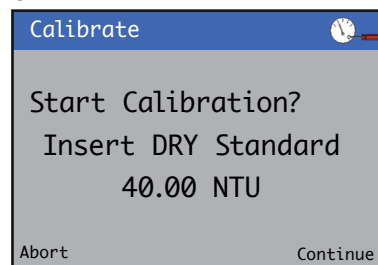
The Start Calibration prompt is displayed.

- 6 Use the  key to start the calibration and proceed to the next step.

(Press the  key to abort the calibration.)



OR




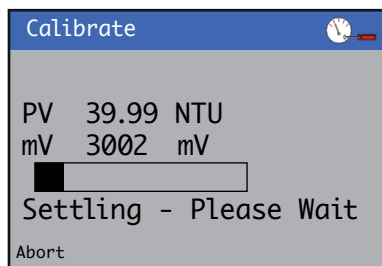
The calibration progress is displayed.

...13 Calibration procedures


...Turbidity

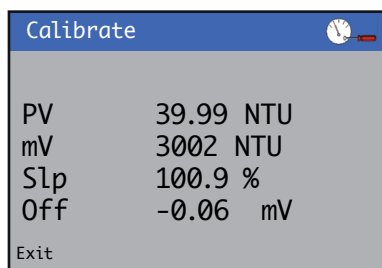
The Turbidity and probe mV values are shown and after approximately 1 minute automatically move on to the next step.

(Press the  key to abort the calibration.)




The calibration results are displayed.

(Press the  key to exit the calibration.)



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 process can be canceled at any time by pressing the **Abort** key (.

2-Point calibration


To perform a 2-point calibration using formazine span solution:

- Close the isolating valve installed upstream of the sensor.
- Close the sensor inlet valve and open the drain valve; allow the sensor to drain.
- Carefully remove the wiper unit (7998 011 and 012) or the wiper plug (7998 016) to aid complete drainage of the system. When the system is empty, close the drain valve.
- Thoroughly dry the flow chamber internally using clean tissue.
- Thoroughly clean and dry the emitter and receiver lenses using clean tissue.
- Insert the dry calibration standard with the zero NTU indication facing the optical receiver ensuring the lug engages correctly.
- Start the zero calibration.
- After approximately 1 minute the display moves to the next frame automatically.
- Remove the dry standard and place it in its storage container.
- Fill the flow chamber with the formazine span solution and refit the wiper unit (7998 011 and 012) or wiper plug (7998 016).
- Start the span calibration; a wipe is performed.
- When the calibration is complete, open the drain valve. Allow the sensor to drain. Ensure all the formazine span solution is removed.
- When the system is empty, close the drain valve.
- Open the inlet valve and ensure that the flow through the sensor is 0.5 to 1.5 l/min.

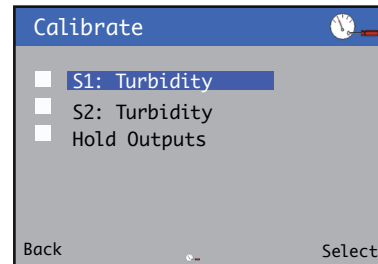
To perform a 2-point DRY standard calibration:




- Close the isolating valve installed upstream of the sensor.
- Close the sensor inlet valve and open the drain valve. Allow the sensor to drain.
- Carefully remove the wiper unit (7998 011 and 012) or the wiper plug (7998 016) to aid complete drainage of the system.
- Thoroughly dry the flow chamber internally using clean tissue.
- Thoroughly clean and dry the emitter and receiver lenses using clean tissue.
- Insert the dry calibration standard with the zero NTU indication facing the optical receiver ensuring the lug engages correctly.
- Start the zero calibration
- After approximately one minute the display will automatically move to the next frame.
- Remove the dry standard, rotate it through 180° and refit it, ensuring the NTU value indication faces the receiver and the locating lug engages correctly.
- Start the span calibration.
- When the calibration is complete. Remove the dry standard and place it in its storage container.
- Refit the wiper unit (7998 011 and 012) or wiper plug (7998 016). Close the drain valve.
- Open the inlet valve and ensure that the flow through the sensor is 0.5 to 1.5 l/min.

2-Point calibration (manual)

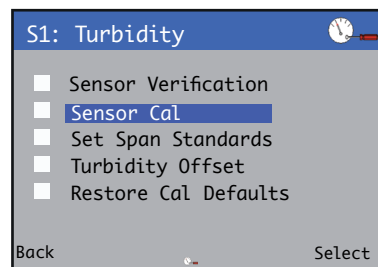
- 1 At the Calibrate level, press the  key:




The Calibrate menu is displayed:







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

The Sensor calibration menu is displayed:

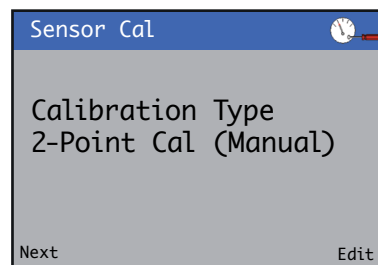


- 3 Use the / keys to select Sensor Cal and press the  key to confirm selection.

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  key to proceed to the next step.



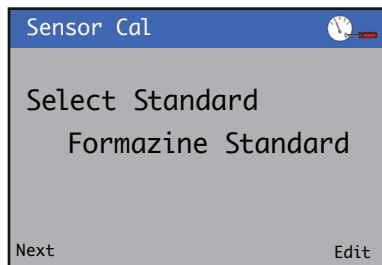
The Select Standard is displayed.

...13 Calibration procedures

...Turbidity

- 5 Use the  key to edit the Calibration Standard. Use the / keys to select the required Calibration Standard and press the  key to confirm selection.

Press the  key to proceed to the next step.



Sensor Cal

Select Standard

Formazine Standard

Next Edit

OR







Sensor Cal

Select Standard

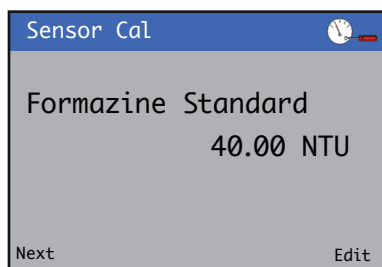
DRY Standard

Next Edit

The Calibration Standard value is displayed.

- 6 Use the  key to edit the Calibration Standard value. Use the / keys to set the Calibration Standard value and press the  key to confirm selection.

Press the  key to proceed to the next step.



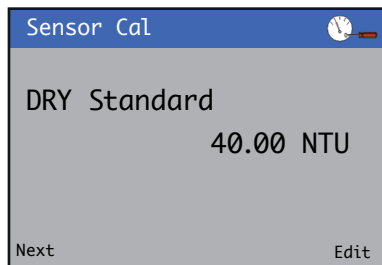
Sensor Cal

Formazine Standard

40.00 NTU

Next Edit

OR




Sensor Cal


DRY Standard

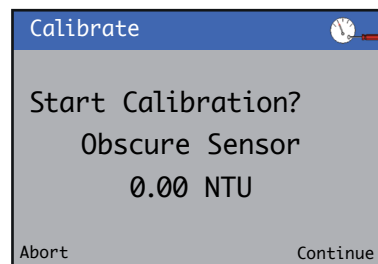
40.00 NTU

Next Edit

The Start Calibration prompt is displayed.

- 7 Use the  key to start the calibration and proceed to the next step.

(Press the  key to abort the calibration.)



Calibrate

Start Calibration?


Obscure Sensor

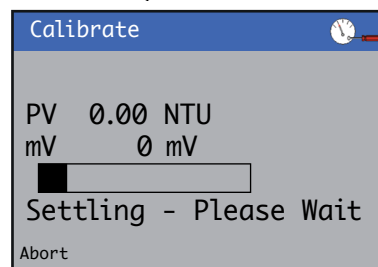
0.00 NTU

Abort Continue

The calibration progress is displayed.

The Turbidity and probe mV values are shown and after approximately 1 minute automatically move on to the next step.

(Press the  key to abort the calibration.)



Calibrate


PV 0.00 NTU


mV 0 mV

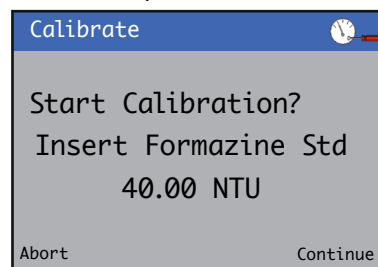
Settling - Please Wait

Abort

The Start Calibration prompt is displayed.

- 8 Use the  key to start the calibration and proceed to the next step.

(Press the  key to abort the calibration.)



Calibrate

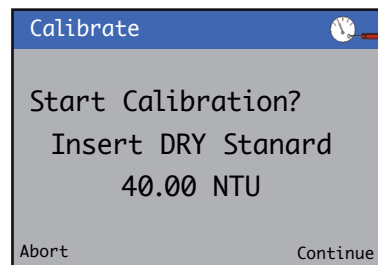
Start Calibration?

Insert Formazine Std

40.00 NTU

Abort Continue

OR



Calibrate

Start Calibration?


Insert DRY Standard

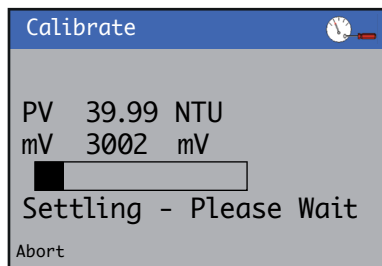
40.00 NTU


Abort Continue

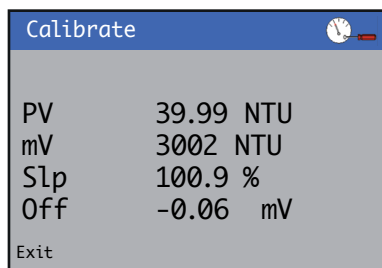
The calibration progress is displayed.

The Turbidity and probe mV values are shown and after approximately 1 minute automatically move on to the next step.


(Press the  key to abort the calibration.)




The calibration results are displayed.
(Press the  key to exit the calibration.)



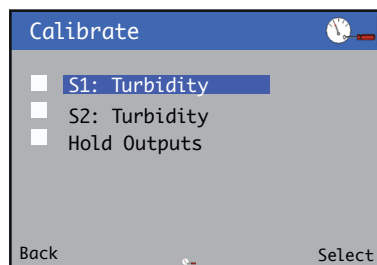
On completion the result screen is displayed.




- If the calibration passes the new settings are displayed.
 - If the calibration fails the reason for failure is displayed.
- Note.** The calibration process can be canceled at any time by pressing the **Abort** key (.

2-Point calibration (automatic)

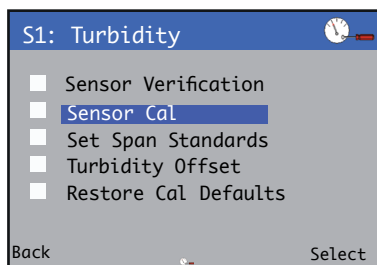
- 1 At the Calibrate level, press the  key:




The **Calibrate** menu is displayed:







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

The **Sensor calibration** menu is displayed:

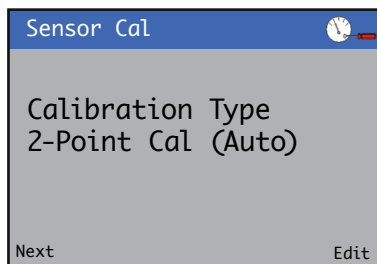


- 3 Use the / keys to select **Sensor Cal** and press the  key to confirm selection.

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  key to proceed to the next step.



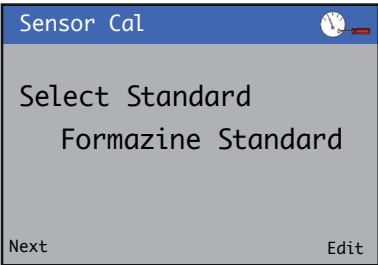
The **Select Standard** is displayed.

...13 Calibration procedures

...Turbidity

- 5 Use the  key to edit the Calibration Standard. Use the / keys to select the required Calibration Standard and press the  key to confirm selection.


Press the  key to proceed to the next step.




OR



The Start Calibration prompt is displayed.


- 6 Use the  key to start the calibration and proceed to the next step.

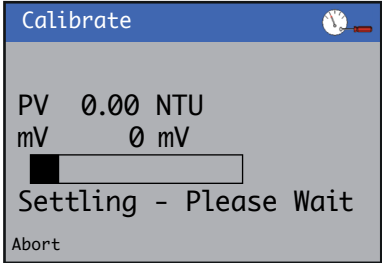
(Press the  key to abort the calibration.)




The calibration progress is displayed.


The Turbidity and probe mV values are shown and after approximately 1 minute automatically move on to the next step.

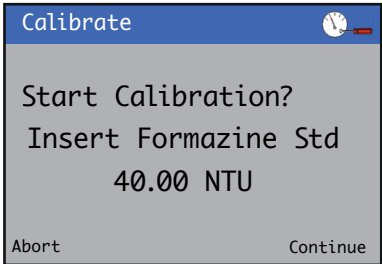
(Press the  key to abort the calibration.)



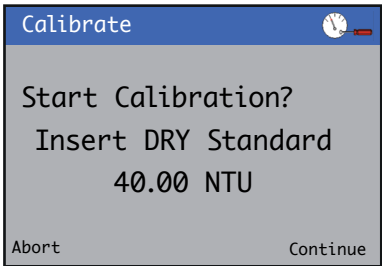
The Start Calibration prompt is displayed.


- 7 Use the  key to start the calibration and proceed to the next step.


(Press the  key to abort the calibration.)

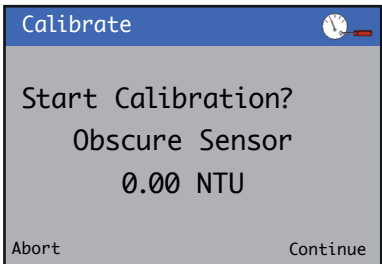


OR




The calibration progress is displayed Use the  key to start the calibration and proceed to the next step.

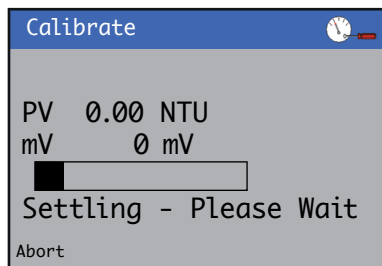
(Press the  key to abort the calibration.)




The calibration progress is displayed.

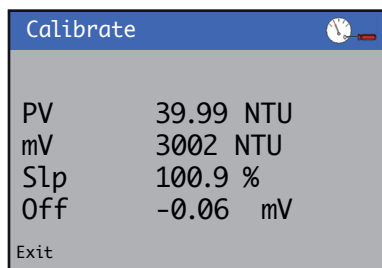
The Turbidity and probe mV values are shown and after approximately 1 minute automatically move on to the next step.

(Press the  key to abort the calibration.)




The calibration results are displayed.

(Press the  key to exit the calibration.)




On completion the result screen is displayed.

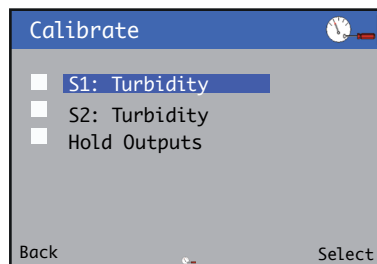
- If the calibration passes the new settings are displayed.
- If the calibration fails the reason for failure is displayed.




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

Set span standard

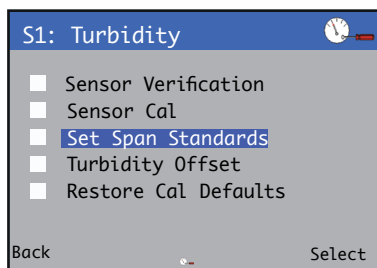
- 1 At the Calibrate level, press the  key:




The **Calibrate** menu is displayed:



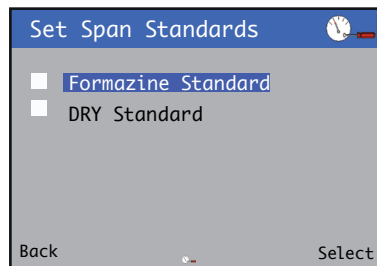
- 2 Use the / keys to select the sensor to be calibrated, and press the  key to confirm selection.




The **Sensor calibration** menu is displayed:



- 3 Use the / keys to select **Set Span Standards** and press the  key to confirm selection.

The **Set Span Standards** menu is displayed.







- 4 Use the / keys to select the **Span Standard** and press the  key to confirm selection.

The calibration standard value is displayed.

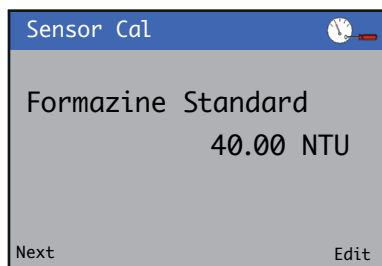
...13 Calibration procedures

...Turbidity

- 5 Use the  key to edit the calibration standard value.

Use the / keys to set the calibration standard value and press the  key to confirm selection.

Press the  key to proceed to the next step.

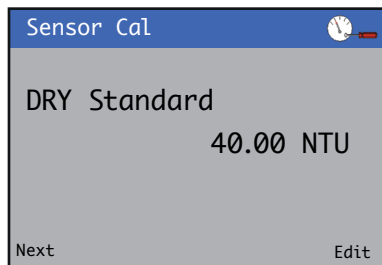


Sensor Cal

Formazine Standard
40.00 NTU

Next Edit

OR



Sensor Cal

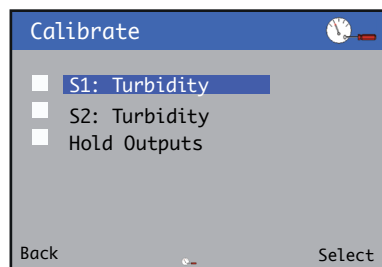
DRY Standard
40.00 NTU

Next Edit

Manual Offset adjustment

- 1 At the Calibrate level, press the  key:




The Calibrate menu is displayed:



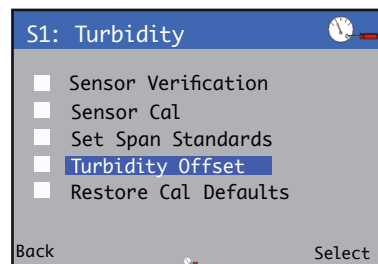
Calibrate

- ☒ S1: Turbidity
- ☐ S2: Turbidity
- ☐ Hold Outputs

Back Select

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




The **Turbidity Offset** calibration menu is displayed:

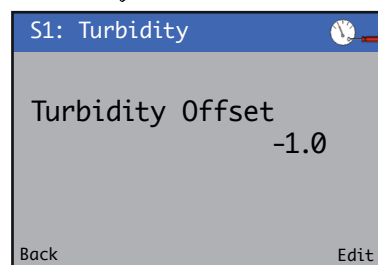


S1: Turbidity

- ☐ Sensor Verification
- ☐ Sensor Cal
- ☐ Set Span Standards
- ☒ Turbidity Offset
- ☐ Restore Cal Defaults

Back Select

- 3 Use the / keys to select **Turbidity Offset** and press the  key to confirm selection.

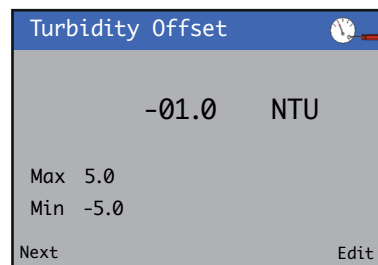


S1: Turbidity

Turbidity Offset
-1.0

Back Edit

The **Turbidity Offset** is displayed.







Turbidity Offset

-01.0 NTU

Max 5.0
Min -5.0

Next Edit

- 4 Use the  key to edit the Turbidity Offset value.

Use the / keys to set the required **Turbidity Offset** value and press the  key to confirm selection.

Press the  key to proceed to the next step.

For the Low Range sensors, the adjustment is ± 2.000 NTU and for the High Range sensors, the adjustment is ± 5.0 NTU.

Note. The **Turbidity Offset** is reset to 0.0 NTU when a calibration has been initiated, or default calibration is restored.

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 72.	
Turbidity Cal	See Turbidity calibration – page 73. There are two possible calibration modes: <ul style="list-style-type: none">• 1-point• 2-point	
TSS Cal	See TSS calibration – page 75. There are two possible calibration modes: <ul style="list-style-type: none">• 1-point• 2-point	
TSS Manual Cal	See TSS manual calibration – page 77.	
Sample Collection	See In process calibrations – page 78.	
Collection Complete	See In process calibrations page 78.	
Restore Cal Defaults	Resets slope and offset values to default values.	

...13 Calibration procedures

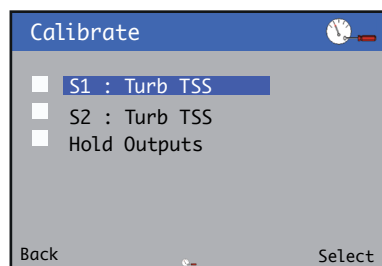
Turbidity TSS sensor verification




Preparing the verification tool and locking the sensor in place

Refer to operating instruction [OI/ATS430-EN](#).

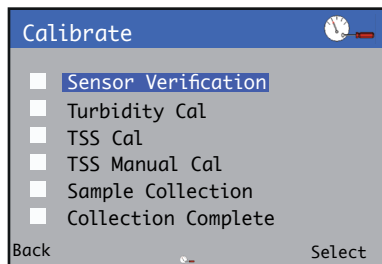
- 1 At the Calibrate level, press the  key:




The Calibrate menu is displayed:



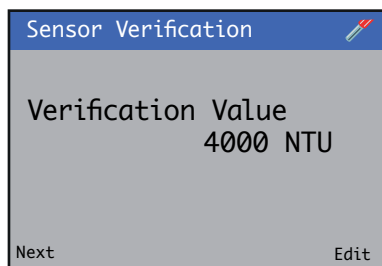
- 2 Use the / keys to select the sensor to be calibrated, and press the  key to confirm selection.





The TSS calibration menu is displayed:



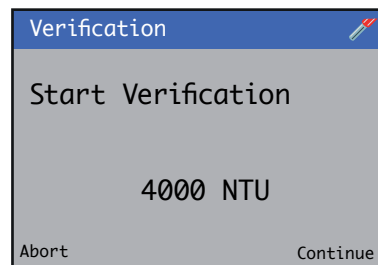
- 3 Press the / keys to select Sensor Verification and press the  key to confirm selection.


The Verification Value is displayed:



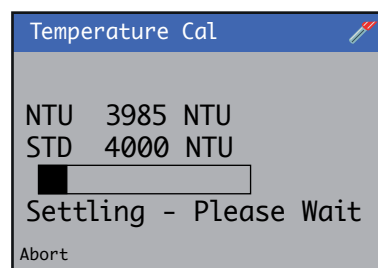
- 4 Use the  key to edit the verification value. Use the / keys to set the value and press the  key to confirm changes.

Press the  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

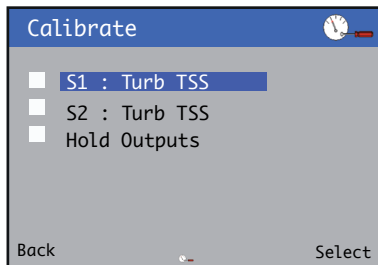
Note. The verification process can be canceled at any time during the process by pressing the **Abort** key ().




Turbidity TSS calibration

1-Point calibration

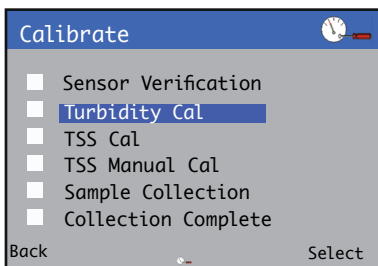
- 1 At the Calibrate level, press the  key:




The Calibrate menu is displayed:



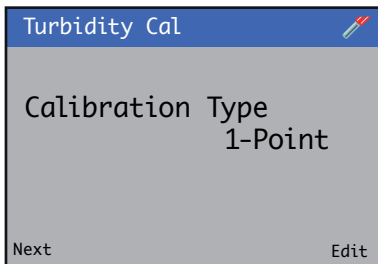
- 2 Use the / keys to select the sensor to be calibrated, and press the  key to confirm selection.





The Turbidity Cal menu is displayed:



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

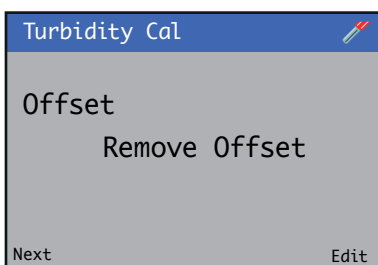
The Calibration Type is displayed:



- 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  key to proceed to the next step.

The Offset setting is displayed:



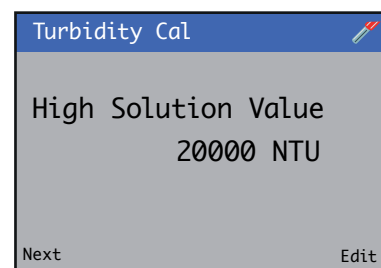
- 5 For most cases a zero offset is suitable. However, in situations where an offset was previously determined during a 2-point calibration, it is possible to retain the previously measured offset during the 1-point calibration.





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.

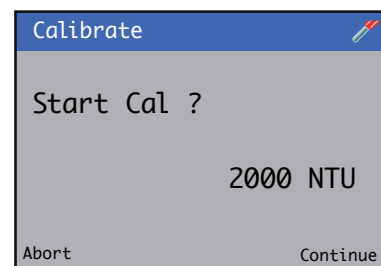
Press the  key to proceed to the next step.


The High Solution Value is displayed:



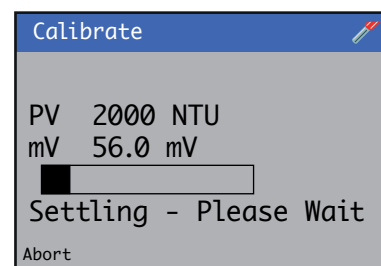
- 6 Use the  key to edit the solution value. Use the / keys to set the value and press the  key to confirm changes.

Press the  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 ().

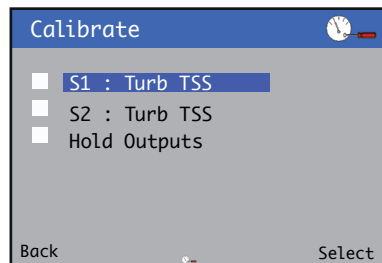
...13 Calibration procedures




...Turbidity TSS calibration

2-Point calibration

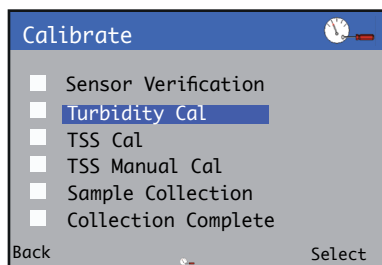
- 1 At the Calibrate level, press the  key:




The Calibrate menu is displayed:



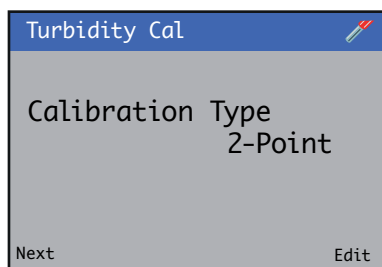
- 2 Use the / keys to select the sensor to be calibrated, and press the  key to confirm selection.





The Turbidity Cal menu is displayed:



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

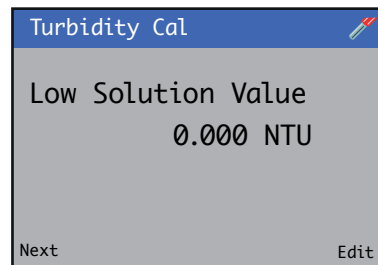
The Calibration Type is displayed:







- 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  key to proceed to the next step.

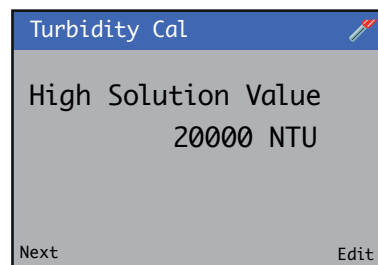
The Low Solution Value is displayed:







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

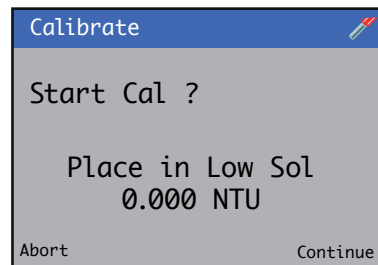
Press the  key to proceed to the next step.


The High Solution Value is displayed:



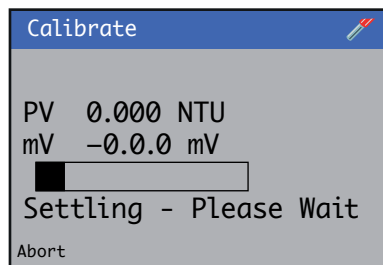
- 6 Use the  key to edit the solution value. Use the / keys to set the value and press the  key to confirm changes.

Press the  key to proceed to the next step.

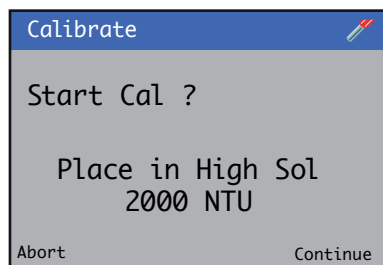



- 7 Ensure the sensor is inserted in the solution and press the  key to start the verification routine.

The calibration process screen is displayed:

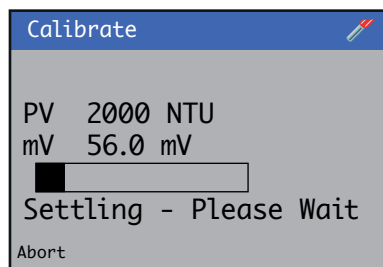


- If the calibration fails the result screen is displayed with the reason for failure.
- If the calibration passes the procedure moves automatically to the high buffer calibration.




- 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.

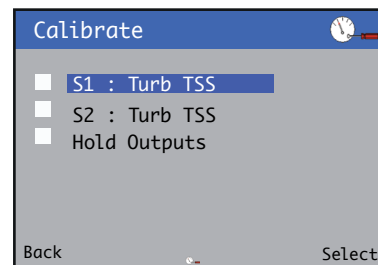
Note. The calibration can be canceled at any time during the process by pressing the **Abort** key (.




TSS calibration

1-Point calibration

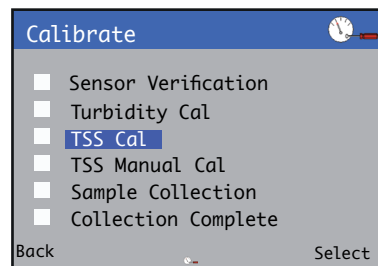
- 1 At the Calibrate level, press the  key:




The **Calibrate** menu is displayed:



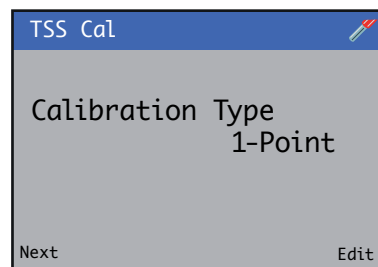
- 2 Use the / keys to select the sensor to be calibrated, and press the  key to confirm selection.

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:



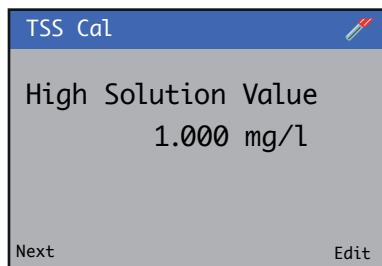
...13 Calibration procedures

...Turbidity TSS calibration

- 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 High Solution Value is displayed:



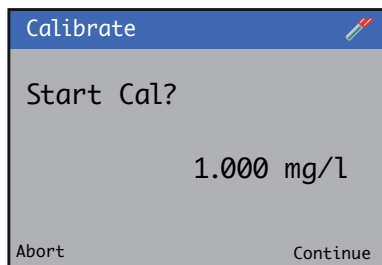
TSS Cal

High Solution Value
1.000 mg/l

Next Edit

- 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  key to proceed to the next step.



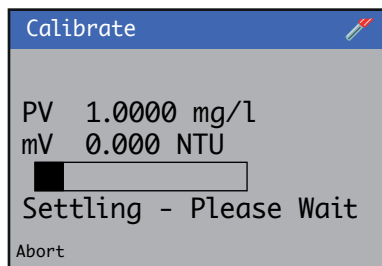
Calibrate

Start Cal?
1.000 mg/l

Abort Continue

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

The calibration process screen is displayed:



Calibrate


PV 1.0000 mg/l
mV 0.000 NTU

Settling - Please Wait

Abort

On completion the result screen is displayed.

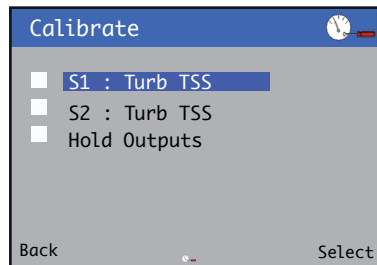
- If the calibration passes the new settings are displayed.
- If the calibration fails the reason for failure is displayed.

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:



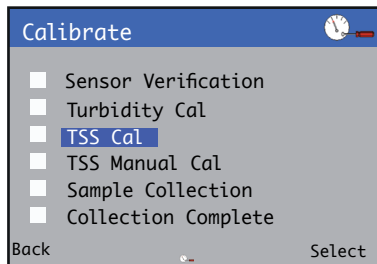
Calibrate

☐ S1 : Turb TSS
☐ S2 : Turb TSS
☐ Hold Outputs

Back Select

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



The Turbidity Cal menu is displayed:



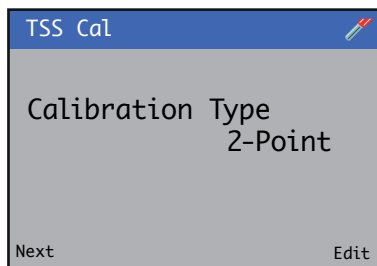
Calibrate

☐ Sensor Verification
☐ Turbidity Cal
☒ TSS Cal
☐ TSS Manual Cal
☐ Sample Collection
☐ Collection Complete

Back Select

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





The Calibration Type is displayed:



TSS Cal

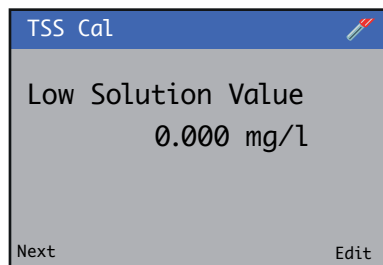
Calibration Type
2-Point

Next Edit

- 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 **Low Solution Value** is displayed:



TSS Cal

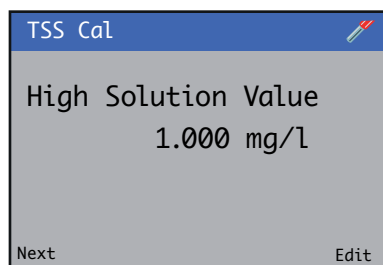
Low Solution Value
0.000 mg/l

Next Edit

- 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  key to proceed to the next step.





The **High Solution Value** is displayed:



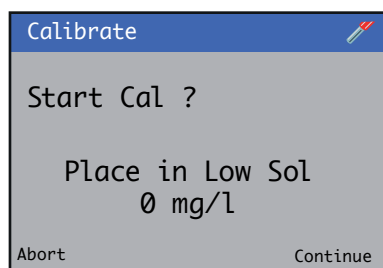
TSS Cal

High Solution Value
1.000 mg/l

Next Edit

- 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  key to proceed to the next step.




Calibrate

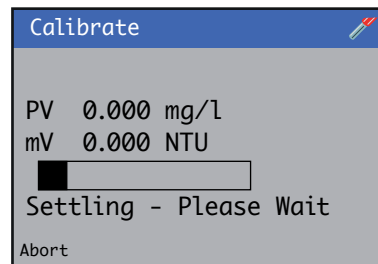
Start Cal ?

Place in Low Sol
0 mg/l

Abort Continue

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

The calibration process screen is displayed:



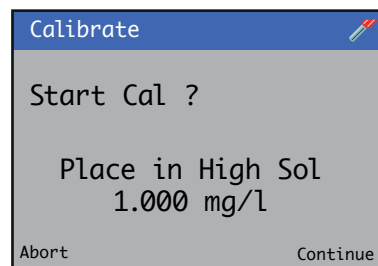
Calibrate

PV 0.000 mg/l
mV 0.000 NTU

Settling - Please Wait

Abort

- 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.




Calibrate

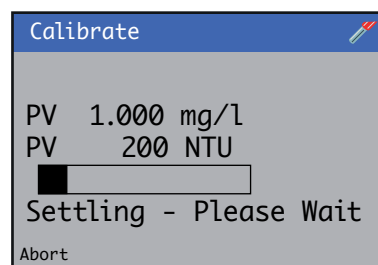
Start Cal ?

Place in High Sol
1.000 mg/l

Abort Continue

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

The calibration process screen is displayed:



Calibrate


PV 1.000 mg/l
PV 200 NTU

Settling - Please Wait

Abort

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.

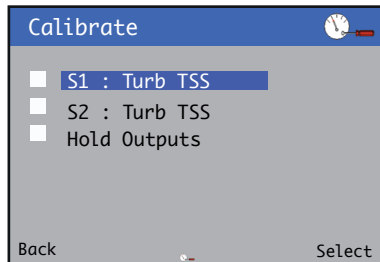
Note. The calibration can be canceled at any time during the process by pressing the **Abort** key ().




...13 Calibration procedures

TSS manual calibration

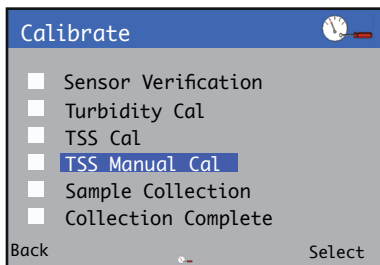
- 1 At the Calibrate level, press the  key:




The Calibrate menu is displayed:



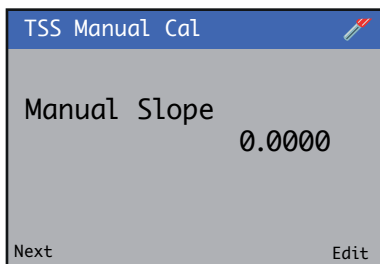
- 2 Use the / keys to select the sensor to be calibrated, and press the  key to confirm selection.





The TSS Manual Cal menu is displayed:



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

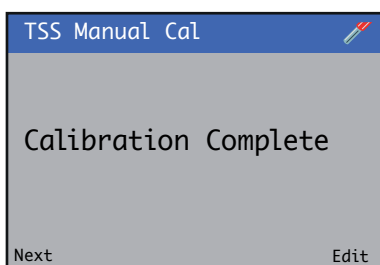
The calibration slope is displayed:



- 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  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

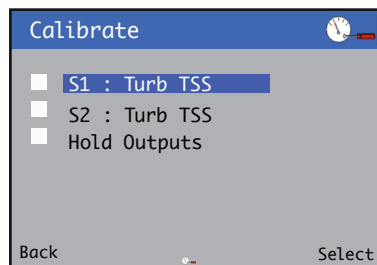
- The Total suspended solids of the sample is measured in the laboratory and entered into the transmitter.




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

Sample collection

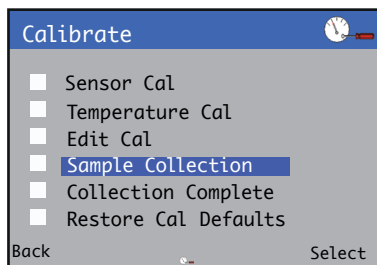
- 1 At the Calibrate level, press the  key:

The Calibrate menu is displayed:

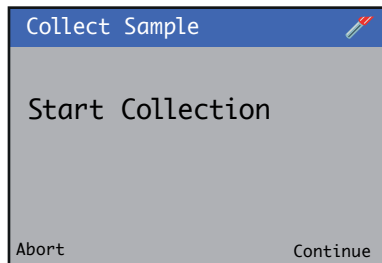


- 2 Use the / keys to select the sensor to be calibrated, and press the  key to confirm selection.

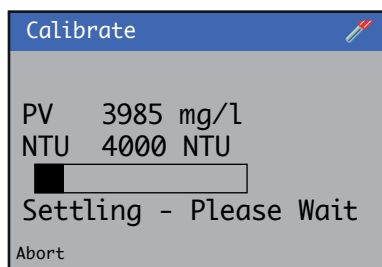
The Sample Collection menu is displayed:



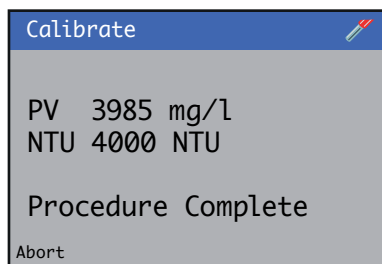
- 3 Use the Δ/∇ keys to select **Sample Collection** and press the ∇ key to proceed to the next step.



- 4 Press the ∇ key to proceed to the next step.
The collection process screen is displayed:



On completion the collection complete screen is displayed:



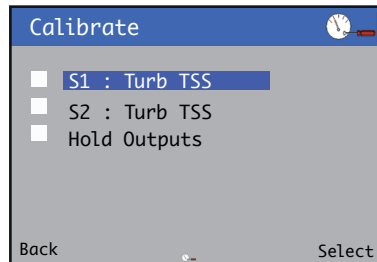
The value of the sample turbidity is now stored.

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

Collection complete

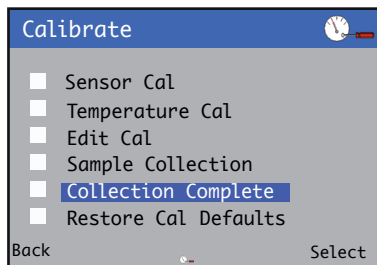
- 1 At the **Calibrate** level, press the ∇ key:

The **Calibrate** menu is displayed:

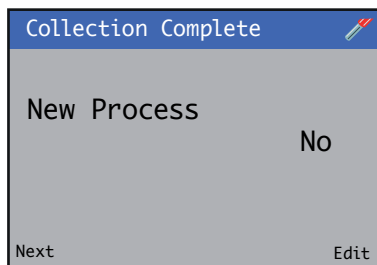


- 2 Use the Δ/∇ keys to select the sensor to be calibrated, and press the ∇ key to confirm selection.

The **Collection Complete** menu is displayed:







- 3 Use the Δ/∇ keys to select **Collection Complete** and press the ∇ key to proceed confirm selection.



...13 Calibration procedures

...In Process calibration

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

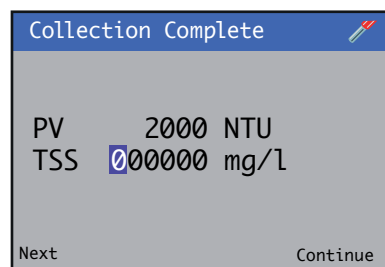
Use the / keys to select **Yes/No** and press the  key to confirm selection.

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](#).

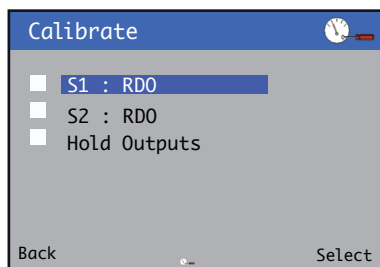
Menu	Comment	Default
Sensor Calibration	See Dissolved oxygen calibration . There are two possible calibration modes: • 1-point (water-saturated air) • 2-point (100 % and 0 % saturation)	




Dissolved oxygen calibration

1-Point calibration

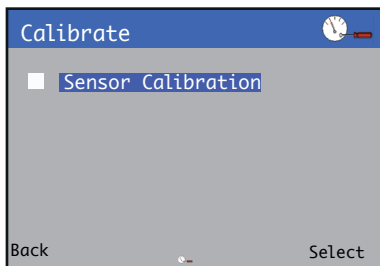
- At the Calibrate level, press the  key:


The Calibrate menu is displayed:



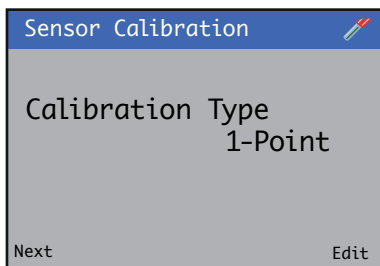
- Use the / keys to select the sensor to be calibrated, and press the  key to confirm selection.





The RDO calibration menu is displayed:



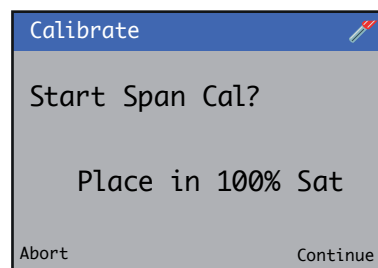
- Press the  key to confirm selection.


The Calibration Type is displayed:



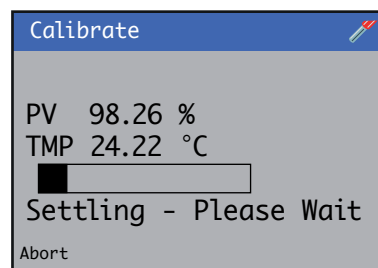
- Use the  key to edit the Calibration Type. Use the / keys to select the required Calibration Type and press the  key to confirm selection.

Press the  key to proceed to the next step.




- 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 ().

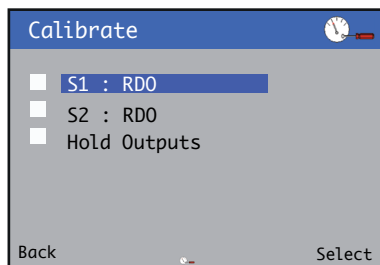
...13 Calibration procedures




...Dissolved oxygen calibration

2-Point calibration

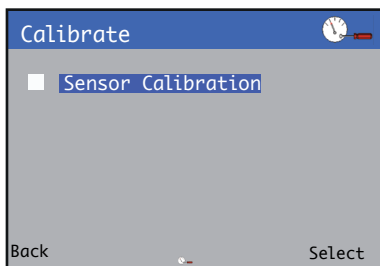
- At the Calibrate level, press the  key:


The Calibrate menu is displayed:



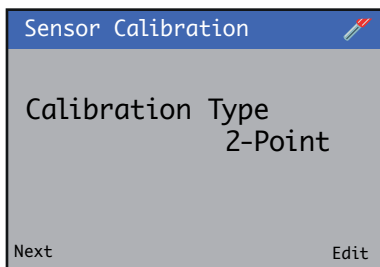
- Use the / keys to select the sensor to be calibrated, and press the  key to confirm selection.





The RDO calibration menu is displayed:



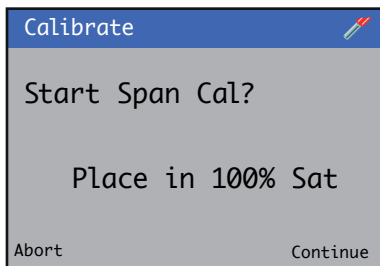
- Press the  key to confirm selection.


The Calibration Type is displayed:



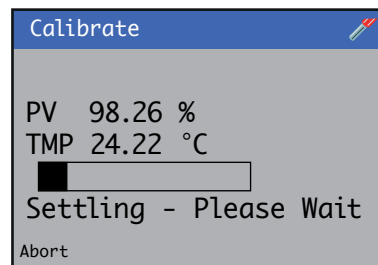
- Use the  key to edit the Calibration Type. Use the / keys to select the required Calibration Type and press the  key to confirm selection.

Press the  key to proceed to the next step.

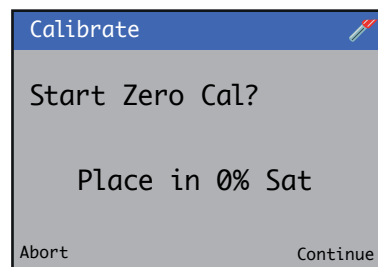



- Ensure the sensor is subjected to 100 % saturation and press the  key to start the calibration process.

The calibration process screen is displayed:

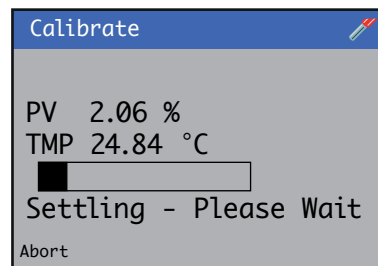


- If the calibration fails the result screen is displayed with the reason for failure.
- If the calibration passes the procedure moves automatically to the high buffer calibration.




- 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 ().

14 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 8 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 24.
	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_4 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.












...14 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.	<ol style="list-style-type: none"> 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 24. 6. If Sensor Write Error persists, contact local service organization.
	Alarm Active	One or more of the process alarms (1 to 8) is active.	<p>Check the process and make any adjustments required.</p> <p>If the alarm condition has passed but the diagnostic remains active, acknowledge the alarm via the Operator menu.</p>
	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.









...14 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

...14 Troubleshooting

...Diagnostic messages

...pH diagnostics

NAMUR icon	Diagnostic message	Cause	Recovery action
	S(n): Process Temp Out of Range	<p>Solution temperature is outside the measurement range of the sensor.</p> <p>Refer to the sensor data sheet to determine the temperature range.</p>	<p>Ensure that the solution temperature is within the sensor measurement limits.</p> <p>Check the process and reduce the effect of any potential heat sources.</p> <p>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.</p>
	S(n): Reference Warning	<p>The measurements taken from the reference electrodes indicate that the reference electrodes are becoming contaminated (Reference Poisoning).</p> <p>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.</p>	<p>Visually inspect sensor tip for signs of damage or dirt and clean if necessary.</p> <p>Contact local service organization to order a new sensor.</p>
	S1: Slope Low	<p>The pH sensor is reaching the end of its serviceable life.</p> <p>A pH sensor degrades over time. As this happens the slope calculated by a calibration procedure gradually decreases.</p> <p>A Low Slope Limit is configured in Sensor Setup – see page 24.</p> <p>If the slope calculated by a calibration procedure is less than Low Slope Limit, the calibration fails.</p> <p>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.</p>	<ol style="list-style-type: none"> 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.	<p>Move the sensor to a location where the ambient temperature within the operating range.</p> <p>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.</p>
	S(n): Ref. Blocked	<p>The measurement taken from the reference electrode indicates that the reference electrode is blocked.</p> <p>This warning may also occur if the probe is not properly immersed in solution.</p>	<p>Visually inspect sensor tip for signs of damage or dirt and clean if necessary.</p> <p>Ensure pH probe is submersed in solution.</p> <p>If Reference Blocked persists, contact local service organization.</p>
	S(n): Out of Solution	Sensor readings indicate that the sensor is not properly immersed in process solution.	<p>Visually inspect the sensor for signs of damage and clean the tip if necessary.</p> <p>Check that the sensor is properly immersed in the process solution.</p> <p>If Out of Solution persists, contact local service organization.</p>
	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.









...14 Troubleshooting

...Diagnostic messages

Turbidity diagnostics

NAMUR icon	Diagnostic message	Cause	Recovery action
	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) 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) 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): PV Out of Range	Check Function.	Check Function.
	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) 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 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.
	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.









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.

...14 Troubleshooting

...Diagnostic messages

...TSS diagnostics

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.

Appendix A 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

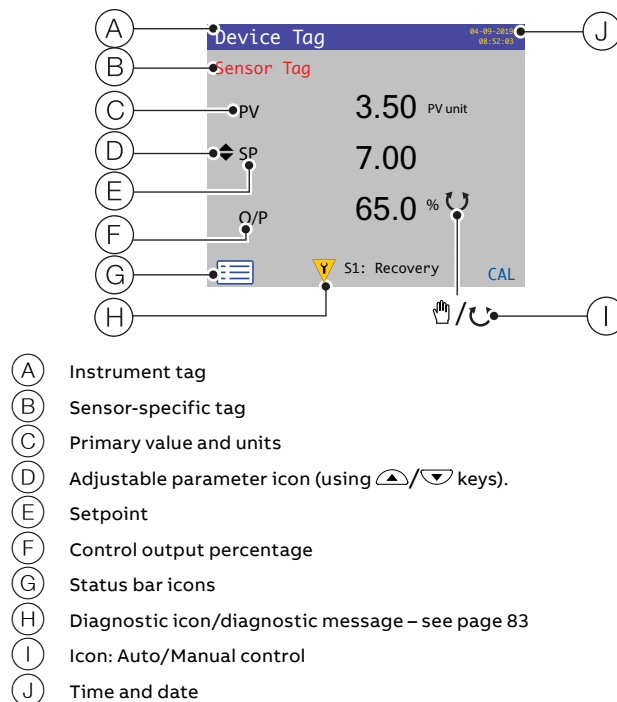


Figure 19 Operator page – reverse or direct-acting control

Dual-acting (Acid and Base) control

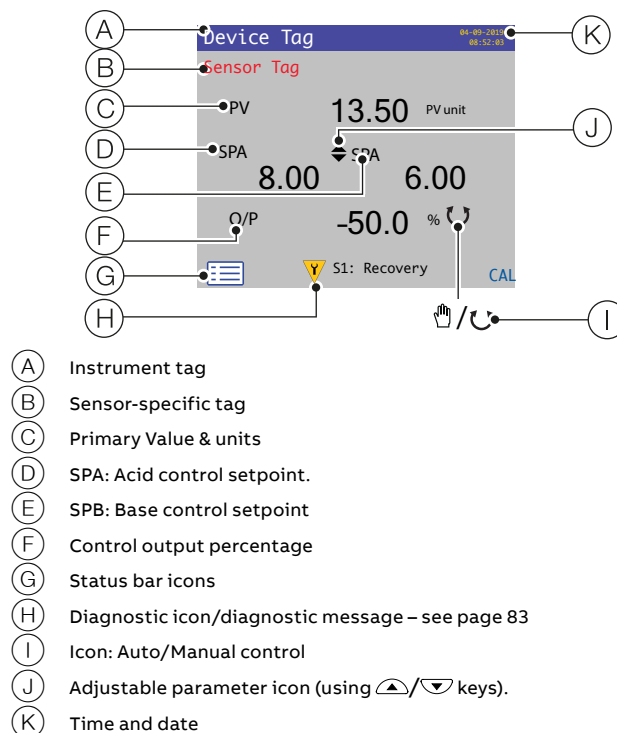


Figure 20 Operator page – dual-acting (Acid and Base) control

...Appendix A PID 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:

Operator menus

Operator menu access key

Autoscroll

Manual Hold

Enter Configuration

iguration

CAL

▲

◻

▲

▼

◻

▲

Control Mode

Control Mode

Adjust

Operator Views

Data Logs

Logs

Manual Hold

Autoscroll

Enter Configuration

Auto

● Manual

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

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

Control Mode

Adjust

Operator Views

Data Logs

Logs

Manual Hold

Autoscroll

Enter Configuration

SPA

● Output

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)

Control Mode

Adjust

Operator Views

Data Logs

Logs

Manual Hold

Autoscroll

Enter Configuration

SPA

SPB

● Output

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 21 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 21.

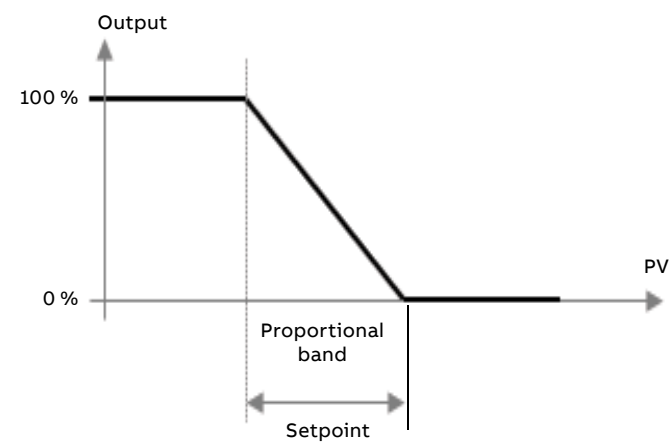


Figure 22 Reverse-acting control

- 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 21.

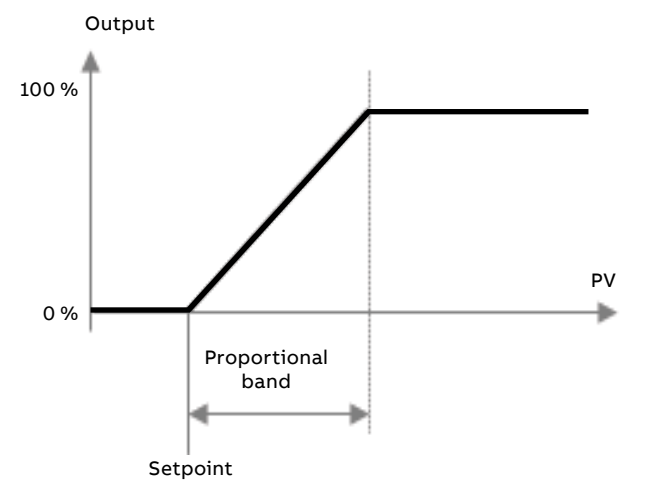


Figure 23 Direct-acting control

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

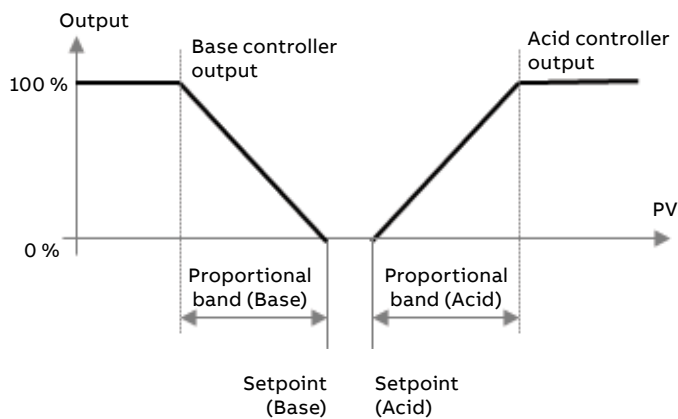


Figure 24 Dual-acting control

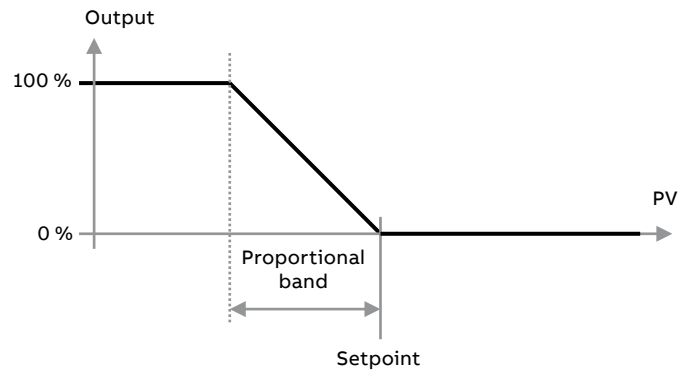
Manual Reset (proportional band offset)

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).

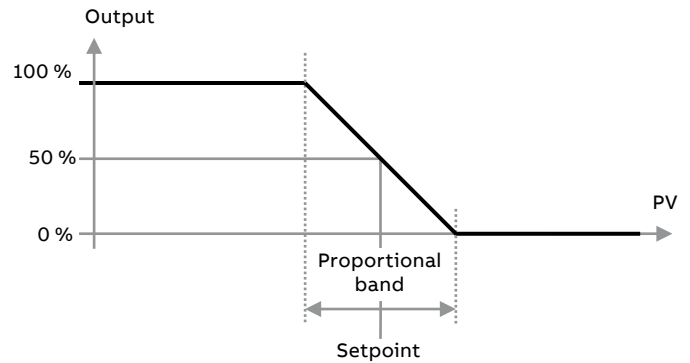
When the process variable is equal to the control setpoint, the output value is equal to the Manual Reset value – this effectively changes the position of the proportional band.

* By default the manual reset value is zero.

Manual Reset = 0 %



Manual Reset = 50 %



Manual Reset = 100 %

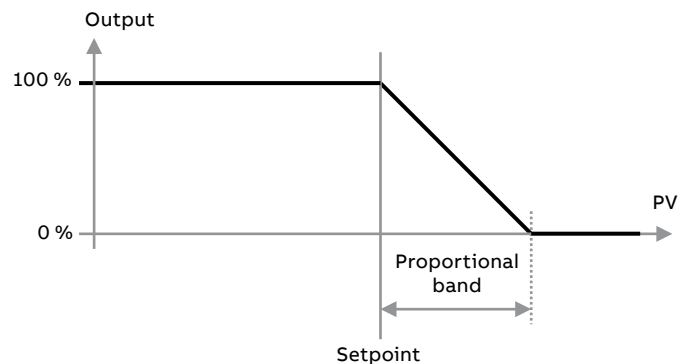


Figure 25 Manual Reset (proportional band offset)

...Appendix A PID control

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.

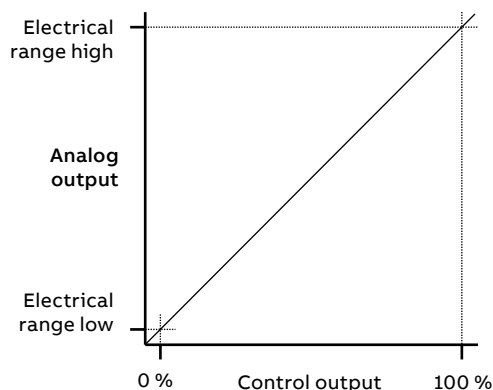


Figure 26 Analog output

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

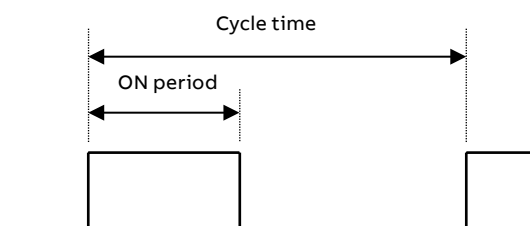


Figure 27 Analog output

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

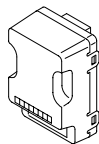
Appendix B Spares

Sensor module assemblies

AWT420 pH/ORP PCB upgrade/spares kit

Part number

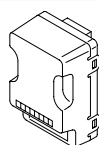
3KXA877420L0014



AWT420 2-electrode conductivity PCB upgrade/spares kit

Part number

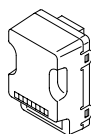
3KXA877420L0013



AWT420 4-electrode conductivity PCB upgrade/spares kit

Part number

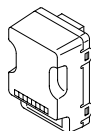
3KXA877420L0011



AWT420 Turbidity PCB upgrade/spares kit

Part number

3KXA877420L0016

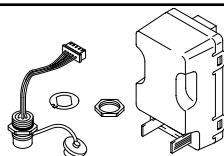


EZLink module assemblies

AWT420 EZLink PCB upgrade/spares kit

Part number

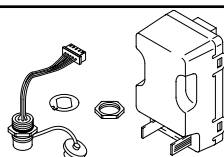
3KXA877420L0015



AWT420 EZLink HazLoc PCB upgrade/spares kit

Part number

3KXA877420L0018

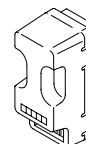


Communications module assemblies

AWT420 HART PCB upgrade/spares kit

Part number

3KXA877420L0051



AWT420 Profibus PCB upgrade/spares kit

Part number

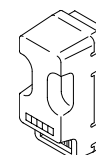
3KXA877420L0052



AWT420 Modbus PCB upgrade/spares kit

Part number

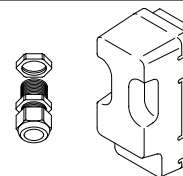
3KXA877420L0054



AWT420 Ethernet PCB upgrade/spares kit

Part number

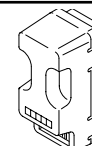
3KXA877420L0065



AWT420 analog output PCB upgrade/spares kit

Part number

3KXA877420L0056

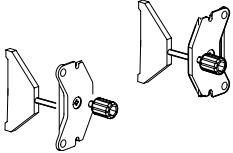


...Appendix B Spares

Mounting kits

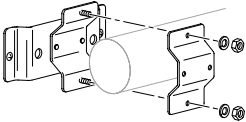
Panel-mount kit

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



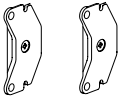
Pipe-mount kit

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



Wall-mount kit

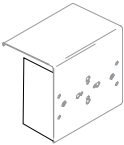
Part number	
3KXA877210L0105	Wall-mount kit



Weathershield kits

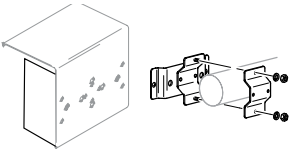
Weathershield kit

Part number	
3KXA877210L0103	



Weathershield and pipe-mount kit

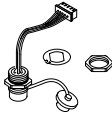
Part number	
3KXA877210L0104	



EZLink connectors/cables

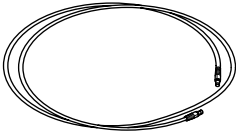
EZLink and EZLink HazLoc connector assembly

Part number	
3KXA877420L0066	



EZLink extension cable assembly

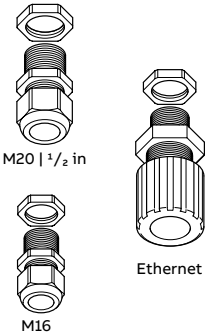
Part number	Description
AWT4009010	1 m (3.3 ft)
AWT4009050	5 m (16.4 ft)
AWT4009100	10 m (32.8 ft)
AWT4009150	15 m (49.2 ft)
AWT4009250	25 m (82.0 ft)
AWT4009500	50 m (164.0 ft)
AWT4009000	100 m (328.0 ft)



Gland packs

Standard cable glands

Part number	
3KXA877420L0111	M20 (qty. 5), M16 (qty. 2)
3KXA877420L0112	½ in NPT (qty. 5), M16 (qty. 2)
3KXA877420L0113	M20 (qty. 4), M16 (qty. 2) Ethernet (qty. 1)
3KXA877420L0114	½ in NPT (qty. 4), M16 (qty. 2) Ethernet (qty. 1)
3KXA877420L0115	Ethernet gland (qty. 1)
3KXA877420L0116	Ex-E gland pack (5 × M20, 2 × M16)
3KXA877420L0117	Ex-E gland pack (5 × ½ in NPT, 2 × M16)
3KXA877420L0118	Ex-E gland pack (4 × M20, 2 × M16, 1 × Ethernet)
3KXA877420L0119	Ex-E gland pack (4 × ½ in NPT, 2 × M16, 1 × Ethernet)



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