700 ULTRA

12 mm pH/Redox (ORP) sensor

Measurement made easy

12 mm pH/Redox sensors

Introduction

The 700 ULTRA pH/Redox sensor is designed specifically for power and potable water industry applications, where the measurement is critical.

The flowing reference junction provides a very stable junction potential in high purity applications.

The **analog** sensor is designed for use with ABB's AWT210 and AWT420 transmitters with analog-capable inputs.

The **digital** sensor is designed for use with ABB's AWT420 and AWT440 multi-input transmitters featuring EZLink connectivity. EZLink enables new or replacement sensors to be connected easily without the need to power down the transmitter.

The digital sensor features advanced warning of electrode poisoning giving the user advanced warning of electrode failure.

For more information

Publications for the associated transmitters are available for free download from:

www.abb.com/measurement

or by scanning these codes:

AWT420

AWT440

	Search for or click on:
Data Sheet AWT210 2-wire conductivity, pH/ORP pION transmitter	DS/AWT210-EN
Data Sheet AWT420 Universal 4-wire, dual-input transmitter	DS/AWT420-EN
Data Sheet Aztec AWT440 Multi-input transmitter	DS/AWT440-EN
Operating Instruction AWT210 2-wire conductivity, pH/ORP pION transmitter	OI/AWT210-EN
Operating Instruction AWT420 Universal 4-wire, dual-input transmitter	OI/AWT420-EN
Operating Instruction Aztec AWT440 Multi-input transmitter	OI/AWT440-EN
Parts List Sensor accessories pH/ORP, turbidity, dissolved oxygen	PL/ANAINST/001-EN

Sales

Service

Contents

1 Health & Safety

Document symbols

Symbols that appear in this document are explained below:

⚠ WARNING

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

Potential safety hazards

The sensor operates on 3.3 V DC. There are no hazardous voltages present in the sensor.

⚠ WARNING

Before removing a sensor from the process, reduce process pressure to zero and ensure the sensor is cool enough to handle.

⚠ WARNING

ATEX/IECEx

All 500 Pro and 500 Pro-D elecrodes are certified to ATEX/IECEx. The plastic enclosure is a potential electrostatic hazard. Clean with a damp cloth only and **do not** mount in a high-velocity dust laden atmosphere.

Product symbols

Symbols that may appear on this product are shown below:

⎓ Direct current supply only.


This symbol identifies a risk of chemical harm and indicates that only individuals qualified and trained to work with chemicals should handle chemicals or perform maintenance on chemical delivery systems associated with the equipment.


This symbol indicates the need for protective eye wear.


This symbol indicates the need for protective hand wear.


Recycle separately from general waste under the WEEE directive.

Product recycling and disposal (Europe only)


Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August 2005. To conform to European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of-life equipment to the manufacturer for disposal at no charge to the user. 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.

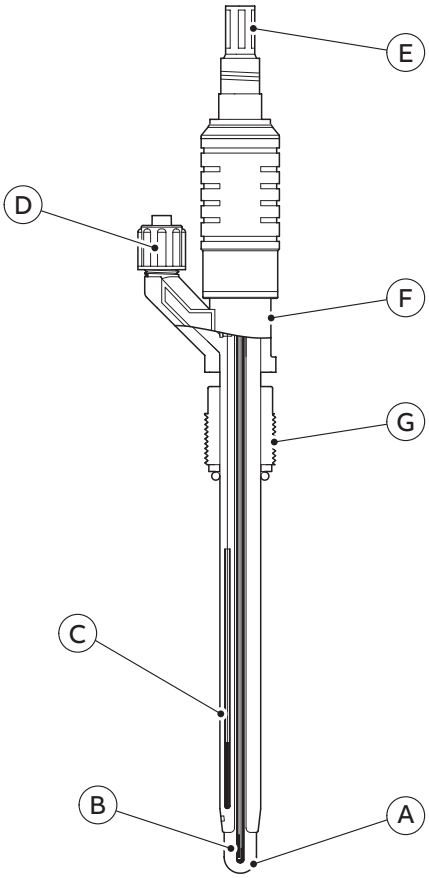
NOTICE

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

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

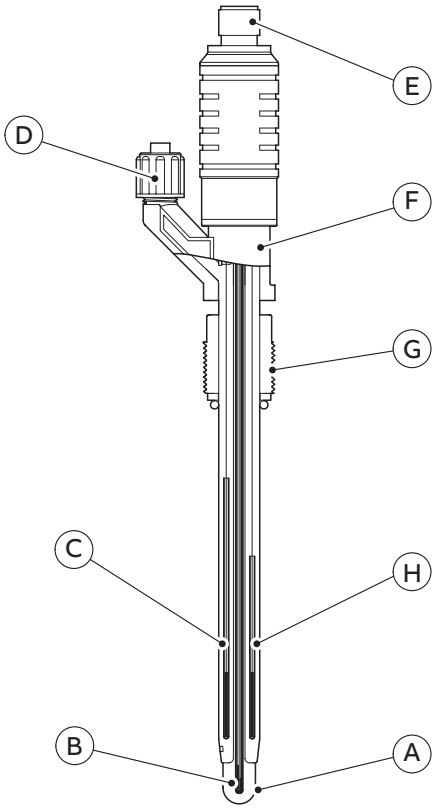
ABB, Industrial Automation, Measurement & Analytics, UK, fully supports the objectives of the ROHS II directive. All in-scope products placed on the market by IAMA UK on and following the 22nd of July 2017 and without any specific exemption, will be compliant to the ROHS II directive, 2011/65/EU.

2 System overview



Item	Component
A	Glass sensor
B	Temperature sensor (Pt100)
C	Reference electrode
D	Electrolyte side arm
E	VarioPin (VP) connector (illustrated) or integral cable
F	Sensor body
G	PG13.5 nut

Figure 1 Analog pH sensor components

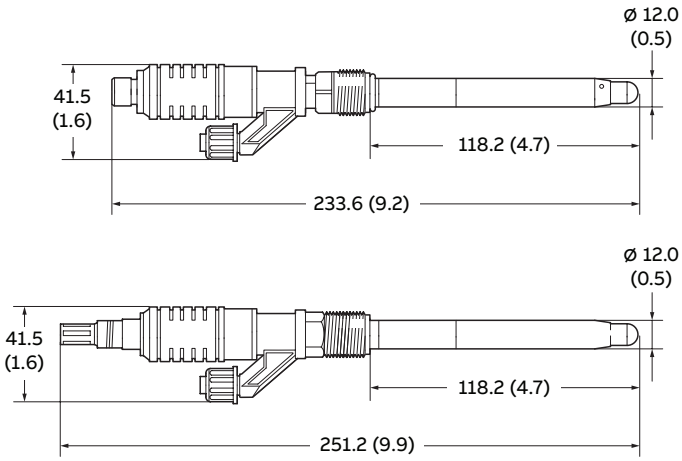


Item	Component
A	Glass sensor
B	Temperature sensor (Pt1000)
C	Dual reference electrode
D	Electrolyte side arm
E	EZLink connector (illustrated) or integral cable
F	Sensor body
G	PG13.5 nut
H	Reference electrode

Figure 2 Digital pH sensor components

3 Dimensions

Dimensions in mm (in)



4 Installation

ABB's 700 ULTRA sensors are designed for use with ABB's flow cells and reservoirs. Refer to **Accessories and spares on page 27** for part numbers.

⚠ WARNING

- Sensors must be installed and maintained by suitably trained personnel only.
- Shut down and de-pressurize process lines before inserting or removing sensors.

Referring to Figure 3:

1. Unscrew cap (A), remove sensor from storage bottle (B) and rinse the end of the sensor with clean water.
2. Remove knurled nut (C), remove ferrule (D) and pull bung (E) from the side arm. Retain the bung for future use.
3. Insert the sensor into the flow cell (F) and secure with PG13.5 nut (G).
4. Set up the required sample flow rate into the flow cell.
5. Close reservoir tube clip (H).
6. Remove reservoir lid (I) and fill the reservoir with 3.5M KCl solution.
7. Replace the reservoir lid and unscrew filler plug (J) to avoid creating a vacuum in the reservoir.
8. Place the end of reservoir tube (K) in a beaker and open tube clip (H). When the flow of solution is free of air bubbles, close the tube clip.
9. Referring to inset, slide knurled nut (C) and ferrule (D) over the end of reservoir tube (K) and push the end of the tube over the spigot in the side arm. Secure with knurled nut (C).
10. Open tube clip (H) to allow KCl solution to flow into the sensor.
11. Calibrate the sensor – see **Calibration** on page 12.

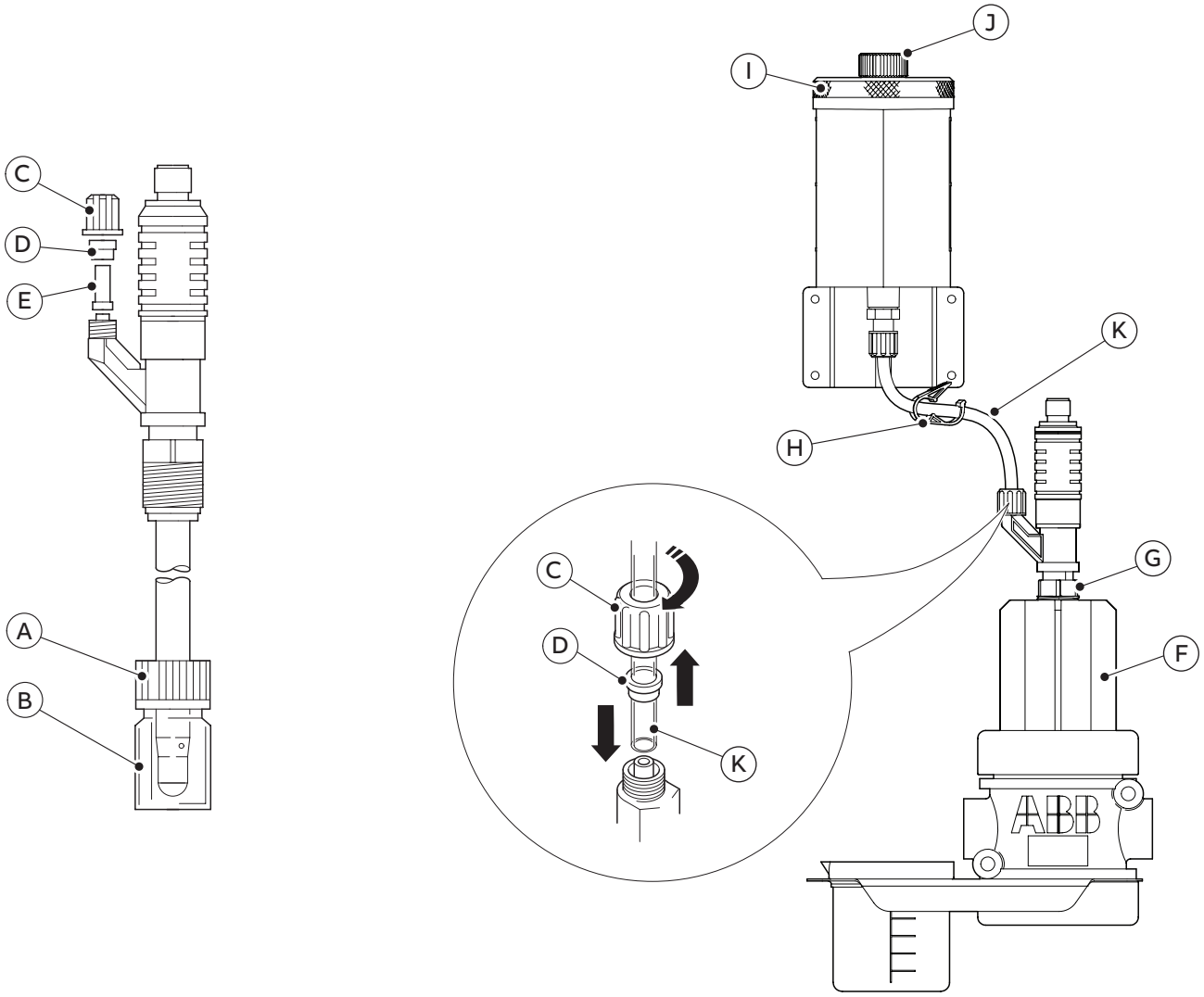
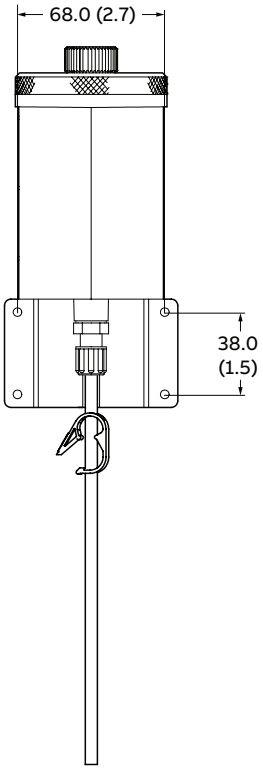


Figure 3 Installing the sensor

...4 Installation

Mounting options

Dimensions in mm (in)



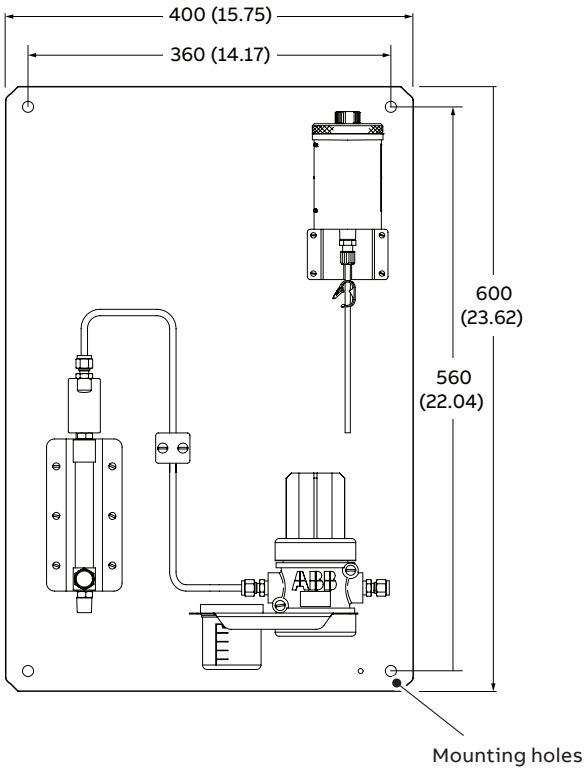


Figure 4 Reservoir

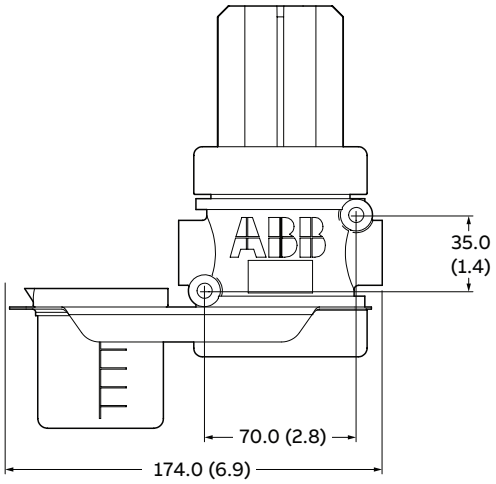


Figure 5 Flow cell

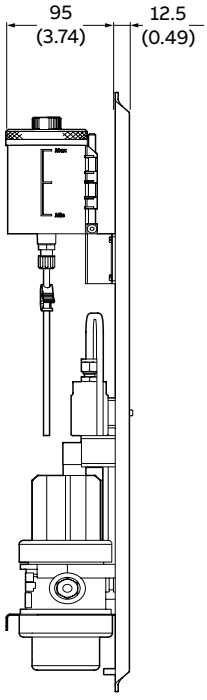


Figure 6 700 ULTRA panel

Electrical connections

Digital sensors

All digital sensors come with EZLink connectivity

Analog sensors – pH with temperature compensation

Wire color	Function
Blue	Glass sensor
Yellow	Guard
Black	Reference sensor
Red	2-wire compensation
White	2-wire compensation
Grey	3rd wire

5 Sensor setup

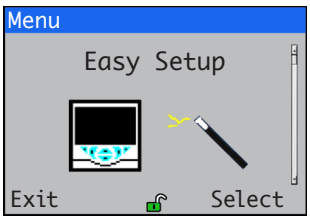
Notes.

- Perform this procedure when connecting a new/replacement sensor to an AWT420 or AWT440 transmitter.
- If connecting to a transmitter other than an AWT420 or AWT440, refer to the appropriate Operating Instruction.

1 Connect the sensor to the transmitter. The following menu prompt is displayed:

To enter Easy Setup level, press the key (below the ✓ icon).

The Easy Setup start screen is displayed:



2 Press the key (below the **Select** prompt).

3 Press the key (below the **Edit** prompt) to change the default value to the required value/selection.

4 Press the key (below the **Next** prompt) to accept the value/selection displayed and advance to the next configuration parameter.

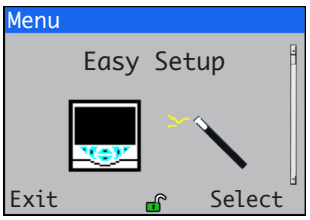
The following Configuration parameters are set at Easy Setup level:

Parameter	Options
Tag	16-character user-defined tag
Range High	Customizable range high
Range Low	Customizable range low
Cleaning	Configure an external cleaner
Filter type	Low, Medium, High
Temperature compensation	Automatic solution, Automatic
Analog output	Configure the analog output channels

Note. Refer to page 11 for parameter details – not all parameters are displayed at Easy Setup level.

5 Continue with configuration of the required parameters.

6 On completion the Easy Setup start screen is displayed:



7 To exit Easy Setup, press the key (below the **Exit** prompt) to display the Operator Page.

Pressing the key (below the **Select** prompt) re-enters the Easy Setup level where parameters can be reviewed or modified after first-time connection.

After completing the Easy Setup level, pressing the or key enters the Advanced Configuration level, where all available sensor and transmitter parameters can be reviewed or modified.

Menu	Comment	Default
S1(to 4):pH/Redox(ORP)	Select the pH/Redox sensor to set up.	
Tag	Enter an alphanumeric sensor tag (16 characters maximum) to identify the sensor on the **Operator Pages**	TAG1
Filter Type	Set the filter type: • Off • Low • Medium • High	Off
Temp. Compensation	Set the temperature compensation type * • Automatic Sol. • Automatic	Automatic Sol
Sample Coefficient	Set the sample coefficient for solution compensation *	0.0 pH/10 °C
Low pH Slope Limit	Set the low slope level for pH calibrations. Calibrations fail at this level. Diagnostic warning is displayed at 20 % above this level	40 %
pH Diagnostics	Enable/disable the following diagnostics: • Out of solution • Broken glass	 Enabled Enabled
Clean Interval	Set the interval between cleans: Off/15 mins/30 mins/45 mins/1 to 24 hours	Off
Clean Type	None or External. The external option enables the transmitter to control an external cleaning device through the digital I/O lines. **Note.** Refer to Aztec ADS430 EZCLEAN operating instructions (OI/ADS430/EZCLN-EN) for an example of the use of this facility	None
Clean Type	Set the clean type: Continuous/Pulsed	Continuous
Clean On Time	Set the duration of the clean: 1 to 60s	30 s
Clean Off Time	Set the duration between cleans: 1 to 60s	30 s
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	Display the total duration of the clean: Clean type set to continuous = clean on time + recovery time Clean type set to pulsed = (clean on time + clean off time) * number of pulses + recovery time	
Clean Output	Displays the output signal the clean is assigned to. This can be set to relay 1 to 6 or digital output 1 to 6	Not assigned
Restore Defaults	Restores the sensor back to default configuration	

* Available only for pH sensors

6 Calibration

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.

Calibrations are initiated via the **Cal** prompt displayed on the main page or via the **Operator** pages or **Calibrate** and **Advanced** menu items on the **Access Level** page – refer to the transmitter's Operating Instruction OI/AWT420-EN or OI/AWT440-EN for all transmitter menu options.

Note. Before removing the sensor for calibration purposes, set the currents outputs and alarms to **Hold** (enabled via the **Operator Menu/Manual Hold** function).

Calibration procedure

pH sensor

When the sensor has been correctly connected and all electrical connections made to the transmitter, the sensor is ready for calibration by immersing the sensor (using suitably sized beakers) in either:

- a calibration solution (buffer) of known pH value for a single-point calibration

or

- sequentially in two separate calibration solutions of known pH values for a two-point calibration

For sensors already in use:

⚠ WARNING

Before removing a sensor from a flow line, ensure that all isolating valves have been closed.

1. Remove the sensor from the flow line.
2. Wash the visible surface of the sensor with demineralized water.
3. Perform a single- or two-point calibration.

To have agreement with a measured sample, there may be times when an in-process calibration is necessary.

1. Perform a buffer calibration.
2. Return the sensor to the process for a minimum of 10 minutes before performing an in-process calibration.
3. To minimize solution temperature effects, measure the sample at the same temperature as the process.

Refer to the Operating Instruction for the pH transmitter for full details of the calibration procedures.

Note. To ensure measurement accuracy when buffering:

- clean the visible surfaces of the sensors using demineralized water
- wash the sensors and dry them carefully using a soft tissue when moving from one buffer solution to the next

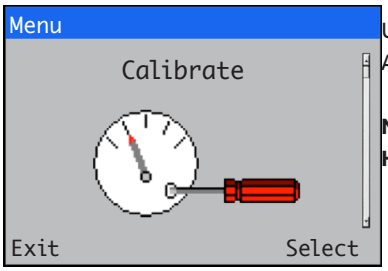
Redox/ORP sensor

When the sensor has been correctly connected and all electrical connections made to the transmitter, the sensor is ready for calibration. Follow the calibration procedure in the transmitter instruction manual.

For sensors that are connected to transmitters that do not have Redox calibration capabilities, it is possible to check the response as follows:

1. Prepare standard 4 and 7 pH buffer solutions. Add one gram (heaped spatula) of analar quinhydrone to 100 ml of each buffer solution. Let them stand for 30 minutes.
2. Immerse the sensor in each solution in turn and note the mV value when stable.

Calibrate menu



Used to calibrate the sensor.
Access to the **Calibrate** menu is via the **Calibrate** and **Advanced** levels only.

Note. During calibration, current outputs and alarms are set to **Hold** automatically if **Hold Outputs** is enabled (see below).

Menu	Comment	Default
S1(to 4):pH/Redox(ORP)	Select the pH/Redox (ORP) sensor to calibrate.	
Automatic Cal	Calibration using standard buffers with automatic temperature compensation. **Note.** Displayed only if pH sensor connected.	
1 Point Cal	Perform a 1-point automatic calibration	
2 Point Cal	Perform a 2-point automatic calibration	
Manual Cal	Manual calibration of pH and Redox sensors	
1 Pt Manual Cal	Perform a 1-point manual calibration	
2 Pt Manual Cal	Perform a 2-point manual calibration	
Edit Cal	Manually edit the calibration values	
pH Slope	Edit the pH slope **Note.** Displayed only if pH sensor connected	
pH Offset	Edit the pH offset **Note.** Displayed only if pH sensor connected	
mV Slope	Edit the mV slope **Note.** Displayed only if Redox sensor connected	
mV Offset	Edit the mV offset **Note.** Displayed only if Redox sensor connected	
Sample Collection	Perform the sample collection procedure	
Sample Complete	Perform the sample complete procedure	
Restore Defaults	Restores values to default factory settings	
Set Auto pH Buffers	Sets the buffer type to be used. Also enables a custom buffer to be defined.	
Hold Outputs	Enable/disable the hold outputs function. The current outputs and alarm functions are held during calibrations.	Enabled

...6 Calibration

Automatic calibration

Note. Automatic calibration is applicable only to pH sensors.

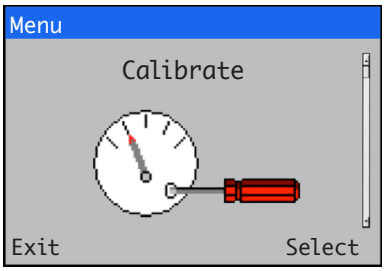
Automatic calibration calibrates the sensor to measure pH using pH buffers. Automatic calibration provides automatic temperature compensation to the selected buffer. There are two possible calibration modes:

- 1-point calibration
- 2-point calibration

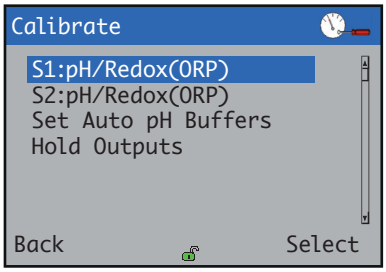
A 1-point calibration adjusts the calibration offset value.
A 2-point calibration adjusts the calibration offset and slope values.

Before starting the calibration procedure ensure that the automatic buffer is set to the correct buffer (see **Automatic calibration buffers** on page 15)

1 At the **Calibrate** level, press the key (below the **Select** prompt)

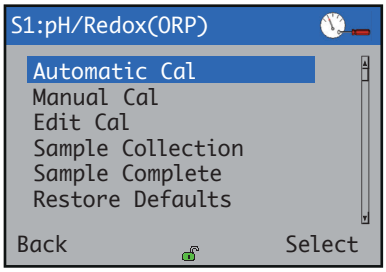


The sensor selection menu is displayed:

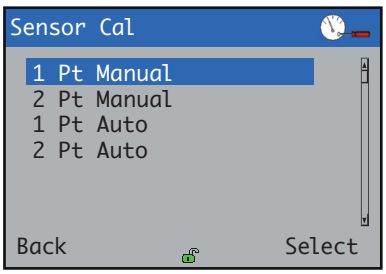


2 Highlight the sensor to be calibrated (for example, **S1:pH/Redox(ORP)**) and press the key (below the **Select** prompt)

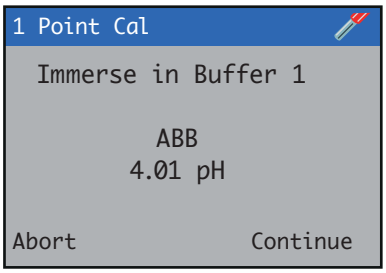
The menu options for **S1:pH/Redox(ORP)** are displayed:



3 Select **Automatic Cal**



4 Select **1 Point Auto** or **2 Point Auto** as required



5 Immerse the sensor in the buffer of the value displayed on the screen.

6 Press the key (below the **Continue** prompt) to perform the calibration. The calibration process screen is displayed. The calibration can be canceled at any time during the process by pressing the key (below the **Abort** prompt)

If **1 Point Cal** was selected, the result screen is displayed. If **2 Point Cal** was selected, repeat steps 5 and 6 for the second buffer.

On completion of the calibration the result is displayed on the screen automatically. If the calibration passes, the slope and offset is displayed. If the calibration fails, the reason for failure is displayed on the screen. See **pH/Redox calibration failure reasons** on page 23 for explanation of calibration failure reasons.

Automatic calibration buffers

Automatic calibration uses buffer tables programmed into the sensor to provide more accurate calibrations.

The following buffers are supported by the sensor:

ABB capsules
- 4.01
- 7.00
- 9.00
- 10.00

NIST
- 4.001
- 6.881
- 9.225
- 10.062

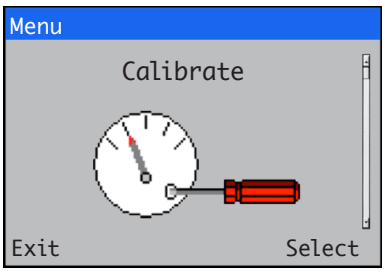
Technical
- 4.01
- 7.00
- 10.01

Phthalate free
- 4.00

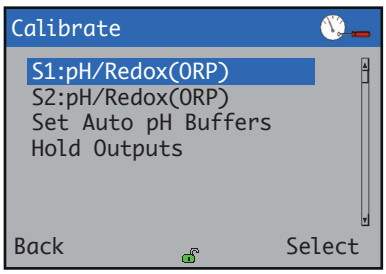
DIN19266
- 1.679
- 4.005
- 6.865
- 9.180
- 10.012

ABB sachets
- 4.01
- 7.00
- 9.18

1 At the **Calibrate** level, press the key (below the **Select** prompt)

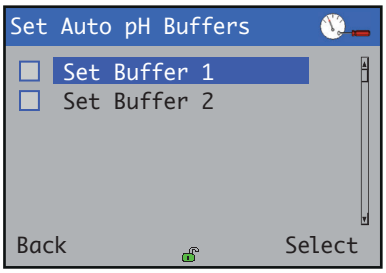


The sensor selection menu is displayed:

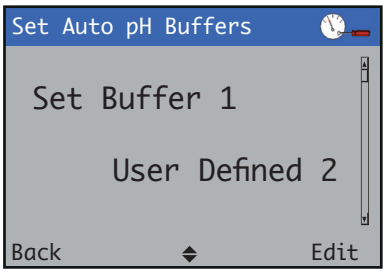


2 Highlight **Set Auto pH Buffers** and press the key (below the **Select** prompt)

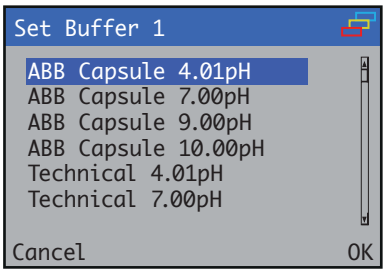
The menu options for **Set Auto pH Buffers** are displayed:



3 Select the buffer to be set and press the key (below the **Select** prompt). The **Set Buffer X** menu is displayed:



4 Press the key (below the **Edit** prompt). The buffer selection menu is displayed:



5 Highlight the buffer to use.

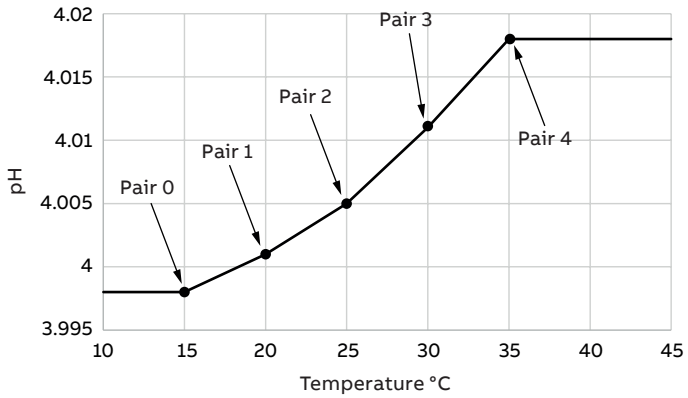
6 Repeat for buffer 2 if performing a two point calibration.

Note. Buffer 1 is used for single point calibrations

...6 Calibration

User-defined automatic calibration buffers

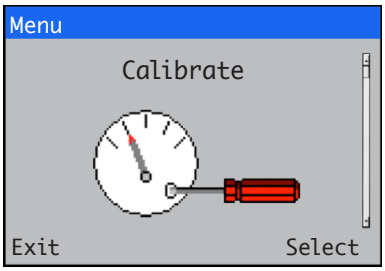
Two user-defined buffers may be used for automatic calibrations. Automatic buffers are defined using a table that relates the value of the buffer to a given temperature point. The software extrapolates between the user-defined points during the calibration. The graph below shows an example of the data required to define a buffer



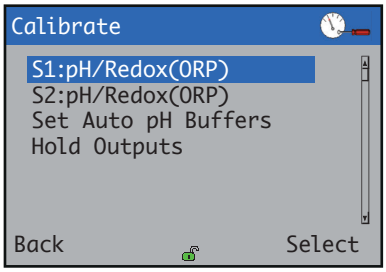
Note.

- If the temperature of the buffer is below the minimum value entered, the pH of the buffer is set to the value that corresponds with the minimum temperature value entered.
- If the temperature of the buffer is above the maximum value entered, the pH of the buffer is set to the value that corresponds with the maximum value entered.
- pH/Temperature pairs must be entered such that the temperature increases from pair 0 to pair 4.

1 At the **Calibrate** level, press the key (below the **Select** prompt)

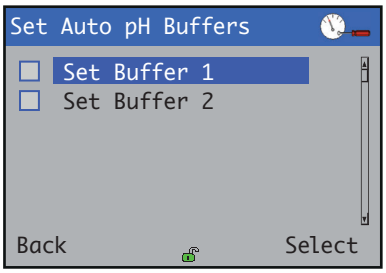


The sensor selection menu is displayed:

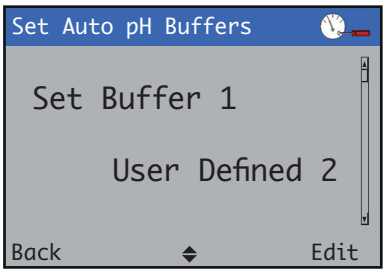


2 Highlight **Set Auto pH Buffers** and press the key (below the **Select** prompt)

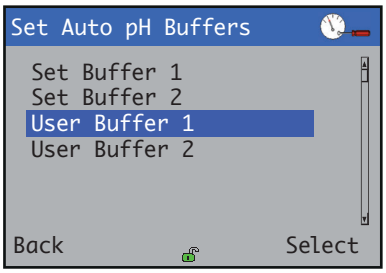
The menu options for **Set Auto pH Buffers** are displayed:



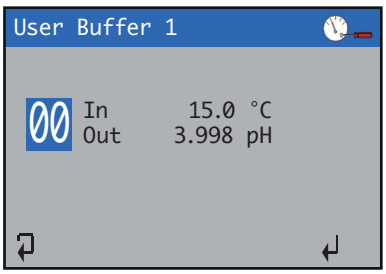
3 Select the buffer to be set and press the key (below the **Select** prompt). The **Set Buffer X** menu is displayed:



4 Select **User Defined X** and press the key (below the **Edit** prompt). The buffer selection menu is displayed:

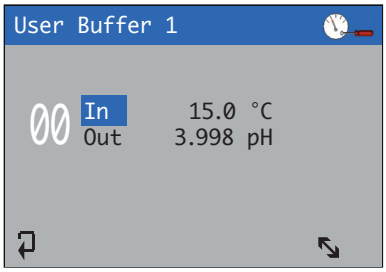


5 Select **User Buffer 1** and press the key (below the **Select** prompt). The buffer edit screen is displayed:

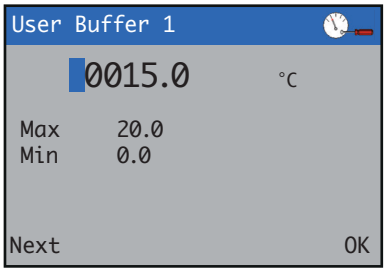


Note. Pressing the key cycles between the point number, temperature input and pH input.

6 With point 00 selected, press the key to select the temperature input and press the key to edit the temperature.



7 Use the / keys to select a required temperature value between the limits shown on the screen and press the key to accept it



8 Repeat steps 6 and 7 to select a required pH value.

9 Press the key to highlight the point number followed by the / keys to select the next point to edit and press the key.

10 Repeat steps 6 to 9 to edit the remaining points as required or press the key to exit the buffer edit page.

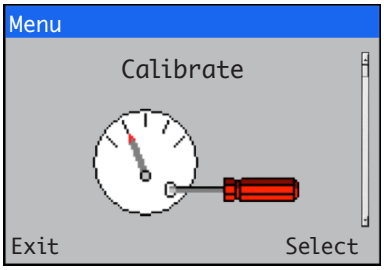
Manual calibration

Manual calibration calibrates the pH or Redox value to a value defined by the user. There are two possible calibration modes:

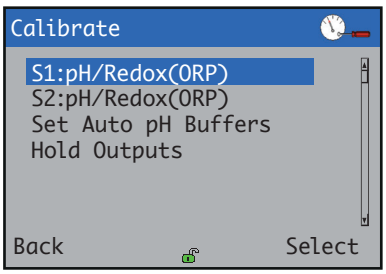
- 1-point calibration
- 2-point calibration

A 1-point calibration adjusts the pH offset value.
A 2-point calibration adjusts the pH offset and slope values.

1 At the **Calibrate** level, press the key (below the **Select** prompt).

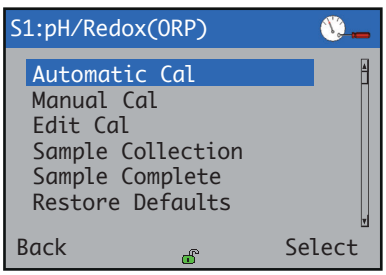


The sensor select menu is displayed:



2 Highlight the sensor to be calibrated (for example, **S1:pH/Redox(ORP)**) and press the key (below the **Select** prompt)

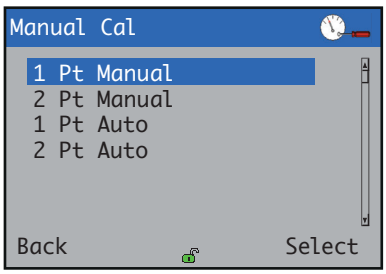
The menu options for **S1:pH/Redox(ORP)** are displayed:



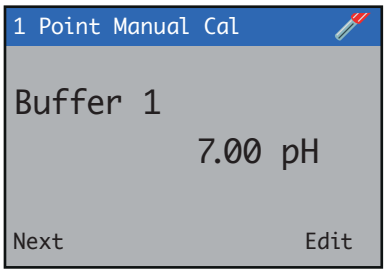
...6 Calibration

...Manual calibration

3 Select **Manual Cal**.



4 Select **1 Point Manual** or **2 Point Manual** as required.



5 Immerse the sensor in buffer of the value displayed on the screen and press the key (below the **Next** prompt).

6 Press the key (below the **Continue** prompt) to perform the calibration. The calibration process screen is displayed. The calibration can be canceled at any time during the process by pressing the key (below the **Abort** prompt)

If **1 Point Cal** was selected, the result screen is displayed. If **2 Point Cal** was selected repeat steps 5 and 6 for the second buffer.

On completion of the calibration the result is displayed on the screen automatically. If the calibration passes, the slope and offset are displayed. If the calibration fails, the reason for failure is displayed on the screen. See **pH/Redox calibration failure reasons** on page 23 for explanation of calibration failure reasons.

Edit calibration

Edit calibration enables the user to enter the calibration coefficients directly. The following calibration coefficients can be entered:

- **pH slope and offset**
  Note. Available only if a pH sensor is connected to the transmitter
  – The following formula is used to calculate pH from the measured millivolts:

$$pH = offset - \frac{slope \times mv}{100 \times 59.15296}$$

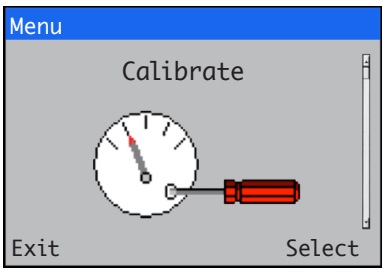
  Where:
  pH = the measured pH of the solution
  offset = calibration offset (an ideal sensor has an offset value of 7.00 pH)
  slope = calibration slope (an ideal sensor has a slope value of 100.0 %)
  mV = measured millivolts of the solution

- **Redox slope and offset**
  Note. Available only if a Redox sensor is connected to the transmitter.
  – The following formula is used to calculate ORP from the measured millivolts:

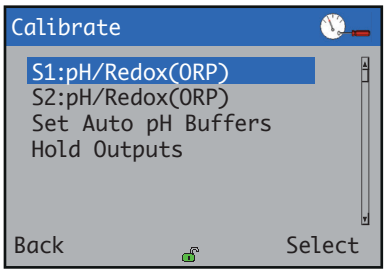
$$Redox = offset + \frac{slope \times mv}{100}$$

  Where:
  Redox = the calibrated ORP mV of the solution
  offset = calibration offset (an ideal sensor has an offset value of 0.0 mV)
  slope = calibration slope (an ideal sensor has a slope value of 100.0 %)
  mV = measured millivolts of the solution

1 At the **Calibrate** level, press the key (below the **Select** prompt)

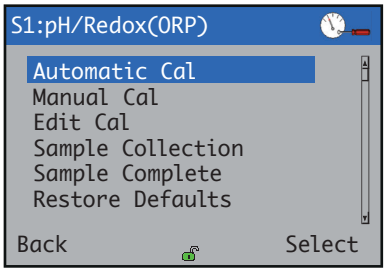


The sensor selection menu is displayed:



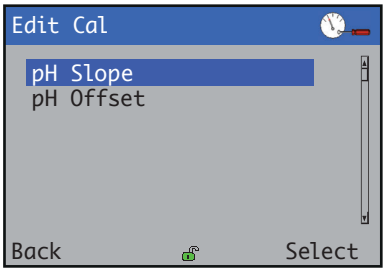
2 Highlight the sensor to be calibrated (for example, **S1:pH/Redox(ORP)**) and press the key (below the **Select** prompt)

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

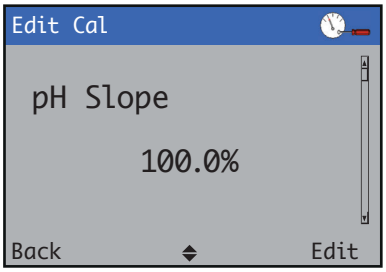


3 Select **Manual Cal**

4 To enter a coefficient, select the required coefficient from the menu and press the key (below the **Select** prompt).



5 Press the key (below the **Edit** prompt) to enter the value of a coefficient and press the key (below the **OK** prompt) when complete.



...6 Calibration

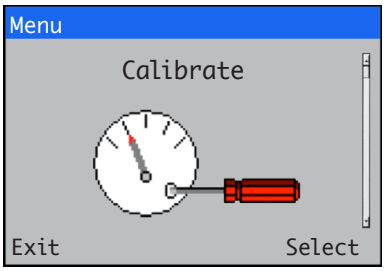
In-process calibration

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 sample is used to calibrate the sensor.

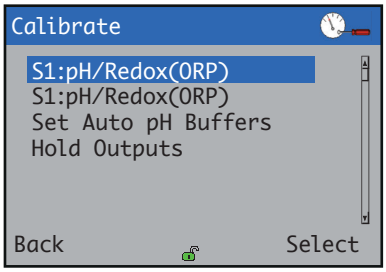
In-process calibration takes place in two steps. During the first step, a grab sample is taken from the process and the sensor records the measured value of the sample at that time. The pH of the sample is then measured in the laboratory and entered into the transmitter in the second step.

Note.
- An in-process calibration adjusts the calibration offset only.
- Take care when collecting, transferring and storing the collected sample; any contamination could result in an inaccurate calibration. This is especially important for low conductivity solutions.

1 At the **Calibrate** level, press the key (below the **Select** prompt)

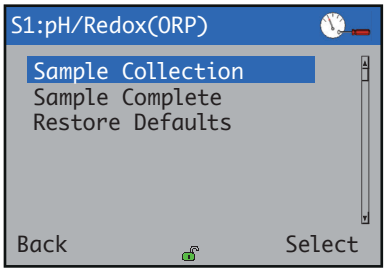


The sensor selection menu is displayed:



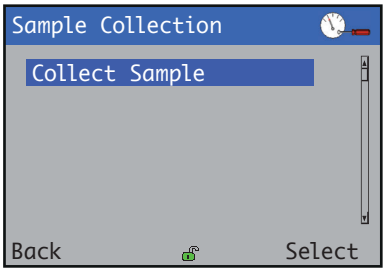
2 Highlight the sensor to be calibrated (for example, **S1:pH/Redox(ORP)**) and press the key (below the **Select** prompt)

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

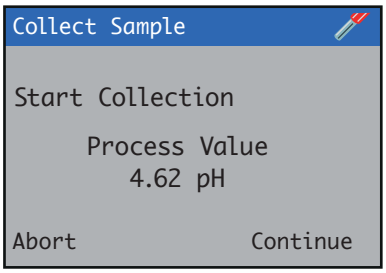


3 Select **Sample Collection** and press the key (below the **Select** prompt).

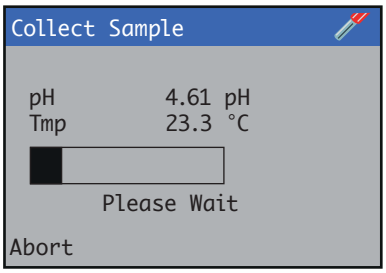
Note. Performing this step erases any sample data stored previously for the selected sensor. Only the data from the last sample collection is stored in each sensor.



The **Collect Sample** screen is displayed:

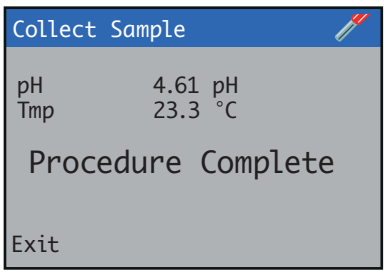


4 Press the key (below the **Continue** prompt) to initiate sample collection.



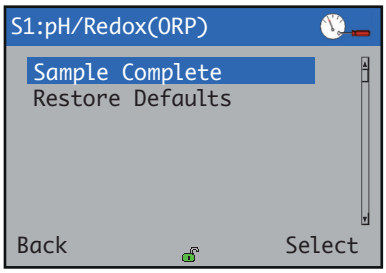
5 Collect a sample from the process for laboratory analysis as close to the sensor as possible to ensure accurate results.

6 When acquisition is complete, press the key (below the **Exit** prompt) to return to the main menu.

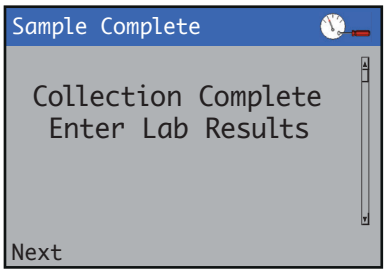


The process pH and temperature values are now stored in the sensor.

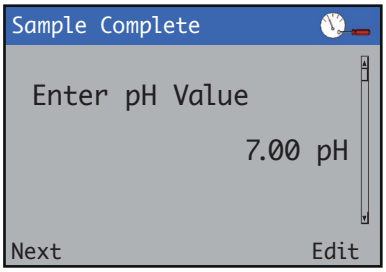
7 When the result of the laboratory analysis has been obtained, select **Sample Complete**:



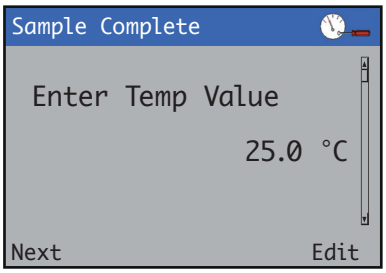
8 Press the key (below the **Next** prompt).



9 Enter the lab pH value.



10 Enter the lab temperature value



In-process calibration is now complete.

7 Calibration log (digital sensors)

The calibration log stored in the sensor holds a record of the last 15 sensor calibration operations performed. To view the calibration log in the transmitter, logs must be enabled. Refer to the transmitter's Operating Instruction OI/AWT420-EN or OI/AWT440-EN for details of how to enable logs.

When logs are enabled, a calibration log page is available for each of the sensors connected to the transmitter. To access the calibration log, press the View key on the transmitter's keypad to display the result from the first most recent calibration.

Use the group key on the keypad to cycle through the calibration logs for each sensor. Calibration results can be:

- **Calibration aborted**
  the calibration was stopped by the user
- **Calibration failed**
  the log entry displays the reason for the calibration failure
- **Calibration successful**
  the log entry displays the new calibration parameters

Each entry displays the date and time of the calibration.

Note. The date and time are taken from the transmitter. To ensure the date and time stored in the log are accurate, ensure the date and time set in the transmitter are correct.

8 Device information (digital sensors)

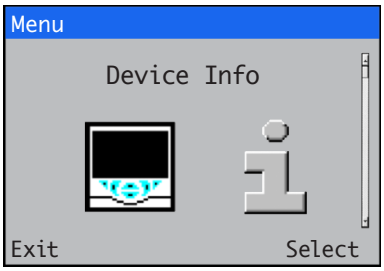
This section describes the information available within the **Device Information** menu for digital pH sensors.

1 Connect the sensor to the transmitter's EZLink connector – refer to the transmitter's Operating Instruction OI/AWT420-EN or OI/AWT440-EN.

2 Press the transmitter's key to display the **Operator Page** menu, then select **Enter Configuration** to display the **Access Level** page.

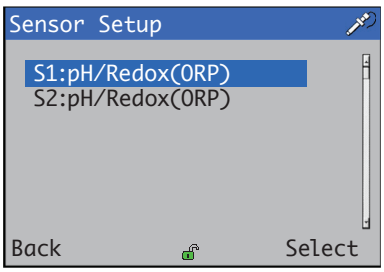
Use the key to select **Advanced** and press the key (below the **Select** prompt).

If the **Device Information** menu is not displayed use the / keys to scroll to it:



3 Press the key (below the **Select** prompt)

The Sensor Setup page is displayed



4 Select the desired sensor and press the key (below the **Select** prompt)

The sensor's device information page is displayed:

Menu	Comment
Type	Sensor type (pH/Redox)
Sensor Type	Sensor type (100GP/100Ultra/500Pro)
Sensor Type	Sensor type (pH/Redox)
Glass Type	Glass type (standard/low temperature)
Serial Number	Factory programmed serial number (3KXA…)
Date of Manufacture	Sensor's date of manufacture
Hardware revision	Sensor's hardware revision
Software revision	Sensor's software revision
Product code	Sensor's product code for reorder.

9 Diagnostics

Diagnostic messages

The table below shows sensor-specific icon types, diagnostic messages and possible causes/suggested remedial action.

Note. The diagnostic icons in the following table conform to NAMUR 107.

For transmitter-specific diagnostic messages, refer to the transmitter's Operating Instruction OI/AWT210-EN, OI/AWT420-EN or OI/AWT440-EN.

Icon	Message	Possible cause	Remedial action
	ADC failure	An error has been reported by the on board ADC.	Cycle power to the sensor.
	NV failure	Failure of non-volatile memory on the sensor board.	Cycle power to the sensor. If power cycling fails, reset the sensor configuration to default and reconfigure as required.
	Temperature failure	Failure detected in the temperature measurement circuit.	Cycle power to the sensor.
	Calibration failed	The last calibration failed.	Check buffer solutions Repeat the calibration procedure.
	PV out of range	The measured process value is out of range.	Change the PV of the sample to a value that is within the sensor's operating range.
	Process temperature out of range	The measured process temperature is out of range.	Change the process temperature to a value that is within the sensor's operating range.
	Internal temperature out of range	The internal temperature of the electronics is out of range.	Move the sensor to a position where the temperature is within the sensor's operating range.
	Out of solution*	The sensor has detected it is out of solution.	Move the sensor into the solution.
	Broken glass*	The sensor has detected that the pH glass is broken.	Replace the sensor.
	Low electrolyte warning*	The electrolyte is low.	Refill the sensor reservoir.
	Low pH slope warning	The last calibration slope was below the user set level.	Prepare to replace the sensor.

* These diagnostics may be enabled/disabled by the user.

pH/Redox calibration failure reasons

The table below shows the various reasons for pH/Redox calibration failure together with possible causes/remedial action.

Failure reason	Possible cause	Remedial action
No response*	No difference in millivolts was seen between the two calibration points.	Ensure that two different buffers were used.
Low slope*	The slope is below the user-set low slope limit.	Re-calibrate with fresh buffers Clean the sensor Replace the sensor.
High slope*	The slope exceeds 110 %.	Replace the sensor.
Unstable temperature	Stability could not be achieved within 1 minute due to temperature variations.	Clean the sensor and ensure probe and solution are at the same temperature.
Unstable mV	Stability could not be achieved within 1 minute due to millivolt variations.	Clean the sensor.
Slow response	A response has been detected but it has not reached steady state within 1 minute.	Clean the sensor.

* These failure reasons are applicable only to 2-point calibrations.

10 Sensor maintenance

General cleaning

WARNING

Before removing a sensor from a flow line, ensure that all isolating valves have been closed.

To ensure accurate monitoring, keep the sensor free of contaminants by periodic cleaning, the frequency of which depends on the particular application.

Methods of removing various types of deposits are detailed below. Replace the sensor if its performance does not improve after cleaning.

Application	Cleaning agent
Grease and oils	Alkaline detergents or water soluble solvents such as alcohols
Resins	Dilute alkalis
Limestone/Carbonated	1M nitric acid
Metal hydroxides, cyanides, heavy biological	1M sulphuric or nitric acid
Proteins	Mixture of 1M sulphuric or nitric acid and pepsin (saturated)

Checking the electrolyte level

It is recommended that the electrolyte level is checked every three months. Refill the electrolyte solution when the level is low. Refer to the **Flow chamber accessories and free-standing reservoir** instruction (IN/ANAINST/040-EN) for additional information

11 Fault finding

Listed below are some common symptoms of sensor malfunction together with possible cures.

- **Short scaling (low slope) or sluggish response**
  - Glass sensor membrane dirty or coated – clean sensor
  - Poor insulation on cable connectors, possibly due to moisture – dry connector with warm dry air (analog sensor only)
  - Replace the sensor if no improvement is seen. It may also be necessary to replace the extension cable (analog sensor only)
  - In some situations, it may be possible to reactivate the membrane glass by soaking in 0.1 mol hydrogen chloride for 24 hours, before rinsing and recalibrating. Ensure the potassium chloride reservoir is fitted during the soaking period.
  - Ensure connectors are clean and free from any particulate
- **No response to pH buffer or sample**
  - Check the sensor has been connected correctly to the transmitter (analog sensors only)
  - Check the glass sensor membrane is not broken or cracked
  - Replace the sensor if no improvement
- **Unstable readings or drift**
  - Check the sensor has been connected correctly to the transmitter (analog sensors only)
  - Dry or dirty reference junction – clean the junction
  - Replace the sensor if no improvement
- **Stable but incorrect readings**
  - Recalibrate using fresh buffer solutions
  - Check temperature compensation settings are correct
  - The sensor responds correctly to pH changes, but if there is an offset (<1.0 to >0.2 pH) perform a one point process calibration

Note. All the above symptoms could be caused by a faulty cable (analog sensors only).

12 Storage

NOTICE

- Always store the sensor in its original packaging until required for use.
- Store the sensor between 15 and 35 °C (59 and 95 °F).
- For long term storage, store the sensor in the original sensor storage bottle.
- Ensure that the glass membrane and the reference junction do not dry out as this may irreversibly affect the response of the sensor.
- Do not store sensors in de-ionized water.

If it is necessary to remove the sensor from the sample line, fill the retaining solution cap with buffer solution and fit it to the sensor.

13 Specification

700 ULTRA/700 ULTRA-D

Measurements

- pH or ORP (Platinum)
- Temperature

Measurement range

High performance (S) glass
0 to 14 pH
Low temperature (LT) glass
0 to 10 pH
ORP
–2000 to 2000 mV

Temperature range

High performance (S) glass
0 to 100 °C (32 to 212 °F)
(typical glass impedance at 25 °C (77°F) = 250 MΩ)
Low temperature (LT) glass
–5 to 50 °C (23 to 122 °F)
(typical glass impedance at 25 °C (77 °F) = 25 MΩ)
ORP platinum electrode
0 to 60 °C (32 to 140 °F)

Temperature sensor

700 ULTRA (analog)
Pt100 (Class B, IEC 60751
700 ULRA-D (digital)
Pt1000 (Class B, IEC 60751)

Maximum pressure

Atmospheric

Recommended minimum sample conductivity

0.055 µS/cm

Recommended sample flowrate

100 to 500 ml/min

Recommended sensor storage

Between 15 and 35 °C (59 and 95 °F)

Isothermal point at 25 °C (77 °F)

pH 7

Reference system

Flowing KCl electrolyte with Ag/AgCl double junction

Process connections

PG 13.5

Wetted materials

Sensor body
Glass
Reference junction system
Ceramic
Measure system
pH: Glass
ORP: Platinum

Approvals, certification and safety

CE Mark
Covers EMC+LV directives
(including latest version of EN61010)
Regulation 31

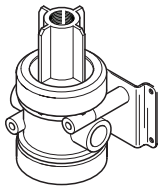
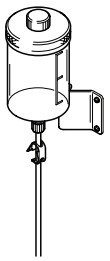
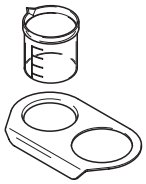
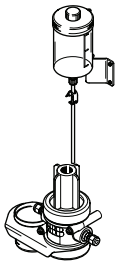
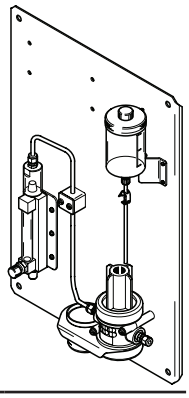
Drinking water approval:	Complies to DWI Regulation 31(4)(b)
Additional tests:	BS6920 parts 2.2 and 2.4 on all wetted parts

EMC
Meets requirements of IEC61326 for an industrial environment

DS/700ULTRA-EN Rev. D
DS/700ULTRAD-EN Rev. D

14 Accessories and spares

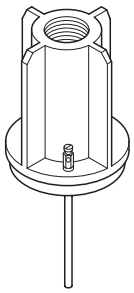
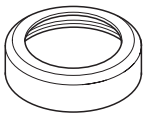
Accessories

Part number	Description	
3KXA163000L0013	½ in NPT stainless steel flow-cell + PG13.5 adapter	
3KXA163000L0014	½ in NPT polycarbonate flow-cell + PG13.5 adapter	
3KXA163700L0001	Reservoir complete with mounting bracket assembly	
3KXA163000L0120	Calibration kit (includes calibration beaker and holder)	
3KXA163700L0005	½ in NPT stainless steel flow-cell + reservoir + calibration kit	
3KXA163700L0006	½ in NPT polycarbonate flow-cell + reservoir + calibration kit	
3KXA163700L0002	700ULTRA panel assembly (316 stainless steel panel and tubing)	

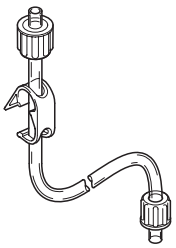
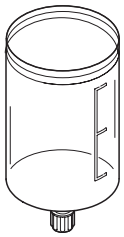
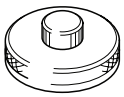
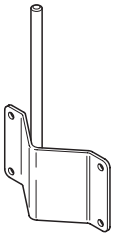
…14 Accessories and spares

Spares

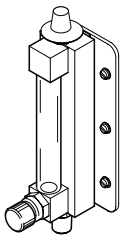
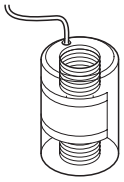
Flow cell

Part number	Description	
3KXA163000L0113	Pack of flow cell O-rings	
3KXA163000L0117	Flow cell PG13.5 adapter kit	
3KXA163000L0111	Flow cell locking ring	

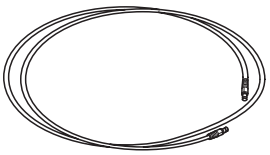
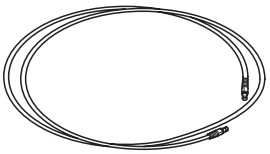
Reservoir

Part number	Description	
3KXA163700L0113	Reservoir tubing with connectors	
3KXA163700L0111	Replacement reservoir	
3KXA163700L0112	Replacement reservoir lid	
3KXA163700L0115	Reservoir mounting bracket assembly	

Panel

Part number	Description	
3KXA163700L0003	VA flowmeter	
3KXA163700L0004	Flow switch	

Extension cables

Part number	Description	
	VP cable	
3KXA163000L0051	1 m (3.3 ft)	
3KXA163000L0052	3 m (9.9 ft)	
3KXA163000L0053	5 m (16.4 ft)	
3KXA163000L0054	10 m (32.8 ft)	
3KXA163000L0055	15 m (49.2 ft)	
3KXA163000L0056	30 m (98.4 ft)	
	EZLink cable	
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 ft)	
AWT4009500	50 m (164 ft)	

Acknowledgements

- Kynar is a registered trademark of Arkema Inc.
- Viton is a registered trademark of the Chemours Company

Notes

Notes

ABB Measurement & Analytics

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

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

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