

Retraction/Submersion/Insertion pH/ORP Sensors



- **SILCORE™² TECHNOLOGY PROVIDES INCREASED SENSOR LIFE** when used in elevated temperature applications.

- MAXIMUM PRESSURE SPECIFICATIONS of 150 psig (1135 kPa [abs]) at 100°C (212°F) on all three models.
- MINIMUM SENSOR MAINTENANCE due to patented TUpH reference technology¹ which ensures steady pH signal when sensor is coated.
- OPTIMUM VERSATILITY by providing various mounting options. Also can be used with all Rosemount Analytical and other manufacturers' instruments.
- FIELD PROVEN ACCUGLASS™² pH glass formulations minimize glass cracking, resulting in enhanced performance and increased life.
- MAXIMUM SENSOR LIFE because of secondary helical reference pathway³ which hinders reference poisoning.

- **MODEL 396:**

A LARGE SELF CLEANING OPTIONAL FLAT OR STANDARD HEMI glass bulb electrode in a stainless steel body, completely sealed by EPDM to eliminate process intrusion.



- **MODEL 396P:**

A RUGGED THREADED POLYPROPYLENE BODY for maximum chemical resistance and completely sealed to eliminate process intrusion.

- **MODEL 396R:**

A TITANIUM RETRACTABLE BODY for insertion depths up to 27 inches and easy sensor removal under pressure without process shut-down (ball valve kit shown can be purchased separately).



¹ May be protected by U.S. Patent No. 5,152,882, Foreign Patent Pending.

² SILCORE, ACCUGLASS, and TUpH are trademarks of Rosemount Analytical.

³ May be protected by U.S. Patent No. 6,054,031, Foreign Patent Pending.

TUpH™ SENSORS

FEATURES AND APPLICATIONS

The TUpH large area reference junction for minimum maintenance requirements: The reference junction provides an electrical connection between the reference electrode and the sample, and helps maintain a stable reference potential, regardless of the change in sample pH. The TUpH reference electrode junction, the entire plastic tip surrounding the glass pH electrode, maintains a steady reference signal even in the dirtiest of applications because it resists plugging (a common cause of pH signal drift). This large reference junction area is made of micron sized reference pathways used for ionic exchange so it resists plugging by large particles and will continue to send a steady pH signal, even in the dirtiest of applications. The TUpH reference junction technology has been field-proven for minimum maintenance requirements.

The TUpH helical reference pathway stops reference poisoning. Ions diffuse through the reference pathways and a charge is passed to the reference element. The reference element must be protected from contamination by poisoning ions such as sulfide, mercury, cyanide, and ammonia or else the pH signal will drift. The TUpH sensor's long internal helical reference pathway hinders and slows down the rate of contaminants migrating to the reference element therefore providing for a longer sensor life.

The entire line of TUpH model sensors now incorporate the new SILCORE technology contaminant barrier. This triple-seal barrier prevents moisture and material impurities from migrating to the pH sensor's reference electrode's metal lead wire. By preventing these contaminants from compromising the integrity of the pH measure-

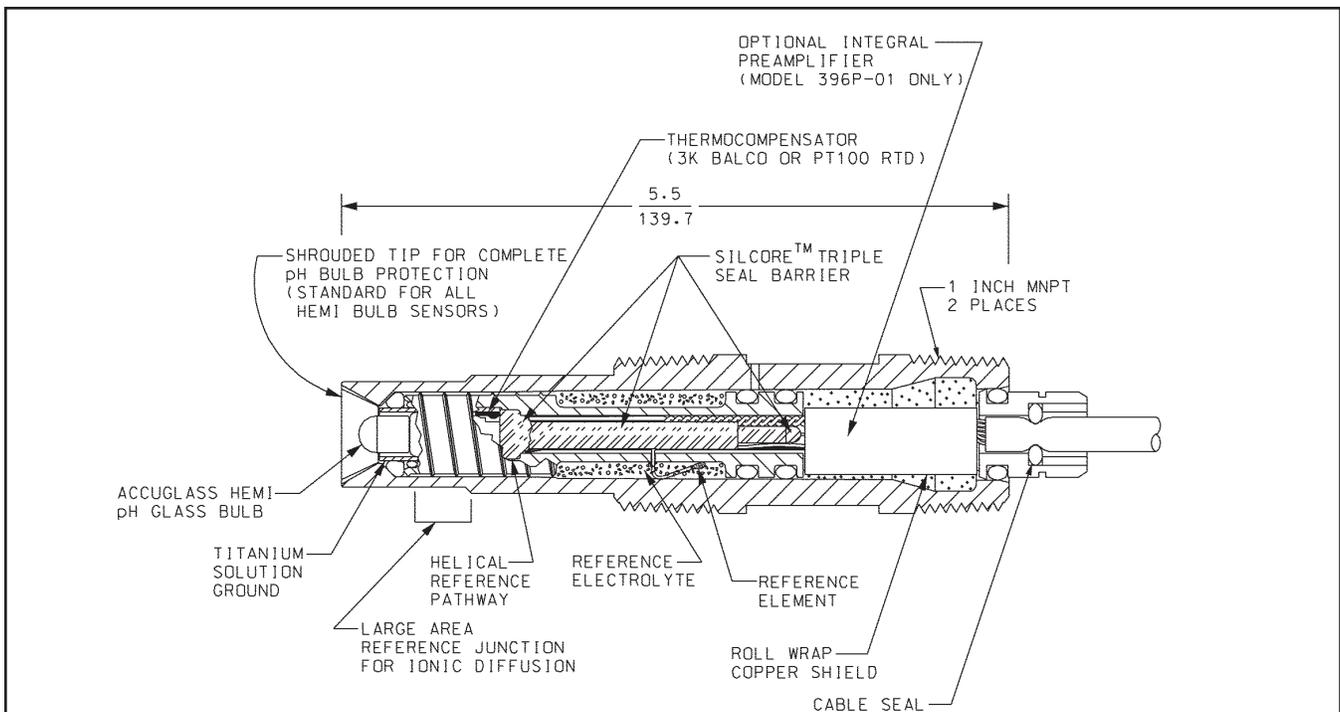
ment, sensor life is increased, especially at higher temperatures where increased migrations occur. In addition, the SILCORE technology provides added protection against sensor failure due to vibrations and shock by transferring damaging energy away from the glass-to-metal seal.

The AccuGLASS pH glass formulations exceed industry standards. The AccuGlass pH glass is a result of many years of glass research resulting in a formulation which has been found to increase the life of the sensor. Unlike other pH glasses presently on the market, this glass resists cracking especially at higher temperatures and reduces sodium ion error commonly found in high pH applications. Overall, the AccuGlass formulation enhances the sensor performance to measure pH more accurately and have a longer sensor life than ever before.

The TUpH reference junction and helical pathway combined with the AccuGLASS pH glass performs exceptionally well in dirty, high solid applications and requires only minimum maintenance. This is the toughest pH sensor on the market and is still unmatched by all other pH sensors. The constant increase in demand for the TUpH sensor proves it's success as the best process industry pH sensor.

All TUpH sensor models have been specifically designed for improved life in harsh, dirty, and abrasive applications such as lime slurry, waste treatment, paper machine headbox, and pigment/dye applications, where large quantities of suspended solids are present. Various sensor materials, depending on the sensor model, is available for a variety of different application needs.

A preamplifier converts the high impedance pH signal into a stable, noise-free signal and must be used with all pH sensors. A preamplifier can be in a remote location or integral to the analyzer/transmitter and has transmission capability of up to three miles. All TUpH Sensors are compatible with all Rosemount Analytical and other manufacturers' instruments.



Cross Section Diagram of the TUpH Patented Reference Technology

All TUpH sensors are designed with a large area reference junction, helical reference pathway, and an AccuGlass pH glass bulb. This patented sensor technology ensures superior performance while only requiring minimal maintenance.

The **Model 396 Sensor** is specifically designed for improved life in harsh, dirty, and abrasive applications such as lime slurry waste treatment, paper machine headbox and pigment/dye applications, where large quantities of suspended solids are present.



The Model 396 is available with custom glass electrodes, optional flat or standard hemi glass pH bulb, to best meet your application needs. Flat glass is advantageous in abrasive or coating applications that etch or build up on glass respectively. In coating applications, such as slurries, the flat surface allows the process flow to act as a scrubbing agent to reduce coating and maintenance whereas in abrasive applications pitting from silicates and other similar materials is minimized by the flat surface to provide longer life. The hemi bulb is ideal for general purpose use and for those processes requiring greater accuracy over the entire pH range.

The sensor is housed in a stainless steel body with EPDM seals. The simplified construction, designed with user convenience in mind, does not require electrolyte replenishment or any component replacement. The Model 396 also features a large glass bulb for increased resistance to high temperature and other effects of aging for longer life.

The Model 396 is not available with an integral preamplifier. The preamplifier must be in a remote location or integral to the analyzer/transmitter.

Therefore, the Model 396 is compatible with all Rosemount Analytical and other manufacturers' instruments.

The **Model 396P Sensor** is specifically designed for improved life in harsh, dirty applications, such as sour water waste treatment and scrubbers, where a high performance, low maintenance, disposable sensor is required.



The sensor is available in two configurations: the standard shrouded tip, in which the pH glass is completely recessed within the reference junction for abrasive or rough applications, and the optional slotted tip with a partially exposed pH glass for viscous or low flow applications.

The Model 396P features a titanium solution ground, constructed in an annular design around the pH/ORP electrode. The solution ground provides advanced sensor diagnostics for preventative maintenance when used with the Models 54 pH/ORP analyzer, 1054B pH/ORP analyzer, and 3081 pH/ORP transmitter. In addition, the Model 396P sensor can be used with most non-diagnostic Rosemount Analytical and other manufacturers' instruments.

The sensor is housed in a molded polypropylene body with EPDM seals, making it virtually indestructible and chemically resistant. Complete encapsulation eliminates leakage or high humidity problems traditionally found in other pH/ORP designs. The simplified construction, designed with user convenience in mind, does not require electrolyte (KCl) replenishment or any high maintenance troubleshooting procedures.

The Rosemount Analytical Model 396P is available with an optional integral preamplifier to convert the high impedance pH or ORP mV signal into a stable, noise-free signal with transmission capability of up to three miles.

For additional information about Model 396P, see product data sheet 71-396P/VP.

pH Range	Percent Linearity				
	396	396	396P	396R	396R
	GPHT Hemi	GPHT Flat	GPLR Hemi	GPLR Hemi	GPLR Flat
0-2 pH	94%	95%	94%	94%	93%
2-12 pH	99%	99%	97%	97%	98%
12-13 pH	97%	96%	98%	98%	95%
13-14 pH	92%	—	98%	98%	—

The Model 396R Sensor

is specifically designed for improved life in harsh, dirty applications where a separate sample stream is difficult to provide and greater insertion depths are required. It is designed for use with a 1-1/4 in. or 1-1/2 in. ball valve for hot tap installation.

The Model 396R is constructed of molded polypropylene housed in a titanium tube with EPDM seals to provide maximum chemical resistance. The sensor also features a titanium solution ground for advanced sensor diagnostics when used with the Model 54 or

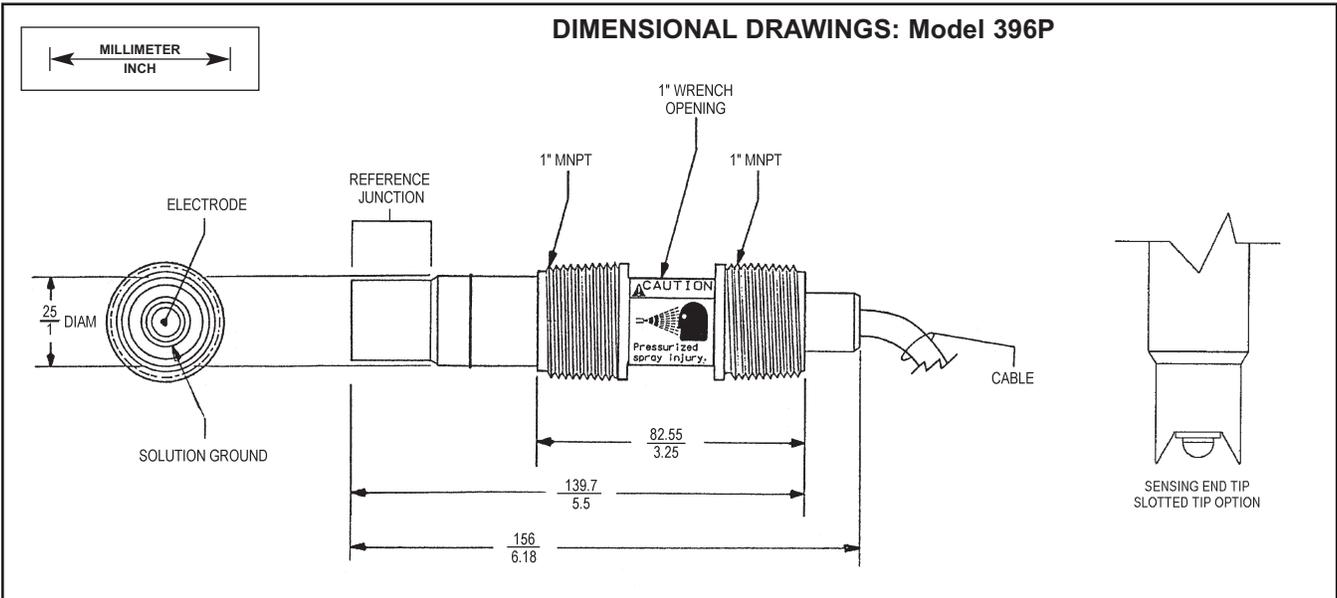
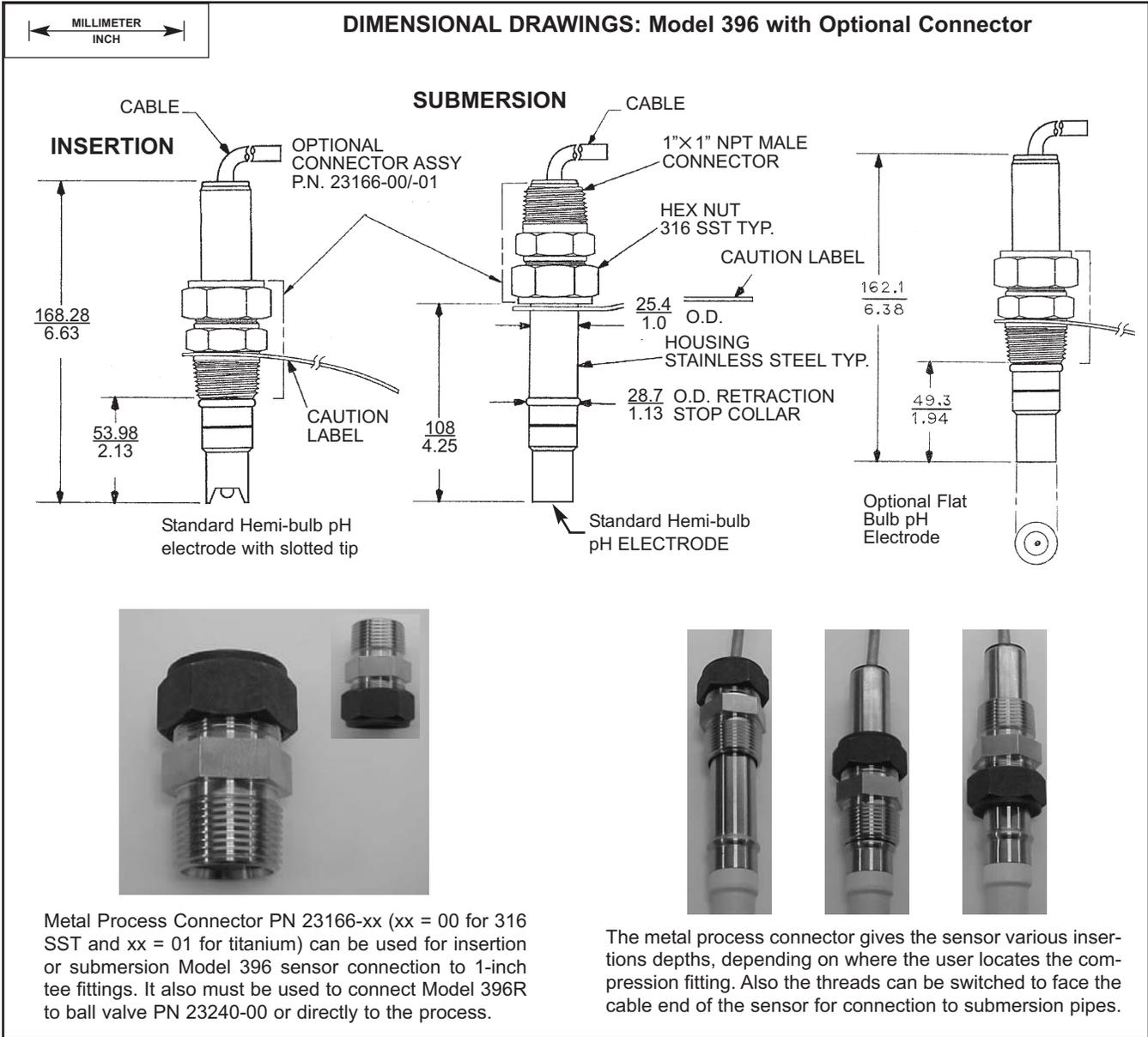


Model 3081 pH/ORP Analyzer/Transmitter. These advanced sensor diagnostics provide preventative maintenance by notifying the operator of the need for replacement and cleaning of an aged or fouled sensor, thus allowing continuous optimum performance.

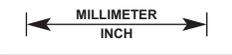
The sensor also features a slotted tip for protection from breakage while allowing the process to flow by the glass electrode for accurate and reliable pH measurement.

The Model 396R is only available without an integral preamplifier and has 15 ft or 9.5 in. of integral high quality 9 conductor cable. The preamplifier must be housed in a remote location or in a junction box kit for attachment at the rear, cable end of the sensor (order separately) or must be integral to the Analyzer/Transmitter. The Model 396R is compatible with all Rosemount Analytical and other manufacturers' instruments.

SPECIFICATIONS	 MODEL 396	 MODEL 396P	 MODEL 396R
Measurements and Ranges	pH: 0-14	pH: 0-14 ORP: -1500 to 1500 mv	pH: 0-14 ORP: -1500 to 1500 mv
Available pH AccuGLASS Types	GPHT hemi bulb or GPHT flat bulb	GPLR hemi bulb	GPLR hemi bulb GPLR flat bulb
Wetted Materials	316 SST, Polypropylene, EPDM, glass	Titanium, Polypropylene, EPDM, glass: platinum (ORP only)	Titanium, Polypropylene, EPDM, glass: platinum (ORP only)
Process Connection	None, use 1 in. NPT process connector, PN 23166-00 or 23166-01 (sold separately)	1 in. MNPT front and rear facing threads	None, use 1-in. process connector or ball valve kit (1-1/2 in. or 1-1/4 in.) (sold separately)
Temperature Range	0-100°C (32-212°F)	0-100°C (32-212°F)	0-100°C (32-212°F)
Pressure Range- Hemi bulb	100-1135 kPa (abs) (0-150 psig)	100-1135 kPa (abs) (0-150 psig)	100-1135 kPa (abs) (0-150 psig)
Pressure Range- Flat bulb	100-790 kPa (0-100 psig)	—	100-790 kPa (0-100 psig)
Maximum Pressure at Retraction or Insertion	Not Applicable	Not Applicable	Code 21: 542 kPa (abs) (64 psig) Code 25: 343 kPa (abs) (35 psig)
Minimum Conductivity	100 µS/cm, nominal 100 µS/cm	100 µS/cm, nominal 100 µS/cm	100 µS/cm, nominal 100 µS/cm
Integral Cable	15 ft coaxial with BNC	Code 01: 25 ft 11 conductor Code 02: 15 ft coaxial	Standard 15 ft coaxial Code 60: 9.5 in. coaxial with BNC Code 61: 9.5 in. coaxial
Preamplifier Options	Remote	Remote or Integral	Remote
Weight/Shipping Weight	0.45 kg/0.9 kg (1 lb/2 lb)	0.45 kg/0.9 kg (1 lb/2 lb)	Sensor: Code 21: 0.9 kg/1.40 kg (2.0 lb/3.0 lb)
			Code 25: 1.40 kg/1.80 kg (3.0 lb/4.0 lb)
			Ball Valve PN 23240-00: 2.25 kg/3.20 kg (5.0 lb/7.0 lb)
			Junction box; 1.40 kg/1.80 kg (3 lb/4 lb)



DIMENSIONAL DRAWINGS: Model 396R with Optional Ball Valve PN 23240-00



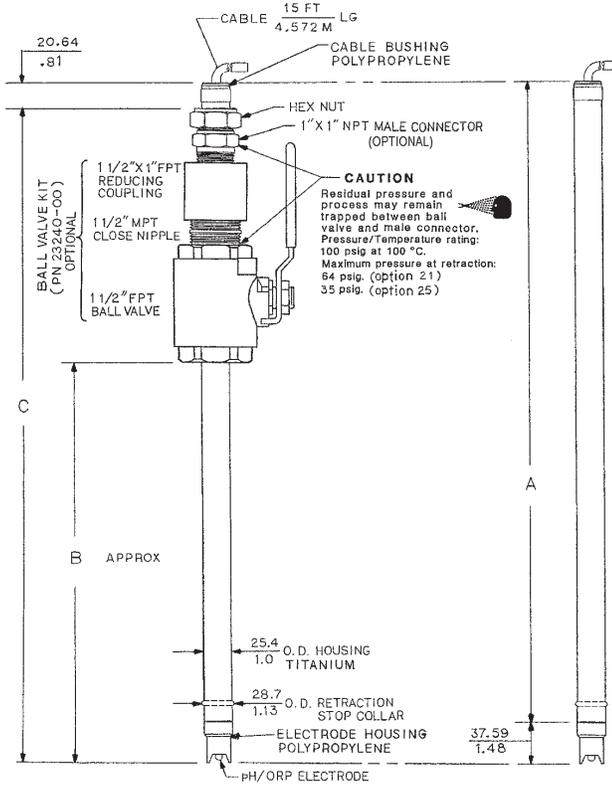
A		B		C		OPTION
MM	IN	MM	IN	MM	IN	
548.64	21.60	327.66	12.90	565.66	22.27	21
916.94	36.10	659.96	27.40	933.96	36.77	25



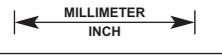
Ball Valve Kit (PN 23240-00) used with Model 396R retractable sensor



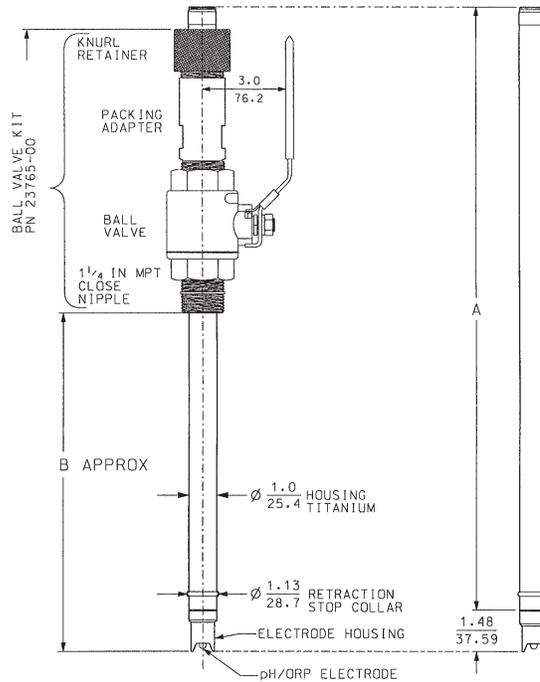
A process connector (PN 23166-00 or -01) must be used to connect the sensor to Ball Valve Kit 23240-00. Process connector can be purchased separately.



DIMENSIONAL DRAWINGS: Model 396R with Optional Ball Valve PN 23765-00



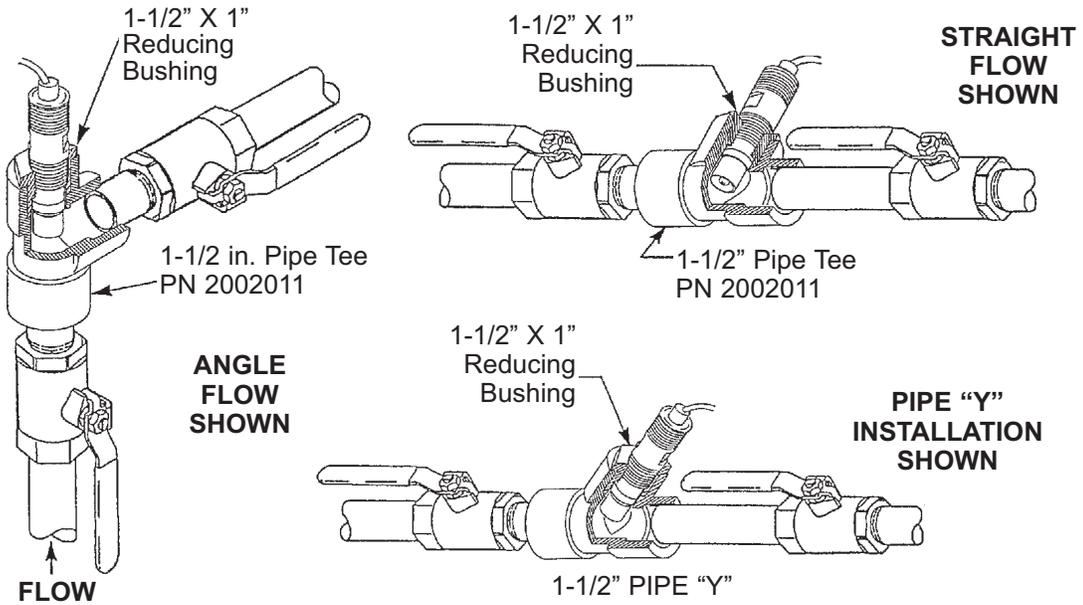
NOTE: Add five (5) inches to dimension A if mounting a sensor head junction box onto the sensor.



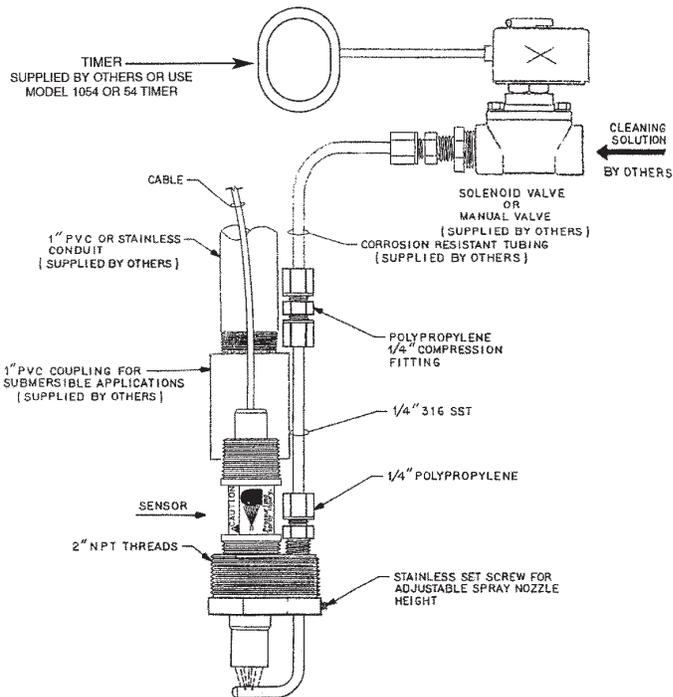
A		B		OPTION
IN	MM	IN	MM	
21.60	548.64	12.12	307.85	21
36.10	916.94	26.62	676.15	25

MOUNTING AND ACCESSORIES

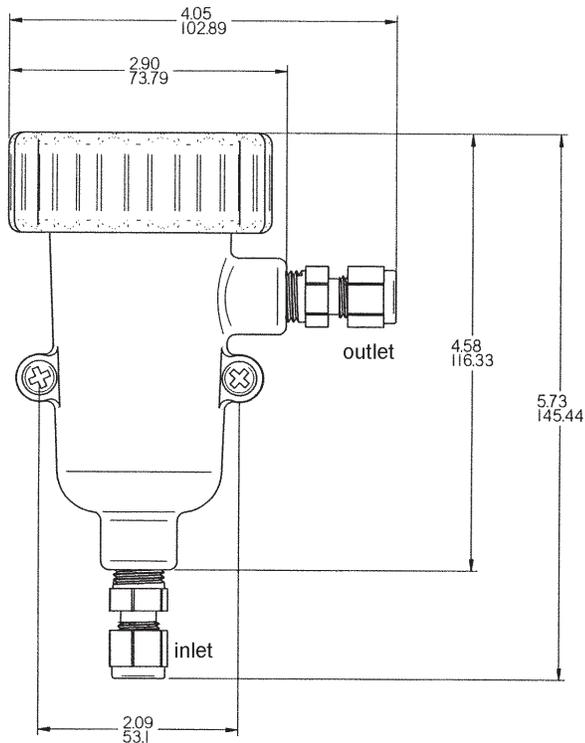
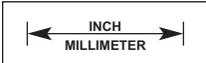
TYPICAL FLOW THROUGH INSERTION INSTALLATION (sensor must be installed at least 10° above the horizon)



JET SPRAY CLEANER PN 12707-00 FOR MODEL 396P



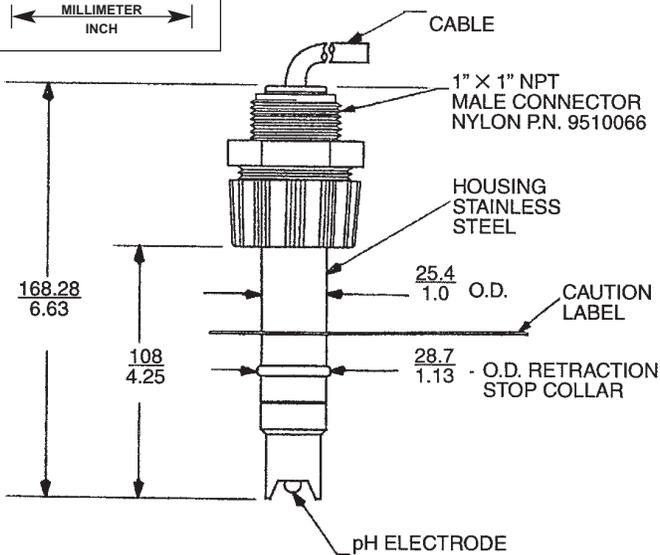
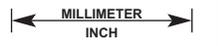
**JET SPRAY CLEANER SHOWN WITH
TUph MODEL 396P pH SENSOR**



Inlet and outlet connections are stainless steel and take 1/4-inch OD tubing. Flow cell is polycarbonate with 1/4-inch FNPT fittings.

LOW FLOW CELL FOR MODELS 396 AND 396P-41

Maximum pressure: 65 psig (549 kPa abs). Maximum temperature: 122°F (50°C)



SUBMERSION ACCESSORY FOR MODEL 396

Other available mounting options are presented in our booklet, "Mounting Solutions" (PN 91-6020). Contact our Customer Service Center to order a free copy.



**ORDERING
INFORMATION**

The Model 396 pH Sensor features your selection of glass electrode type, either the standard hemi bulb or the optional flat glass electrode combined with the coating resistant, polypropylene reference with gel filled electrolyte. The sensor is housed in a stainless steel body with an optional 1 in. MNPT threaded connector suitable for insertion, submersion, or flow through installations. The Model 396 is only available without an integral preamplifier and has 15 ft of cable. Automatic temperature compensation is standard 3 K Balco or Pt100 RTD.

MODEL 396 TUph INSERTION/SUBMERSION STAINLESS STEEL pH SENSOR	
CODE	ANALYZER/TC COMPATIBILITY (Required Selection)
50	For use with Models 1181, 1050, 1003 (3 K TC)
54	For use with Models 54, 54e, 1055, 1054A, 1054B, 2081, 81, 3081, 4081, 5081, Xmt, and SCL-P (Pt100 RTD)
CODE	OPTIONAL OPTIONS
62	Cable termination without BNC (for use with Models 54/54e, 1055, 81, 2081, 3081, 4081, 5081, Xmt)
71	GPHT Flat bulb
396 - 54	
EXAMPLE	

FOR FIRST TIME 396 INSTALLATIONS, ROSEMOUNT ANALYTICAL RECOMMENDS USING THE FOLLOWING GUIDE:

- 1. Process Connector Accessories (required for all first time installations)**
 - Choose one: PN 23166-00, 316 SST, 1 in. x 1 in. NPT process connector
 - PN 23166-01, Titanium, 1 in. x 1 in. NPT process connector
 - PN 9510066, Nylon, 1 in. x 1 in. NPT process connector
- 2. Mounting Accessories (optional)**
 - Choose one: PN 915240-03 PVC flow through tee, 3/4 in. NPT process connection
 - PN 915240-04 PVC flow through tee, 1 in. NPT process connection
 - PN 915240-05 PVC flow through tee, 1-1/2 in. NPT process connection
- 3. Junction Boxes (optional, recommended for sensor to analyzer distances of more than 15 ft)**

Remote Junction Boxes

 - Choose one: PN 23555-00 includes preamplifier for Models 54, 54e, 1055, 81, 3081, 4081, 5081, Xmt
 - PN 23309-03 and PN 22698-02 plug-in preamplifier for Model 1181 Analyzer
 - PN 23309-04 and PN 22698-03 plug-in preamplifier for Models 1054 series, 2081 Analyzers
- 4. Extension cables (used with remote junction boxes)**
 - Choose one: PN 23646-01, 11 conductor, shielded, prepped
 - PN 9200273, 11 conductor, shielded, unprepped
- 5. Wiring Aids**
 - Choose one: PN 9120531 BNC splitter, used in place of BNC coax prepping for connections to junction box (PN 23555-00);
Models 1181, 1054, 2081, 54, 81, 3081, 4081, 5081, Xmt; SoluComp (SCL-P-014)
 - NONE: No wiring aids required for other options not listed above.



ORDERING INFORMATION

The **Model 396P Sensor** is housed in a molded reinforced polypropylene body with 1 in. MNPT threads suitable for insertion, submersion or flow through installation. The sensor includes a general purpose pH electrode or a platinum ORP electrode, a patented reference junction and a solution ground. The Model 396P comes standard with a recessed electrode; an optional slotted tip is also available. In addition, the 396P features an optional integral hermetically sealed preamplifier and 15 ft or 25 ft cable lengths. Automatic temperature compensation, Pt100 or 3K Balco, is standard with the Model 396P.

MODEL 396P	
TupH INSERTION/SUBMERSION POLYPROPYLENE pH/ORP SENSOR	
CODE	PREAMPLIFIER/CABLE (Required Selection)
01	With integral preamplifier, 25 ft cable
02	Without integral preamplifier, 15 ft cable
CODE	MEASURING ELECTRODE TYPE (Required Selection)
10	GPLR hemi bulb, General Purpose Low Resistivity
12	ORP
13	GPLR flat bulb, General Purpose Low Resistivity
CODE	ANALYZER/TC COMPATIBILITY (Required Selection)
50	For Models 1181 (3K TC)
54	For Models 1054A, 1054B, 2081 (Pt100 RTD)
55	For Models 54, 54e, 1055, 81, 3081, 4081, 5081, Xmt (Pt100 RTD)
CODE	OPTIONAL OPTIONS
41	Slotted Tip
396P - 01 - 10 - 55	
EXAMPLE	

NOTE: The Model 396P is also compatible with Models 1003 (option 02-50 only) and SCL-P/Q and (option 02-54 only).

FOR FIRST TIME 396P INSTALLATIONS, ROSEMOUNT ANALYTICAL RECOMMENDS USING THE FOLLOWING GUIDE:

<p>1. Mounting Accessories (optional)</p> <p>Choose one: PN 915240-03, PVC flow through tee, 3/4 in. NPT process connection PN 915240-04, PVC flow through tee, 1 in. NPT process connection PN 915240-05, PVC flow through tee, 1-1/2 in. NPT process connection PN 24091-00, polycarbonate low flow cell PN 2002011, 1-1/2 in. CPVC tee with 1-in. FNPT connection PN 11275-01, sensor handrail assembly</p> <p>2. Junction Boxes (optional)</p> <p>Remote Junction Boxes (used with option -02 sensors, for sensor to analyzer distances of more than 15 ft) Choose one: PN 23555-00 includes preamplifier for Models 54, 54e, 1055, 81, 3081, 4081, 5081, Xmt PN 23309-03 and PN 22698-02 plug-in preamplifier for Model 1181 Analyzer PN 23309-04 and PN 22698-03 plug-in preamplifier for Models 1054 series, 2081 Analyzers Choose one: PN 9120516 BNC Adapter for use with remote junction boxes PNs 23309-03, 23309-04</p> <p>Remote Junction Box (used with option -01 sensors) Choose one: PN 23550-00 cable extension board</p> <p>3. Extension cables (used with remote junction boxes)</p> <p>Choose one: PN 23646-01, 11 conductor, shielded, prepped PN 9200273, 11 conductor, shielded, unprepped</p>
--



ORDERING INFORMATION

The **Model 396R Sensor** is housed in a titanium tube with a patented polypropylene reference junction and titanium solution ground for use with a ball valve (order separately) for hot tap applications. The sensor features a shrouded glass/platinum electrode and Pt100 or 3K temperature compensation. The 396R sensor is only available without a preamplifier and has 15 ft or 9.5 in. of integral cable. Junction box kits with preamplifiers must be ordered separately if the analyzer/transmitter does not have an integral preamplifier within 15 ft of the probe. Process connector and ball valve assemblies must be ordered separately.

MODEL 396R TU pH RETRACTABLE pH/ORP SENSOR	
CODE	MEASURING ELECTRODE TYPE (Required Selection)
10	GPLR hemi bulb, General Purpose Low Resistivity
12	ORP
13	GPLR flat bulb, General Purpose Low Resistivity
CODE	SENSOR LENGTH (Required Selection)
21	21 in. Titanium Tube
25	36 in. Titanium Tube
CODE	ANALYZER/TC COMPATIBILITY (Required Selection)
50	For Models 1181 (3K TC)
54	For Models 54, 54e, 1054A, 1054B, 1055, 2081, 81, 3081, 4081, 5081, Xmt, SCL-(P/Q) (Pt100 RTD)
CODE	OPTIONAL OPTIONS
60	9.5 in. Cable with BNC (for use with Model 1181, 1054 series, 2081 sensor head J-Boxes)
61	9.5 in. Cable no BNC (for use with Model 54/54e, 1055, 81, 3081, 4081, 5081, Xmt sensor head J-Boxes; not valid w/option 50)
396R - 10 - 21 - 54	EXAMPLE

FOR FIRST TIME 396R INSTALLATIONS, ROSEMOUNT ANALYTICAL RECOMMENDS USING THE FOLLOWING GUIDE:

1. Retractable Mounting

1A. Choose one (required for all first time installations, except as noted):

PN 23166-00 1 in. x 1 in. NPT process connector, 316 SST

PN 23166-01 1 in. x 1 in. NPT process connector, Titanium

1B. Choose one:

PN 23240-00 1-1/2 in. ball valve assembly, 316 SST

PN 23765-00 1- 1/4 in. ball valve assembly, 316 SST (process connector not needed)

2. Junction Boxes (Optional, Choose either Sensor Head or Remote)

Sensor Head Junction Boxes (used with option -60 or -61 sensors)

Choose one: PN 23709-00 includes preamplifier for Models 54, 54e, 81, 3081, 4081, 5081, Xmt

PN 23708-01 includes preamplifier for Models 1054 series, 2054, 2081

PN 23707-00 includes preamplifier for Model 1181

Remote Junction Boxes (used with standard 15 ft. cable length sensor)

Choose one: PN 23555-00 includes preamplifier for Models 54, 54e, 1055, 81, 3081, 4081, 5081, Xmt

PN 23309-03 and PN 22698-02 plug-in preamplifier for Model 1181 Analyzer

PN 23309-04 and PN 22698-03 plug-in preamplifier for Models 1054 series, 2081 Analyzers

3. BNC Adapter

Choose one: PN 9120516 BNC Adapter for use with remote junction boxes PNs 23309-03 or 23309-04

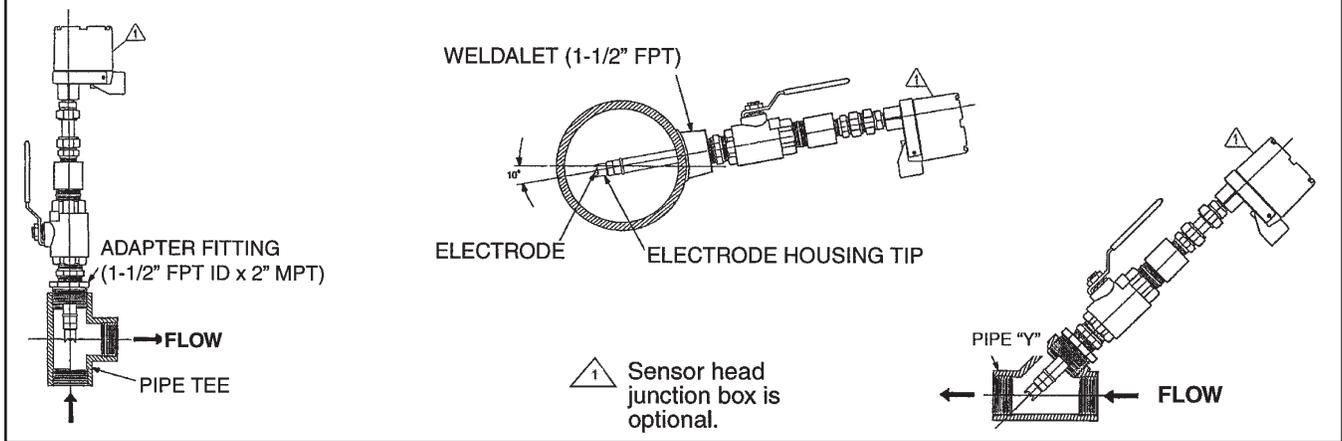
Order option -60 (standard with BNC connector) for PN 23707-00 or 23708-01 Sensor head junction boxes

4. Extension cables

Choose one: PN 23646-01, 11 conductor, shielded, prepped

PN 9200273, 11 conductor, shielded, unprepped

TYPICAL MOUNTING CONFIGURATIONS FOR MODEL 396R



OTHER ACCESSORIES

PART	DESCRIPTION
22698-00	Preamplifier plug-in for junction box, for Model 1003
22698-02	Preamplifier plug-in for junction box, for Models 1181, 1050
22698-03	Preamplifier plug-in for junction box, for Models 1054A/B, 2081
22743-01	Pt100 preamplifier for Model 1181
22744-01	3K Preamplifier for Model 1181
23557-00	Preamplifier for junction box for Models 54, 54e, 1055, 81, 3081, 4081, 5081, Xmt
33046-00	Ferrule, 1 in., split 316SS
9310096	Nut, swage, 1 in. 316SST
9210012	Buffer solution, 4.01 pH, 16 oz
9210013	Buffer solution, 6.86 pH, 16 oz
9210014	Buffer solution, 9.18 pH, 16oz
R508-160Z	ORP solution, 460 mv \pm 10 at 20°C
9550167	EPDM O-ring for Process Connector (PN 23166-00 or 23166-01)
12707-00	Jet Spray Cleaner

NOTE: All accessories above can be used with the Models 396, 396P or 396R.

¹ Kynar is a registered trademark of Elf Atochem North American, Inc.

² Teflon is a registered trademark of E.I. du Pont de Nemours and Company.



*The right people,
the right answers,
right now.*

**ROSEMOUNT ANALYTICAL
CUSTOMER SUPPORT CENTER
1-800-854-8257**



ON-LINE ORDERING NOW AVAILABLE ON OUR WEB SITE
<http://www.raihome.com>

Specifications subject to change without notice.



Credit Cards for U.S. Purchases Only.



Emerson Process Management

Liquid Division

2400 Barranca Parkway
Irvine, CA 92606 USA
Tel: (949) 757-8500
Fax: (949) 474-7250

<http://www.raihome.com>

© Rosemount Analytical Inc. 2005

EMERSON
Process Management