

# 500 X

Analog pH/ORP sensor

ENGINEERED  
TO OUTFIT



# MEASUREMENT MADE EASY

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

## **Superior performance**

- Engineered to resist 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.

## **Superior heat resistance**

- Capable of temperatures up to 155 °C (311 °F), the 500 X's solid-state design can be directly mounted in high-temperature applications for faster and accurate readings.

## 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 analog pH/ORP sensor

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

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

## Applications

The 500 X 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 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 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 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 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.

## Superior heat resistance

In many industrial processes—such as chemical production and oil & gas—temperatures can reach extreme levels. A pH sensor with a high-temperature limit ensures accurate and reliable measurements even under these demanding conditions. This capability is critical because pH readings often influence process control decisions, and inaccurate data at elevated temperatures can lead to costly errors or safety risks.

Traditional sensors may require the sample to be cooled before measurement, adding complexity and time to operations. By using the 500 X sensor which can withstand process temperatures up to 155 °C (311 °F), operators can monitor pH in real time, improving efficiency and responsiveness.

For industries where uptime and precision are paramount, these benefits translate directly into improved productivity and lower total cost of ownership

## Flexible installation

Adaptable with a range of accessories suited for ¾ in sensor body styles, mounting the 500 X 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 is stored in a specially formulated solution with added antimicrobial agent, keeping the sensor active for up to two years when stored as recommended.



## Transmitters that give you more

The analog 500 X 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.

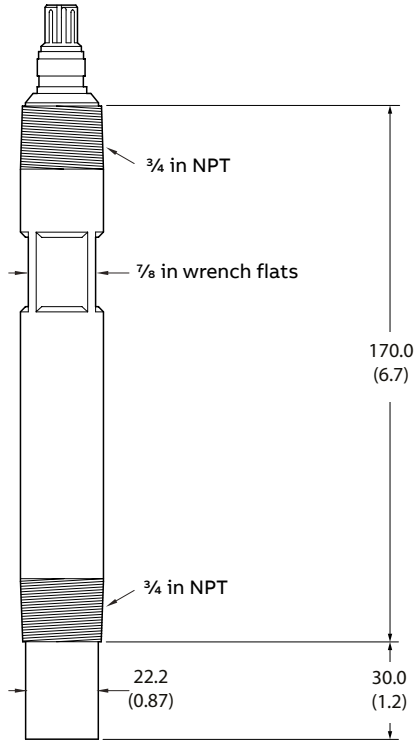
---

\* Transmitter dependent

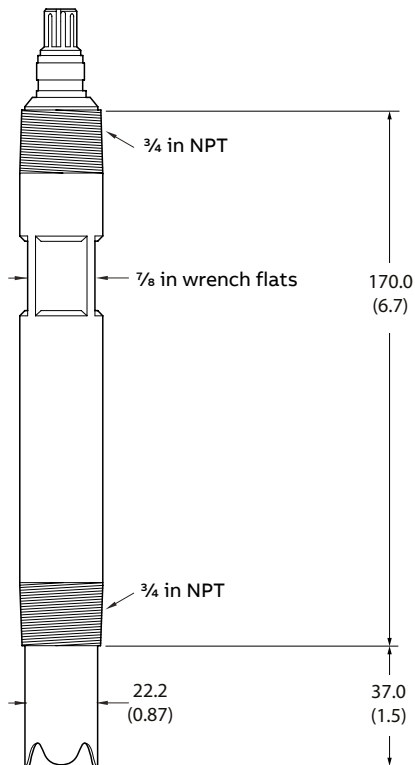
## Dimensions

Dimensions in mm (in)

### Flush sensor body



### Notched sensor body



ASME B1.20.1 3/4 in NPT thread is compatible with ASME B16.11 3/4 in NPT threaded fittings including: couplings, half couplings, bosses, couplets.

## Electrical connections

Wire color	Function
Blue	Glass electrode/ORP
Yellow	Guard
Black	Reference electrode
Red	2-wire compensation
White	2-wire compensation
Gray	3 <sup>rd</sup> wire

## 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 155 °C (32 to 311 °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 155 °C (32 to 311 °F)

ORP gold electrode

0 to 155 °C (32 to 311 °F)

### Temperature sensor

Pt100 (Class B, IEC 60751)

### Maximum pressure

30 bar (435 psi) at less than 100 °C (212 °F)

28 bar (406 psi) up to 155 °C (311 °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 18.0055X
- Bassefa18ATEX0081X
- BAS21UKEX0243X

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

II 1 G EX ia IIC T3 Ga -5°C<Ta<155°C (28 bar)

## Ordering information

500 X ¾ in pH/ORP electrode	APS551/	XX	XX	XX	X	XX	Option
<b>Sensor type</b>							
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					
<b>Liquid junction</b>							
PTFE*			J1				
Wood			J2				
<b>Body style</b>							
¾ in threaded insertion/immersion – no sensor guard (flush)						K1	
¾ in threaded insertion/immersion – notched sensor guard						K2	
<b>Connection type</b>							
Tagged leads							A
BNC on pH/ORP + temperature compensator connector							N
VarioPin cable connector **							V
<b>Integral cable length</b>							
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
<b>Optional order code</b>							
<b>Extension cables ****</b>							
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
<b>Junction box</b>							
Included ****							B1

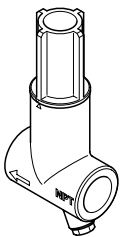
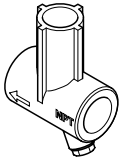
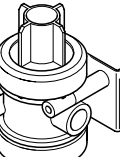
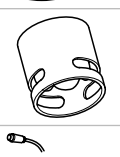
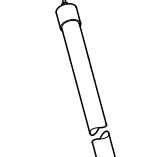
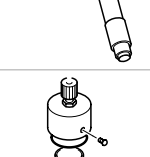
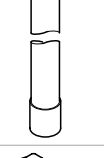
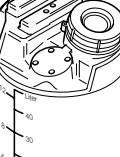
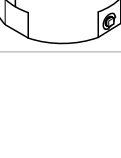


\* For poisoning-prone application, containing oxidizing, caustic, sulfides, ammonia.


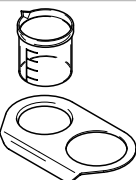
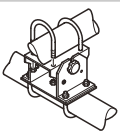
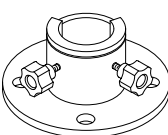
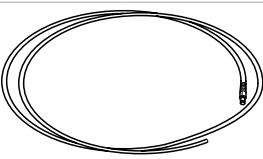

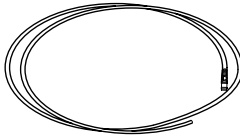
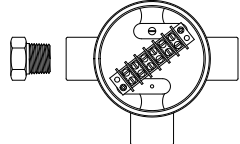
\*\* All VarioPin cables are supplied with tagged leads.

\*\*\* Available only for VarioPin cable connector.

\*\*\*\* Only available with connection type 'N'.

## 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	
	<b>1¼ in NB dip pole assembly</b>	
3KXA163000L0021	2.5 m (8.2 ft)	
3KXA163000L0022	1 m (3.3 ft)	
3KXA163000L0023	Dip pole kit (customer-supplied 1¼ in NB tube)	
3KXA163000L0025	Automatic cleaning system (liquid)	

Part number	Description	
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	
	<b>VarioPin cable*****</b>	
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)	
3KXA163600L0002	InLine ¾ in twist-lock adapter	
	<b>BNC/Molex cable</b>	
3KXA004486U0100	1 m (3.3 ft)	
3KXA004486U0300	5 m (16.4 ft)	
3KXA004486U0400	10 m (32.8 ft)	
3KXA004486U0500	15 m (49.2 ft)	
3KXA004486U0600	25 m (82 ft)	
4TB5023-0088	Junction box	

For a complete list of spares and accessories, refer to Operating Instruction [OI/100/500](#).

\*\*\*\*\* All VarioPin cables are supplied with tagged leads.



## Trademarks

- 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.

### **Additional information**

We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. ABB AG does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents – in whole or in parts – is forbidden without prior written consent of ABB AG.





—

### **ABB Measurement & Analytics**

For your local ABB contact, visit:

**[abb.com/contacts](https://abb.com/contacts)**

For more product information, visit:

**[abb.com/measurement](https://abb.com/measurement)**