Rosemount Analytical, Inc.
(an Emerson Process Management company)
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Irvine, CA 92606
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March 26, 2008

Subject: Request for Exemption Based on Adaptation to Scientific and Technical Progress Under Directive 2002/95/EC: Lead Oxide (PbO) Containing Glass Used for Making High Performance pH and ORP Sensors.

Dear Oko-institute,

Rosemount Analytical Inc. – Liquid Division, an Emerson Process Management Company, respectfully submits the following request to support exemption #25 for lead oxide (PbO) containing glass. Rosemount Analytical currently uses lead oxide containing glass in its high performance electrochemical pH and ORP sensors.

Examples for application of these sensor units include the precise monitoring and controlling industrial and chemical processes, such as waste treatment, water purity applications and so on. The quantity of PbO in each sensor unit is around 0.997g per sensor and the total amount in shipments to the EU in 2007 was less than 8kg (estimated 8,000 PbO-containing pH and ORP sensors are shipped into EU in 2007).

Please note that our supporting exemption request is similar to the granted request submitted by Babcock for use of lead oxide (PbO) in DC plasma displays ("Use of Mercury in Babcock's DC Plasma Displays and Use of Lead Oxide (PbO) in Babcock's DC Plasma Displays Frit Seal," Adaption to Scientific and Technical Progress Under Directive 2002/95/EC Final Report, 28 July 2006, Institute for Applied Ecology, set 4 no 15, pages 130 to 133). From the published information on the Babcock product stating challenges to finding alternative material(s), we believe their application, with respect to the use of lead oxide (PbO), is similar in the technical material requirements of our request. Even though the products in question are very different in form and function, the requirements driving the use of lead oxide (PbO) bearing material are for the technical properties which have not been found in alternatives. A second granted application to Coherent for sealing laser tubes also has many similarities because of the required technical properties of the lead oxide (PbO) material ("Adaption to Scientific and Technical Progress Under Directive 2002/95/EC" Final Report, 28 July 2006, Institute for Applied Ecology, "Lead Oxide in Seal Frit Used for Making Window Assemblies for Argon and Krypton Laser Tubes", set 4 no. 21, pages 127-128). Rosemount's technical need for a lead oxide (PbO) bearing material is very similar to these applications. Therefore we support the Commission's granted exemptions for those products

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Introduction

Rosemount Analytical (Liquid Division) as a reporting division of Emerson Process Management has its roots in two different companies; Industrial Instruments (founded in 1938 by A. Beckman) and Universal Interlock founded in 1963. In 1965 Beckman Instruments acquired Industrial Instruments and created its Cedar Grove division. In 1984 Emerson acquired the division. In 1979 Rosemount acquired Universal Interlock. In 1993 these two entities began consolidation and in 1996 as a result of this consolidation, Rosemount Analytical – Liquid Division was formed. For all of its 69 year history, the division has been involved in the development and manufacture of high-performance sensors and instrumentation.

The PbO-containing high performance pH and ORP sensors are designed to meet the very precise and strict reliability standards for pH and ORP applications in process industries. They are often installed in very hazardous and remote locations. These products have unique quality and meet rigid safety standards worldwide. At present, Rosemount Analytical has no viable alternatives for PbO-containing glass in high performance pH and ORP sensors.

Background on Use of PbO containing glass in high performance pH and ORP Sensors:

The PbO-containing high performance pH and ORP sensors are designed to meet the customer requirements of precise and reliable process measurements and controls. The key to the industry-leading performance of Rosemount Analytical's pH and ORP sensors lies in the formulation of our Accuglass pH sensing glass used in the formation of the hemispherical bulb blown on the end of a piece of glass tubing or "stem" glass. The joining of these two glass components forms the basis of our pH and ORP sensors. It is imperative that this stem glass have certain properties that are critical for performance. Among these are; a coefficient of thermal expansion matching that of the Accuglass, high electrical resistivity, high chemical resistance at elevated temperatures and a good interface chemistry with the Accuglass. Paramount among these properties is a matching coefficient of thermal expansion with the Accuglass. Structural failure of the sensor would result if the coefficients are not closely matched. This may result in a loss of process control or monitoring for the customer.
Currently, commercially available stem glass meets all of our criteria for a very closely matched coefficient of thermal expansion with our Accuglass. An extensive research effort has not identified any viable PbO free alternatives.

Existence of feasible substitutes in an industrial and/or commercial scale:

Despite years of development programs to replace the PbO-containing glass in Rosemount's high performance pH and ORP sensors, a viable alternative has not been found. Some of the most important reasons are as follows. **First**, the coefficient of thermal expansion in the PbO free glass is not a close match to our Accuglass. **Second**, the high-temperature performance is poor compared to the current glass, **Third**, the required interface chemistry cannot be duplicated with the PbO free alternatives.

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Restrictions applicable to such substitutes:

The requirements for any substitute material have been presented above. Beyond this, any replacement material must provide equivalent or better reliability to the function and life time of the Rosemount's high performance pH and ORP sensors. Customers of these products demand it as well as any person or surrounding area that would be affected by the use and failure of this product. Therefore, any substitution has to go through rigorous evaluation of the sensors for strict reliability, high performance, and rigid safety standard requirements. Rosemount's experience does not reveal a viable replacement for the lead oxide containing glass to date.

Costs and benefits, advantages and disadvantages of such substitutes:

Rosemount does not have a viable alternative and there are no clear benefits or advantages to the environment of using alternative materials. There would potentially be significant disadvantages to an alternative with respect to a reduced reliability of the products and the potential consequences from a product failure.

Precise wording for the exemption:

"Lead oxide (PbO) containing glass in Rosemount high performance pH and ORP sensors."

Technical and scientific evidence:

Please refer to the attached Directive 2002/95/EC *c*heck list and Rosemount high performance metal sensor product data sheet.

We appreciate this opportunity to participate in the stakeholder consultation. Please do not hesitate to contact Bob Jantz at Rosemount Analytical at 949-757-8594, if you require additional information or assistances in processing this request.

Sincerely,

Bob Jantz
Director of Engineering

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Attachment to Exemption Request for Rosemount Analytical pH and ORP Sensor

Check List: Directive 2002/95/EC

Technical and scientific evidence in support of request for exemption for PbO-containing glass used to make Rosemount Analytical's pH and ORP sensors.

1a) Please describe the materials/components of the electrical and electronic equipment that contains the hazardous substance.

PbO-containing glass in Rosemount Analytical's pH and ORP sensors.

1b) Please indicate type and quantity of the hazardous substance used in the homogenous material. Please indicate the quantity of the substance in absolute numbers and in percentage in homogenous material.

Lead oxide (PbO) containing glass is used in the Rosemount Analytical's pH and ORP sensors. The glass can contain up to 21 wt% of PbO. Nominal amount of PbO per sensor is around 0.997g.

1c) Please indicate the functionality of the substance in the material of the equipment.

Lead Oxide (PbO) containing glass is used in Rosemount's high performance pH and ORP sensor stem glass.

It is imperative that this stem glass have certain properties that are critical for performance. Among these are; a coefficient of thermal expansion matching that of the Accuglass, high electrical resistivity, high chemical resistance at elevated temperatures and a good interface chemistry with the Accuglass. Paramount among these properties is a matching coefficient of thermal expansion with the Accuglass. Structural failure of the sensor would result if the coefficients are not closely matched.

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1d) Estimated annual quantities of the hazardous substance used in this particular application that would enter the EU market.

An estimated 8,000 sensors were shipped to the EU market in '07. Each containing approximately 0.997g of PbO yielding a total annual quantity of approximately 8kg.

2) Please explain why the elimination or substitution of the hazardous substance via design changes or materials and components is currently technically or scientifically impracticable.

PbO-containing glass is a superior material for making Rosemount Analytical's pH and ORP sensors. The glass currently used provides the correct coefficient of thermal expansion for mating to our Accuglass sensing glass, provides for the required high resistivity, exhibits the required high chemical resistance and has the required interface chemistry for mating to our Accuglass sensing glass.

At present, substitution of PbO-containing glass in Rosemount Analytical's pH and ORP sensors is technically impracticable.

3) Please indicate if the negative environmental, health and/or consumer safety impacts caused by substitution are likely to outweigh the environmental, health and/or consumer safety benefits. If existing, please refer to relevant studies on negative impacts caused by substitution.

Any substitution of the PbO-containing glass for Rosemount Analytical's pH and ORP sensors is technically and commercially not available. Therefore, any environmental impacts of the substitution materials have not been evaluated.

Rosemount Analytical's pH and ORP sensors are used in pH and ORP instrumentation in process plants across industries ranging from chemical, power, refining, pharmaceutical, food & beverage, and wastewater treatment. Any compromise in the integrity of the sensor construction and decreased performance will lead to errors in measuring process parameters that are critical to the safe and efficient operation of customer plants. Significant errors or equipment failure can lead to producing off-spec product that must be disposed of, fugitive emissions, and loss of process control causing damage to equipment, the environment, and personnel.

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4) Please indicate if feasible substitute(s) that is currently exist in an industrial and/or commercial scale. Please indicate the possibilities and/or the status for the development of substitutes and indicate if these substitutes will be available by July 1, 2006 or at a later stage.

There are no substitutes that currently exist which could substitute the PbO-containing glass in Rosemount Analytical's pH and ORP sensors. Developed over many years, these sensors have been thoroughly optimized. Despite years of development programs to replace the PbO-containing glass, any viable alternatives could not be identified. Rosemount is still working and will look for the replacement of the Pb-containing glass for its high performance pH and ORP sensors.

5) Please indicate if any current restrictions apply to such substitutes. If yes, please quote the exact title of the appropriate legislation /regulation.

Not applicable

6) Please indicate the costs and benefits and advantages and disadvantages of such substitutes. If existing, please refer to relevant studies on costs and benefits of such substitutes.

Not applicable

7) Please provide any other relevant information that would support your application for an additional exemption.

All attempted substitutes of PbO free stem glass have failed. They do not possess the required properties of thermal expansion coefficient, high resistivity, high chemical resistance and proper interface chemistry to make them viable. The integrity and performance of Rosemount Analytical's pH and ORP sensors cannot be compromised for the reasons outlined above.

Product Data Sheet
PDS 71-PERpH-X/rev.A
September 2007

PERpH-X® High Performance pH and ORP Sensors

- FAST, ACCURATE, & STABLE MEASUREMENT
- RUGGED, VERSATILE DESIGN
- HIGH TEMPERATURE DESIGN Increases sensor life when used in elevated temperature applications.
- PRESSURE/TEMPERATURE RATINGS of 100 psig at 145°C (293°F) or 250 psig (1825 kPa [abs]) at 100°C (212°F). This applies to the 3300 & 3400
- LONG LASTING REBUILDABLE REFERENCE
- QUICK CONNECT Cable or Integral Cable
- INTEGRAL PREAMPLIFIER Option Model 3500 only

MODEL 3300HT
145°C at 100 psig

MODEL 3400HT
145°C at 100 psig

MODEL 3500
120°C at 100 psig

FEATURES AND APPLICATIONS

The Rosemount Analytical PERpH-X® high performance pH sensors incorporate several design innovations that prolong the life of the sensor in difficult applications. These include improved durability of the AccuGlass® pH glass electrode, increased stability of the reference electrode and overall reliability of the mechanical design. The resulting sensors live longer, respond faster and drift less, thereby minimizing maintenance and lowering the total cost of ownership.

The AccuGlass® pH glass electrode provides exceptional resistance to thermal degradation, even at temperatures of 145°C in the Model 3300 and Model 3400 sensors. This translates into less breakage from thermal stress or shock and improved speed of response for fast and accurate measurements and calibrations even after months of service. The PT100 RTD used for temperature compensation is embedded inside the glass electrode, surrounded by the internal electrode to provide precise compensation when the temperature changes. The beneficial traits of near theoretical response, even at extreme values, and minimal thermal hysteresis carry over from previous AccuGlass[1] designs. A removable slotted tip cap protects the glass bulb from direct impacts while in service and during calibration.

Most pH measurements fail due to reference electrode issues. The most common problems are fouled and poisoned electrolytes or coated and clogged reference junctions. The PERpH-X® sensors feature an enhanced double junction reference electrode that excels in harsh applications. The specially designed porous Teflon® liquid junction has a large surface area that provides a stable contact to the solution and helps resist coating in dirty applications. The large surface area and high porosity also minimize junction potentials allowing accurate measurements without the need of an additional process standardization. The KCl based reference electrolyte is a chemically inert viscous gel that can stand up to the harshest chemicals and it is unaffected by thermal or pressure cycling. The

internal reference junction is a small diameter, low porosity ceramic liquid junction designed to minimize poisoning or the depletion of the primary reference cell maximizing the overall life of the sensor. This design combines the best traits of both liquid junctions, the accuracy of a high porosity junction with the longevity of a low porosity junction.

The PERpH-X® pH sensor's reference electrode can be rebuilt if the reference junction coats or fouls in the application. Replacing a clogged reference junction and recharging the electrolyte will rejuvenate most failed sensors extending the useful life of the sensor in harsh applications. The porous Teflon® junction is easily replaced by simply screwing off the sensor's front protective cap and removing the junction. With the junction removed, the electrolyte can be rinsed out and replaced with one of the various electrolytes available in the SOLUTIONS kits. (See page 17)

The SOLUTIONS Kits optimize the sensor's performance by keeping the porous Teflon® reference from coating and the electrolyte from fouling in the first place. Six different SOLUTIONS are available as electrolyte kits: the High Temperature Kit, the Bio-Film Resistant Kit, the Poisoning Resistant Kit, the Oil Resistant Kit, the Scaling Resistant Kit and the Metals Resistant Kit. Each kit contains a treated porous Teflon® reference junction and a specially formulated electrolyte to extend the life of the reference electrode in its targeted application.

The successful measurement of pH requires more than just a great pH glass electrode, the AccuGlass® electrode, and a great reference electrode, the double junction porous Teflon® reference, it requires that these electrodes are built into a sensor that can withstand the demanding environments present in Chemical Processing Industries. The 3300/3400 pH sensors accomplish this through the use of a molded Ryton[1] body housed in a titanium tube. The 3500 uses only the molded Ryton® body, no titanium tube. The chemically resistant construction is further enhanced by the choice of either EPDM, Viton® or Kalrez® o-rings.

The PERpH-X® High Performance pH sensors were not only evaluated in high temperature applications but in numerous chemically aggressive, dirty, fouling applications. This design provides superior performance in most applications including pulp stock, lime slurries, scrubbers, carpet dyeing and waste neutralizations containing organic solvents.

Models 3300HT and 3400HT are available with 15 ft. of cable for wiring directly to an analyzer/transmitter or a remote junction box. The Model 3400HT retractable sensor is also available with 9.5 in. of cable for use with a sensor head junction box which attaches to the sensor tube via a compression fitting. A variopol VP connector is also available to facilitate quick sensor replacement.

When the 3300/3400 sensors are installed more than 15 feet from the analyzer/transmitter a remote preamplifier should be used to protect the integrity of the high impedance pH signal. The preamplifier can be in a remote junction box or integral to the analyzer/transmitter. All 3300HT and 3400HT sensors are compatible with Rosemount Analytical's Models 54e, 1055, 5081, Xmt instruments, and other manufacturers' instruments that do not require a preamp in the sensor.

PERFORMANCE AND PHYSICAL SPECIFICATIONS FOR MODELS 3300HT AND 3400HT

Measured Range:

pH: 0 - 14 pH

Percent Linearity Over pH Ranges:

pH range	HT series
0-2 pH	94%
2-12 pH	99%
12-13 pH	97%
13-14 pH	92%

Operating Temperature: 5°C to 145°C (41°F to 293°F)

Storage Temperature: -10°C to 70°C (14°F to 138°F)

Maximum Process Pressure and Temperature:

100 psig (790 kPa [abs]) at 293°F (145°C)
250 psig (1825 kPa [abs] at 212°F (100°C)

Maximum Pressure at Retraction or Insertion (Model 3400HT only):

64 psig (524 kPa [abs]) Code 21
35 psig (343 kPa [abs]) Code 25

Wetted Materials: Titanium, Ryton®, Teflon®, glass, and user specified o-ring material

Reference: Replaceable Teflon® junction with refillable electrolyte

Temperature Sensor: Platinum Rtd. PT 100 ohm

Process Connections: NONE

Must use 1 inch compression process connector (PN 23166-00 or 23166-01).

Also, Model 3400HT can be inserted through a ball valve

Cable: 15 ft integral is standard, optional 9.5 in. on Model 3400HT only. VP6 connection; use VP Cable PN 23645-07

Weight/Shipping Weight:

Model 3300HT sensor:

1 lb/2 lb (0.5 kg/0.9 kg)

Model 3400HT sensor:

Code 21; 2 lb/3 lb (0.9 kg/1.4 kg)
Code 25; 3 lb/4 lb (1.4 kg/1.8 kg)

The Model 3500 is available with (-01) or without (-02) an integral preamplifier. The 3500-HT-01 sensor has a 25 ft. cable while the un-amplified sensor the 3500-HT-02 has a 15 ft. cable.

The Model 3500VP is available with or without an integral preamplifier. This sensor uses a VP8 (8 pin) connector and requires the use of a VP8 cable assembly. The VP8 cable assembly will work with most VP6 (6 pin) sensors.

When the 3500 sensor is installed more than 15 ft. from the analyzer/transmitter a remote preamplifier should be used. The remote preamplifier must be mounted in a junction box and it protects the integrity of the high impedance pH signal. The 3500 and 3500VP sensors are compatible with Rosemount Analytical Model's 54e, 1055, 1056, 5081 and XMT instruments, and most other manufacturers' instruments that use PT100 RTDs and do not require an integral preamp.

PERFORMANCE AND PHYSICAL SPECIFICATIONS FOR MODELS 3500 AND 3500VP

Measured Range:

pH range: 0-14 pH

ORP range: -1500 mV to 1500 mV

Percent Linearity:

pH range	3500 series
0-2 pH	94%
2-12 pH	99%
12-13 pH	97%
13-14 pH	92%

Operating Temperature: 0°C to 120°C (32°F to 248°F)

Storage Temperature: -10°C to 70°C (14°F to 138°F)

Maximum Process Pressure and Temperature: 100 psig (790 kPa [abs]) at 120°C

Wetted Materials: Ryton®, Teflon®, Titanium, glass and user specified o-ring material

Reference Electrode: Double junction with replaceable process side electrolyte and Teflon® junction

Temperature Sensor: Platinum RTD, PT100 ohm

Process Connections: 1 inch MNPT, Front and Rear facing Threads

Cable: 3500 with (-01) option: 25 ft. prepped ends
3500 with (-02) option: 15 ft. prepped ends

Weight/Shipping Weight: Model 3500 sensor: 1 lb/2 lb (0.5 kg/1kg)

VP8 connection: use VP cable 24281-00

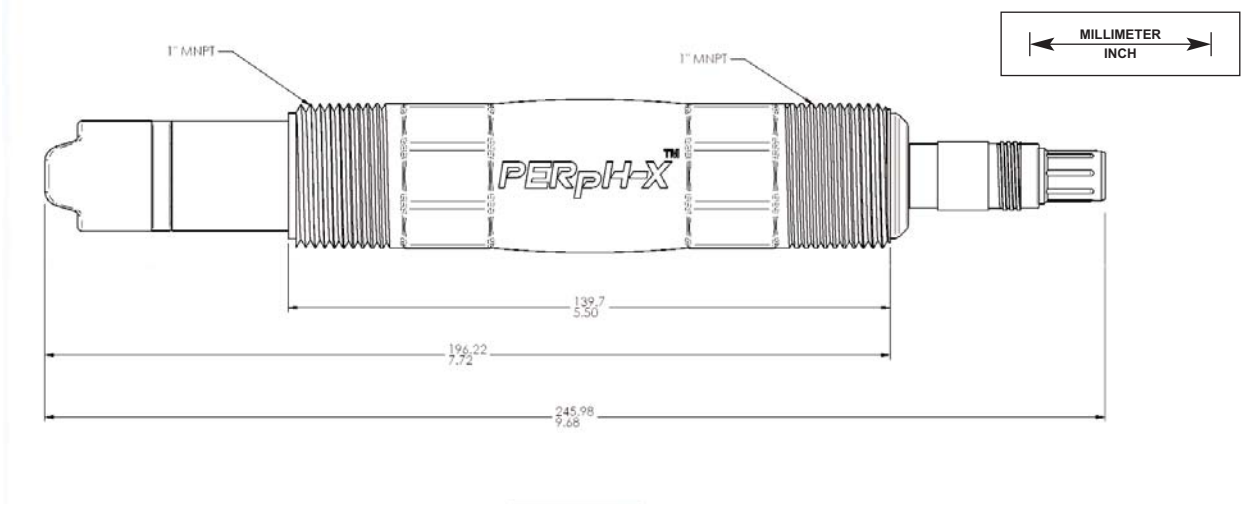
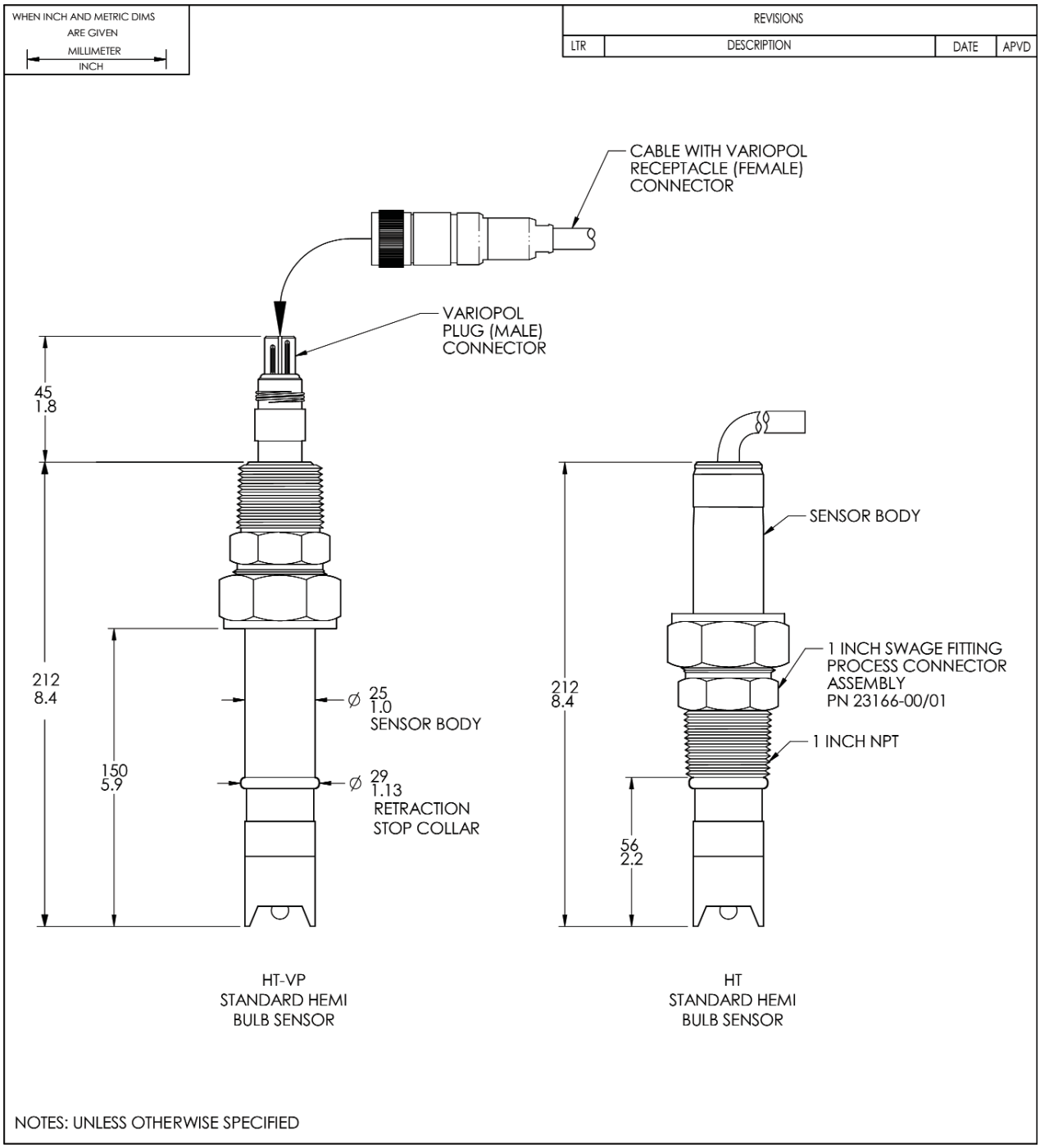


FIGURE 1. Model 3500VP

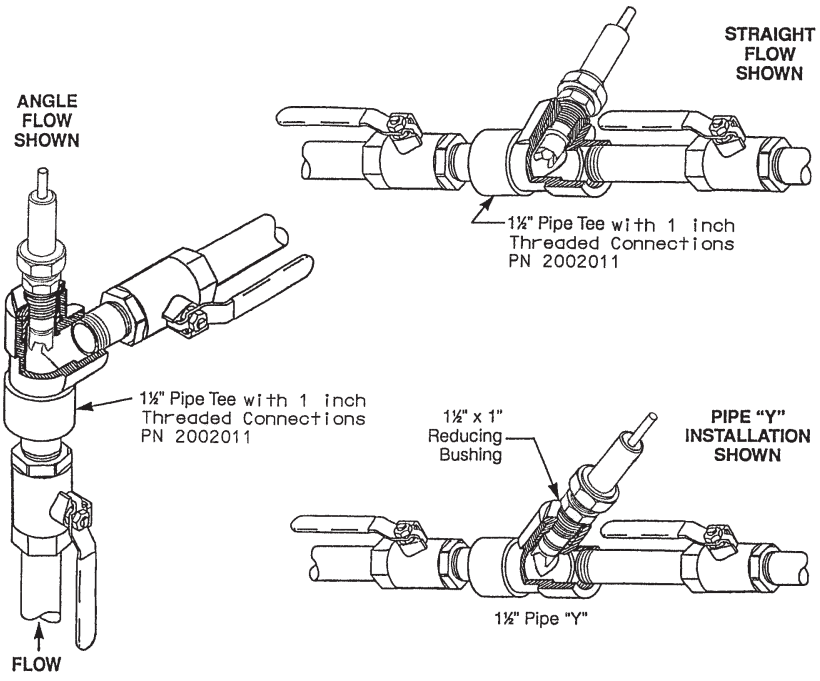
Ryton® is a registered trademark of Chevron Phillips Chemical Company.
Viton® is a registered trademark of DuPont Performance Elastomers.
Kalrez® is a registered trademark of DuPont Performance Elastomers.

AccuGlass® is a registered trademark of Rosemount Analytical.
PERpH-X™ is a trademark of Rosemount Analytical.
Teflon® is a registered trademark of E.I. du Pont de Nemours and Company.



Dimensional Drawing - Model 3300HT and 3300HTVP Insertion/Submersion Sensor

The process connector can be placed onto Model 3300HT with the threads facing down for insertion mounting into a tee or the threads facing up for a submersion pipe mount connection.

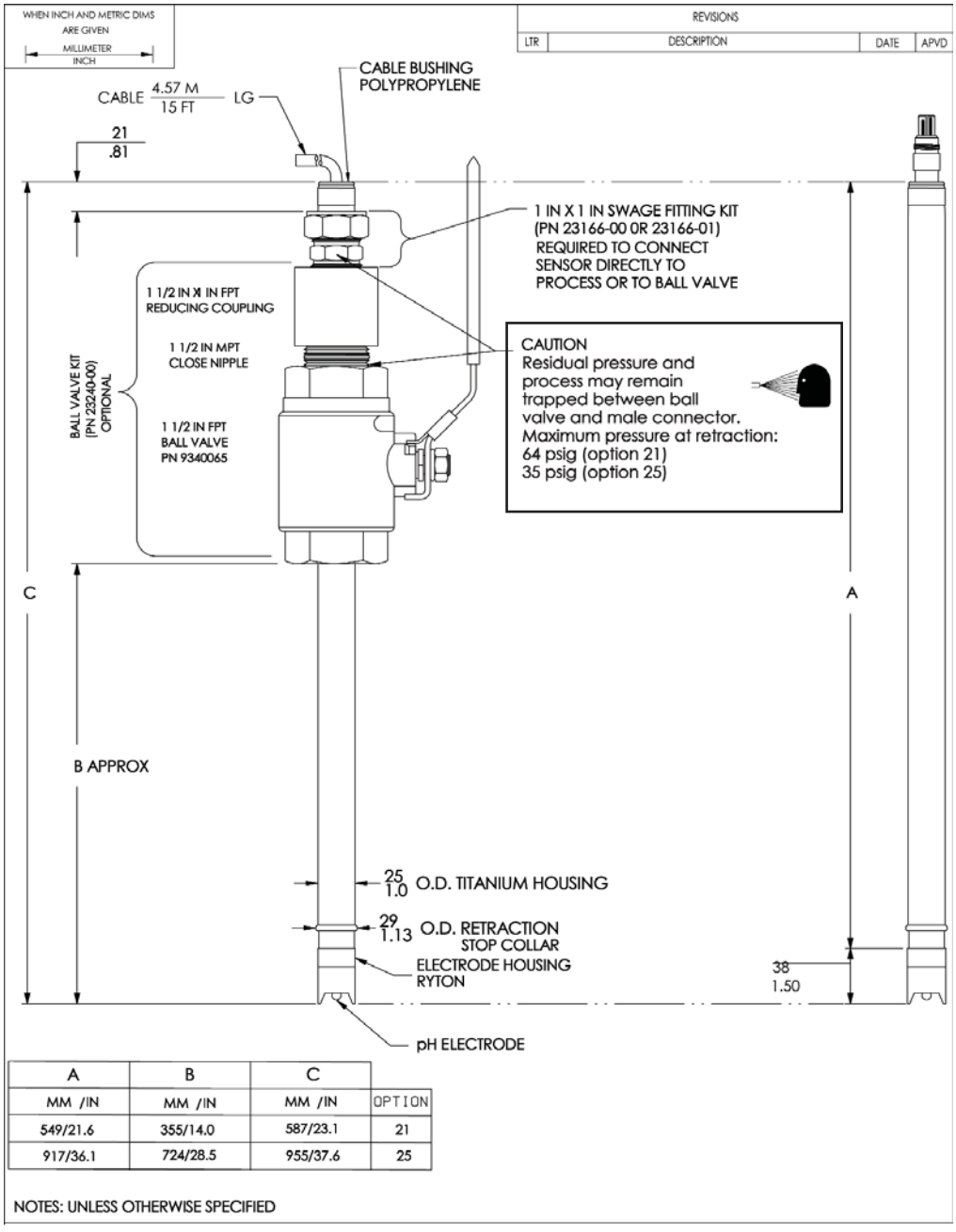


Recommended Flow-Through and Insertion Installation for Model 3300HT

1-1/2 inch Pipe Tee (PN 2002011) with 1 inch threaded connections

Ball Valve Kit (PN 23240-00) used with Model 3400HT retractable sensor

A process connector (PN 23166-00 or -01) must be used to connect the sensor to Ball Valve Kit 23240-00. Process connector can be purchased separately.



A	B	C	
MM /IN	MM /IN	MM /IN	OPTION
549/21.6	355/14.0	587/23.1	21
917/36.1	724/28.5	955/37.6	25

Dimensional Drawings of Model 3400HT with and without 1-1/2 in. Ball Valve PN 23240-00

For the ball valve installation shown, the ball valve kit (PN 23240-00) and 1 in. x 1 in. process connector (PN 23166-00 or 23166-01) must be purchased separately.

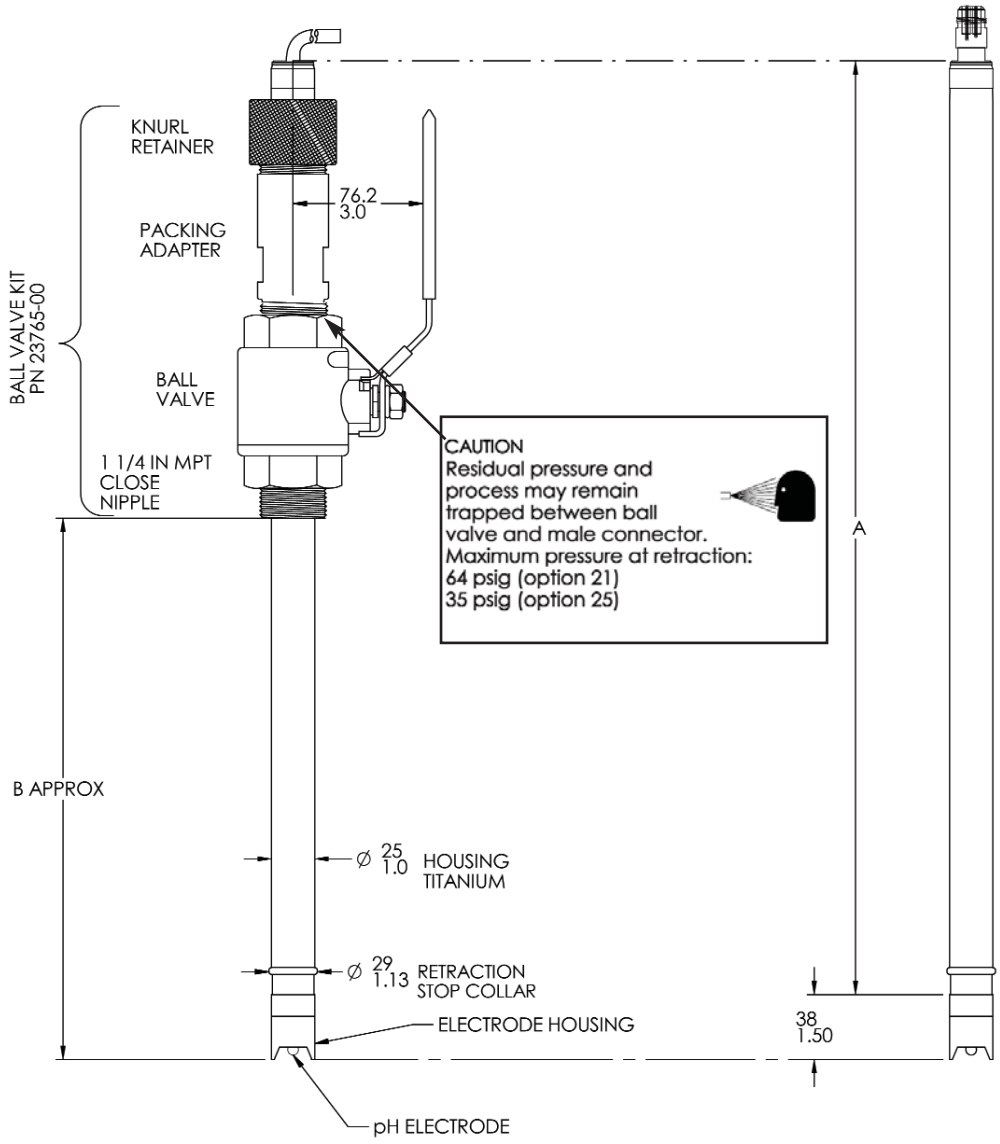
Note: Add five (5) inches to length of sensor if mounting a sensor-head junction box onto the sensor.

WHEN INCH AND METRIC DIMS ARE GIVEN

MILLIMETER
INCH

REVISIONS			
LTR	DESCRIPTION	DATE	APVD

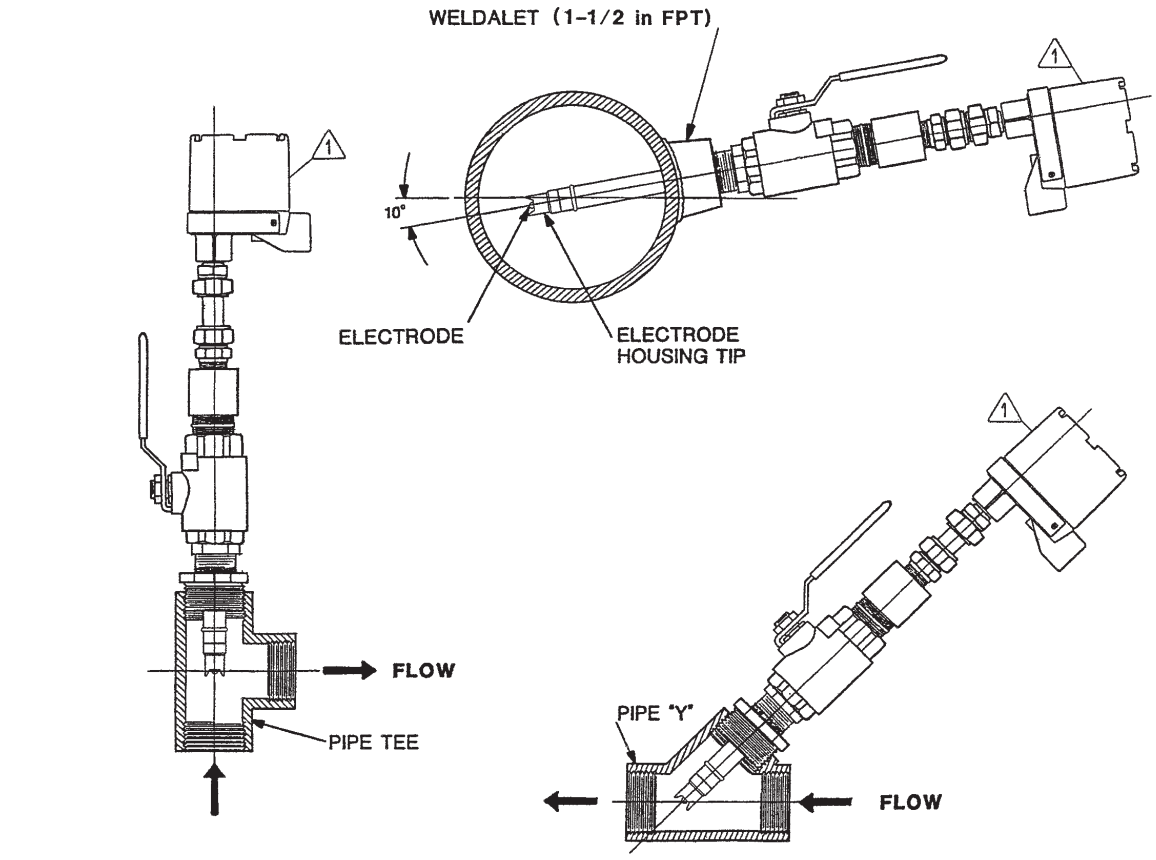
A	B	
IN / MM	IN / MM	OPTION
21.6/549	12.2/310	21
36.1/917	26.7/678	25



NOTES: UNLESS OTHERWISE SPECIFIED

Dimensional Drawing — Model 3400HT with Optional Ball Valve PN 23765-00

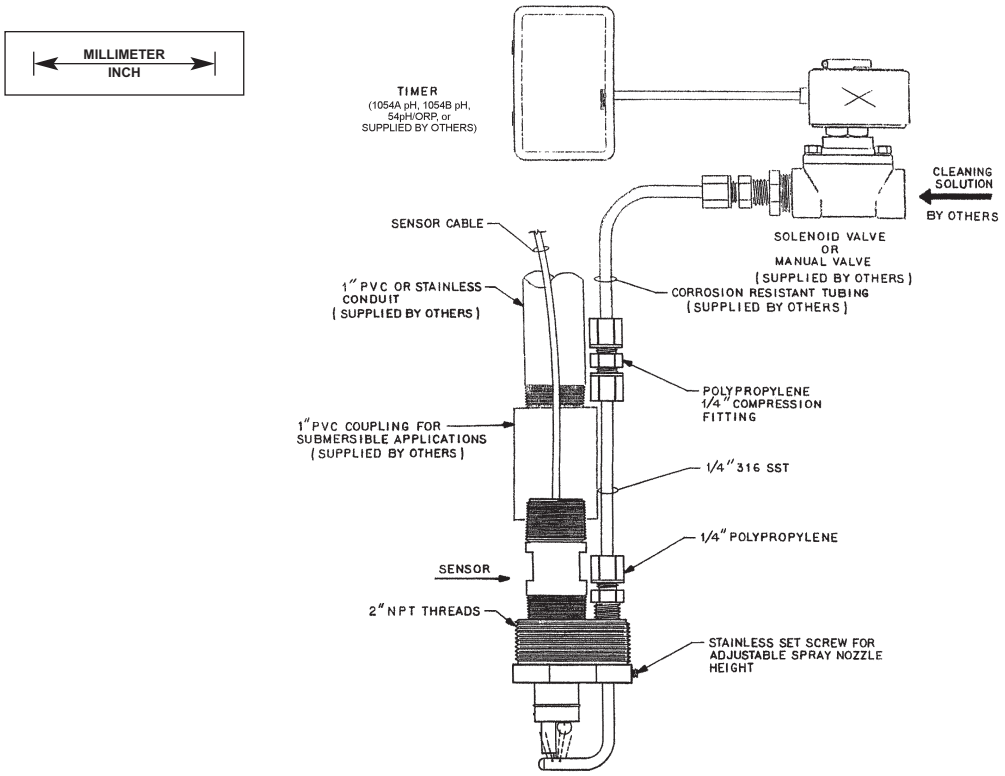
Note: Add five (5) inches to dimension A if mounting a sensor head junction box onto the sensor.



1 JUNCTION BOX IS OPTIONAL

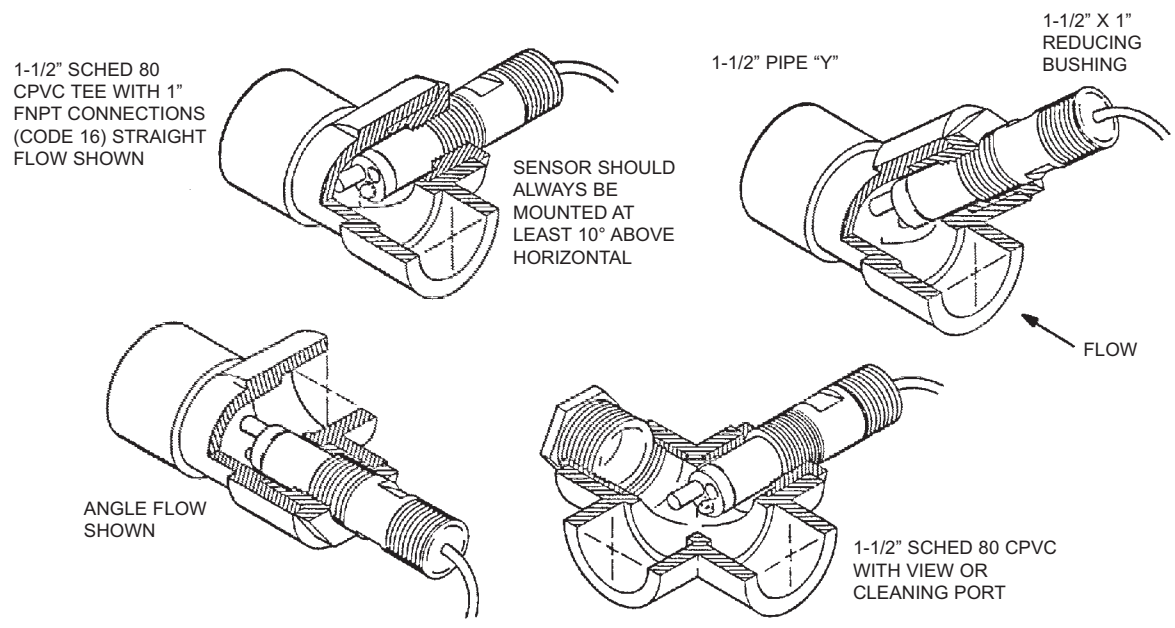
Typical Mounting Details - Model 3400HT Retraction Version

Note: Sensor must be mounted at an angle between 10° and 90° above the horizontal. Pipe tees and weldalets provided by customer.

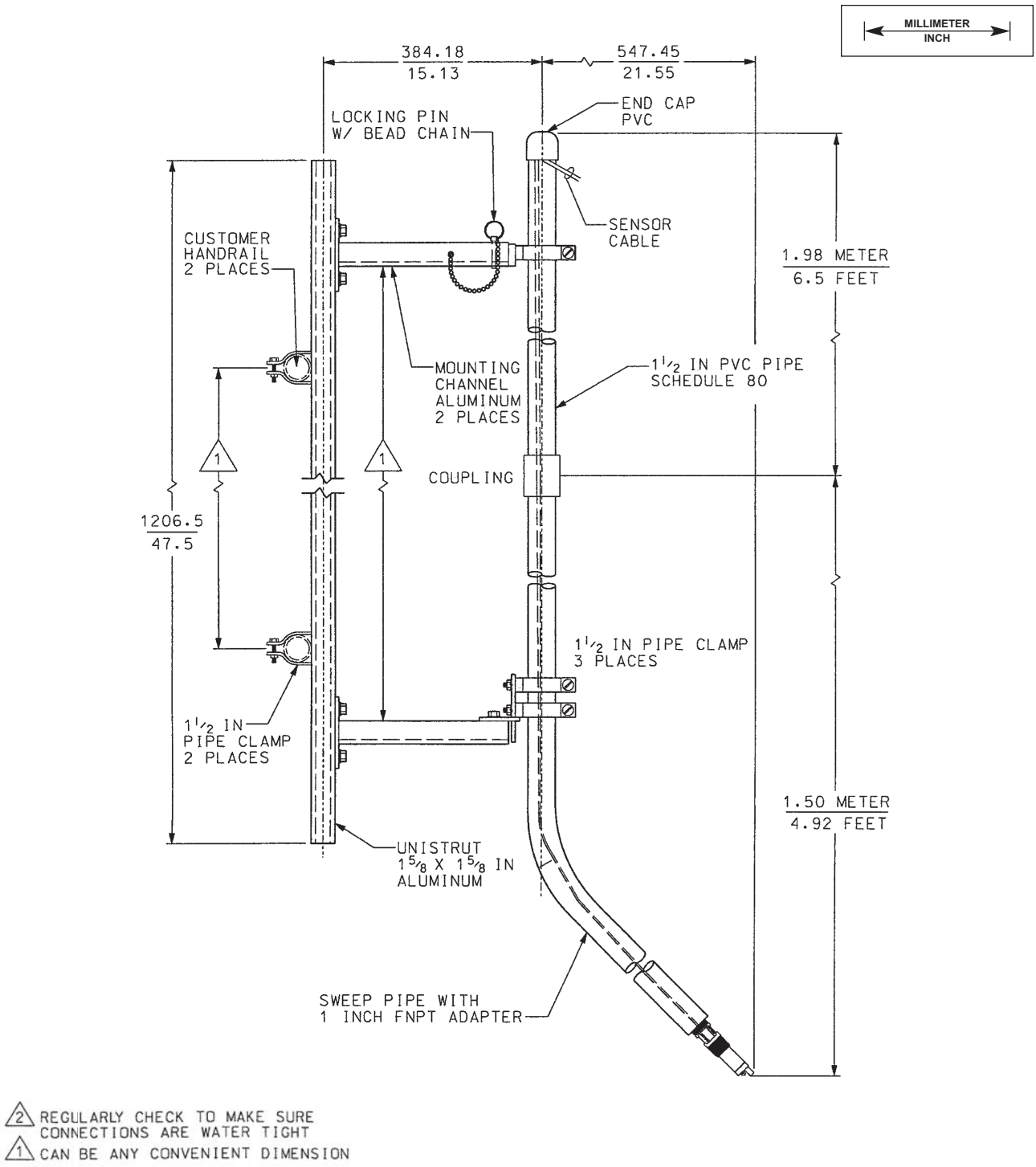


3500 with Jet Spray Cleaner (PN 12707-00) for Submersion Installations

This accessory is especially useful for keeping the sensor clean in dirty ponds or tanks. It can be mounted using the Handrail Mounting Assembly or a similar submersion accessory.

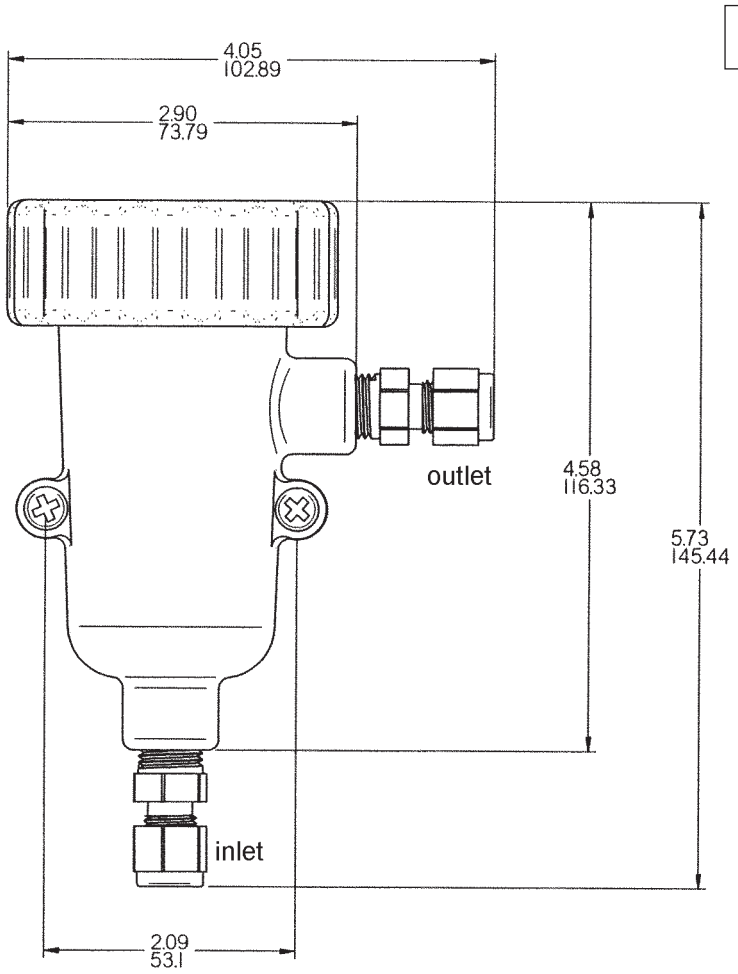


3500 FLOW THROUGH INSTALLATIONS



3500 Submersion Installation Using the Handrail Mounting Assembly (PN 11275-01)

All parts shown are supplied; sensor is sold separately.



3500 Low Flow Cell Assembly (PN 24091-00)

Ideal for tapping into existing pipe lines or for minimal process flow requirements.

ORDERING INFORMATION - Model 3300HT

The **Model 3300HT Sensor** is designed for use at high temperatures and is fabricated with a Ryton® body. The sensor assembly is housed in a titanium tube and requires a process connector (PN 23166-00 or 23166-01, ordered separately) for installation. The sensor includes a hemi glass pH electrode bulb, a Teflon® reference junction, and a Pt100 RTD for temperature compensation. Two wiring configurations are available: Variopol connector (3300HTVP), and 15 foot lead for connecting directly to an analyzer or transmitter (3300HT). A junction box kit with preamplifier (ordered separately) is required if the sensor cannot be installed within 15 feet of the analyzer/transmitter.

Ryton® is a registered trademark of Chevron Phillips Chemical Company.
Teflon® is a registered trademark of E.I. du Pont de Nemours and Company.

MODEL 3300HT INSERTION/SUBMERSION pH SENSOR 3300HTVP INSERTION/SUBMERSION pH SENSOR/VP CONNECTOR	
CODE	MEASURING ELECTRODE TYPE (Required Selection)
10	GPHT hemi glass, General Purpose High Temperature (0-14 pH)

CODE	O-RING MATERIAL (Required Selection)
30	EPDM
31	Viton®
32	Kalrez®
3300HT - 10 - 30	**EXAMPLE**

3300 HT Sensor with PN 23166-00

FOR FIRST TIME MODEL 3300HT INSERTION OR SUBMERSION INSTALLATIONS, ROSEMOUNT ANALYTICAL RECOMMENDS USING THE FOLLOWING GUIDE:

		Weight/Shipping Weight
1. Process Connector Accessories (required for all first time installations with 1-inch process connection threads)		
Choose one:	PN 23166-00, 316 SST, 1 in. x 1 in. NPT process connector, with EPDM o-ring	0.5 lb (0.3 kg)/1.0 lb (0.5 kg)
	PN 23166-01, Titanium, 1 in. x 1 in. NPT process connector, with EPDM o-ring	0.5 lb (0.3 kg)/1.0 lb (0.5 kg)
Choose one (optional process connector o-rings)		
	PN 9550220, Kalrez® o-ring, 2-214	0.1 lb (0.05 kg)/1.0 lb (0.5 kg)
	PN 23238-00, Viton® o-ring, 2-214	0.1 lb (0.05 kg)/1.0 lb (0.5 kg)
2. Remote Junction Boxes (optional, recommended for sensor to analyzer distances of more than 15 ft)		
Choose one:	PN 23555-00 includes preamplifier for Models 54e, 1055, 5081, Xmt	1.3 lb (0.6 kg)/2.0 lb (1.0 kg)
3. Extension cables (used with remote junction boxes)		
Choose one:	PN 23646-01, 11 conductor, shielded, prepped	0.5 lb/ft (0.3 kg/ft)/ 1.0 lb/ft (0.5 kg/ft)
	PN 9200273, 11 conductor, shielded, unprepped	0.5 lb/ft (0.3 kg/ft)/ 1.0 lb/ft (0.5 kg/ft)
	PN 23645-07 cable, 15’ with VP connector	0.5 lb/ft (0.3 kg/ft)/ 1.0 lb/ft (0.5 kg/ft)

Metal Process Connector PN 23166-xx (xx = 00 for 316 SST and xx = 01 for Titanium) can be used for insertion or submersion connection to 1-inch tee fittings. It also must be used to connect Model 3400HT to ball valve PN 23240-00 or directly to the process.

The metal process connector gives the sensor various insertions depths, depending on where the user locates the compression fitting. Also the threads can be switched to face the cable end of the sensor for connection to submersion pipes.

ORDERING INFORMATION - Model 3400HT & 3400HTVP

The **Model 3400HT Sensor** is designed for use at high temperatures and is fabricated with a Ryton® body. The sensor assembly is housed in a titanium tube and requires a process connector (PN 23166-00 or 23166-01, ordered separately) for installation. The sensor can be used in a ball valve (ordered separately) for hot tap (retractable) applications. The sensor includes a hemi glass pH electrode bulb, a Teflon® reference junction, and a Pt100 RTD for temperature compensation. Three wiring configurations are available: Variopol connector (3400HTVP), 9.5 inch lead for sensor head junction box mounting (-61), and 15 foot lead for connecting directly to an analyzer or transmitter(-62). Junction box kits with preamplifiers (ordered separately) are required if the sensor cannot be installed within 15 feet of the analyzer/transmitter.

MODEL	
3400HT	**RETRACTABLE pH SENSOR**
3400HTVP	**RETRACTABLE pH SENSOR/VP CONNECTOR**

CODE	MEASURING ELECTRODE TYPE (Required Selection)
10	GPHT hemi glass, General Purpose High Temperature (0-14 pH)

CODE	SENSOR LENGTH (Required Selection)
21	21 in. Titanium Tube
25	36 in. Titanium Tube

CODE	O-RING MATERIAL (Required Selection)
30	EPDM
31	Viton®
32	Kalrez®

CODE	CABLE LENGTH (required selection for 3400HT, not available for 3400HTVP)
61	9.5 in. Cable no BNC (for use with Models 54e, 1055, 5081 and Xmt sensor head junction boxes)
62	15 ft Cable, no BNC for wiring directly to 1055, 54/54e, 5081, and Xmt Transmitter/Analyzers/J-box

3400HT - 10 - 21 - 30 - 62 EXAMPLE

3400 HTVP with PN 23796-00 process connector

FOR FIRST TIME INSTALLATIONS OF MODEL 3400HT RETRACTABLE SENSOR, ROSEMOUNT ANALYTICAL RECOMMENDS USING THE FOLLOWING GUIDE

ACCESSORIES	WEIGHT/SHIPPING WEIGHT
1. Retractable Mounting	
A. Choose one (required for all first time installations without ball valves or with 1-1/2 in. ball valve):	
PN 23166-00, 1 in. MNPT process connector, Stainless Steel with EPDM O-ring	0.5 lb (0.3 kg)/1.0 lb (0.5 kg)
PN 23166-01, 1 in. NPT process connector, Titanium with EPDM O-ring	0.5 lb (0.3 kg)/1.0 lb (0.5 kg)
B. Choose one (Optional; Process Connector O-rings):	
PN 9550220, O-ring, Kalrez®, 2-214	0.1 lb (0.05 kg)/1.0 lb (0.5 kg)
PN 23238-00, O-ring, Viton®, 2-214	0.1 lb (0.05 kg)/1.0 lb (0.5 kg)
C. Choose one:	
PN 23240-00, 1-1/2 in. ball valve assembly, 316 SST (process connector required)	6.0 lb (3.0 kg)/7.0 lb (3.5 kg)
PN 23765-00, 1-1/4 in. ball valve assembly, 316 SST	6.0 lb (3.0 kg)/7.0 lb (3.5 kg)
2. Junction Boxes (Optional; Choose either Sensor Head or Remote)	
A. Sensor Head Junction Boxes (used with 9.5 in. cable length sensor) Choose one:	
PN 23709-00; includes preamplifier for Models 54e, 1055, 5081, Xmt	3.3 lb (1.5 kg)/4.0 lb (2.0 kg)
B. Remote Junction Boxes (used with 15 ft cable length sensor) Choose one:	
PN 23555-00; includes preamplifier for Models 54e, 1055, 5081, Xmt	1.3 lb (0.6 kg)/2.0 lb (1.0 kg)
3. Extension Cables - Choose one:	
PN 23646-01, 11 conductor, shielded, prepped	0.1 lb/ft (0.05 kg/ft)/1.0 lb/ft (0.5 kg/ft)
PN 9200273, 11 conductor, shielded, unprepped	0.1 lb/ft (0.05 kg/ft)/1.0 lb/ft (0.5 kg/ft)
PN 23645-07 cable, 15' with VP connector	0.1 lb/ft (0.05 kg/ft)/1.0 lb/ft (0.5 kg/ft)

ORDERING INFORMATION - Model 3500

The **Model 3500** Sensor is a versatile sensor platform for measuring pH or ORP. A platinum PT100 RTD is used for temperature compensation. The rugged Ryton body and rebuildable reference electrode construction with front and rear facing 1" MNPT threads allows use in either insertion or submersion applications. The 3500 uses an integral cable, 25 ft., with preamplifier (-01) and 15 ft. without (-02).

MODEL 3500	**High Performance pH sensor**
CODE	Electrolyte Selection
HT	High Temperature **default choice**
BF	Bio-film Resistant
PR	Poisoning Resistant
OR	Oil Resistant
SR	Scaling Resistant
MR	Metal Resistant

CODE	Preamplifier/Cable (Required Selection)
01	With integral Preamplifier, 25 ft. Cable (0°C to 85°C)
02	Without integral Preamplifier, 15 ft. Cable

CODE	Measuring Electrode Type (Required Selection)
10	GPHT hemi glass bulb
12	Platinum ORP

CODE	Reference Type (Required Selection)
21	Double Junction

CODE	O-Ring Material (Required Selection)
30	EPDM
31	Viton®
32	Kalrez®
3500-HT -02 -12 -21 -32 EXAMPLE	

3500 pH sensor

ORDERING INFORMATION - Model 3500VP

The **Model 3500VP** Sensor is a versatile sensor platform for measuring pH or ORP. A platinum PT100 RTD is used for temperature compensation. The rebuildable reference electrode and rugged Ryton body construction with front and rear facing 1" MNPT threads allow use in either insertion or submersion applications. The 3500VP uses the VP8 connector and it requires a cable assembly purchased separately.

MODEL 3500VP	High Performance pH sensor
CODE	Electrolyte Selection
HT	High Temperature **default choice**
BF	Bio-film Resistant
PR	Poisoning Resistant
OR	Oil Resistant
SR	Scaling Resistant
MR	Metal Resistant

CODE	Preamplifier/Cable (Required Selection)
01	With integral Preamplifier, 25 ft. Cable (0°C to 85°C)
02	Without integral Preamplifier, 15 ft. Cable

CODE	Measuring Electrode Type (Required Selection)
10	GPHT hemi glass bulb
12	Platinum ORP

CODE	Reference Type (Required Selection)
21	Double Junction

CODE	O-Ring Material (Required Selection)
30	EPDM
31	Viton®
32	Kalrez®
3500VP-HT -01 -10 -21 -31 EXAMPLE	

3500VP pH sensor

ACCESSORIES

Part Number	Description
23555-00	Junction Box with Preamplifier for Models 54e, 3081, 4081, 5081, XMT, 1055, 1056
915240-03	PVC flow through Tee, ¾ in. NPT process connection
915240-04	PVC flow through Tee, 1 in. NPT process connection
915240-05	PVC flow through Tee, 1-1/2 in. NPT process connection
2002011	CPVC flow through Tee, 1-1/2 in. NPT process connection
11275-01	Sensor handrail assembly
24091-00	Acrylic low flow cell
12707-00	Jet Spray Cleaner
24281-00	15 ft. cable with mating VP8
24281-01	25 ft. cable with mating VP8
9210012	Buffer solution, 4.01 pH, 16oz
9210013	Buffer solution, 6.86 pH, 16oz
9210014	Buffer solution, 9.18 pH, 16oz
R508-16OZ	ORP solution, 460 mv ± 10 at 20°C

PERpH-X® pH Sensor Solution Kits

FEATURES AND APPLICATIONS

There are no perfect pH sensors, but the PERpH-X® is moving closer.

The large variety of process applications makes it impossible for one sensor to excel everywhere. The reference electrode accounts for nearly all pH measurement failures. Errors such as noisy and drifting readings or slow and inaccurate calibrations are typically caused by the coating, fouling or poisoning of the reference electrode.

The PERpH-X® sensor family was designed to expand application flexibility. The PERpH-X sensor features a rebuildable double junction reference cell so that one sensor can succeed in a variety of processes by using different reference electrolytes. No need to buy different sensors, just different electrolytes.

Simply unscrew the sensor cap to remove the Porous Teflon® Liquid Junction. The junction can then be cleaned and reinstalled or replaced with one treated for a specific process. With the junction removed, the reference is easily replaced with a specific electrolyte that optimizes the sensor for the process. The aim is to keep the Porous Teflon® Liquid Junction from coating or fouling in the first place.

Six different SOLUTIONS are available as electrolyte kits:

- High Temperature Kit
- Bio-Film Resistant Kit
- Poisoning Resistant Kit
- Oil Resistant Kit
- Scaling Resistant Kit
- Metals Resistant Kit.

Each kit uses a specific chemistry formulated to extend the life of the reference electrode in its targeted application. While these SOLUTIONS extend the life of the electrode in the target applications, they only last so long before they are exhausted. The PERpH-X® reference chamber should be refilled on a regular basis in order to maintain the highest level of performance. Each electrolyte kit contains enough reference gel for five refills.

HIGH TEMPERATURE SOLUTION KIT

This is the standard electrolyte that is used in all PERpH-X® sensors. It is suitable for highly acidic, basic or oxidative solutions and of course high temperature. It is the base electrolyte from which each of the following are formulated.

BIO-FILM RESISTANT SOLUTION KIT

This kit is targeted at the water applications where biofilms and algae grow on the sensor, such as treated effluent outfalls, aeration basins, cooling towers or

influent water from lakes or rivers. While safe for human contact, this electrolyte inhibits the growth of bacteria and algae on the sensor.

POISONING RESISTANT SOLUTION KIT

Chemicals that poison pH sensors typically attack the silver wire inside the electrode. These are primarily sulfides, mercaptans and cyanides. This kit targets these chemicals and should be used in any application containing sulfides. Refineries, Pulp Manufacturing, Mining and Waste Water treatment are suitable applications.

OIL RESISTANT SOLUTION KIT

This kit is targeted at any water based system where light oils and greases foul the sensor. Refineries, Food Processing and many industrial waste treatment processes contain oils that foul the porous reference junction of most electrodes. This kit minimizes the fouling and allows the Porous Teflon® Liquid Junction to be replaced when it eventually does foul instead of replacing the complete pH sensor.

SCALING RESISTANT SOLUTION KIT

This kit targets applications where the precipitation of calcium magnesium salts like gypsum or water hardness coat over the electrode. Applications include limestone scrubbers in Power Plants, lime treatment in sugar processing and other processes.

METAL RESISTANT SOLUTION KIT

This kit targets applications where the chloride in the reference electrolyte would react with the process. These are typically metal processing applications, hence the name. The electrolyte in this kit is not KCl based, as are all of the others, but instead uses potassium nitrate. Applications in the Metal Mining and the Chemical Processing industries are the most common.

The PERpH-X® pH sensor solution kits consist of a Porous Teflon Liquid Junction (PTLJ) treated in the specific electrolyte, an EPDM O-ring kit and a syringe of the reference electrolyte capable of recharging the reference five times. Viton® or Kalrez® O-ring kits can also be ordered separately.

Part #	Description
24231-00	High Temperature (HT) Solution Kit (0°C to 145°C, 293°F)
24231-01	Bio-Film Resistant (BF) Solution Kit (0°C to 60°C, 140°F)
24231-02	Poisoning Resistant (PR) Solution Kit (0°C to 100°C, 212°F)
24231-03	Oil Resistant (OR) Solution Kit (0°C to 100°C, 212°F)
24231-04	Scaling Resistant (SR) Solution Kit (0° C to 100°C, 212°F)
24231-05	Metals Resistant (MR) Solution Kit, KNO3 (0°C to 145°C, 293°F)
24238-00	HT Porous Teflon Liquid Junction (EPDM O-rings)
24238-01	BF Porous Teflon Liquid Junction (EPDM O-rings)
24238-02	PR Porous Teflon Liquid Junction (Viton® O-rings)
24238-03	OR Porous Teflon Liquid Junction (Viton® O-rings)
24238-04	SR Porous Teflon Liquid Junction (EPDM O-rings)
24238-05	MR Porous Teflon Liquid Junction (Viton® O-rings)
9210392	HT Refill Kit, 30 cc Syringe (4-5 refills per syringe) (0°C to 145°C, 293°F)
9210426	BF Refill Kit, 30 cc Syringe (4-5 refills per syringe) (0°C to 60°C, 140°F)
9210425	PR Refill Kit, 30 cc Syringe (4-5 refills per syringe) (0° C to 100°C, 212°F)
9210423	OR Refill Kit, 30 cc Syringe (4-5 refills per syringe) (0° C to 100°C, 212°F)
9210424	SR Refill Kit, 30 cc Syringe (4-5 refills per syringe) (0° C to 100°C, 212°F)
9210422	MR Refill Kit, 30 cc Syringe (4-5 refills per syringe) (0° C to 145°C, 293°F)
24250-00	Viton® O-ring kit
24251-00	Kalrez® O-ring Kit
24270-00	EPDM O-ring Kit

Four Wire Analyzers

1056 - Dual Input Intelligent Analyzer. Multiparameter instrument with large easy-to-read display. Easy to install with modular boards. Intuitive menu screens for quick start up include advanced diagnostics.

54e - Analyzer/Controller. Backlit display with easy-to-use interface and two independent outputs. Unit includes optional TPC & PID control capability.

Two Wire Transmitters

Xmt - Two wire transmitter. Simple to use menu structure with non-volatile memory retains program settings & calibration data during power failures.

5081 - Two wire transmitter. Robust Nema 4X or Nema 7B enclosures with intrinsically safe design for use in hazardous environments. Choice of Hart® or FOUNDATION® fieldbus communication protocols.

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