Valve Retractable pH & ORP Sensors

pH Sensors & ORP Sensors for HOT-TAP Valve Retractable Installations

Shown above is a complete HOT-TAP insertion assembly with an ORP sensor installed from the process view

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
Ideal for organic manufacturing processes employing volatile solvents& pressurized vessels requiring safe HOT-TAP use
Standard Viton®-75 O-rings with CV75, Simriz® 485 & Kalrez® 4079 optional as required

for material compatibility

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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 PDF** 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) configurations
- Rugged industrial grade sensors can operate in a temperature range from -35 to 150 degrees Celsius at pressures up to 200 psig (100 psig max for HOT-TAP insertion)
- 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.
- Available end of cable terminations include tinned leads, BNC connector for pH sensors and ORP sensors without integral preamplifier.
- **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.
- **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.**
- Convenient HOT-TAP 316SS sensor holder allows for cleaning and calibrations without removing fitting
- Double O-ring design ensures secure seal between sensor and holder during operation; Standard material of construction is Viton®-75, with CV75, Simriz® 485 and Kalrez® 4079 Optional .
- Back of sensor insertion tube available sealed with watertight cable gland assembly to ensure watertight operation and protection from washdowns, moisture and outside 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 conductive polymer reference system 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 model

Shown below is a 5X31 RADEL series pH sensor with 316SS sensor holder close-up

Shown to the left is a complete 2″ NPT HOT-TAP Ball Valve Retractable Assembly including:

- 316SS Sensor Holder with 5X31 series pH/ORP sensor installed with sealing O-rings
- 36 inch 316SS extension Tube for insertion up to 18 inches into process (max 42 inch insertion with 60 inch extension tube) with sealing cable gland for watertight cable
- 2 Inch full port ball valve HOT-TAP assembly with purge port (also available in 1.5 inch version)
- 1″ MNPT X 1.00 inch compression fitting with Viton Sealing O-ring (Kalrez Optional)

FOR DETAILS ON HOT-TAP BALL VALVE RETRACTABLE HARDWARE CLICK HERE

Shown above is a 5841 PEEK series ORP sensor close-up with sealing O-rings installed

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 100 psig
- Insertion depths up to 42 inches (~107 cm) with HOT-TAP valve retraction assembly
- 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

Material of Construction for Sensor Body and Dimensional Drawings for pH Sensors & ORP Sensors For use with 3rd Generation HOT-TAP Valve Retractable Assemblies

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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HOT-TAP VALVE RETRACTABLE SENSOR HOLDER DRAWING & INSALLATION GUIDE

HOT-TAP Sensor Holder Assembly Drawing

Complete HOT-TAP Assembly Cross-Sectional Drawing and Installation Schematics

Procedure for Installation of 5XX1 series pH sensor or ORP sensor into HOT-TAP sensor holder

HOT-TAP VALVE RETRACTABLE SENSOR DIMENSIONAL DRAWINGS

HOT-TAP Valve Retractable pH Sensor Dimensional Drawing 5-1
Hemispherical pH Glass Element
50X1 Series General Purpose & Wide Range Resistant
51X1 & 52X1 Series High Temp & Ultra-High Temp Resistant
54X1 Series Acid, Fluoride & HF Resistant

56X1 Series hydrogen sulfide gas (H_2S), hydrogen sulfide (HS^-) or sulfide ion (S^{2-}) Resistant
57X1 Series Aggressive Dissolved Gas & Volatile Organic Solvent Resistant
59X1 Series Saturated Sodium (Brine) Resistant

HOT-TAP Valve Retractable 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

HOT-TAP Valve Retractable Sensor Dimensional Drawing 5-1-Pt
Low-Profile Platinum Ball Style ORP Sensing Element
58X1 Oxidation Reduction Potential (ORP) Series

Valve Retractable pH Sensor and ORP Sensor Selection Guide

Sensors for 3rd Generation HOT-TAP Valve Retractable Hardware Assemblies

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**

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Valve Retractable Sensor & Assembly 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).
    - Contact the ASTI factory to decide which guard configuration is most appropriate for your planned installation.

- Fast temperature compensation response may be desired for some installations with variable temperature conditions (Iotron™ AccuTemp™). The ACCU-TEMP (“X”) option is recommended for most HOT-TAP valve retractable and compression fitting only installation for best temperature compensation.

Compression fitting only assembly configuration shown above with 5X31 series sensors, 316SS sensor holder, 12 inch extension tube, 1″MNPT X 1.00″O.D. compression fitting and sealing cable gland. This installation style is ideal for batch processes where the process is periodically shut-down and the assembly can be periodically removed from service without the use of a ball valve for location isolation. **DOWNLOAD A SAMPLE INSTALLATION DRAWING** for this described compression fitting only installation approach for the 5X31 series type sensors.

1.25″ MNPT inline 316SS fitting shown above with 5X3 series sensors, 3/4″X1/2″ reducer bushing and sealing cable gland. This installation style is ideal for installations where plastic threaded sensors are insufficient for the process conditions due severe process flow, pressure or mechanical wear. Special order options include welding the 1.25″ MNPT nipple further back on the fitting to allow for a deepr insertion into the process (minimum order quantity MOQ may apply for special order options).

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

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).

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)

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 compatibility. 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 *
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

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

* 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

Supported Hardware with Known Issues – LIMITED COMPATIBILITY

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

* ASTI offers pH & ORP sensors compatible with the transmitters listed above as an alternative to mating OEM pH & ORP sensors detailed.

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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.

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**

Download the Complete Printable HOT-TAP Valve Retractable pH Sensors & ORP Sensors Product Brochure (PDF)