MEASUREMENT & ANALYTICS | DATA SHEET | DS/500XD-EN REV. C

# 500 X-D

## Digital pH/ORP sensor

ENGINEERED
TO OUTRUN



# MEASUREMENT MADE EASY

The ¾ in digital pH/ORP sensor for use in the most extreme high-pressure, temperature, and fouling applications

**Superior performance**

- Engineered to resists poisoning from sulfides, cyanide, and other aggressive ions commonly found in industrial applications.
- Clog-resistant design ensures stable reading even in particulate-laden or non-conductive hydrocarbon media.
- Lasts up to 10 times longer than competing sensors.

**Measurement confidence**

- Improved temperature response giving more precise and accurate pH readings especially in dynamic conditions.
- Reduced calibration drift with close-coupled temperature compensation enabling faster and more reliable results.

**EZLink™ connectivity**

- Connect and measure capabilities make sensor integration fast and easy.
- Advanced diagnostics providing end-of-life indication and fault analysis.
- Improved measurement accuracy with digital communication.

## Introduction

Making the right sensor selection for your application should be simple and easy. To help you make the right choice, we've divided our new family of pH/ORP sensors into three distinct ranges based on the applications they have been designed for: the 100, 500, and 700 ranges.

The 100 range has entry-level sensors designed for light duty use, while the 500 range offers a robust design for industrial applications. The 700 range is a specialty range for target applications.

Each electrode is clearly named and is also color-coded for ease of identification. This enables you to easily select the best sensor to meet your needs, ensuring optimal plant efficiency, performance, and lifetime—every time.

## The 500 X-D digital pH/ORP sensor

Part of the next generation of ABB's pH/ORP sensors, the 500 X-D series feature the ultimate combination of performance, functionality and durability delivering a competitive offering for harsh industrial applications.

Ruggedly designed with hazardous area approvals, the 500 X-D delivers complete measurement confidence and value for challenging applications.

## Applications

The 500 X-D has been designed to measure the most challenging industrial applications, in particular, high temperatures and pressures as well as poisoning and fouling-prone samples. These applications include::

- Pulp & Paper
- Oil & Gas
- Chemical and Petrochemical
- Metals and Mining

## Superior performance

Industrial applications can be challenging with frequent and time-consuming maintenance requirements. Elevated pressures and temperatures, fouling/abrasive media and even exposure to strong chemicals can dampen or shift sensor response giving poor or inaccurate readings.

The 500 X-D is built for the harshest industrial applications and relies on the market-proven solid-state design with over 50 years of success in the industrial markets.

Utilizing a unique cellular structure, the 500 X-D has superior performance when dealing with applications which are prone to poisoning or plugging: common failure points for pH sensors used in industrial markets allowing it to operate up to 10 times longer than competing sensors in these conditions.



01 Teflon vs. wood junctions

**Liquid junctions; Teflon™ vs. wood**
When choosing the right sensor, determining the right liquid junction can significantly impact sensor performance and lifespan.

The 500 X-D is available with either Teflon or Wood junctions giving users flexibility across a wider range of challenging applications.

A standard offering in most applications, Teflon junctions offer excellent chemical resistance, longevity, and measurement stability especially in high pH (>11.5) or oxidizing (high ORP/Redox) environments such as Pulp and Paper. Teflon also works well in applications prone to fouling or coating.

Wood junctions on the other hand, offer customers unique benefits especially in applications which struggle from sensor clogging, in particular non-conductive media such as hydrocarbons such as in the Oil and Gas, Petrochemical and Chemical industries.

Ultimately, customers can benefit from more reliable pH measurements, lower maintenance costs, and improved performance no matter the application

## Measurement confidence

Customers often face challenges with inaccurate or slow pH readings when temperature conditions fluctuate, especially in dynamic industrial environments.

These delays and inconsistencies can lead to process inefficiencies, misinterpretation of results, and increased calibration frequency.

## ...Measurement confidence

The 500 X-D uses a close-coupled temperature element within the measuring electrode enabling rapid and precise temperature compensation, ensuring the sensor quickly adjusts to changing sample conditions.

The result is faster stabilization of pH readings and improved measurement accuracy for more reliable data, reduced downtime, and greater confidence in their pH monitoring processes.

## EZLink connectivity

Convenient EZLink technology enables seamless plug-and-play integration when using the 500 X-D. Automatically recognized, the sensor uploads calibration, diagnostic and manufacturing information to any of ABB's EZLink-capable transmitters within seconds; significantly reducing commissioning and product maintenance

**Sensor health check**
The 500 X-D provides advanced sensor diagnostics such as the unique perpetual impedance monitoring (patent-pending) that detects electrode faults such as Broken Glass or Out-of-Sample in real-time without the need for a solution earth.

In addition, ABB's SMART reference electrode monitoring (REM) system provides early warning notification of electrode poisoning allowing users the ability to detect when a sensor is about to fail.

**Enhanced accuracy**
Instantaneous signal conditioning from analog to digital ensures minimal electrical interference and strengthens signal strength, greatly improving measurement accuracy even with longer cable distances

## Flexible installation

Adaptable with a range of accessories suited for ¾ in sensor body styles, mounting the 500 X-D can be easy with either dip pole, chain mounting, flow cell, in-line fitting or retractable assemblies greatly increasing adaptability without sacrificing availability.

## Extended storage

We understand most customers maintain stock of pH/ORP sensors in case of unexpected demand. Ensuring peak performance, even after extended storage, is critical in maintaining product availability and keeping your process running.

The 500 X-D is stored in a specially formulated solution with added antimicrobial agent, keeping the sensor active for up to two years when stored as recommended.



## Hazardous area approval

Offering ATEX/IECEx approvals, the 500 X-D ensures compliance and operational safety, providing peace of mind in hazardous area locations.

## Transmitters that give you more

The digital 500 X-D is compatible with ABB's AWT424 4-wire, multi-input, and AWT210 2-wire, single-channel transmitters, offering true flexibility for measuring a wide variety of applications and locations.




02 AWT424 4-wire, multi-input transmitter

**Simple to integrate**
Both the AWT424 and AWT210 offer swappable communications and sensor modules, options for panel, pipe, and wall mountings, and general-purpose and hazardous area approvals. This ensures versatility for measuring a range of parameters including pH/ORP, conductivity, dissolved oxygen, turbidity, total suspended solids, and chlorine in a wide range of environments.




03 AWT210 transmitter with plug-in modules

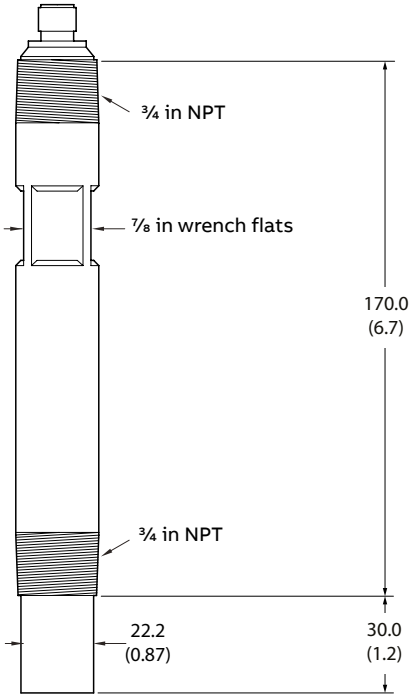
Each transmitter is available in both corrosion-resistant polycarbonate, or a durable metal version with optional non-incendive and intrinsic safety approvals* for hazardous area installations. This flexibility offers a versatile solution for use in utility and industrial process applications.

* Transmitter dependent

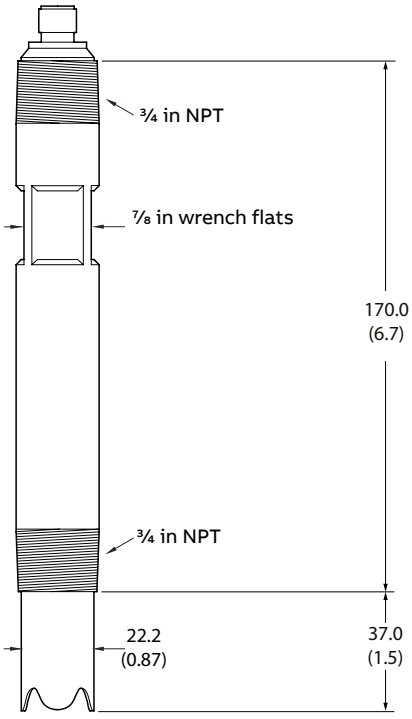
# Dimensions

Dimensions in mm (in)

**Flush sensor body**




**Notched sensor body**




ASME B1.20.1 ¾ in NPT thread is compatible with ASME B16.11 ¾ in NPT threaded fittings including: couplings, half couplings, bosses, couplets.

# Specifications

## Measurements

- pH/ORP (platinum and gold)
- Temperature

## Measurement range

**High performance (S) and high temperature (HT) glass**
0 to 14 pH
**Hydrofluoric acid-resistant (HF) glass**
0 to 12 pH
**Low temperature (LT) glass**
0 to 10 pH
**ORP**
-2,000 to 2,000 mV

## Temperature range

**High performance (S) glass (flat)**
5 to 100 °C (41 to 212 °F)
(typical glass impedance at 25 °C [77 °F] = 600 MΩ)
**High temperature (HT) glass**
0 to 105 °C (32 to 221 °F)
(typical glass impedance at 25 °C [77 °F] = 800 MΩ)
**Hydrofluoric acid-resistant (HF) glass**
0 to 80 °C (32 to 176 °F)
(typical glass impedance at 25 °C [77 °F] = 700 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 105 °C (32 to 221 °F)
**ORP gold electrode**
0 to 105 °C (32 to 221 °F)

## Temperature sensor

Pt100 (Class B, IEC 60751)

## Maximum pressure

30 bar (435 psi) up to 100 °C (212 °F)

## Recommended minimum sample conductivity

50 µS/cm

## Recommended sensor storage

Between 15 and 35 °C (59 and 95 °F)

## Isothermal point at 25 °C (77 °F)

pH 7

## Reference system

Ag/AgCl with quadruple junction, KCl-saturated solid-state (wood) plus ion trap

## Process connections

¾ in NPT

## Wetted materials

**Electrode body**
PVDF (Kynar)
**Reference junction system**
Porous PTFE and Viton™ Extreme™ O-rings
Wood
**Measure system**
pH: Glass
ORP: Platinum or gold

## Approvals, certification and safety

**CE Mark/UKCA**
Covers EMC+LV directives
(including latest version of EN61010)
**cFMus**
Certificate numbers:
- FM20US0155X
- FM20CA0078X

IS:
Class I Div 1 ABCD T4
Class I Zone 0 AEx/Ex ia IIC
NI:
Class I Div 2 ABCD T4
Class I Zone 2 AEx/Ex ic IIC T4
**EMC**
Meets requirements of IEC61326 for an industrial environment
**ATEX/IECEx**
Certificate numbers:
- IECEx BAS 18.0047X
- Bassefa18ATEX0071X
- BAS21UKEX0244X

II 1 G Ex ia IIC T4 Ga -5°C<Ta<100°C (30 bar)

# Ordering information

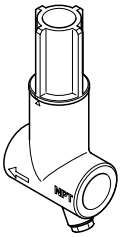
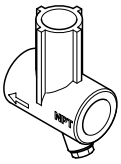
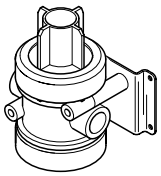
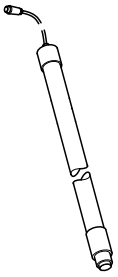
| 500 X-D ¾ in pH/ORP electrode (digital EZLink) | APS552/ | XX | XX | XX | D | XX | Option |
|---|---|---|---|---|---|---|---|
| **Sensor type** | | | | | | | |
| pH – flat glass for in-line, fouling applications: high performance (S) glass | | P3 | | | | | |
| pH – low temperature (LT) glass | | P4 | | | | | |
| pH – hydrofluoric acid-resistant (HF) glass | | P5 | | | | | |
| pH – high temperature (HT) glass | | P6 | | | | | |
| ORP (Redox) – platinum | | R2 | | | | | |
| ORP (Redox) – gold | | R3 | | | | | |
| **Liquid junction** | | | | | | | |
| PTFE * | | | J1 | | | | |
| Wood ** | | | J2 | | | | |
| **Body style** | | | | | | | |
| ¾ in threaded insertion/immersion – no sensor guard (flush) | | | | K1 | | | |
| ¾ in threaded insertion/immersion – notched sensor guard | | | | K2 | | | |
| **Integral cable length** | | | | | | | |
| None | | | | | | 00 | |
| 1 m (3.3 ft) | | | | | | 01 | |
| 3 m (9.9 ft) | | | | | | 03 | |
| 5 m (16.4 ft) | | | | | | 05 | |
| 10 m (32.8 ft) | | | | | | 10 | |

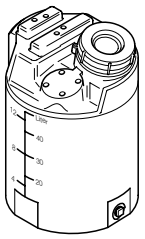
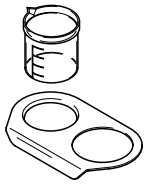
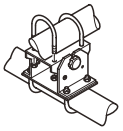
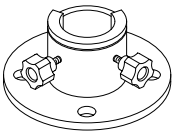
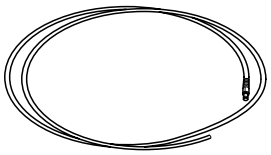
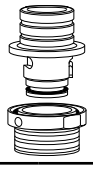
| Optional order code | Option |
|---|---|
| **Extension cables** | |
| 1 m (3.3 ft) | E01 |
| 5 m (16.4 ft) | E05 |
| 10 m (32.8 ft) | E10 |
| 15 m (49.2 ft) | E15 |
| 25 m (82 ft) | E25 |

* For poisoning-prone applications, containing oxidizing, caustic, sulfides, ammonia.

** For plugging prone applications containing hydrocarbon, organics

# Accessories

| Part number | Description | |
|---|---|---|
| 3KXA163000L0002 | 1 in BSP bayonet polycarbonate T-piece |  |
| 3KXA163000L0004 | 1 in NPT bayonet polycarbonate T-piece | |
| 3KXA163000L0006 | 1 in BSP screw polycarbonate T-piece |  |
| 3KXA163000L0008 | 1 in NPT screw polycarbonate T-piece | |
| 3KXA163000L0012 | ½ in NPT polycarbonate flow cell and ¾ in adapter |  |
| 3KXA163000L0011 | ½ in NPT stainless steel flow cell and ¾ in adapter | |
| 3KXA163000L0024 | Protective shroud for ¾ in body |  |
| | **1¼ in NB dip pole assembly** |  |
| 3KXA163000L0021 | 2.5 m (8.2 ft) | |
| 3KXA163000L0022 | 1 m (3.3 ft) | |
| 3KXA163000L0023 | Dip pole kit (customer-supplied 1¼ in NB tube) |  |

| Part number | Description | |
|---|---|---|
| 3KXA163000L0025 | Automatic cleaning system (liquid) |  |
| 3KXA163000L0026 | T-piece cleaning adapter |  |
| 3KXA163000L0120 | Calibration kit (includes calibration beaker and holder) |  |
| ATS4000760 | Rail mounting kit (tilt only) |  |
| ATS4000785 | Open-tank flanged dip mount |  |
| | **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 ft) | |
| AWT4009500 | 50 m (164 ft) | |
| 3KXA163600L0002 | InLine ¾ in twist-lock adapter |  |

For a complete list of spares and accessories, refer to Operating Instruction OI/100/500.

## Trademarks

- EZLink is a trademark of ABB Limited.
- Kynar is a registered trademark of Arkema Inc.
- Teflon is a trademark of The Chemours Company FC, LLC.
- Viton and Viton Extreme are trademarks of the Chemours Company.

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