Sanitary pH & ORP Sensors

Sanitary pH Sensors & ORP Sensors for Tri Clover Installations
Requiring Chemical Clean-In-Place (CIP) Sterilization

5X31 series pH sensor installed into Tri-Clover 316SS sensor holder shown above is ready for field installation

5731 Aggressive Dissolved Gas & Solvent Resistant pH sensor
Without preamplifier configuration & 20 feet integral cable
Shown without mating 316SS sanitary Tri-Clover fitting

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ASTI offers unique solutions for process measurement problems. Features and options are itemized below:

- Leading novel and proprietary solid-state industrial pH sensor & ORP sensor design and technology combined with built-to-order extensively configurable manufacturing offer the best possible service lifetime at the most cost effective price point. Review the **Competitive Advantages of Design & Technology for IOTRON™ & ZEUS™ Industrial pH & ORP Sensors webpage** for details.

- Best reference service lifetime in process industry through proprietary, novel, non-porous, cross-linked, conductive polymer technology; Available in double junction (standard) or triple junction (optional “TJ”) configurations

- Rugged industrial grade sensors can operate in a temperature range from -35 to 150 degrees Celsius at pressures up to 200 psig

- Base models for general purpose, high temperature resistant, ultra-high temperature resistant, slurry & viscous material resistant, acid/fluoride & HF resistant, pulp & paper resistant, aggressive dissolved gas & volatile organic solvent resistant, Oxidation Reduction Potential (ORP) and saturated sodium (brine) resistant.

- Selected optional features include Ammonia gas resistant (“A”), Chlorine gas resistant (“C”), Wide Range -0.5 to +14.5 pH Media Resistant (“V”), Organic Media Resistant (“L”), Solvent Resistant (“TS”), 3-Wire TC (“M”), ACCU-TEMP Fast TC (“X”), Add Protective Tines 4 ea. (“GR”), Add Protective Tines 2 ea. (“GRO”), Shielded Preamplifier Cable (“BL”).

- Available with most any integral temperature compensation element (Pt100 or Pt1000 Standard), Solution Ground Liquid Earth (316SS or Platinum), Dual pH/ORP All-In-One Configuration and Conventional or Differential Analog preamplifier to allow for interfacing with most any existing OEM transmitter.

- **Quick disconnect IP67 & NEMA 6P rated** waterproof and corrosion resistant **Q7M/Q7F snap connector** option is available for pH sensors and ORP sensors with integral preamplifiers.

- Convenient Quick-Disconnect Tri-Clover sanitary fittings allows easy calibration and cleaning from process line or tank.

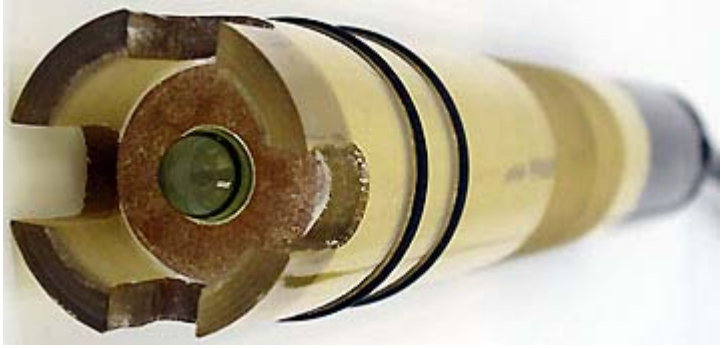
- **HiQDT SMART DIGITAL MODBUS RTU pH & ORP SENSORS FOR DIRECT CONNECTION TO ANY PLC, HMI, SCADA** or any other data acquisition or control device that can serve as the MODBUS RTU master.
    - The PLC or HMI employed can either be customer supplied or else ASTI supplied as a part of a turn-key ready system ready for plug and play field commissioning right out of the box.

    - ASTI supplied HMI & PLC include options for advanced smart touchscreen controllers with full remote access suitable use in for Class I, Division II hazardous locations as well as Explosion-Proof controller suitable for use in

hazardous Class I, Division I EX rated locations. Lower cost instrumentation options also exist for use in safe non-hazardous locations as well as blind installations if no local display is required.

- **Available in smart digital configurations for use with intelligent pH/ORP digital transmitters. Detailed information about this smart digital type configuration option can be found in the separate 3TX-HiQ digital pH/ORP measurement product webpage.**
- 316SS Sanitary Sensor Fitting available in 1.5″, 2.0″ or 2.5″ Tri-Clover sizes (other larger sizes available upon request).
- Alternate fittings can be welded to sensor holder upon request. One example is a 1.25″ MNPT threaded nipple for high-pressure inline screw-in style installations
- Double O-ring design ensures secure seal during operation; Standard material of construction is Viton®-75, with CV75, Simriz® 485 and Kalrez® 4079 Optional
- Back of sensor is sealed with watertight cable gland assembly to ensure watertight operation from washdowns, moisture and outdoor installations
- Each standard sensor selection and/or special customized sensor design are based upon a thorough review of the customer supplied application information by senior in-house chemists to ensure that the best possible choice of available pH sensor or ORP sensor model and options is made at the lowest possible price configuration which is suitable for the intended process measurement & installation scheme.
- pH sensors & ORP sensors are manufactured with rugged RADEL® (Poly-Phenyl-Sulfone, PPSU), KETASPIRE® (Poly-Ether-Ether-Ketone, PEEK) or RYTON® (Poly-Phenylene-Sulfone, PPS) for the sensor body housing material of construction.
- The solid state reference is highly resistant to dehydration and our thick wall glass is nearly impervious to cracking, even under high pressure conditions.
- **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 parabolic thick-wall, low-profile, break-resistant pH glass is now standard for all X3XX series pH sensors.

- **Novel extreme dehydration resistant reference technology option allows sensor to endure prolonged exposure to dryness as well as intermittent wet and dry operation conditions for batch applications and uncertain fluid levels**
    - Invoked with Alpha Prefix “E” on supported sensor models



5731 Aggressive Dissolved Gas & Solvent Resistant pH sensor
Close-up view of tip with 4 each "GR" thick protective tines
Double sealing O-rings for integrity & safety of installation

Model 5331 RADEL bodied sanitary pH sensor shown with low-profile break-resistant parabolic pH glass element for use in high viscosity and slurry abrasives type solutions in the without protective tines configuration

Model 5841 PEEK bodied sanitary ORP sensor shown with low-profile ball-style platinum ORP sensing element for use in high viscosity and slurry abrasives type solutions in the with 4 each "GR" protective tines configuration

APPLICATIONS FOR IOTRON™ IMMERSION SERIES
BUILT-TO-ORDER pH SENSORS & ORP SENSORS
WITH EXTENSIVE CUSTOMIZATION OPTIONS

- 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

TECHNICAL CAPABILITIES OF IOTRON™ TWIST LOCK QUICK DISCONNECT BUILT-TO-ORDER pH SENSORS & ORP SENSORS WITH EXTENSIVE CUSTOMIZATION OPTIONS

- 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 (with RADEL or PEEK bodied type sensors)
- 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

1.5″, 2.0″ & 2.5″ Tri-Clover Sanitary Configurations (316SS Standard)

SENSOR HOLDER DRAWING & INSALLATION GUIDE

Sanitary Sensor Holder Assembly Drawing

Sanitary Sensor Installation Procedure

SANITARY SENSOR DIMENSIONAL DRAWINGS

Sanitary pH Sensor Dimensional Drawing 5-1
Hemispherical pH Glass Element

Sanitary pH Sensor Dimensional Drawing 5-2
Low-Profile Parabolic Thick-Wall Break-Resistant pH Glass

53X1 Series Slurry & Viscous Media Resistant
55X1 Series Pulp & Paper Resistant

Sanitary ORP Sensor Dimensional Drawing 5-1-Pt
Low-Profile Platinum Ball Style ORP Sensing Element

58X1 Oxidation Reduction Potential (ORP) Series

Material of Construction for Sensor Body of 5XX1 Series Sanitary pH Sensors & ORP Sensors		
5X31 Series Sensors – Body Housing RADEL® Poly-Phenyl-Sulfone, PPSU	**5X41 Series Sensors – Body Housing KETASPIRE® Poly-Ether-Ether-Ketone, PEEK**	**5X51 Series Sensors – Body Housing RYTON® Poly-Phenylene-Sulfone, PPS**
RADEL® R-5000 NT Chemical Resistance Chart **RADEL® R-5000 NT Thermal & Mechanical Performance Data**	**KETASPIRE (PEEK) Chemical Resistance** **KETASPIRE® KT-880 NT Specifications**	**RYTON (PPS) Chemical Resistance** **RYTON® R-4-230BL Specifications**
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Sanitary pH Sensor and ORP Sensor Selection Guide

Sensors for Sanitary Tri Clover Installations Requiring Chemical Clean-In-Place (CIP) Sterilization

Description of pH/ORP Sensor Series *KYNAR Junction for all 5XX1 Sensors*	**Sensor Body Housing RADEL® Poly-Phenyl-Sulfone, PPSU**	**Sensor Body Housing KETASPIRE® Poly-Ether-Ether-Ketone, PEEK**	**Sensor Body Housing RYTON® Poly-Phenylene-Sulfone, PPS**
General Purpose	**5031**	**5041**	**5051**
High Temperature Resistant	**5131**	**5141**	**5151**
Ultra High Temperature Resistant	**5231**	**5241**	N/A
Slurry & Viscous Material Resistant	**5331**	**5341**	**5351**
Acid, Fluoride & HF Resistant	**5431**	**5441**	**5451**
Paper & Pulp Resistant	**5531**	**5541**	**5551**
Sulfide Resistant	**5631**	**5641**	**5651**
Aggressive Dissolved Gas & Volatile Organic Solvent Resistant	**5731**	**5741**	N/A

Oxidation Reduction Potential a.k.a. ORP	**5831**	**5841**	**5851**
Saturated Sodium (Brine) Resistant	**5931**	**5941**	**5951**

Replacement pH & ORP Sensors
For Transmitters that support and/or require Integrated Preamplifiers

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. A sensor hook-up schematics for interfacing to the given OEM pH/ORP transmitter is supplied with each sensor, and some of the most common wiring schematic are posted on our website (please inquire for any not listed).

Replacement pH & ORP Sensors
For Transmitters DO NOT SUPPORT Integrated Preamplifiers

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 compatility. A sensor hook-up schematics for interfacing to the given OEM pH/ORP transmitter is supplied with each sensor, and the some of the most common wiring schematic are posted on our website (please inquire for any not listed). 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:** 1000, 1001, 1002, 1003, 1050, 1181, 1055, 2081, 3081, 81, 54pH, 54epH, XMT **MODERN:** 1056, 1057, 56, 1066, 5081, 6081	385/385+, 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, 876PH, 873PH, 873DPX	PH10 DolpHin™ pH sensors, ORP10 DolpHin™ ORP sensors, 871A & 871PH pH & ORP sensors, EP460 & EP466 pH & ORP sensors

Honeywell (formerly Leeds and Northrup, a.k.a. L&N)	**LEGACY:** 7030, 7075, 7076, 7079, 7081, 7082 , 7083, 7084, 7096, 9782 **MODERN:** UDA2182, APT2000PH, APT4000PH	7773, 7774/7774D, 7777/7777D/7777DVP, 7794DVP Sanitary DURAFET™, HB/HB546, HB/HBD547, HB/HB551
Electro-Chemical Devices (a.k.a. ECD)	**LEGACY:** T20, T21, T27, T29, T30, C22 **MODERN:** T23, T28	S10 (PHS10) and S17 (PHS17)

* 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.

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, CPM253	Inquire to ASTI Factory for atlternatives 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, M800	Inquire to ASTI Factory for atlternatives to Mettler-Toledo pH & ORP sensors
ABB (formerly TBI-Bailey)	**LEGACY:** TB515, TBN580, TB701/702, 4630, 4631, 4635, 4636, AX416, AX436, AX468, AX460, AX466 **MODERN:** AX460, AX416, AX436, APA592, TB82pH, TB84pH,	AP100, AP200, AP300, TB(X)551, TB(X)556, TB(X)557, TB(X)561, TB(X)567, TB(X)587
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)-110	Inquire to ASTI Factory for atlternatives to Knick pH & ORP sensors

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Supported Hardware with Known Issues – LIMITED COMPATIBILITY

Manufacturer	pH & ORP Transmitters	OEM pH & ORP Sensors *
Rosemount Analytical Liquid Division A Part of Emerson Process Management	**LEGACY:** 1054, 1054A, 1054B, 1055	385/385+, 389, 3900 pH & ORP sensors 3300HT, 3400HT & 3500P PERpH-X™ pH & ORP sensors 397, 398/398R, TF396 TUpH™ 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
GF (Georg Fischer) Signet a.k.a +GF+	**LEGACY:** 710, 2720, 9030, 9040, 8710, 5700 **MODERN:** 9900, 8900, 8750	2724-2726 pH/ORP Electrodes, 2734-2736 pH/ORP Electrodes, 2774-2777 Threaded DryLoc pH/ORP Electrodes, 2764-2767 Differential DryLoc pH-ORP Electrodes, 3719 pH/ORP Wet-Tap, 2714-2717 pH/ORP Electrodes

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Supported Hardware with Known Issues – LIMITED COMPATIBILITY

Manufacturer	pH & ORP Transmitters	OEM pH & ORP Sensors *

Yokogawa Electric Corporation (Formerly Johnson Yokogawa Controls, a.k.a. JYC)	**LEGACY:** pH/ORP 200, pH/ORP 400, pH/ORP 202, pH/ORP 402, pH150, pH100, OR100 **MODERN:** PH450G, PH202G	FU20 pH/ORP Combined Sensor, PH8EFP, PH8ERP, OR8EFG, OR8ERG pH/ORP Sensors

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Most of the pH/ORP transmitter models listed also have a both contacting conductivity and toroidal (inductive contactless) conductivity transmitter counterpart to which ASTI can also supply alternative sensors to the OEM model sensors. Please inquire for any such conductivity retrofit and replacement sensor needs as well as for the pH & ORP measurements.

The manufacturers and models detailed on this webpage are not a complete listing of the supported OEM pH & ORP transmitters, analyzers and controllers to which ASTI can retrofit our replacement pH, ORP and conductivity sensors.

Sanitary Sensor Options

- All 5X31, 5X41 & 5X51 series pH sensors and ORP sensors are supplied without tines (no guard) as the standard configuration (default). Four (4) each protective tines (“GR”) or 2 each protective tines (“GRO”) are available in both the full length 0.5″ inches (for pH sensors) or the reduced 0.3″ inch length (typically for parabolic pH or ORP sensors).
- Fast response (AccuTemp™) temperature compensation option recommended for all sanitary installations
- Sensors with integral preamplifiers can be supplied with the rugged field ready Q7M/Q7F NEMA 6P rated quick disconnect snap connector system. See pictures shown below for visualization of this option.

Q7M sensor end of cable snap connector detail close-up view

Q7F-Xm-TL Female Q7F snap to tinned leads extension cable

Q7M/Q7F snap connectors are NEMA 6P rated when interfaced.

Installation Guide for Q7M/Q7F Quick Disconnect Snap Connector for pH/ORP sensors with conventional integral preamplifiers; For all modern Rosemount & ASTI Transmitters

Installation Guide for Q7M/Q7F Quick Disconnect Snap Connector forpH/ORP sensors with 5-wire differential preamplifiers; For all modern HACH & GLI Transmitters

APPENDIX "A"

Custom Applications	**Add-On Alpha Prefix**
Dissolved Gas Resistant	"A" or "C"
Organic Media Applications*	"L"
Teflon Silicone Required*	"TS"
Triple Junction*	"TJ"

High-Level HF Resistant*	“HF”
Impact & break resistant low-profile parabolic pH glass for slurries*	“X3XX” & “X5XX” series
Aggressive Dissolved Gas & Organic Solvent Resistant Configuration*	“X7XX” series
Extreme Dehydration Resistant*	“E”
Custom Configurations	**Add-On Alpha Prefix**
Accu-Temp Option for Fast Temperature Response*	“X”
Low Impedance Glass*	“Z”
316SS Solution Ground Addition*	“Y”
Platinum Solution Ground Addition*	“Pt”
Platinum Solution Ground with 2 each reference half-cells allows for simultaneous use on two completely separate input channels or transmitters Addition*	“PtD”
3-wire TC*	“M”
Add 4 each Protective Tines (for HOT-TAP Series Only)*	“GR”
Add 2 each Protective Tines (for HOT-TAP Series Only)*	“GRO”
Shielded & Reinforced Preamplifier Blue Cable*	“BL”
Upgrade from standard Viton® -75 to CV75, Simriz® 485 or Kalrez® 4079*	“W”, “U” or “K” respectively

*** Additional charges apply for these options. Not all options available on all models (inquire to factory).**

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PLEASE INQUIRE FOR COMPATIBILITY INFORMATION ABOUT ANY INSTRUMENTATION NOT LISTED HERE

Naturally, all of the ASTI pH, ORP and Ion selective (ISE) sensors are compatible with our own **2TX, 3TX and 4TX transmitters**

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