ChloroStar™ Sensor

Digital chlorine sensor



Introduction

The ChloroStar digital chlorine sensor is a rugged, reliable instrument designed to deliver accurate chlorine data across a wide measurement range, using the latest electrochemical technology for chlorine measurement.

The sensor is designed for use with ABB multi-input transmitters, such as the AWT420, which feature hot-plugging capability. Hot-plugging lets new or replacement sensors be connected without needing to power down the transmitter.

The ChloroStar Sensor is available in either a free or total chlorine version, depending on process requirements. The sensor is designed for use with the InFlow Multi-Cell modular flow cell, providing advanced features such as pH compensation, low-flow detection and ultra low-flow use with the Steady-Flow module add-on.

For information on the ChloroStar Sensor in hazardous areas, refer to INF/ANAINST/014.

For more information

Further publications for the ChloroStar Sensor are available for free download from: abb.com/wateranalysis or by scanning this code:

ChloroStar Sensor – Data sheet	DS/ACL420
ChloroStar Sensor – Quick setup guide	CI/ACL420
ChloroStar Sensor – Hazardous area information	INF/ANAINST/014
InFlow Multi-Cell modular flow cell Quick setup guide– Commissioning instruction	CI/AZA100
InFlow Multi-Cell modular flow cell – Operating instruction	OI/AZA100
AWT420 Universal 4-wire dual input transmitter – Operating instruction	OI/AWT420

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1 Health and safety

1.1 Document symbols

Symbols that appear in this document are explained below:

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

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

Note:
Indicates useful or important information about the product.

1.2 Safety precautions

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

⚠ WARNING

Installation, operation, maintenance and servicing must be performed:

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

1.3 Potential safety hazards

1.3.1 ChloroStar Sensor – electrical

The sensor operates on 3.3 V DC supplied from the transmitter. There are no hazardous voltages present.

1.4 Safety standards

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

1.5 Product symbols

Symbols that may appear on this product are shown below:

⎓ 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.

1.6 Product recycling and disposal (Europe only)


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

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

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



ABB, Automation, Measurement & Analytics UK, fully supports the objectives of the RoHS II directive. All in-scope products placed on the market by Measurement & Analytics UK on and following the 22 July 2017, will be compliant to the RoHS directive, 2011/65/EU.

2 Cyber security

This product is designed to be connected to and to communicate information and data via a network interface. It is the operator's 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). The operator shall establish and maintain any appropriate measures (such as, but not limited to, the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc.), to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB 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.

3 System overview

Figure 1 shows the components of the ChloroStar Sensor:

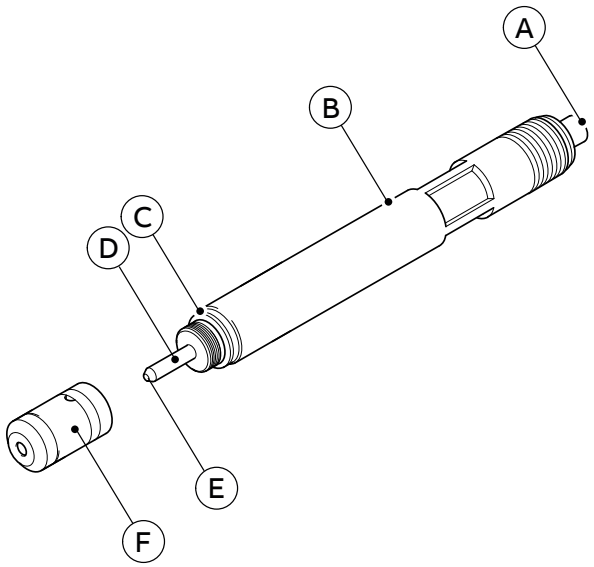


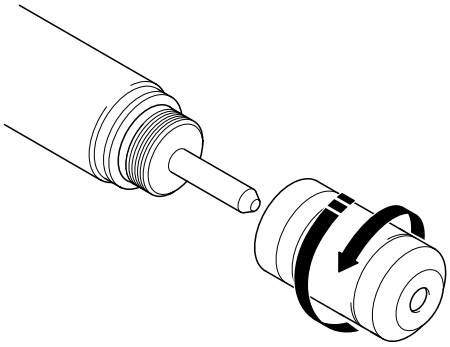
Figure 1 ChloroStar Sensor components

Table 1 ChloroStar Sensor parts

Part	Description
A	EZLink™ digital sensor connector
B	PVDF sensor body
C	Stainless steel counter electrode
D	Silver halide reference electrode
E	Gold working electrode
F	Sensor membrane cap

4 Commission the ChloroStar Sensor

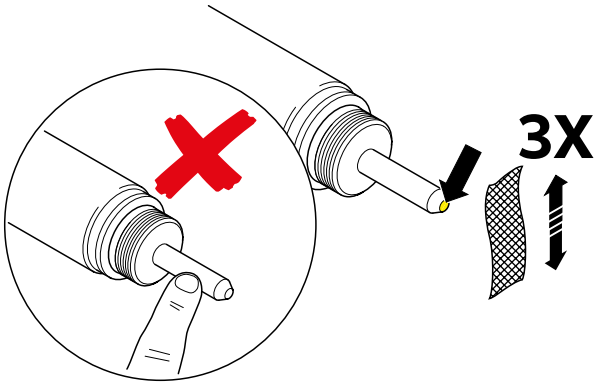
1 Loosen and remove the sensor membrane cap.



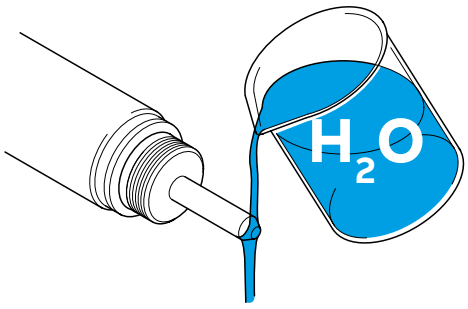
NOTICE

Do not touch the silver halide reference electrode to prevent scratching it.

2 Lightly polish the gold working electrode until it is clean (shiny in appearance). Rub the gold working electrode against the polishing strip three times in one direction only.



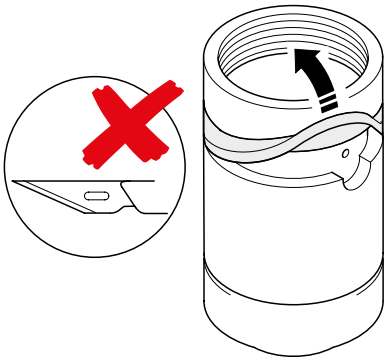
3 Clean the tip of the electrode with water.



NOTICE

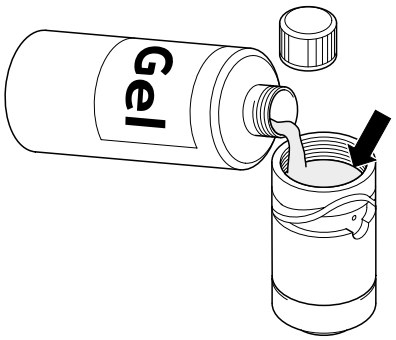
Do not use a sharp tool to lift the EPDM band.

4 Lift the EPDM band of the sensor membrane cap with your fingers.

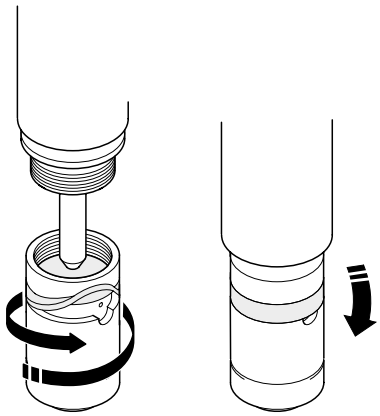


Note:
Do not shake the gel before use. This can create air bubbles that can have an unwanted effect on the measurement.

5 Fill the sensor membrane cap with the gel from the bottle. Fill to the lowest thread of the sensor membrane cap. Make sure that the gel is within the use-by date on the label.

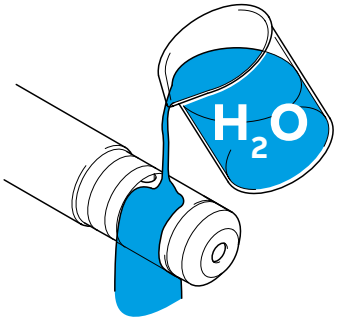


6 Connect the sensor membrane cap onto the sensor, then put the EPDM membrane back in its position.

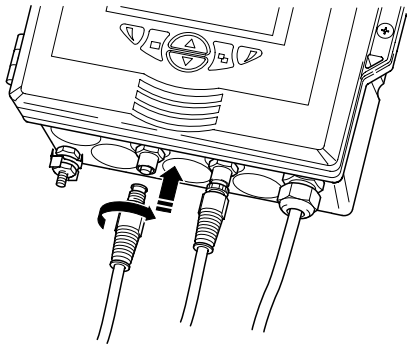


...4 Commission the ChloroStar Sensor

7 Clean the sensor membrane cap with water to remove spilled gel.



8 Connect the transmitter.



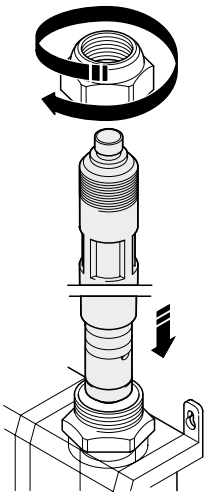
9 Start the Easy Setup.



10 Commission the sensor. Refer to "Table 2 ChloroStar Sensor setup menus" on page 7.

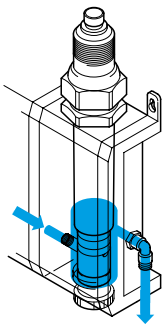
11 If your typical measurement range is less than 0.4 ppm, then perform a zero calibration in air. Place the sensor in air and wait for a period of 3 hours. Complete the zero calibration as outlined in section "6.4 PV zero calibration" on page 11.

12 Put the ChloroStar sensor into the flow cell and tighten the nut fully.



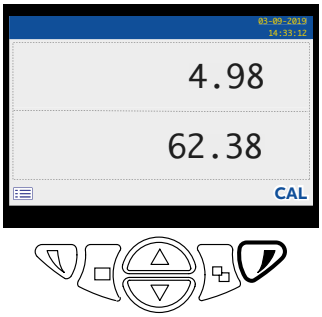
13 Wait 24 hours with the flow rate within specification for the sensor to polarize.

Note:
The flow rate and pressure changes have an effect on the measurement. Make sure that they are as stable as possible. Ensure the outlet tubing is less than 15 cm (5.9 in) below the elbow. The use of a valve of the outlet to create back-pressure is recommended to prevent bubbles affecting the reading.



14 Press the **Cal** button to start the calibration.

Note:
Calibrate the sensor in the same conditions where it will be used (flow rate, pressure, temperature, etc.)
Keep the stainless steel ring (the counter electrode) under the water when the sensor is powered. This will increase the life of the gel and reference electrode.



5 Sensor setup menus

Table 2 ChloroStar Sensor setup menus

Menu	Comment	Default
Tag	Enter an alphanumeric sensor tag (16 characters maximum) to identify the sensor on the **Operator Pages.**	TAG1
Measurement Type	Shows Total or Free. Read only.	
Chlorine Units	Select the chlorine units: • mg/L / ppm / µg/L / ppb / Custom	ppm
Custom Unit	Enter a user-defined 6-character unit to be displayed next to the chlorine value. **Note**: Only available if Chlorine Units = Custom.	ppm
Range High	Set the span value used in **Chart** and **Bar graph** views.	20.00 mg/L
Range Low	Set the zero value used in **Chart** and **Bar-graph** views.	0.00 mg/L
Filter Type	None / Low / Medium / High	None
Temp. Compensation	Set the temperature compensation: None / Manual / Automatic	Automatic
Manual Temperature	Set the manual temperature value to use. **Note**: Only displayed if Temp. Compensation is set to manual.	25
Bubble Reject	Allows the Steady-Flow module to be periodically turned off allowing air to escape. • Enabled / Disabled **Note:** Once enabled, this feature can be manually triggered from the **Operator** page.	Disabled
Bubble Rej. Frequency	Configurable between 30 minutes and 24 hours • 30 minutes / 1 hour / 2 hours / 3 hours / 6 hours / 12 hours / 24 hours	30 minutes
Bubble Rej. Recovery	Configurable stabilization period following bubble reject process: • 1 minute / 2 minutes / 3 minutes / 4 minutes / 5 minutes / 10 minutes / 20 minutes / 30 minutes / 40 minutes / 50 minutes / 60 minutes	1 minute
Note: The following menus are displayed only if a pH sensor is fitted to the other slot		
pH Compensation	Select pH compensation: • Enabled / Disabled	Disabled
pH Drift Alarm Trip	Limited 0 to 14.00 pH	5 pH
pH Drift Alarm Cal	The current pH reading after a successful ACL420 calibration. Read only. **Note:** The pH drift alarm is calculated based on the following equations: Current pH reading > (pH drift alarm cal + pH drift alarm trip) OR current pH reading < (pH drift alarm cal - pH drift alarm trip) If either is true, a pH drift alarm diagnostic will be deemed active, and an entry will be placed in the diagnostic log. The pH drift alarm is not calculated while in calibration.	7 pH
Membrane Lifetime	Set the default lifetime in days. Limited between 30 and 180 days.	180 days
Reset Memb. Lifetime	Command to reset the membrane lifetime to the default value.	
Electrolyte Lifetime	Set the default lifetime in days. Limited between 30 and 180 days.	90 days
Reset Elec. Lifetime	Command to reset the electrolyte lifetime to the default value.	
Commission	Commission the sensor. **Note:** Only available if the sensor is not commissioned.	
Reset to Defaults	Select to reset all sensor setup parameters to the default values.	

6 Calibration

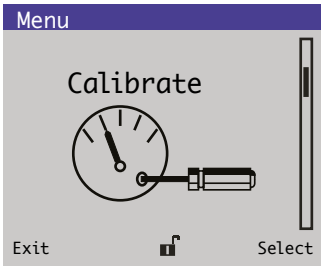
This section describes how to calibrate the sensor and involves measuring the sensor's sensitivity to chlorine concentration by performing a grab sample analysis with the AWQ101 EZTest 100 handheld chlorine calibrator.

Calibrations are initiated via the Cal prompt displayed on Operator pages or via the **Calibrate** and **Advanced** menu items on the **Access Level** page. Refer to the transmitter operating instruction OI/AWT420 for all transmitter menu options.

Note:
- Do not perform a calibration until the sensor and transmitter are installed and ready for operation.

Before performing a calibration, set the currents, outputs and alarms to Hold (enabled via the **Operator Menu/Manual Hold** function).
- After calibration and sensor replacement, reset the currents outputs and alarms. Refer to "6.1 Calibrate menu" on page 8.
- For samples running below 0.4 ppm, a zero calibration is recommended, however the sensor will still need a span calibration to adjust its sensitivity.
- This span calibration must be done with flowing sample (not static).

6.1 Calibrate menu



Used to calibrate the sensor.

Note:
Calibrate menus are sensor-specific.

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

6.2 Calibration menu options

Table 3 ChloroStar sensor calibration menus

Menu	Comment	Default
S1: ACL420	Select the chlorine sensor to calibrate	
PV Span Cal	Select to perform a 1-point calibration in chlorinated solution Refer to "6.3 PV span calibration" on page 10	
PV Zero Cal	Select to perform a 1-point calibration in dechlorinated solution Refer to "6.4 PV zero calibration" on page 11	
Sample Collection	Select to perform the sample collection routine to record the active current measured by the sensor Refer to "Sample calibration" on page 12	
Collection Complete	Select to perform the collection complete routine to update the calibration coefficients based on a lab measurement Refer to "Sample calibration" on page 12	
Temperature Cal	Select to perform a temperature calibration Refer to "6.6 Temperature calibration" on page 14	
Edit Cal	Select to manually edit the calibration coefficients	
PV Slope	Edit the slope value: • Valid slope values range from 20 to 500 %	100 %
PV Offset	Edit the offset value: • Valid offset values are ±5 mg/L	0 mg/L
Temp Slope	Edit the temperature slope value: • Valid slope values range from 20 to 500 %	100 %
Temp Offset	Edit the temperature offset value: • Valid offset values are ±50 °C	0 °C
Scheduled Zero Cal	Select to configure the schedules calibration	
Calibration Frequency	Select the Calibration Frequency: • Off / 4 hours / 8 hours / 12 hours / 1 day / 2 days / 4 days / 8 days / 12 days / 1 month / 2 months	Off
Next Calibration	Set the date and time of the next calibration	—
Delay Time	Set the delay time between 1 and 30 minutes	1 min
Recovery Time	Set the recovery time between 1 and 30 minutes	1 min
Inlet Valve	Source relay assigned Calibration Filter Inlet	None
Outlet Valve	Source relay assigned Calibration Filter Outlet	None
Reset Cal Defaults	Select to reset the calibration values back to defaults	
Hold Outputs	Enable/disable the **Hold Outputs** function If enabled, the current outputs and alarm functions are held during calibrations	Enabled

...6 Calibration

6.3 PV span calibration

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

To do the span calibration:

1 Prepare the equipment for taking a grab sample.
This includes the EZTest 100 handheld chlorine calibrator, and the selected tablets or powders for the type of measurement (free/total chlorine) and the expected range.

For more information on selecting the reagents, refer to OI/AWQ101.

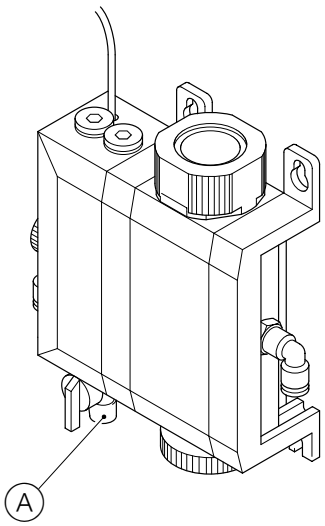
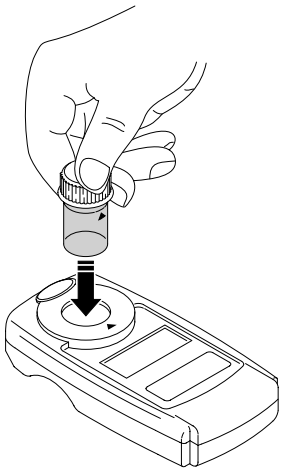


Figure 2 Flow cell port

2 Take a grab sample using the port (A) on the flow cell.

3 Fill the cell to the 10 mL level.
Note:
The correct level is when the bottom of the concave meniscus is at the 10 mL level.

4 Place the cell in the EZTest 100 handheld calibrator.



5 Power on the unit, then select the method that is being used, and perform the zero measurement.



6 Empty the cell.

7 Add the selected reagent (powder or tablet) to the cell. Crush the reagent if it is necessary.

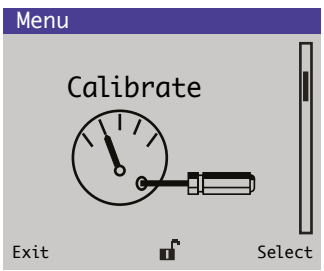


8 Fill the cell with the sample up to the line.

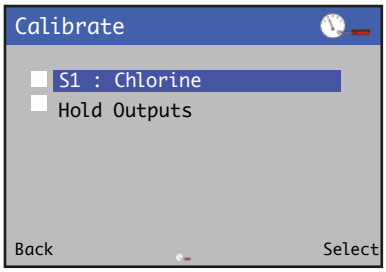
9 Place the cell in the EZTest 100 handheld calibrator, and press the **Test** button to take a measurement.

10 Record the result of the chlorine measurement.

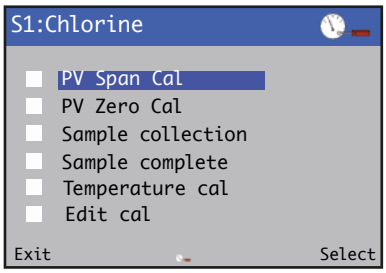
11 On the transmitter, navigate to the **Calibrate** menu:



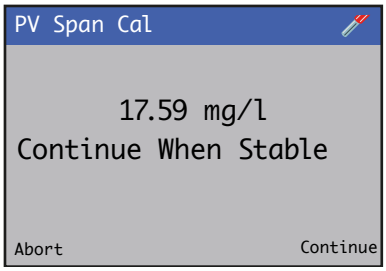
12 Select the sensor to calibrate:



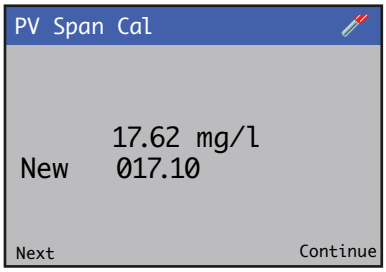
13 Select **PV span calibration**:



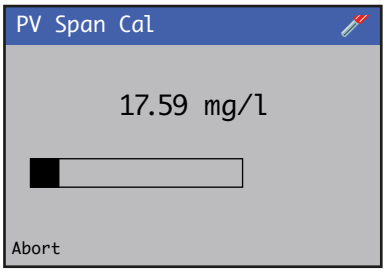
14 Wait for the reading to become stable.



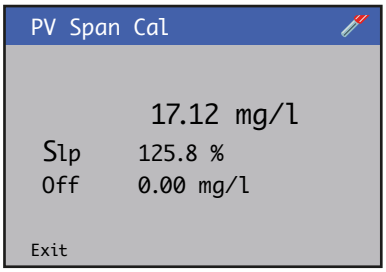
15 Use the ▲/▼ keys to enter the new PV reading reported in the EZTest 100 handheld calibrator, then press the ◢ key to confirm the changes:



16 The PV Span calibration process screen is displayed:



17 Wait for the progress bar to update and for the calibration to complete. The updated calibration information will be displayed on the screen, and added to the calibration log:



6.4 PV zero calibration

Note:
Zero calibration should be performed on de-chlorinated samples only. When using carbon filters, allow 24 hours on de-chlorinated sample before performing a zero calibration.

Alternatively, the sensor can be suspended in air to perform a zero calibration using the following steps:

- Remove the sensor from sample.
- Gently dry the end of the sensor.
- Leave the sensor in air for 3 hours.
- Perform zero calibration.

A zero calibration can be performed if the sensor reports a nonzero value when in a dechlorinated sample.
The process is the same as the PV span calibration on page 10, but with **PV zero cal** selected in step 13 instead of **PV Span Cal**.
Only the offset will be adjusted, not the slope.

...6 Calibration

6.5 Sample calibration

Note. The sample calibration feature may be used to perform a calibration with sample analysis off site.

To do the sample calibration:

1 Perform a sample collection routine in the transmitter.

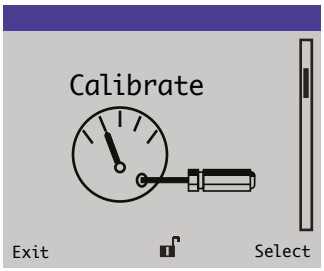
2 Collect a sample from the grab sample port on the flow cell.

3 Analyze sample for chlorine concentration (may use handheld calibrator or offline lab analysis).

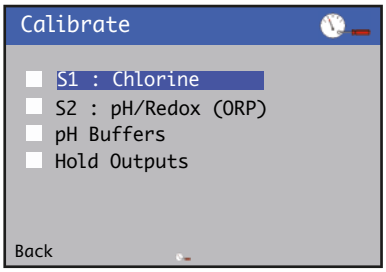
4 Perform the collection complete routine to update calibration coefficients in the sensor.

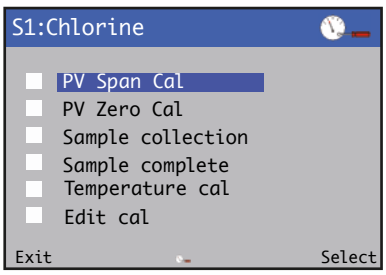
To do the sample collection routine:

1 On the transmitter, navigate to the **Calibrate** menu:

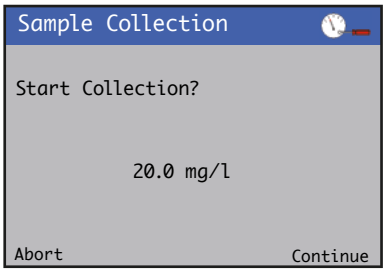


2 Select sensor to calibrate, then select **Sample Collection**:

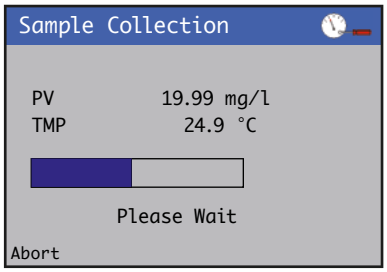


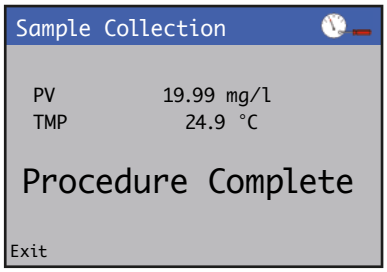


3 Wait for the reading to become stable and then press the **Continue** button:



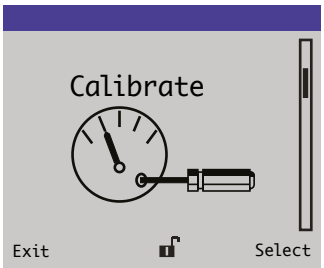
4 Wait for the routine to finish while the analyzer records the current being measured by the sensor:



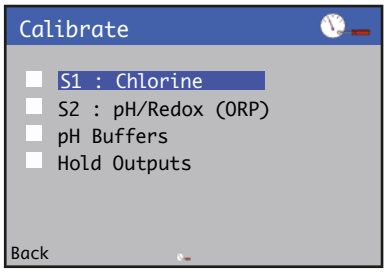


To do the collection complete routine:

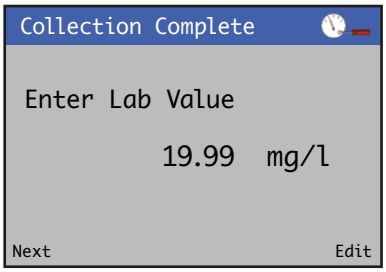
1 On the transmitter, navigate to the **Calibrate** menu:



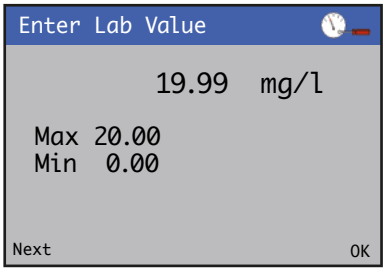
2 Select sensor to calibrate:



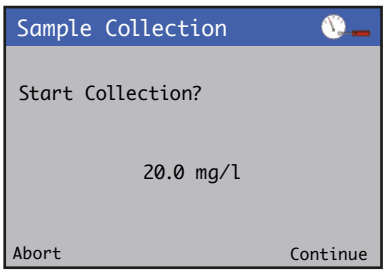
3 Select **Collection Complete** and then press the **Edit** button:



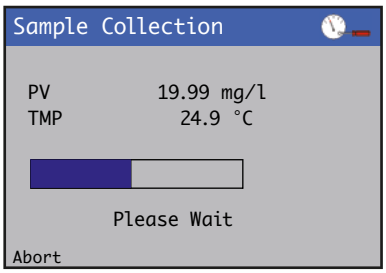
4 Use the ▲/▼ keys to enter the new PV reading reported from the analysis , then press **Next** to confirm the changes:



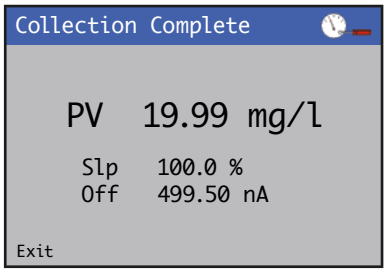
5 The **Sample collection** screen is displayed to start collection. Press **Continue** to confirm the changes:



6 Wait for the progress bar to update and for the calibration to complete. The updated calibration information will be displayed on the screen, and added to the calibration log:



7 The **Collection Complete** process screen is displayed:



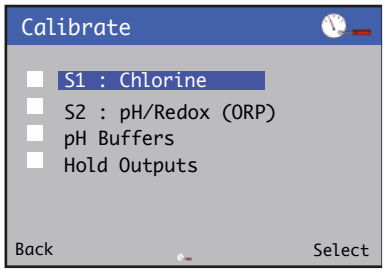
...6 Calibration

6.6 Temperature calibration

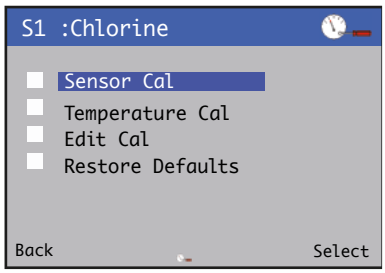
Note. The calibration can be canceled at any time during the process by pressing the **Abort** key.

To do the temperature calibration:

1 At the **Calibrate** level, press the key:
The **Calibrate** menu is displayed:

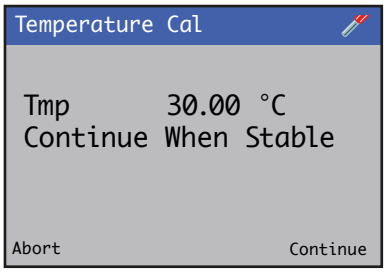


2 Use the / keys to select the sensor to be calibrated, and press the key to confirm selection.
The sensor calibration menu is displayed:

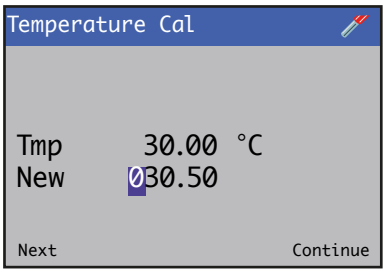


3 Press the / keys to select **Temperature Cal** and press the key to confirm selection.

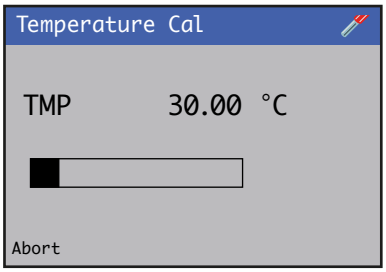
4 Wait for the displayed value to become stable, then press the key to start the calibration and proceed to the next step.



5 The new PV reading is displayed.
Use the / and keys to set the new temperature, then press the key to confirm the changes.

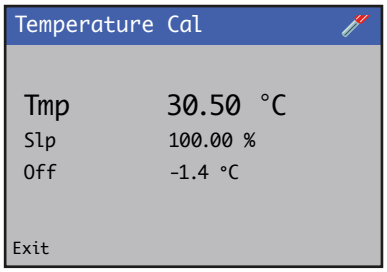


6 The temperature calibration process screen is displayed:



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.



7 Maintenance

7.1 Maintenance schedule

Table 4 Maintenance schedule

Maintenance task	Interval
Clean the sensor membrane cap	As required
Re-polarizing the sensor	As required
Changing the gel	3 months or as required
Replacing the membrane cap	6 months or as required
Polishing the working electrode	On replacement of gel
Replace the sensor	2 years

Note:
After you complete any maintenance task, it will be necessary to recommissioning the sensor. Refer "Commission the ChloroStar Sensor" on page 5.

7.2 Clean the sensor membrane cap

Estimated time:
5 minutes.

1 Remove the sensor from the flow cell.

2 Use a soft, lint-free cloth or soft-bristled brush to clean the sensor membrane cap, and the stainless steel counter electrode above the cap to remove build-up or fouling.

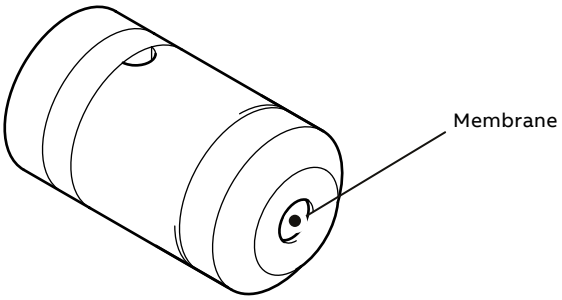


Figure 3 Sensor membrane cap

NOTICE

Do not use a sharp or pointed object to clean the membrane part of the sensor membrane cap in the next step. The membrane is easily damaged.

3 If necessary, clean the membrane in the center of the sensor membrane cap with a cotton bud, soft lint-free cloth, or soft-bristled brush.

7.3 Re-polarize the sensor

Estimated time:
24 hours.

If the sensor has not reached stability after the polarization period, then re-polarization might be necessary.

To re-polarize the sensor:

1 Disconnect the sensor from the power.

2 Turn off the flow to the flow cell, and remove the sensor from flow cell.

3 Remove the membrane cap.

4 Dry the sensor.

5 Polish the gold working electrode with a polishing strip.

6 Fill a new membrane cap with gel.

7 Install the new membrane cap to the sensor.

8 Install the sensor to the flow cell.

9 Start the flow to the flow cell.

10 Start the power to the sensor.

11 Wait for the sensor to stabilize before you calibrate it (approximately 24 hours).

...7 Maintenance

7.4 Change the gel

It might be necessary to replace the gel when:
- The gel has reached the end of its life.
- The slope has decreased by more than 50 % since commissioning.

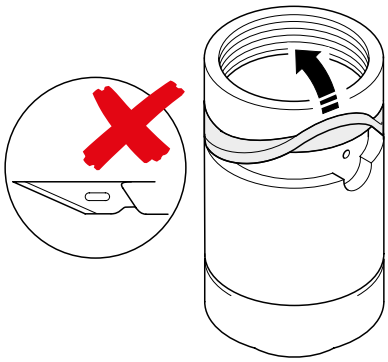
Note:
When the gel is replaced, the calibration must be reset to defaults.

To change the gel:

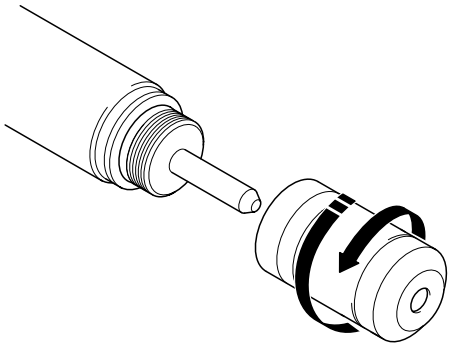
NOTICE

Do not use a sharp tool to lift the EPDM band.

1 Lift the EPDM band of the sensor membrane cap with your fingers.



2 Loosen and remove the membrane cap from the sensor body.



3 Discard the gel left in the membrane cap.

4 Wash the membrane cap in deionized water.

5 Fill the membrane cap with gel. Refer to "Commission the ChloroStar Sensor" on page 5.

7.5 Replace the membrane cap

Estimated time:
10 minutes.

The membrane cap might need to be replaced for these reasons:
- Fouling of the membrane cap that you cannot remove by cleaning.
- The membrane cap is at the end of its life.
- The slope decreased by more than 50 % since commissioning, and replacing the gel has not improved the performance.

Note:
When the membrane cap is replaced, the calibration must be reset to defaults.

To replace the membrane cap:

1 Loosen and remove the old membrane cap and discard it.

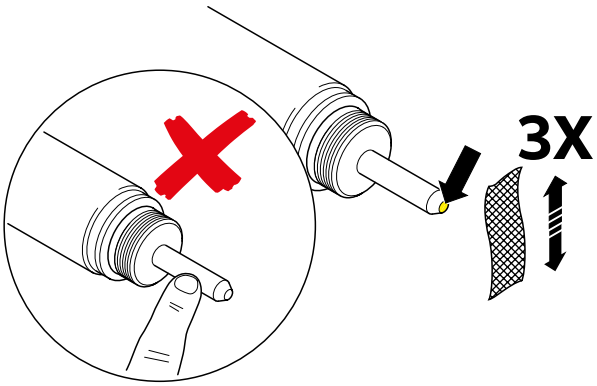
2 Fill the new membrane cap with gel, and install the membrane cap to the sensor. Refer to "Commission the ChloroStar Sensor" on page 5.

7.6 Polish the working electrode

Estimated time:
2 minutes.

If you see stains on the gold working electrode when you do maintenance on the electrode:

1 Polish the gold working electrode with the polishing strip provided. Brush the tip three times in one direction.



7.7 Store the sensor

7.7.1 Store the sensor for less than 1 week

1 Store the sensor in clean water.

7.7.2 Store the sensor for less than 1 month

1 Dry the sensor.

2 Store the sensor in air (with the gel left in the membrane cap).

7.7.3 Store the sensor for more than 1 month

1 Remove the gel from the membrane cap.

2 Store the sensor in air.

8 Diagnostic messages

This section describes sensor-specific icon types, diagnostic messages and possible causes/suggested remedial action.

Table 5 NAMUR 107 diagnostic icons

			
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

For transmitter-specific diagnostic messages, refer to the transmitter operating instruction OI/AWT420.

8.1 S(n): ADC failure

Diagnostic message

 S(n): ADC failure

Cause
Failure of the analog-to-digital converter in the sensor module.

Recovery actions
1 Cycle power to the sensor.
2 If the failure persists, contact the local service organization.

8.2 S(n): NV failure

Diagnostic message

 S(n): NV failure

Cause
The sensor configuration data is corrupt, or the sensor's nonvolatile memory is faulty. The sensor's configuration might be affected, and changes might not be kept after power cycle.

Recovery actions
1 Cycle the power to the transmitter.
2 If the failure persists, check all configuration parameters for all sensor, and correct any errors. Save the configuration to SD™ Card or via the Bluetooth® app.
3 Reset the sensor to the defaults from the **Sensor Setup** menu, and reload the saved configuration.
4 If the failure persists, contact the local service organization.

8.3 S(n): Temperature failure

Diagnostic message

 S(n): Temperature failure

Cause
The measurement taken from the temperature sensor is invalid, indicating that the temperature sensor failed, or the related connections are open circuit or short circuit.

Recovery actions
1 Visually examine the sensor/temperature sensor for signs of damage. Replace the damaged sensor.
2 Examine the wiring to the sensor module terminals.
3 If the failure persists, contact the local service organization.

8.4 S(n): Calibration failed

Diagnostic message

 S(n): Calibration failed

Cause
The most recent sensor calibration has failed, calibration coefficients have not been updated, and the previous values continue to be applied.

Recovery actions
1 Visually examine the sensor for signs of damage or dirt and clean it if necessary.
2 Make sure that the sensor is fully submerged in the solution.
3 Do the calibration again.
4 If the failure persists, contact the local service organization.

8.5 S(n): PV out of limits

Diagnostic message

 S(n): PV out of limits

Cause
The measured process value is out of specification of the sensor.

Recovery actions
1 Change the process value of the sample to a value that is within the sensors operating range, and recalibrate the sensor.

8.6 S(n): Process temp out of limits

Diagnostic message


S(n): Process temp out of limits

Cause
Solution temperature is outside the measurement range of the sensor. Refer to the sensor data sheet to determine the temperature range.

Recovery actions
1. Make sure that the solution temperature is in the sensor measurement limits.
2. Check the process and reduce the effect of any potential heat sources.
3. If this diagnostic is consistently active, it might be necessary to replace the sensor with an alternative that has a wider or more appropriate temperature range.
4. Contact the local service organization for possible solutions.

8.7 S(n): Internal temp out of limits

Diagnostic message


S(n): Internal temp out of limits

Cause
The sensor module measurement circuitry is operating at a temperature outside its recommended range. This might cause measurements to be inaccurate.

Recovery actions
1. Make sure that the ambient temperature of the transmitter that contains the sensor module is within its operating temperature range.
2. If the failure persists, contact the local service organization.

8.8 S(n): Membrane replacement overdue

Diagnostic message


S(n): Membrane replacement overdue

Cause
The membrane is overdue replacement.

Recovery actions
1. Replace the membrane (see "Maintenance" on page 15 for more details).

8.9 S(n): Electrolyte replacement overdue

Diagnostic message


S(n): Electrolyte replacement overdue

Cause
The electrolyte is overdue replacement.

Recovery actions
1. Replace the electrolyte (see "Maintenance" on page 15 for more details).

8.10 S(n): Sensor replacement overdue

Diagnostic message


S(n): Sensor replacement overdue

Cause
The sensor reached the end of its life.

Recovery actions
1. Replace the sensor.

8.11 S(n): Calibrating

Diagnostic message


S(n): Calibrating

Cause
Sensor calibration in progress

Recovery actions
This diagnostic clears when the calibration is complete.

8.12 S(n): Recovery

Diagnostic message


S(n): Recovery

Cause
Active during the period between completion of a sensor calibration, and the sensor being ready to make measurements.

Recovery actions
This diagnostic clears when the calibration is complete.

...8 Diagnostic messages

8.13 S(n): Manual temperature compensation active

Diagnostic message



S(n): Manual temperature compensation active

Cause
Temperature compensation mode has been configured to manual mode

Recovery actions
The diagnostic is cleared if manual temperature compensation is turned off.

8.14 S(n): Sensor uncommissioned

Diagnostic message



S(n): Sensor uncommissioned

Cause
The sensor has not been commissioned.

Recovery actions
1 Commission the sensor from the transmitter.

8.15 S(n): Membrane replacement warning

Diagnostic message



S(n): Membrane replacement warning

Cause
The membrane cap in the chlorine sensor reaches its expiry date in 2 weeks.

Recovery actions
1 Replace the membrane soon.

8.16 S(n): Electrolyte replacement warning

Diagnostic message



S(n): Electrolyte replacement warning

Cause
The electrolyte in the chlorine sensor reaches its expiry date in 2 weeks.

Recovery actions
1 Replace the electrolyte soon.

8.17 S(n): Sensor replacement warning

Diagnostic message



S(n): Sensor Replacement Warning

Cause
The chlorine sensor reaches its expiry date in 1 month.

Recovery actions
1 Replace the sensor soon.

8.18 Low flow

Diagnostic message



Low flow

Cause
Low flow or no flow detected.

Recovery actions
1 Make sure that there is a flow of fluid.

2 Examine the connections to the transmitter and the low flow sensor.

8.19 pH drift

Diagnostic message



pH drift

Cause
pH reading exceeded +/- pH drift limit.

Recovery actions
1 Investigate the source of the pH drift.
Note:
Recalibrating the chlorine sensor will also recalibrate the pH drift alarm calculation.

9 Troubleshooting

This section describes common reasons for sensor malfunctions and gives possible solutions.

9.1 Reading is unstable or fluctuates

Causes	Recovery actions
The membrane cap is fouled or damaged	Replace membrane cap
Bubbles present on the membrane surface	Make sure incoming sample is free from bubbles
Bubbles inside the membrane cap	Replace filling gel
Unstable sample flow rate/pressure	Stabilize the incoming sample flow

9.2 No reading

Causes	Recovery actions
Electrode conditioning is not complete	Replace gel and membrane. Wait approximately 24 hours for sensor polarization to complete
Faulty cable/connection	Replace the extension cable and check all connections

9.3 High zero point

Causes	Recovery actions
The water sample is not chlorine free	Replace zero calibration point with chlorine-free sample
Interfering substances in the sample	Polish the electrode

9.4 Low slope

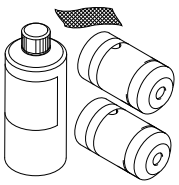
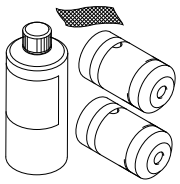
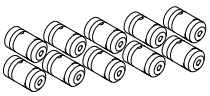
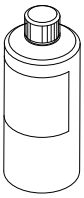
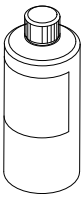
Causes	Recovery actions
The membrane cap is fouled	Replace the membrane cap
Electrolyte is aging	Replace the electrolyte
Insufficient conditioning	Re-polarize the sensor
Low flow rate	Make sure the flow rate is within minimum specification and is stable

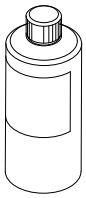
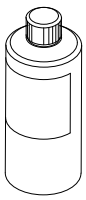
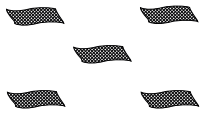
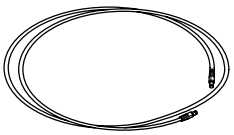
9.5 Flow response time

Causes	Recovery actions
The membrane cap is fouled	Replace the membrane cap
Bubbles present	Make sure incoming sample is free of bubbles

Note:
If the failure persists, contact the local service organization.

10 Spares

Part number	Description	
3KXA843401L0001	Annual maintenance kit (total) – Includes: • Electrolyte (total) – 125 mL, • Membrane (× 2), • Polishing strip (× 5)	
3KXA843401L0002	Annual maintenance kit (free) – Includes: • Electrolyte (free) – 125 mL, • Membrane (× 2), • Polishing strip (× 5)	
3KXA843401L0003	Membrane pack (× 10)	
3KXA843401L0004	Electrolyte (total) – 125 mL	
3KXA843401L0005	Electrolyte (free) – 125 mL	

Part number	Description	
3KXA843401L0006	Electrolyte (total) – 60 mL	
3KXA843401L0007	Electrolyte (free) – 60 mL	
3KXA843401L0008	Polishing strips (× 5)	
	EZLink cable	
AWT4009010	1 m (3.3 ft)	
AWT4009030	3 m (9.8 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)	

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- EZLink is a trademark of ABB Limited.
- SD is a trademark of SD-3C.

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abb.com/measurement

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