ZEUS™ pH & ORP Sensors

ANALOG & SMART DIGITAL ZEUS™ pH SENSORS & ORP SENSORS
TO SOLVE TOUGHEST INDUSTRIAL APPLICATIONS
FOR INLINE, IMMERSION AND FULLY SUBMERSIBLE INSTALLATIONS





ZEUS™ Industrial Grade pH sensors are designed and built with Extremely Rugged Construction to handle the Toughest Severe Service Process Inline, Immersion or Submersible Installations.

Unique solid-state non-porous conductive polymer reference technology and thick-wall break-resistant parabolic pH glass sensing elements along with the specially designed construction of ZEUS™ pH sensors ensure the longest service lifetime possible in aggressive media such as abrasive slurries and solutions with high particulate content.

ZEUS™ pH Sensors support High Temperatures & High Pressures for Process Solutions with Dissolved Ammonia, Chorine, and Sulfide gases and are compatible with most Organic Solvents.

ZEUS™ pH Sensors are available in three ANALOG CONFIGURATIONS to interface most all existing OEM transmitters:

1. ***UNIVERSAL (Item # 1202) configuration is without integral preamplifiers for instruments that can accept this type of pH sensor and installations that do not require longer than 25 feet of cable (cable length for UNIVERSAL sensors cannot be extended)***
2. ***WITH CONVENTIONAL PREAMPLIFIER (Item # 1203) configuration is for instruments that can accept this type of pH sensor with 20 feet cable standard & NEMA 6P snap connector; Max 330 feet total cable length with snap extensions***
3. ***WITH 5-WIRE DIFFERENTIAL PREAMPLIFIER (Item # 1204) configuration is for instruments that can accept this type of pH sensor with 20 feet cable standard & NEMA 6P snap connector; Max 1,000 feet total cable length with snap extensions***

ZEUS™ pH Sensors are available in the SMART DIGITAL CONFIGURATION

to provide a complete plug & play zero-configuration turn-key measurement solution including mating intelligent 3TX-HiQ-pH transmitter:

> ***WITH SMART DIGITIAL SENSOR BOARD (Item # 1205) configuration is for use with the 3TX-HiQ-pH intelligent transmitter that accepts IOTRON™ & ZEUS™ smart digital pH sensors; Comes complete with 20 feet cable standard & NEMA 6P snap connector; Max 2,000 feet total cable length with snap extensions***

> ***ZEUS HiQDT SMART DIGITAL MODBUS RTU pH SENSOR configuration can be directly interfaced to any PLC, SCADA, datalogger or other data acquisition that can serve as the MODBUS RTU master (sensor is the MODBUS RTU slave). For further details on HiQDT smart digital MODBUS RTU pH sensor platform please CLICK HERE***

> ***ZEUS HiQDT SMART DIGITAL MODBUS RTU ORP SENSOR configuration can be directly interfaced to any PLC, SCADA, datalogger or other data acquisition that can serve as the MODBUS RTU master (sensor is the MODBUS RTU slave). For further details on HiQDT smart digital MODBUS RTU ORP sensor platform please CLICK HERE***

Complete specification sheets linked above for item # 1202, 1203, 1204 or 1205 configurations can also be obtained from the QR code on the respective ZEUS™ sensor label via the QR scanner app on your mobile device

While the ZEUS™ pH Sensors are only available in the configurations as detailed above, all other IOTRON™ series pH sensors can be custom built-to-order specific to your exact application requirements. Please review our **pH sensor overview webpage** to select the customizable product line that is most suitable for your need if you prefer this option. All other IOTRON™ series pH sensors are not in stock since they are built-to-order to suit specific requirements. Lead times are normally relatively nominal since most all necessary components are well stocked for most combinations and the availability is only limited by actual manufacturing time, processing of the order and time in the production queue.

SELECTED UNIQUE FEATURES OF INTEREST FOR ALL ZEUS™ SENSOR CONFIGURATIONS:

- Best reference service lifetime in process industry through the proprietary and novel non-porous, cross-linked conductive polymer technology with triple junction is standard for all ZEUS™ sensor configurations.
    - This solid-state proprietary reference system is nearly impervious to intrusion from most all gases, ions and solvents to facilitate minimal cleaning and recalibration and maximum service lifetime.

- Leading novel and proprietary solid-state industrial pH sensor & ORP sensor design and technology offers the best possible service lifetime for the most difficult

severe service and difficult process measurement applications. Review the **Competitive Advantages of Design & Technology for IOTRON™ & ZEUS™ Industrial pH & ORP Sensors webpage** for details about the core technology underlying the ZEUS™ pH sensors.

- The extremely rugged industrial grade construction including an extra thick sensor body housing makes ZEUS™ sensors the ideal choice to operate in most any installation in a temperature range at pressures up to 200 psig for 1″MNPT screw-in type inline style installations or immersion & submersible type installations with aggressive abrasives that can induce mechanical wear. The 5.6mm (0.22″) thickness for the back of the sensor body minimizes the impact of the process exposure due to mixers, vibration and other stress induced by rugged field installations.

- The solid state reference is highly resistant to dehydration and our thick wall parabolic glass is nearly impervious to cracking, even under high pressure and flow conditions.

- Supports continuous use from -15 to +150 degrees Celsius to handle most any process conditions.

- Standard features all ZEUS™ sensor configurations include Ammonia, Chlorine and Sulfide Gas Resistant and can operate pH media from -0.5 to +14.5 in the presence of most organic media & volatile solvents.

- All ZEUS™ sensor configurations include ACCU-TEMP Fast Response Pt1000 Temperature Compensation (TC) Element and 4 each Ultra-Thick 3.0mm (0.12″) Protective Tines to avoid pH glass breakage in handling and field use

- Universal and 5-wire differential preamplifier configurations of ZEUS™ pH sensors include Solution Ground Liquid Earth with Hastelloy® C-276 Material of Construction to ensure suitability for most any process chemistry

- UNIVERSAL CONFIGURATION terminated with tinned leads and the **wiring schematic detail** can be used to interface to your mating OEM pH transmitter (see list of supported transmitters below).

- **WITH CONVENTIONAL PREAMPLIFIER CONFIGURATION** OR **WITH 5-WIRE DIFFERENTIAL PREAMPLIFIER CONFIGURATION** are terminated with quick disconnect IP67 & NEMA 6P rated waterproof and corrosion resistant snap Q7M/Q7F connectors as detailed in the respective installation guides linked above.

- Back of sensor 1.25″ MNPT threads are sealed with robust waterproofing assembly so that all ZEUS™ pH sensors are suitable for use in immersion or submersible type applications as well as for inline use.

- Wrench flats feature is standard to allow for securing sensor into threaded 1″ NPT inline process connection or 1.25″ NPT immersion tube without damaging sensor body.
    - Care must be taken not to over-tighten any sensor to avoid damage during commissioning or insertion and removal from process for cleaning, recalibrating or replacement during maintenance. Consult ASTI factory for assistance to ensure best practice care and use. The **general care and maintenance guide for pH sensors** is the starting basis but inquire to the ASTI factory for specific best practice instructions for your particular application for optimal results.

- ZEUS™ pH sensors are manufactured with RADEL® (Poly-Phenyl-Sulfone, PPSU) sensor body housing materials of construction and KYNAR® (Poly-Vinylidene-Fluoride, PVDF) to handle even the most difficult field process measurement applications.
    - Technical information regarding the chemical resistance as well as the thermal and mechanical properties for these materials of construction are provided further below in this webpage to assist with confirmation of suitability for your intended process use.

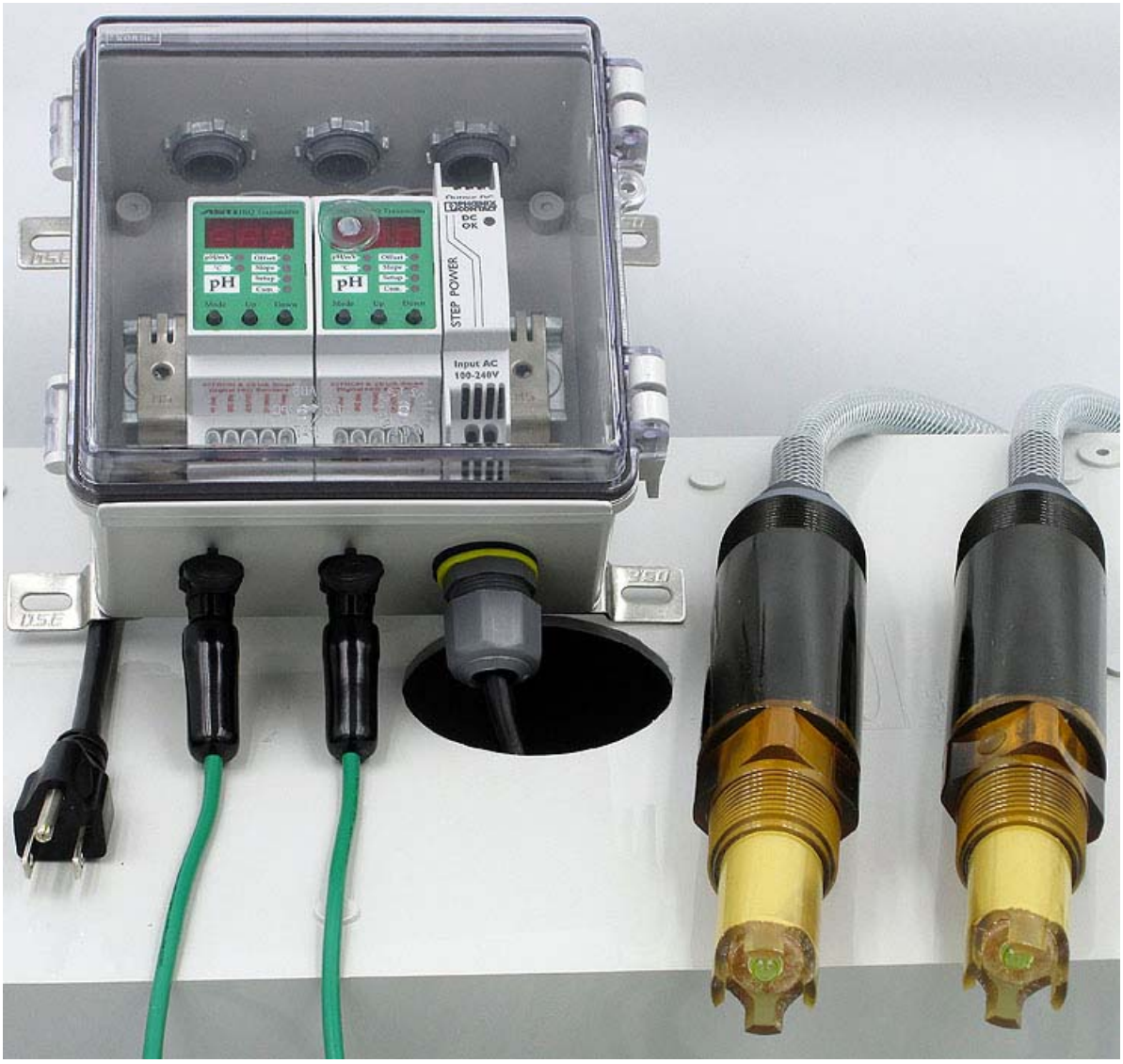
- **Thick-wall break resistant low-profile parabolic pH glass element for slurry and viscous type process media extends service life for tough installations.**
    - This type of rugged thick-wall, low-profile, break-resistant parabolic pH glass is standard the WITH CONVENTIONAL PREAMPLIFIER OR WITH 5-WIRE DIFFERENTIAL PREAMPLIFIER ZEUS™ pH SENSOR CONFIGURATIONS

- **Factory Statement of Warranty for IOTRON & ZEUS electrochemical sensors**: Please review before making any purchase and inquire to factory with questions if necessary.

FEATURES SPECIFIC TO SMART DIGITAL CONFIGURATION OF ZEUS™ pH SENSOR:

- Integral smart digital board stores calibrations & transmitter configuration in sensor
- Waterproof NEMA 6P quick disconnect HiQ4M Snap Corrosion Resistant Connector
- Up to 610 meters (2,000 feet) noise insensitive digital cable with HiQ4F extensions
- True plug and play sensor with automatic loading of calibration values for hot-swap
- Calibrate conveniently in lab or shop and install quick-disconnect sensor in the field
- Advanced autoread algorithm for reproducible & operator independent calibrations
- Automatic recognition of 4.00, 6.86, 7.00, 9.18 & 10.00 NIST traceable pH buffers with built-in correction for temperature induced changes to pH buffer value
- Reliable readings in acidic or alkaline range with 1-point, 2-point or 3-point calibrations
- Calibrate with sophisticated HiQ Windows software or any 3TX-HiQ-pH transmitter
- Entire transmitter configuration can be downloaded to sensor or uploaded from sensor to intelligent 3TX-HiQ-pH transmitter for advanced management of field installations
- Stores last five offset (1-point), slope (2-point & 3-point) and temperature calibrations

- See **3TX-HiQ webpage** for complete set of features & functionality for the smart digital platform



ZEUS™ pH Sensors in Smart Digital Configuration with NEMA 6P rated HiQ4M cable connector (Item # 1205)
shown connected to dual channel 3TX-3MF-2H-2EA-HiQ-pH-PS intelligent digital pH transmitter (Item # 11305)
via the receiving 2 each female panel mount HiQ4FP snap connector installed into 3MF NEMA 4X enclosure.

PRIME PROCESS APPLICATIONS FOR ZEUS™ pH SENSORS	**TECHNICAL CAPABILITIES OF ZEUS™ pH SENSORS**

- Measurement in strong acids or bases
- Acid fluoride etching solutions
- HF waste treatment systems

- High Temperatures & Pressures
    - Examples include ammonium nitrate manufacturing, sugar extraction
    - Treatment of discharge from processes employing autoclaves
- Pulp digesters for Kraft type mills
- Bleaching lines for white paper mills
- Abrasives and Viscous Processes
- Extraction of precious metal ore with floatation tanks and concentrators
- Gold extraction circuits with cyanide (batch or continuous)
- Cyanide destruction with peroxide and/or sulfur dioxide
- Dissolved Sulfides such as hydrogen sulfide gas (H_2S), hydrogen sulfide (HS^-) or sulfide ion (S^{2-})
- Solvent extraction (SX) with kerosene and other long chain hydrocarbons
- Measurement in most Volatile Organic Compounds (VOC) and most Organic Solvents
- Biodiesel and ethanol fuels
- Processes employing dissolved chlorine (Cl_2), chlorine dioxide (ClO_2), ammonia (NH^3), sulfur dioxide (SO_2) and nitric oxide (NO) and nitrous oxide (NO_2) sometimes together referred to as (NO_x) type gases
- Municipal or industrial wastewater treatment
- General Purpose pH monitoring or control for discharge compliance

View Selected Case Studies as Examples of Selected Applications

- Low pH range down to -0.5 (with ASTI calibration procedures and buffers)
- High pH range up to 14.5 (with ASTI calibration procedures and buffers)
- Low Temperatures down to -15 degrees Celsius (°C)
- High Temperatures up to 150 degrees Celsius (°C)
- High Pressures up to 200 psig
- Insertion depths up to 6 feet into tank or line with **compression fitting assembly installation scheme**
- Mining Slurries up to 50% solid & particulate content
- Solids Content up to 12% consistency pulp
- Fluorides up to 50,000 ppm and -0.5 pH

- Support for measurement in most dissolved gases up to saturation
    - Examples include chlorine, chlorine dioxide, ammonia, sulfide gases

- Cyanides up to 10,000 ppm

- Almost All Organic Chemical Mixtures
    - Minimum ~1% aqueous content required to ensure stable readings

- Clean in Place (CIP) processes with hot acid and hot base for food and beverage and pharmaceutical use

- Sterilization with Peroxide (H_2O_2) and Ozone (O_3)

- Up to 600% Saturation Dissolved Oxygen (O_2)

- Fully submersible assembly that can be installed by thick reinforced vinyl tubing seal on cable
    - For best results the use of a suitable immersion tube, standpipe or guiderod is recommended to fix the installation location and to minimize mechanical related damage is recommended

PLEASE INQUIRE FOR ANY CAPABILITIES NOT LISTED HERE

Materials of Construction for ZEUS™ pH Sensors for Inline, Immersion & Submersion Installation

Body Housing RADEL® Poly-Phenyl-Sulfone, PPSU	**Reference Junction Support Matrix KYNAR® Poly-Vinylidene-Fluoride, PVDF**
RADEL® R-5000 NT Chemical Resistance Chart **RADEL® R-5000 NT Thermal & Mechanical Performance Data**	**KYNAR (PVDF) Chemical Resistance Chart**

RADEL® is a registered trademark of SOLVAY and KYNAR® is a registered trademark of ARKEMA

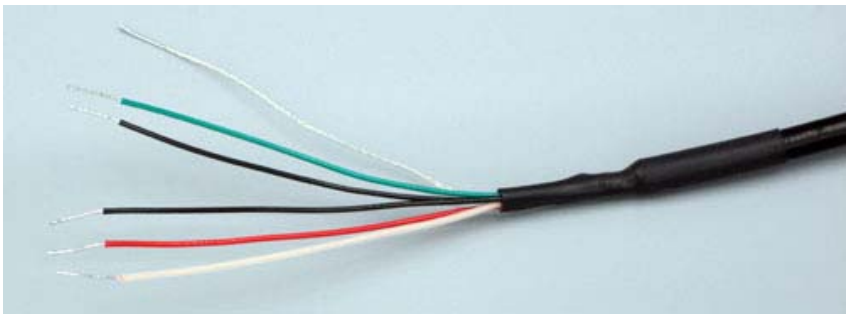
Selected Pictures for Visualization of Analog ZEUS™pH Sensors in. Universal and with Conventional or Differential Preamplifier Configurations.



ZEUS™ Analog pH Sensor Universal Configuration with 25 feet cable assembly complete, submersible to 12 feet



Front View of ZEUS™ pH Sensor Sensing Tip



ZEUS™ pH Sensor Universal Configuration
End of Cable Tinned Lead Wire Terminations



ZEUS™ pH sensor with Analog Preamplifier Configuration with 20 foot snap extension cable connected
Max 330 for with Conventional Preamplifier Configuration & Max 1,000 feet for with Differential Preamplifier Configuration



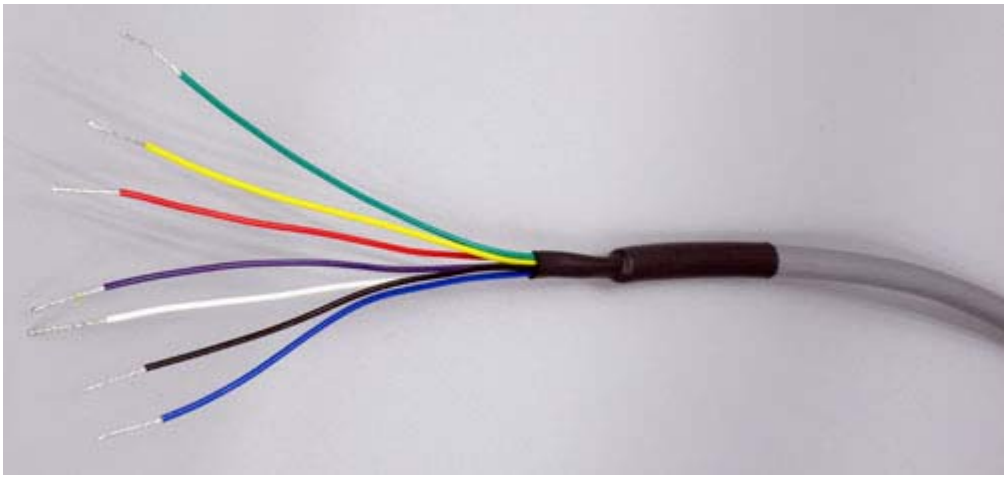
ZEUS™ pH Sensor Analog Preamplifier Configuration with 20 feet cable assembly complete, submersible to 12 feet



Male Snap from ZEUS™ Analog pH sensor with Preamplifier Connected to Female Snap from Extension Cable NEMA 6P rated for use in aggressive field service

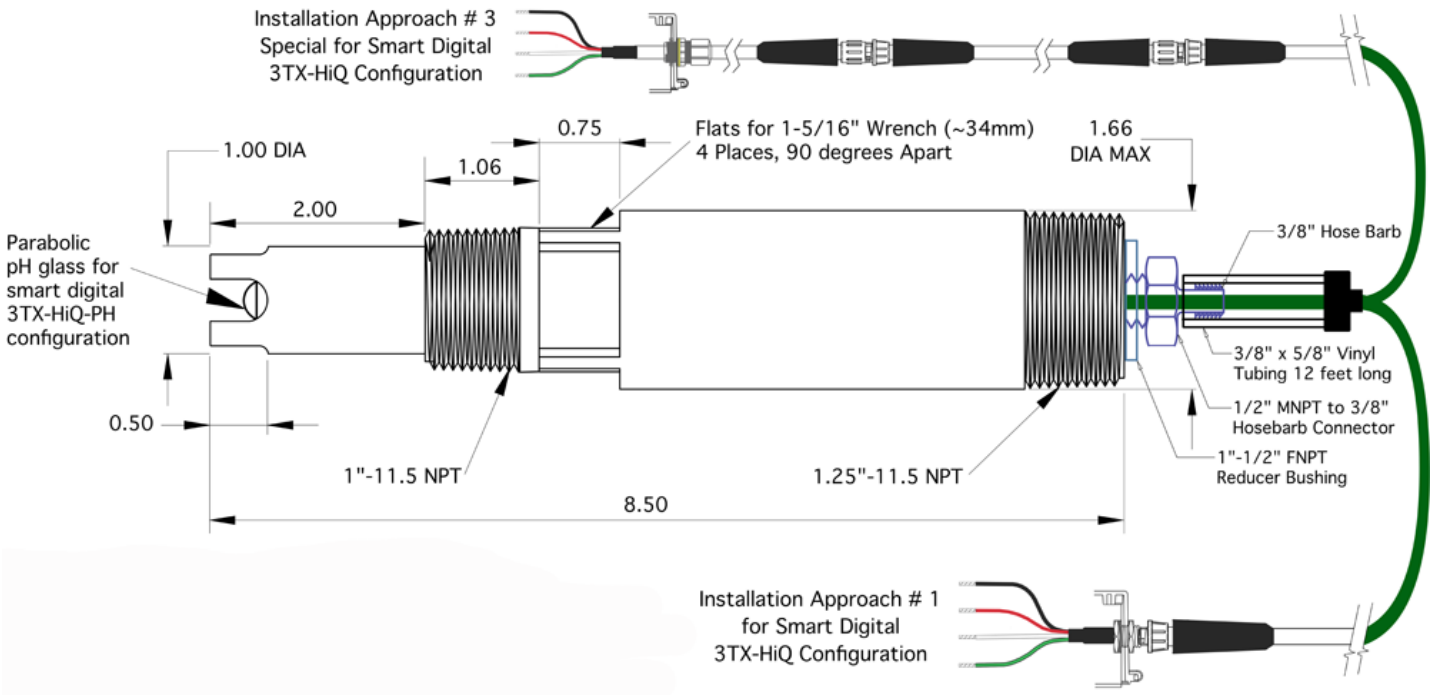


Snap Extension Cable for Analog ZEUS™ pH Sensor with Preamplifiers Stocked in 5 feet, 10 feet, 20 feet & 40 feet cable lengths Other cable lengths available as special order option



Snap Extension Cable for Analog ZEUS™ pH Sensors with Preamplifiers. End of Cable Tinned Lead Wire Terminations Detail

Dimensional Drawing & Details for Analog ZEUS™pH Sensors for Inline, Immersion & Submersion Industrial Process Installations



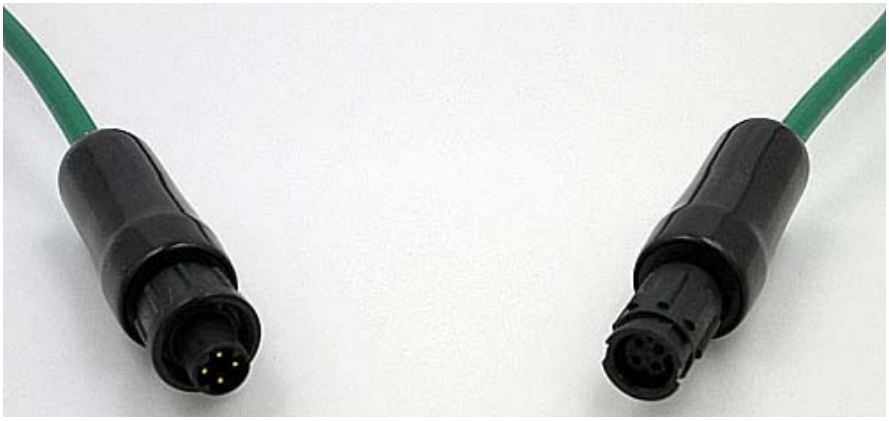
Selected Pictures for Visualization of ZEUS™ pH Sensor in the Smart Digital Configuration



ZEUS™ pH sensor in Smart Digital Configuration with 20 feet (6 meter) snap extension cable connected
Max 2,000 feet (610 meters) total table length for Smart Digital Sensor Configuration used with intelligent 3TX-HiQ-pH Transmitter



ZEUS™ pH Sensor in Smart Digital Configuration with 20 feet cable assembly complete, submersible to 12 feet. Shown with protective cap installed on NEMA 6P rated quick disconnect snap connector termination as shipped from factory.





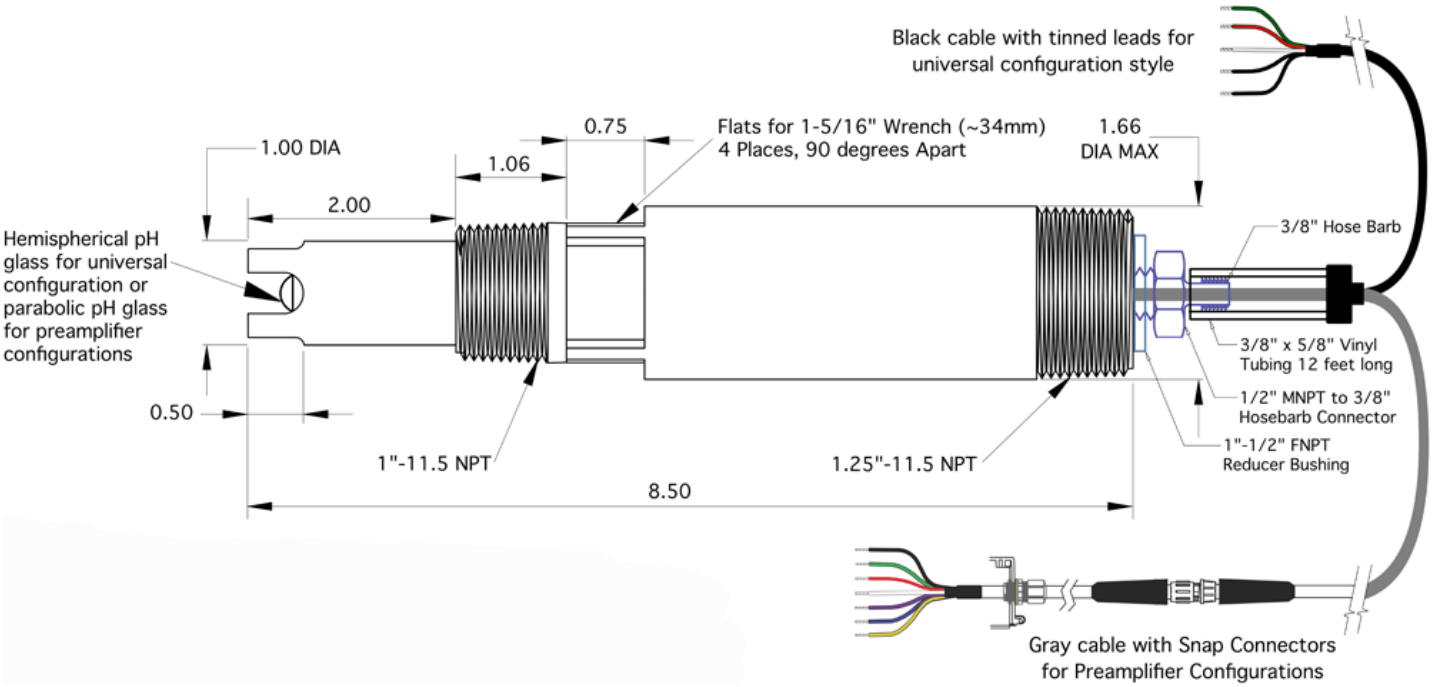
Male Snap from ZEUS™ pH sensor in Smart Digital Configuration. Connected to Female Snap from Extension Cable NEMA 6P rated for use in aggressive field service



Snap Extension Cable for ZEUS™ pH Sensor in Smart Digital Configuration
Stocked in 10 feet, 20 feet, 40 feet (shown above) & 80 feet cable lengths
Other cable lengths are available as special order option



Close-up of ZEUS™ pH sensor measuring tip. Solid-state conductive polymer reference system (brown) is sealed to thick-wall break-resistant low-profile parabolic pH sensing element (green) protected by ultra-rugged 4 each protective tines for guard



Selected Pictures for Visualization of ZEUS™ pH Sensor in the Smart Digital Configuration

COMPATIBILITY COLOR CODING GUIDE:

UNIVERSAL CONFIGURATION COMPATIBLE TRANSMITTER SHOWN IN **PURPLE**

5-WIRE DIFFERENTIAL CONFIGURATION COMPATIBLE TRANSMITTERS SHOWN IN **PINK**

TRANSMITTERS COMPATIBLE WITH **BOTH UNIVERSAL & CONVENTIONAL PREAMPLIFIER CONFIGURATION** SHOWN IN **BLUE**

Replacement pH Sensors **For Transmitters that support and/or require Integrated Preamplifiers** **UNIVERSAL AND/OR** **CONVENTIONAL/DIFFERENTIAL PREAMP CONFIGURATIONS** The instruments listed below require and/or support integral preamplifiers. Sensors to mate with these OEM pH & ORP transmitters are supplied with the appropriate integrated temperature compensation element, solution ground & OEM compatible high-impedance CMOS operational amplifier (a.k.a. preamplifier) as may be required to ensure full compatibility and optimal performance. Some manufacturers and analyzer models can support both sensors with or without preamplifiers on the same instrument.	**Replacement pH Sensors** **For Transmitters DO NOT SUPPORT Integrated Preamplifiers** **UNIVERSAL CONFIGURATION ONLY** The instruments listed below do no support preamplifiers. Sensors to mate with these OEM pH & ORP transmitters are supplied with the appropriate internal temperature compensation and/or solution ground signals to ensure compatibility. If longer cable runs may be required for your planned installation, it is recommended to select a transmitter that supports preamplifiers (see list to the left).
Fully Supported Hardware – FULL COMPATIBILITY **Manufacturer pH & ORP Transmitters OEM pH & ORP Sensors** * Rosemount Analytical Liquid Division A Part of Emerson Process Management **LEGACY:** 54pH, 54epH, XMT **MODERN:** 1056, 1057, 56, 1066, 5081, 6081385/385+, 389, 3900 pH & ORP sensors 3300HT, 3400HT & 3500P PERpH-X™ pH & ORP sensors 397, 398/398R, TF396 TUpH™ pH & ORP sensors Foxboro Analytical EChem by Schneider Electric (a Division of Invensys) **LEGACY:** 870IT **MODERN:** 875PH, 876PHPH10 DolpHin™ pH sensors, ORP10 DolpHin™ ORP sensors, 871A & 871PH pH & ORP sensors, EP460 & EP466 pH & ORP sensors	**Fully Supported Hardware – FULL COMPATIBILITY Manufacturer pH & ORP Transmitters OEM pH & ORP Sensors** * Endress+Hauser (a.k.a. E+H) **LEGACY:** CPM152, CPM280, CPM431 **MODERN:** CPM153, CPM223, CPM253Inquire to ASTI Factory for alternatives to E+H pH & ORP sensors Mettler-Toledo International (formerly Ingold) **LEGACY:** 1120, 1140, 2050, 2100, 2220, 2400, 2500, 2800X, 2050e, pH 2100-PA, pH 2100e **MODERN:** M200, M300, M400, M700, M800Inquire to ASTI Factory for alternatives to Mettler-Toledo pH & ORP sensors Knick **LEGACY:** Stratos Eco 2402 **MODERN:** Stratos Evo, Stratos Pro A2 pH, Stratos Pro A4 pH, Stratos Eco 2405 pH, Stratos 2221 pH, Stratos Stratos 2231 pH, Protos 3400(X)-035, PHU 3400(X)-110Inquire to ASTI Factory for alternatives to Knick pH & ORP sensors

Supported Hardware with Known Issues – LIMITED COMPATIBILITY Manufacturer pH & ORP Transmitters OEM pH & ORP Sensors * HACH (formerly Great Lakes Instruments, a.k.a. GLI) **LEGACY:** 33, 53, 60, 62, 63, 70, 83, 90, 95, 570, 670, 671, 690, 691, 692, P33, P53, P63 **MODERN:** si792, si794, PRO-P3 GLI PRO series, sc200 **Encap Diff pH Sensors:** 6028P0, 6028P020, 6028P050, 6028P033, 6058P0, 6022P0, 6022P020, 6028P015, 6028P025000010N, 6028P420, 6052P0, 6058P01000A000N, 6028P510, 6028P4, 6028P210000010N, 6058P025, 6028P090, 6058P4, 6028P6, 6028P01000A000N, 6028P012, 6028P010F00000N, 6028P010000010N, 6022P610, 6022P010000200N, 6022P050, 6058P610F00010N, 6058P6, 6058P050, 6028P010000200N, 6022P2, 6058P010000000N, 6058P033, 6058P620 **3/4 in Combination pH/ORP Sensors:** PC1R1A, RC1R5N, PC1R2A, PC1R1N, PC1R3A, PC1R1A-V12, PC2K1A, PC2K2A, PC3K2A, PC1R2N, RC2K5N, PC1R1A-STC, RC1R5N-HF **Analog Differential pH/ORP Sensors:** PD1P1, PD1R1, PD2P1, PD1R3, PD1P3, PD3P1, PD2P1A30, PD2P1A50, PD1P1A25, PD2P3, PD1P1-PRO1	**NOTES ABOUT SUPPORTED TRANSMITTERS FOR ANALOG ZEUS™ pH SENSORS The manufacturers and models detailed on this webpage are not a complete listing of the supported OEM pH transmitters, analyzers and controllers to which ZEUS™ pH sensors can retrofit. Please inquire to the ASTI factory to see if your existing pH transmitter can be supported by one of the three analog ZEUS™ pH sensor configurations.** **UNIVERSAL AND CONVENTIONAL PREAMPLIFIER CONFIGURATIONS ARE COMPATIBLE WITH ALL OF THE ASTI 2TX, 3TX and 4TX pH TRANSMITTERS** Hook-up details for any ZEUS™ configuration pH sensor to a particular mating OEM pH transmitter can be accessed from the **wiring schematic**. For any pH transmitter not listed in this table please review our **built-to-order customizable IOTRON™ series pH sensors webpage**. * ASTI offers pH & ORP sensors compatible with the transmitters listed above as an alternative to mating OEM pH & ORP sensors detailed. Trademarks (indicated with ™) are registered to the respective corporations as listed above.