# 500 PRO
## Analog pH/ORP sensor

# Measurement made easy
The ¾ in analog pH/ORP sensor for use in light industrial applications

### Increased efficiency
- High-performance glass formulation designed for harsh industrial applications providing fast and accurate response over the entire pH range
- Close-coupled temperature measurement ensures high accuracy even with rapid temperature changes

### Dependable performance
- Triple junction design with ion trap and reference shielding provides enhanced poisoning resistance
- Unique tertiary cellular junction matrix slows poisoning effects, maximizing sensor lifetime without compromising performance
- Robust Kynar® body provides high chemical and abrasion resistance
- ATEX/IECEx certified for use in hazardous areas

### Modular design
- Common ¾ in sensor design paired with intelligent accessories provides mounting flexibility with safety and convenience in mind

## 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 are entry-level sensors designed for light duty use, while the 500 range offer a robust design for industrial applications. The 700 range are 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 PRO analog pH/ORP sensor

Part of the next generation of ABB's pH/ORP sensors, the 500 PRO 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 500 PRO delivers complete measurement confidence and value for challenging applications including:

- wastewater effluents
- scrubbers
- dye baths
- mineral processing
- paper mills

## Performance you can trust

The 500 PRO features ABB's advanced tertiary cellular junction matrix designed to offer exceptional performance in harsh chemical applications. This unique approach ensures an arduous pathway for poisoning elements while the ion traps inhibit poisoning elements from reaching the reference electrode, helping extend the life of the sensor, without compromising performance.

**Anti-poisoning**

Reference wire protection inhibits poison attack

**Ion trap**

Ion trap captures silver chloride ions preventing blocking of the reference junction

**Long life**

Tertiary cellular junction slows poisoning ions and extends the sensor's lifetime

**Anti-fouling**

Sealed PTFE junction with Viton® Extreme™ O-rings increases the sensor's lifetime
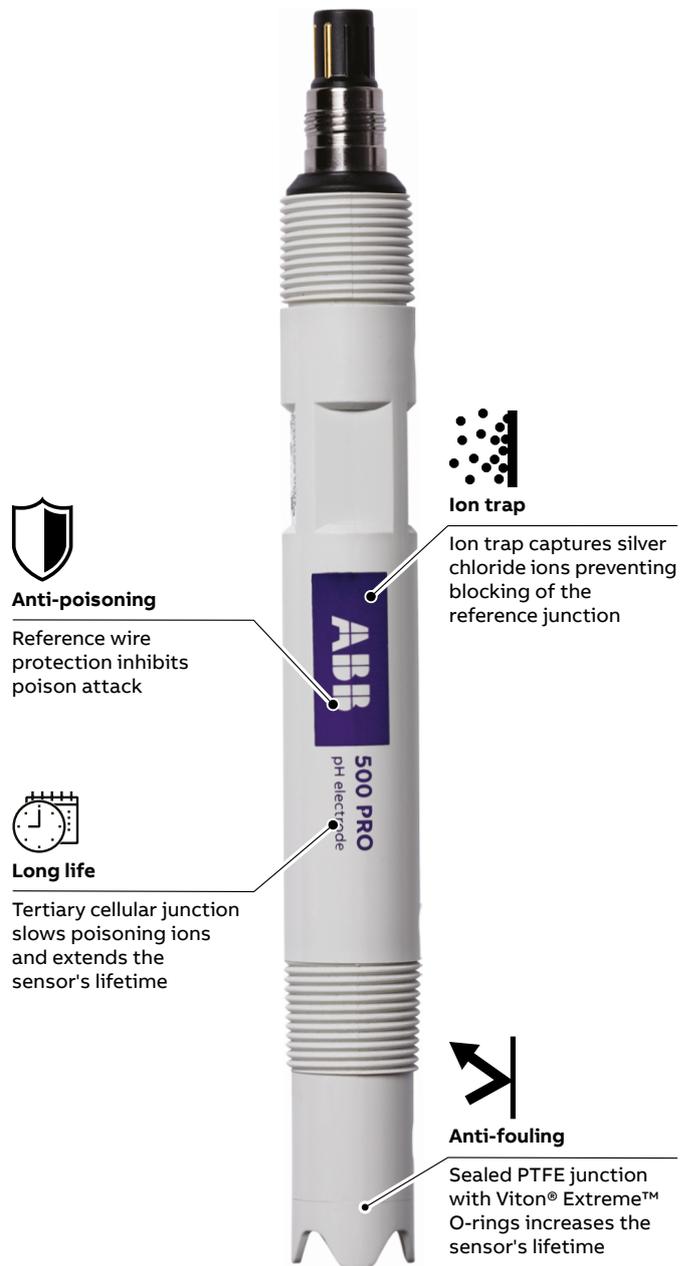
## Improved process efficiency

Varying sample temperature is one of the most common causes of pH measurement error due to its impact on sensor output. The 500 PRO is equipped with a close-coupled temperature element capable of rapid response to quickly changing process conditions, ensuring a high level of accuracy and confidence in your measurement.



Reference electrode

Temperature sensor

pH glass electrode
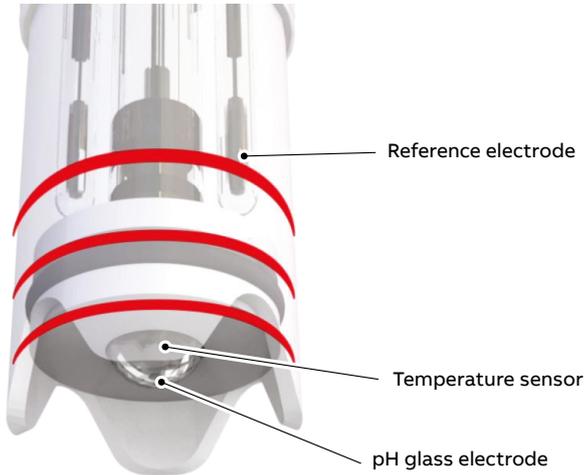
**Temperature element location**

## Robust glassware

Utilizing ABB's experience in glass manufacturing dating back to the 1950s, the proprietary glass formulations used with the 500 PRO offer fast response without sacrificing durability. Selectable in several configurations, the robust glassware is made suitable for wide range of general-purpose applications.

**High temperature (HT) glass**
Our durable high-temperature glass provides accurate, reliable measurement in applications with process temperatures of 90 °C (194 °F) or higher, making it ideal for industries such as pulp and paper and chemical processing.

**Hydrofluoric acid-resistant (HF) glass**
Resistant to attack and etching from hydrofluoric acid, our robust HF glass lasts up to three times longer than other commercially available HF glassware in applications containing up to 1 % (10,000 ppm) HF

**Low temperature (LT) glass**
For measurement below 15 °C (59 °F), our low temperature blue glass provides ultrafast response in applications such as municipal and industrial wastewater treatment. Available in bullet style.

**High-performance (S) glass**
Our high-performance yellow glass provides fast response and accurate measurement over the entire pH range. With an extremely low sodium error, the glass can maintain its accuracy even at very high pH levels. Available in flat or bullet style.

**ORP platinum electrode**
Chemically inert, our platinum electrode is design for conventional ORP/Redox measurement with an RTD element providing process temperature information.



**High performance (S) glass – flat with flush body**



**Low temperature (LT) glass with notched body**



**ORP electrode with notched body**

## Product adaptability

The 500 PRO is available in flush or notched body design helping extend sensor operation and maintainability in challenging applications.

### Flush-body design
The flush-body design, when paired with a flat-shaped glass electrode, helps promote self-cleaning when installed perpendicular to sample flow. In addition, the minimal protrusion prevents unwanted buildup, especially in fouling applications.

### Notched-body design
The notched-body design provides additional protection for bullet-style glass electrodes, especially from abrasive applications that can damage the glass electrode rendering it unresponsive.

### Intelligent accessories
The 500 PRO is offered with mounting accessories designed to improve adaptability into your process while providing safe and convenient operation. Available with flowcell, quick-connect bayonet and dip pole assemblies, the 500 PRO utilizes modular accessories that are compatible with all ABB's next generation ¾ in threaded sensor bodies.

Optional auto-cleaning functionality is available as an added feature ensuring extended operation with minimal intervention.

### 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 PRO is stored in a specially-formulated solution with added antimicrobial agent keeping the sensor active for up to 2 years when stored as recommended.

## Hazardous area approval

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

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## Dimensions

Dimensions in mm (in)

**Flush sensor body**

¾ in NPT

⅞ in wrench flats

170.0
(6.7)

¾ in NPT

22.2
(0.87)

30.0
(1.2)

**Notched sensor body**

¾ in NPT

⅞ in wrench flats

170.0
(6.7)

¾ in NPT

22.2
(0.87)

37.0
(1.5)
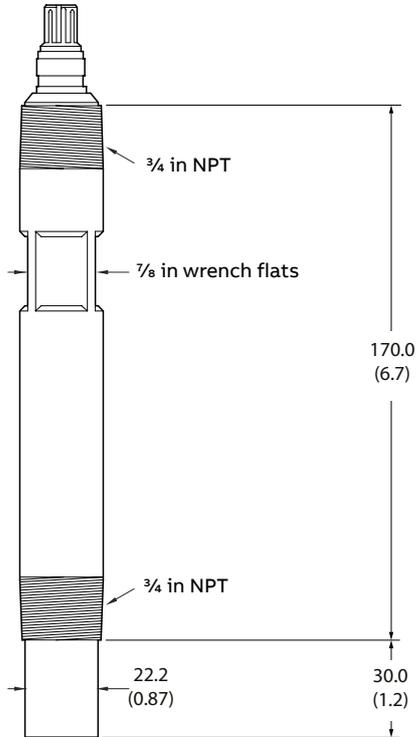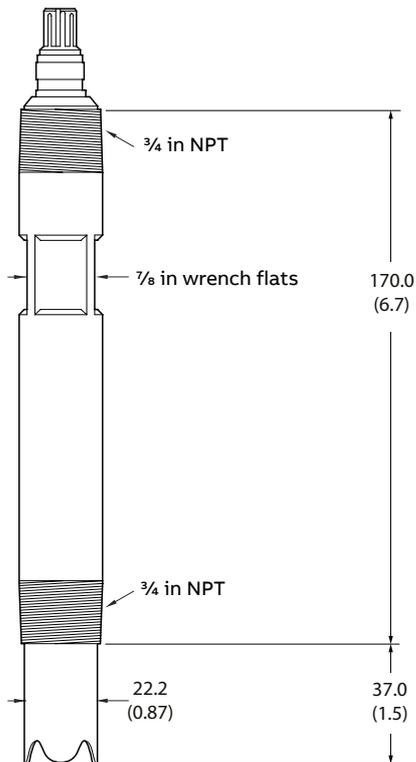
ASME B1.20.1 ¾ in NPT thread is compatible with ASME
B16.11 ¾ in NPT threaded fittings including: couplings, half
couplings, bosses, couplets.

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## Electrical connections

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

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# Specifications

**Measurements**
- pH/ORP (platinum)
- 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 (bullet)**
0 to 100 °C (32 to 212 °F)
(typical glass impedance at 25 °C [77 °F] = 250 MΩ)

**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 100 °C (32 to 212 °F)

**Temperature sensor**
Pt100 (Class B, IEC 60751)

**Maximum pressure**
10 bar (145 psi)

**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 triple junction, KCl gel electrolyte plus ion trap

**Process connections**
¾ in NPT

## Wetted materials

**Electrode body**
PVDF (Kynar)

**Reference junction system**
Porous PTFE and Viton Extreme O-rings

**Measure system**
pH: Glass
ORP: Platinum

## Approvals, certification and safety

**CE Mark**
Covers EMC+LV directives
(including latest version of EN61010)

**Regulation 31**

| | |
|---|---|
| Drinking water approval: | Complies to DWI Regulation 31(4)(b) |
| Additional tests: | BS6920 parts 2.2 and 2.4 on all wetted parts |

**EMC**
Meets requirements of IEC61326 for an industrial environment

**ATEX/IECEx**
Certificate numbers:
- IECEx BAS 18.0047X
- Bassefa18ATEX0071X

Entity parameters:
- Ui = 15.0 V
- Ii = 20 mA
- Ci = 5 NF
- Li = 30 uH
- Pi = 120 mW

**CRN approval**
Maximum allowable working pressure (MAWP): 5.58 bar (81 psi)
Design temperature: -5 to 105 °C (23 to 221 °F)
CRN number: 0F22557

**MCERTS**
Certificate no: Sira MC220375/00

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# Ordering information

| 500 PRO ¾ in pH/ORP electrode | APS521/ | XX | XX | X | XX | | XX |
|---|---|---|---|---|---|---|---|
| **Sensor type** | | | | | | | |
| pH – bullet glass for standard applications: high performance (S) glass | | P2 | | | | | |
| 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 | | | | | |
| **Body style** | | | | | | | |
| ¾ in threaded insertion/immersion – no sensor guard (flush) | | | K1 | | | | |
| ¾ in threaded insertion/immersion – notched sensor guard | | | K2 | | | | |
| **Connection type** | | | | | | | |
| Tagged leads | | | | A | | | |
| BNC on pH/ORP + temperature compensator connector | | | | N | | | |
| VarioPin cable connector [1] | | | | V | | | |
| **Integral cable length** | | | | | | | |
| None [2] | | | | | 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** | | | | | | | |
| **Operating instructions** | | | | | | | |
| English | | | | | | | M5 |

[1] All VarioPin cables are supplied with tagged leads
[2] Available only for VarioPin cable connector

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# 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 flowcell and ¾ in adapter | |
| 3KXA163000L0011 | ½ in NPT stainless steel flowcell and ¾ in adapter | |
| 3KXA163000L0024 | Protective shroud for ¾ in body | |
| 3KXA163000L0021 | 1¼ in NB dip pole assembly 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) | |
| | VarioPin cable [1] | |
| 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) | |
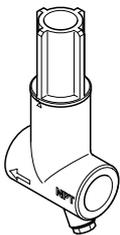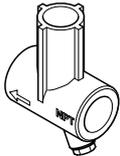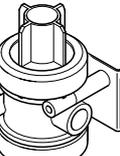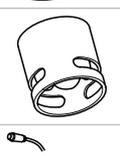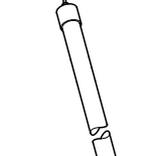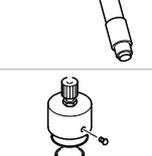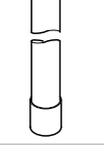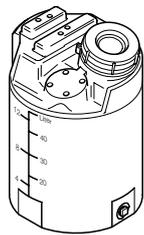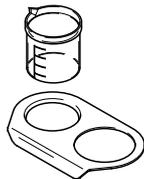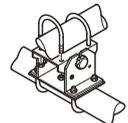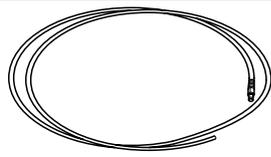
[1] All VarioPin cables are supplied with tagged leads

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

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# Notes

# ABB

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**ABB Measurement & Analytics**

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

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