MEASUREMENT & ANALYTICS | DATA SHEET | DS/ACL420-EN REV. B

CHLOROSTAR™ SENSOR

Digital chlorine sensor

ENGINEERED
TO OUTRUN



MEASUREMENT MADE EASY

The ¾ in digital chlorine sensor for the measurement of free or total chlorine in water disinfection schemes

Easy to operate
- Plug-and-play digital sensor connection.
- Scheduled maintenance notification.
- Bufferless operation for elevated pH and total chlorine applications.

Measurement confidence
- Proven three-electrode membrane reduces measurement drift.
- Dual measurement validation.
- Operation over wide pH range.

Simple to install
- Optional InFlow Multi-Cell modular flow cell capable of accepting ABB ¾ in or PG 13.5 sensor.
- Reduced samples waste down to 1 L/h (0.26 galUS/h).
- Optional flow control and out of sample notification.

Introduction

The ChloroStar Digital Chlorine Sensor is a rugged and compact sensor capable of measuring free or total chlorine for use in municipal and industrial water and wastewater applications.

The three-electrode membrane-based design offers excellent protection against measurement drift, without compromising speed of response.

Analysis and signal conditioning are conducted within the sensor housing and transmitted digitally to the transmitter. Featuring ABB's EZLink™ technology, simplified calibration, and low-service design, you benefit from simple operation, enhanced accuracy, and the lowest cost-of-ownership.

Measuring principle

The ChloroStar Sensor uses electrochemical measurement technology that provides an extremely stable and accurate measurement system with minimal drift.

Measuring principle
The sensor is a three-electrode amperometric cell comprising three electrodes:

- Gold measuring electrode
- Stainless steel counter electrode
- Silver halide reference electrode



Figure 1 ChloroStar Sensor electrodes

These three electrodes are covered by a membrane and filled with an electrolyte solution. This protects the electrodes and makes the sensor less sensitive to changes in process pH than an electrode without a membrane.

When oxidizing substances such as chlorine are present in the sample, they will diffuse through the membrane and react at the measuring electrode, causing a current to flow.
This current is measured by the onboard digital electronics and converted into a chlorine concentration. The signal is compensated for temperature by an onboard temperature sensor located near the sample to a give fast response to changes in temperature.

Applications

The ChloroStar Sensor measures free and total chlorine in a wide range of applications requiring disinfection monitoring and control. Due to its three-electrode, membrane-based design, the sensor excels in applications susceptible to light fouling without the need for additional hardware for sample conditioning.

The ChloroStar Sensor is designed for applications such as:

- Municipal and industrial water and wastewater
- Food and beverage
- Distribution monitoring

Easy to operate

The ChloroStar Sensor is designed with features that make chlorine measurement easy and simple.

Plug and play connectivity
Convenient EZLink technology enables seamless plug-and-play integration when using the ChloroStar Sensor.

Automatically recognized, the sensor uploads calibration diagnostic, and manufacturing information to ABB's AWT420 universal multi-channel transmitters within seconds, significantly reducing commissioning and product maintenance.

Convenient sample verification

ABB's EZTest handheld calibration testing kits allow users to perform quick and easy on-site sample measurement. With results available in minutes, the ChloroStar Sensor can be easily verified to ensure measurement accuracy without the need for remote lab analysis.



Figure 2 EZTest 100 Chlorine handheld calibrator

This accessory makes on-site chlorine measurement verification and calibration simple with a one-time zero function that allows users to keep the calibration factors without having to adjust the zero prior to each measurement.

Key features:

- Convenient all-in-one travel case including portable device, reagents, measuring vials, and cleaning accessories
- Easy-to-use interface
- Durable, IP68 waterproof design

For additional information on the EZTest 100 handheld calibrator, refer to the product data sheet: DS/AWQ101.

Measurement confidence

Minimal measurement drift is achieved by use of a three-electrode design, which, compared to a two-electrode design, is able to achieve measurement stability.

This method, paired with a membrane design, protects the electrodes from fouling effects, reducing the need for frequent calibration or sensor refurbishment.

A convenient annual maintenance kit allows you to quickly refurbish the ChloroStar Sensor with new internal electrolyte solution and membranes ensuring extended operation of the Sensor for up to two years.

Accurate and reliable
Variations in pH can contribute to inaccuracies in the chlorine measurement. A key feature of the ChloroStar Sensor is the internal electrolyte capable of withstanding changes in pH without sacrificing sensor responsiveness and accuracy.

In addition, the internal electrolyte allows for measurement of total chlorine without the need of additional hardware and chemicals, normally required for open-cell chlorine measurement.

Simplified integration

The ChloroStar Sensor performance can be designed for use with ABB's InFlow Multi-Cell modular flow cell. Given the modular design, it allows users to meet their process needs by quickly adapting the flow cell to a range of process requirements.



Figure 3 InFlow Multi-Cell

Modular design
The snap-into-place components of the modular flow cell allow the customer to choose between a basic, single-parameter configuration for chlorine measurement only, to more advanced solutions, which can include a flow control module and additional inputs from pH/ORP, dissolved oxygen, or additional chlorine sensors—all easily upgraded in the field.

Low-flow capable
One of the challenges faced when measuring chlorine are low-flow conditions. Installations trying to minimize sample waste will struggle in keeping chlorine sensors from drifting, making it a difficult balance between measurement accuracy and waste

The InFlow Multi-Cell is capable of dealing with low-flow conditions with the Steady-Flow stirrer module, which agitates the sample around the sensor, minimizing measurement drift. Capable of maintaining accuracy down to 1 L/h, you no longer have to make the difficult decision.

For additional information on the modular flow cell, refer to the data sheet: DS/AZA100.

The transmitter that gives you more

The AWT420 universal multi-channel transmitter offers true flexibility for measuring a wide variety of parameters in a single device.



Figure 4 AWT420 universal multi-channel transmitter

pH compensation
Chlorine measurement is susceptible to variations in pH, especially at higher pH values. Traditionally, customers would either buffer the sample to control changes in pH, but this requires additional hardware like pumps and chemicals to control the level of pH.

When equipped with an additional pH sensor, the AWT420 transmitter is able to compensate the chlorine reading by use of an internal algorithm, ensuring measurement accuracy without the use of additional pumps or reagents.

pH drift alarm
As chlorine measurement is influenced by pH variants, the AWT420 allows users to provide notification of any drift by a user-defined level, when using an additional pH sensor. This provides advanced warning for any corrective actions to be taken ensuring measurement accuracy.

Dual verification
Considering the importance of chlorine measurement, some applications require higher confidence in their chlorine measurement. If one sensor were to drift or report an inaccurate reading, it would be difficult to determine whether this change was process-related, or due to drift in the sensor.

The AWT420 allows users to perform a dual verification of two chlorine measurements, the result of which can be used to calculate a difference in measurement or an average of the two.

Simple to integrate
Offering swappable communications and sensor modules, options for panel, pipe, and wall mountings and general purpose and safety enclosures, the AWT420 is the versatile single-box solution for measuring a range of parameters including pH/ORP, conductivity, dissolved oxygen, turbidity, total suspended solids, and chlorine.



Figure 5 AWT420 transmitter showing plug-in modules

Available in both corrosion-resistant polycarbonate, or a durable metal version with optional non-incendive approvals for hazardous area installation, it offers a versatile solution for use in utility and industrial process applications.

Your data, when you need it

The AWT420 incorporates several key features to help you find the data you need quickly and easily. An easily navigable, full-color TFT display makes it easy to find and access sensor data, while Bluetooth® technology provides up-to-the-minute information and technical support using ABB's EZLink Connect app.



Secure access to your data
Easy and secure access to measurement, diagnostic and audit data.

Keep your analysis up-to-date
Access software updates and sensor information through your smartphone.

Reduce process downtime
Keep track of current and upcoming maintenance tasks.

Figure 6 EZLink Connect app

Dimensions

All dimensions in mm (in).

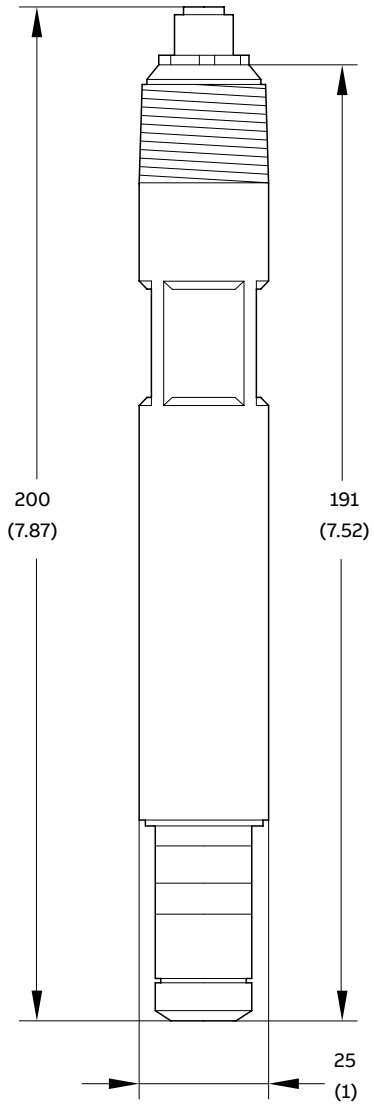


Figure 7 ChloroStar Sensor dimensions

Specifications

Measurement range
0.1 to 20 ppm (mg/L)
Measurement technology
3-electrode membrane-covered amperometric cell
Measurement interval
Continuous

Measurement performance

Accuracy
±1.5 % of the reference test (DPD) per ppm deviation from the grab sample point at stable pH*
Repeatability
0.05 ppm (mg/L)
Limit of detection
0.03 ppm (mg/L)
pH range
4 to 11
Response time
T90: 140 s

Environmental data

Ambient operating temperature
0 to 60 °C (32 to 140 °F)
Sample operating temperature
0 to 50 °C (32 to 122 °F)
Minimum sample flow rate
1 L/h (0.26 galUS/h) (with low-flow module)
10 L/h (2.6 galUS/h) (without low-flow module)
Maximum sample pressure
4.5 bar (65 psi)

Maintenance

Maintenance intervals
- Electrolyte replacement:
  Recommended every 3 months (dependent on process)
- Membrane replacement:
  Recommended every 6 months (dependent on process)

Calibration
- Single or two-point manual calibration
- Comparison to lab-based method

Wetted materials

- PTFE
- Gold
- Stainless steel
- PVDF
- Acrylic
- Silicone rubber

Mechanical data

Ingress protection
IP66

Approvals, certification, and safety

EPA Method 334.0
Measurement is compliant with EPA method 334.0
CE Mark
Covers EMC & LV directives (including latest version of EN61010)
EMC
Meets the requirements of IEC61326 for an industrial environment
ATEX/IECEx
Refer to hazardous area supplement, INF/ANAINST/014

Dimensions

Overall dimensions
200 × 25 mm
(7.8 × 1 in)

* Accuracy depends on the accuracy of the chemical test used to calibrate the sample. It is recommended that the sensor is used within 1 ppm or 20 % of the set point.

Ordering information

ChloroStar sensor	ACL420/	A	X	Options
Measurement type				
Free chlorine			1	
Total chlorine			2	

Optional ordering codes

The ChloroStar Sensor does not come with an EZLink extension cable. For new installations, order an EZLink extension cable:

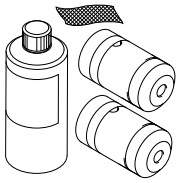
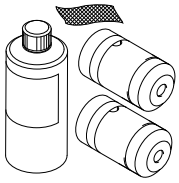
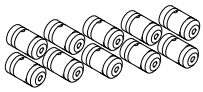
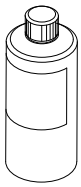
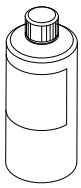
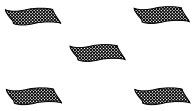
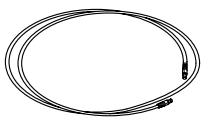
EZLink digital sensor extension cable	
1 m (3.3 ft)	E01
3 m (9.8 ft)	E03
5 m (16.4 ft)	E05
10 m (32.8 ft)	E10

What's included

- ChloroStar Sensor
- Membrane (× 1)
- Electrolyte (60 mL)
- Polishing strip (× 1)
- Sensor cabling*
- Commissioning instruction

* Optional

Spares

Part number	Description	
3KXA843401L0001	Annual maintenance kit (total) – Includes: • Electrolyte (total) – 125 mL • Membranes (× 2) • Polishing strips (× 5)	
3KXA843401L0002	Annual maintenance kit (free) – Includes: • Electrolyte (free) – 125 mL • Membranes (× 2) • Polishing strips (× 5)	
3KXA843401L0003	Membrane pack (× 10)	
3KXA843401L0004	Electrolyte (total) – 125 mL	
3KXA843401L0005	Electrolyte (free) – 125 mL	
3KXA843401L0008	Polishing strips (× 5)	
AWT4009010 AWT4009030 AWT4009050 AWT4009100 AWT4009150 AWT4009250 AWT4009500	1 m (3.3 ft) EZLink cable 3 m (9.8 ft) EZLink cable 5 m (16.4 ft) EZLink cable 10 m (32.8 ft) EZLink cable 15 m (49.2 ft) EZLink cable 25 m (82.0 ft) EZLink cable 50 m (164.0 ft) EZLink cable	

Trademarks

- Bluetooth is a registered trademark of Bluetooth SIG, Inc.
- ChloroStar is a trademark of ABB Limited.
- EZLink is a trademark of ABB Limited.

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