

ABB MEASUREMENT & ANALYTICS | DATA SHEET | DS/ACL410-EN REV. A

ChloroStar™ Cell

Free and total chlorine cell



Measurement made easy

For the measurement of free and total chlorine in fouling-prone applications

Dependable performance

- Open-cell design allows for instant response to changes of chlorine
- Unique self-cleaning sensor helps minimize maintenance and maintain accuracy

Measurement confidence

- Dual measurement validation
- Measurement compensation to offset pH variability
- pH drift notification
- Hand-held calibrator available for measurement verification

Flexible measurement options

- Free chlorine, total chlorine*, and chlorine dioxide
- Optional pH sensor available

*with optional buffer assembly

Introduction

The ChloroStar Cell is an amperometric cell capable of measuring free or total chlorine and chlorine dioxide in municipal and industrial water and wastewater applications.

The two-electrode, open-cell design offers excellent speed of response while the self-cleaning electrodes minimize measurement drift.

Compatible with the AWT420 transmitter through the universal input module, users can benefit from a dual channel device capable of accepting analog or digital inputs, a simplified HMI, and the latest communication protocols.

Measuring principle

The ChloroStar Cell is an amperometric cell comprising of two concentric electrodes;

- 1 An inner, spiral gold electrode
- 2 An outer, copper cylinder

Sample water flows into the electrode chamber through nozzles located in the measuring cell. The cell also contains a small amount of a special corundum sand that is circulated by the water and acts as an abrasive on the electrodes, keeping them at peak sensitivity.

The ChloroStar Cell is polarized because of the normal potential of these two different metal electrodes in water. When oxidizing substances such as chlorine, chlorine dioxide, ozone or their derivatives are present in the sample between the electrodes, the measuring (gold) electrode is depolarized and the counter electrode (copper electrode) dissolves as Cu^+ .

This electron flow generates a signal (current), that is proportional to the oxidizing agent concentration in the sample. The signal is temperature compensated for improved accuracy.

Applications

The ChloroStar Cell has been designed to measure oxidants in a wide range of applications, in particular ones challenged with fouling-prone samples. These applications include:

- Municipal and industrial water and wastewater
- Cooling water for power stations and industrial facilities
- Food and beverage
- Distribution monitoring

Dependable performance

The unique self-cleaning open-cell approach offers a number of benefits especially in fouling-prone applications which are susceptible to sluggish response and drift.

Speed of response

The open-cell approach allows the measuring electrodes direct contact with the process for increased speed of response, improving process control in demanding applications.

Reduced maintenance

One of the challenges faced when dealing with chlorine measurement is drift with time due to fouling effects on the electrodes. ABB's open cell, self-cleaning system helps reduce the need for regular cleaning with its unique concentric shaped cell which continuously cleans the electrodes with corundum sand. This action extends the operation of the cell while maintaining sensor sensitivity even in high-fouling applications.

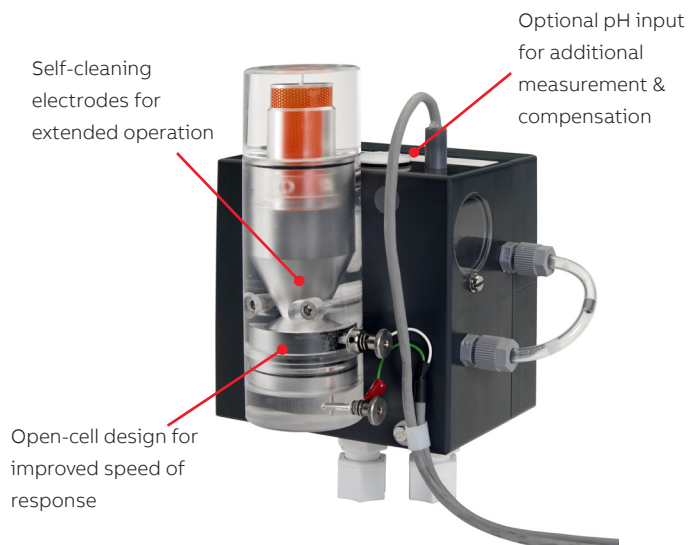


Figure 1 ChloroStar Cell key benefits

Measurement confidence

A key challenge in chlorine measurement is having the confidence in your reading and being able to effectively control a process. ABB offers a number of solutions to help meet issues faced by customers in routine daily measurement.

Accurate and reliable

Variations in pH can contribute to inaccuracies in the chlorine measurement. A key feature of the ChloroStar Cell is an optional buffer assembly for use in high-pH samples (> 7.5 pH) where small variations in pH can have a large impact on the chlorine measurement.

If reagent-less operation is preferred, an optional pH sensor can be equipped allowing for pH-compensation for improved measurement accuracy. In addition, an alarm notification can be programmed to notify users of any sudden changes in pH levels.

Convenient sample verification

ABB's EZTest 100 hand-held calibration testing kits allow users to perform quick and easy on-site sample measurement. With results available in minutes, the ChloroStar Cell 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.

For additional information on the EZTest 100 handheld calibrator, refer to the data sheet [DS/AWQ101](#).

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

The transmitter that gives you more

The AWT420 four-wire, dual-channel transmitter offers true flexibility for measuring a wide variety of parameters in a single device.



Figure 3 AWT420 transmitter

Enhanced performance

A universal input module provides connectivity to ABB's AWT420 modular transmitter allowing for more advanced functionality like dual measurement validation, helping track deviation from two chlorine sample points, or the ability to pH-compensate your chlorine measurement when using a secondary pH input.

pH compensation

Measurement is susceptible to variations in pH, especially at higher pH values. Traditionally, customers would 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.

Measurement 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/T.S.S., and chlorine.



Figure 4 AWT420 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 5 EZLink Connect App

Dimensions – ChloroStar Cell

All dimensions in mm (in)

203 (8.0) min. clearance for cell removal

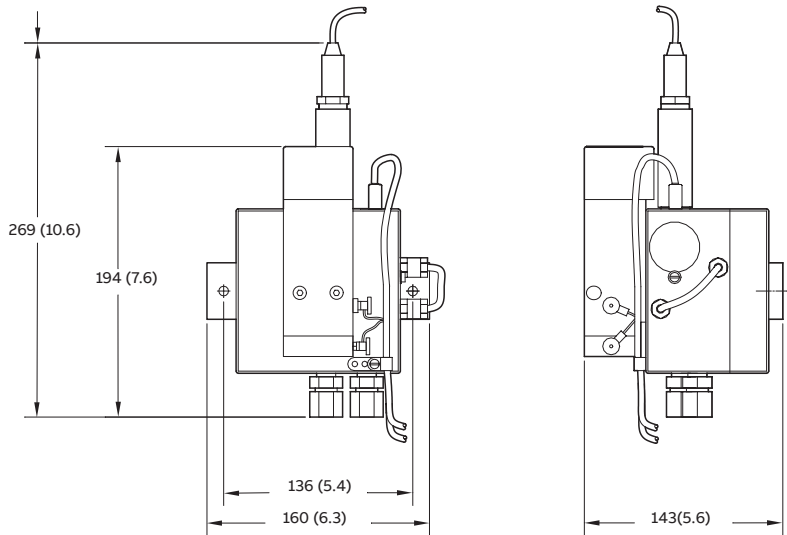


Figure 6 ChloroStar Cell dimensions

Dimensions – Buffer pump

All dimensions in mm (in)

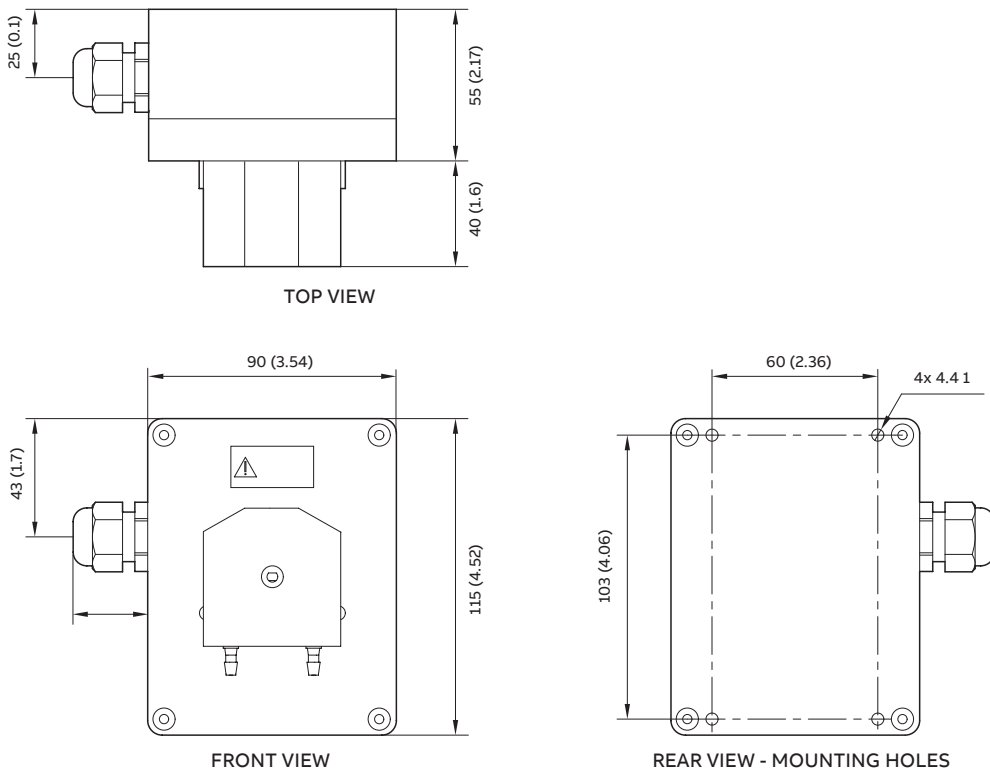


Figure 7 Buffer pump dimensions

Dimensions – Mixer assembly

All dimensions in mm (in)

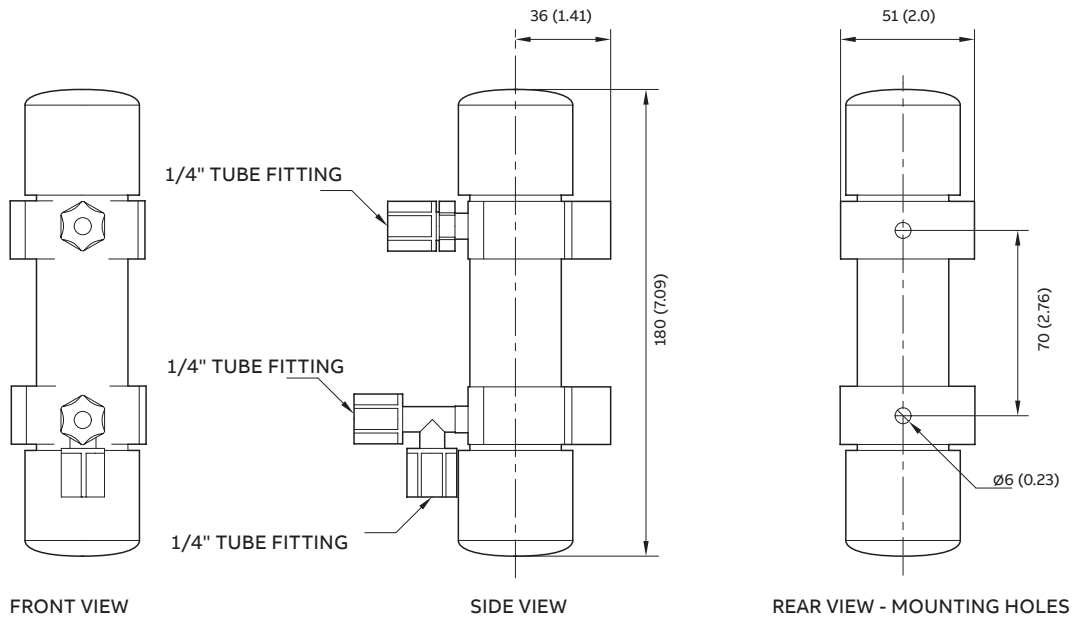


Figure 8 Mixer assembly dimensions

Specifications

Measurement range

Chlorine, chlorine dioxide: 0 to 20 ppm (mg/L)

Measurement technology

Amperometric cell

Measurement interval

Continuous

Measurement performance

Accuracy

- Unbuffered: 2% or ± 0.01 ppm (mg/L), whichever is greater at pH <7.5
- Buffered: 2 % or ± 0.01 ppm (mg/L), whichever is greater at pH <10

Sensitivity

0.001 ppm (mg/L)

Minimum detection limit

0.005 ppm (mg/L)

Drift

- Zero drift: ± 1 % over 30 days max
- Span drift: -5 % over 30 days max

Response time

(T90): 90 s

Interferences

Samples with high concentrations of metal ions or other strong oxidants may affect the analyzer operation

Environmental data

Ambient operating temperature

-10 to 50 °C (14 to 122 °F)

Ambient operating humidity

80 % RH at 31 °C (88 °F) with linear decrease to 50 % at 40 °C (104 °F)

Sample operating temperature

2 to 50 °C (36 to 122 °F)

Minimum sample flow rate

60 to 75 L/h (0.26 to 0.33 gal/min)

Maximum sample pressure

0.2 to 4 bar (2.90 to 58.01 psi)

For pressures over 4 bar (58.01 psi), install a pressure reducing valve

Recommended operating pressure is 2 bar (29.00 psi)

Sample pH

4 to 10*

*Buffer feed assembly is required for pH greater than 7.5.

No correction is needed when measuring chlorine dioxide

Maintenance

Maintenance interval

- Electrode replacement:
Recommended every 12 months
- O-rings replacement:
Recommended every 12 months

Calibration:

- Single- or two-point manual calibration
- Comparison to portable analyzers (like the EZTest 100 Chlorine handheld device), lab-based method with process sample, or dechlorinated sample

Cell construction material

- Electrodes: copper/gold
- Electrode Chamber: Plexiglas®
- Differential pressure regulator: PVC

Mechanical data

Ingress protection

IP64

Sample connections inlet/outlet

$\frac{3}{8}$ in OD polyethylene or flexible PVC tubing



Ordering information

ACL410 ChloroStar Cell	ACL410	XX	XX	XX
Build revision				
Reserved		A1		
Additional Parameters				
Not required			Y0	
100E pH sensor (pH electrode, PT100, 3m tinned cable)			B1	
Reagent feed assembly*				
Not required				Y0
230V pump system				R1
115V pump system				R2

*To include buffer pump, tubing and bottles - reagent sold separately

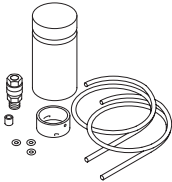
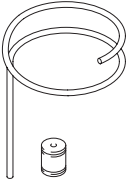


What's included

- ChloroStar cell and regulator assembly
- Corundum sand & measuring spoon
- Signal and temperature cables
- 100E pH electrode & holder*
- Reagent feed assembly, including pump, tubing and static mixer*
- Commissioning Instructions

*Optional

Spares - ChloroStar Cell

Part number	Description	
3KXA843400L0073	Cell maintenance kit	
3KXA843400L0074	Replacement gold electrode kit	

Acknowledgments

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



Notes



Notes

ABB Measurement & Analytics

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

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



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