

## Submersion/Insertion pH/ORP Sensors



- **SILCORE™<sup>3</sup> TECHNOLOGY PROVIDES INCREASED SENSOR LIFE when used in elevated temperature applications.**

- QUICK CABLE-TO-SENSOR RELEASE, provided by the watertight VP multiple pin connector, eliminates cable twisting.
- MINIMUM SENSOR MAINTENANCE due to patented TUpH reference technology<sup>1</sup> which ensures steady pH signal when sensor is coated.
- MAXIMUM SENSOR LIFE due to helical reference pathway<sup>2</sup> which hinders reference poisoning.
- FIELD PROVEN ACCUGLASS™<sup>3</sup> pH glass formulations minimize glass cracking, resulting in enhanced performance and increased life.
- OPTIMUM VERSATILITY by providing various mounting options.
- PROVIDES ADVANCED SENSOR DIAGNOSTICS for pH and reference signals when used with Rosemount Analytical's advanced analyzers.

### FEATURES:

**Wetted Materials:** Polypropylene, EPDM, glass, titanium

**pH Glass Style:** Flat or Hemi bulb

**Insertion Depth:** 2.5 inches to 5 inches (6.3 cm to 12.7 cm)

**Sensor Design:** Threaded connection for in-line or submersion mounting

**Electrical Connection:** Integral cable or VP connector

**Temperature Compensation:** 3K or Pt100

**Operating Temperature:** up to 100°C (212°F)

**Operating Pressure:** up to 150 psig (1138 kPa [abs])



**MODEL 396P**

Insertion/Submersion Sensor with integral cable



**MODEL 396PVP**

Insertion/Submersion Sensor with new VP connector (uses mating VP cable)

<sup>1</sup> U.S. Patent No. 5,152,882, Foreign Patent Pending.

<sup>2</sup> U.S. Patent No. 6,054,031, Foreign Patents Pending.

<sup>3</sup> SILCORE, ACCUGLASS and TUpH are trademarks of Rosemount Analytical.

**The TUpH Reference Technology includes a 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.

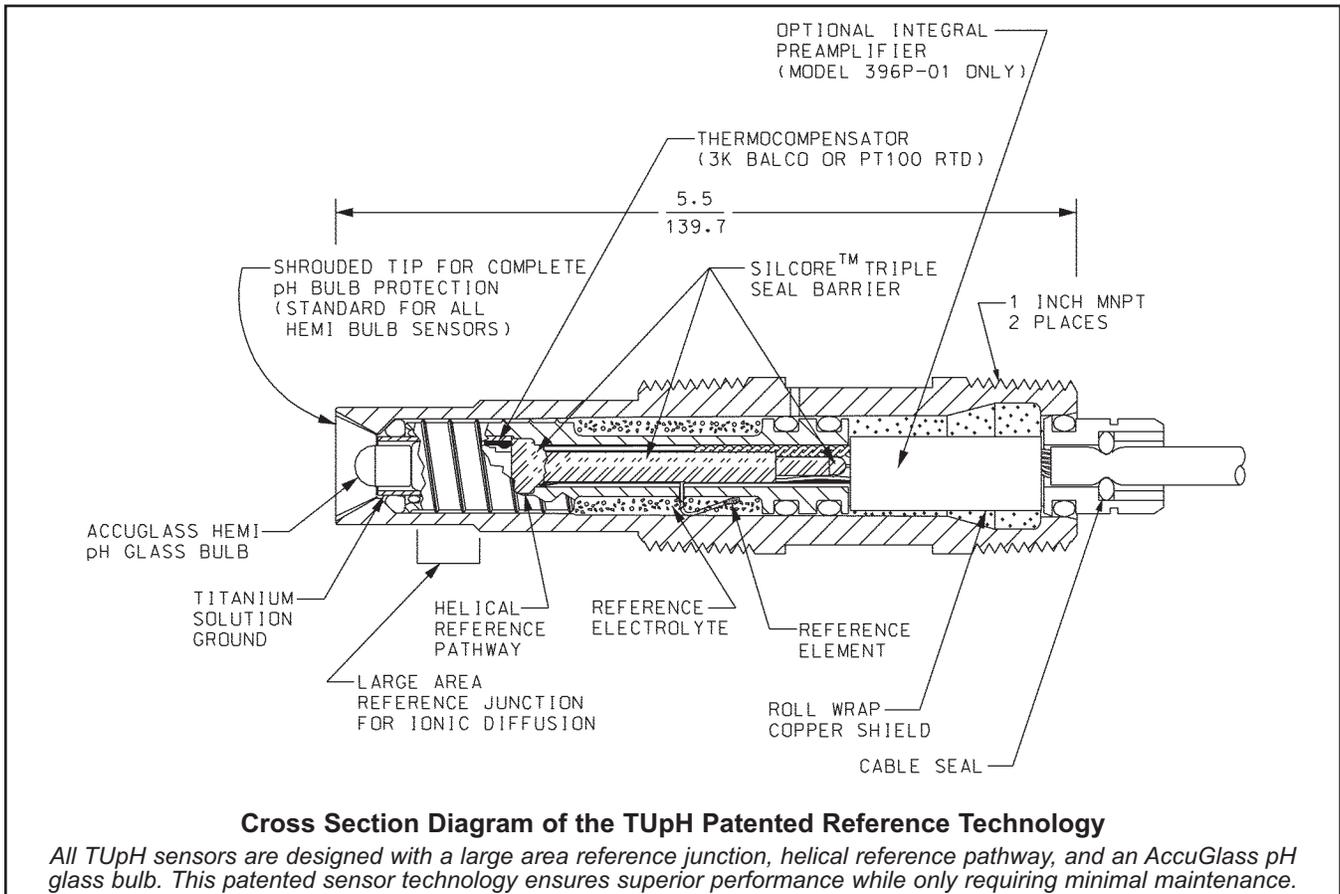
**The TUpH helical reference pathway stops reference poisoning.** Ions diffuse through the reference pathways and a charge is passed to the reference element. The reference element must be protected from contamination by poisoning ions such as sulfide, mercury, cyanide, and ammonia or else the pH signal 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 measurement, 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 has a longer sensor life than ever before.

**The TUpH reference junction and helical pathway combined with the AccuGLASS pH glass** perform exceptionally well in dirty, high solid applications and require 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 its 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 head-box, and pigment/dye applications, where large quantities of suspended solids are present.





## FEATURES AND APPLICATIONS (cont.)

**Both models can provide advanced sensor diagnostics** due to the standard titanium solution ground, constructed in an annular design around the pH/ORP electrode. The solution ground provides diagnostics for preventative maintenance when used with the Models 54/54e pH/ORP Analyzer, 3081 pH/ORP Transmitter, and 4081 pH/ORP Transmitter. In addition, the Model 396P Sensor can be used with all other non-diagnostic Rosemount Analytical and other manufacturers' instruments.

**A choice of flat or hemi glass pH glass electrodes** is available to best meet various application needs. Flat glass (see item #4 in cross sectional diagram) 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. In abrasive applications pitting from silicates and other similar materials is minimized by the flat glass surface to provide longer sensor life. Flat glass sensors are offered with a flat tip which is flush with the flat glass. The hemi bulb glass (see item #3 in cross sectional diagram) is ideal for general purpose use and for those processes requiring greater accuracy over the entire pH range. All hemi bulb sensors are offered with a standard shrouded tip which completely surrounds the glass bulb for protection against solids. An optional slotted tip is

also available and allows the process to flow by the glass electrode for accurate and reliable pH measurement. Both pH glass bulbs — the standard hemi or optional flat pH glass — are exceptional for increased resistance to high temperature and other effects of aging for longer life.

**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 built into the sensor, 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.

**NEW - Model 396PVP is offered with a watertight sensor-to-cable connector which eliminates re-wiring and cable twisting** when replacing sensors. The Variopool VP multiple pin connector is an integral part of each sensor model and uses a mating VP cable; see example below. Once the cable is installed and wired to the analyzer, sensors are easily replaced without replacing the cable, and, if the replacement sensor is the same as its predecessor, without rewiring the analyzer. Also the cable can be disconnected from the sensor before removal from the process which eliminates cable twisting.



Variopool connector shown with mating variopool cable receptacle

### Examples of all sensing tip offerings



**Shrouded Tip** is standard on all hemi bulb sensors



**Optional Slotted Tip** is available on all hemi bulb sensors, ordered as option -41



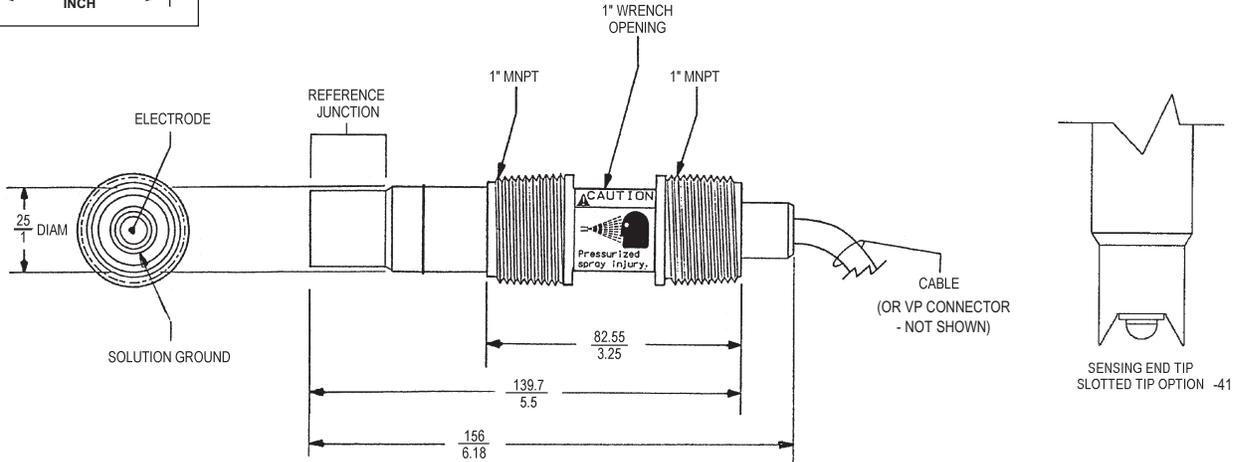
**Flat Tip** is available with flat glass bulb sensors

### PERCENT LINEARITY\*

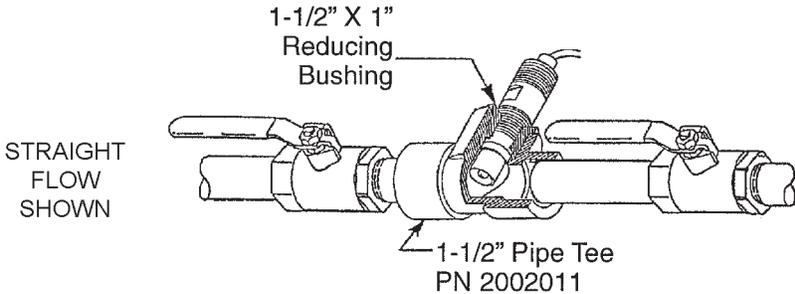
| pH range   | GPLR hemi bulb | GPLR flat bulb |
|------------|----------------|----------------|
| 0 - 2 pH   | 94%            | —              |
| 2 - 12 pH  | 97%            | 98%            |
| 12 - 13 pH | 98%            | 95%            |
| 13 - 14 pH | 98%            | —              |

| SPECIFICATIONS               |   |
|------------------------------|---|
| Measurements and Ranges      | *pH: 0-14<br>ORP: -1500 to 1500 mv  |
| Available pH AccuGLASS Types | GPLR hemi or flat glass   |
| Wetted Materials             | Titanium, Polypropylene, EPDM, glass; platinum (ORP only)                                 |
| Process Connection           | 1 in. MNPT front and rear facing threads  |
| Temperature Range            | 0-100°C (32-212°F)  |
| Pressure Range-Hemi bulb     | 100-1136 kPa [abs] (0-150 psig)   |
| Pressure Range-Flat bulb     | 100-790 kPa [abs] (0-100 psig)  |
| Minimum Conductivity         | 75 µS/cm, nominal; 100 µS/cm  |
| Integral Cable               | 396P: Code 01 - 25 ft; Code 02 - 15 ft coaxial<br>396PVP: none - must use mating VP cable |
| Preamplifier Options         | 396P: Remote or Integral<br>396PVP: Remote only   |
| Weight/Shipping Weight       | 0.45 kg/0.9 kg (1 lb/2 lb)  |

**DIMENSIONAL DRAWINGS: Model 396P and 396PVP**



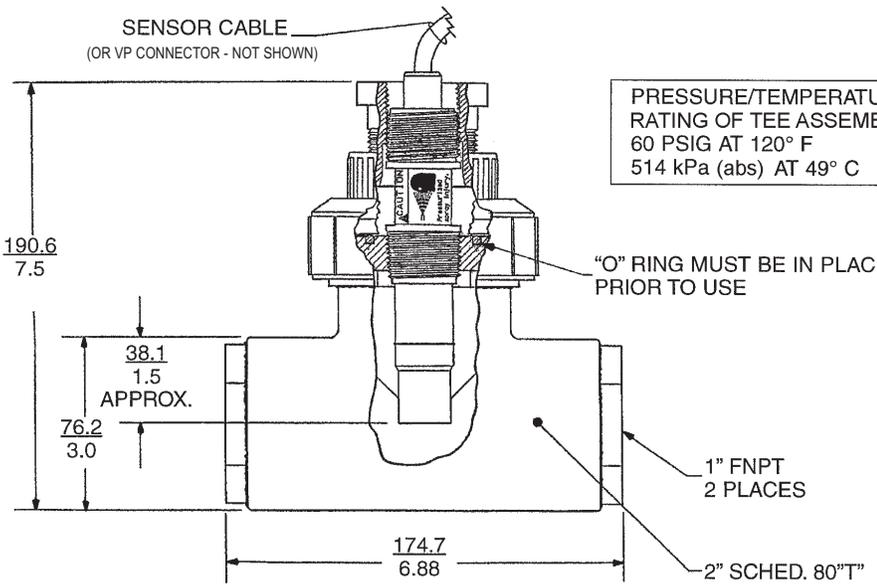
**TYPICAL FLOW THROUGH INSERTION INSTALLATION USING PN 2002011 PIPE TEE  
(sensor must be installed at least 10° above the horizon)**



**HORIZONTAL PIPE TEE (PN 2002011)  
PRESSURE/TEMPERATURE RATINGS**

| psig (kPa [abs]) | °F (°C)  |
|------------------|----------|
| 150 (1136)       | 150 (65) |
| 128 (984)        | 160 (71) |
| 102 (805)        | 170 (77) |
| 80 (653)         | 180 (82) |
| 57 (494)         | 200 (93) |
| 48 (432)         | 210 (99) |

**FLOW THROUGH TEE WITH ADAPTER (PN 915240-04)**



PRESSURE/TEMPERATURE RATING OF TEE ASSEMBLY  
60 PSIG AT 120° F  
514 kPa (abs) AT 49° C

NOTE: Similar flow through tees are available with 3/4 in. or 1 1/2 in. FNPT process connections.



### LOW FLOW CELL PN 23728-00

The low flow cell uses inlet and outlet 1/4" tubing for connection to the process stream. The see-through flow cell can be used for processes where flow regulation is desired.

**WETTED MATERIALS:**

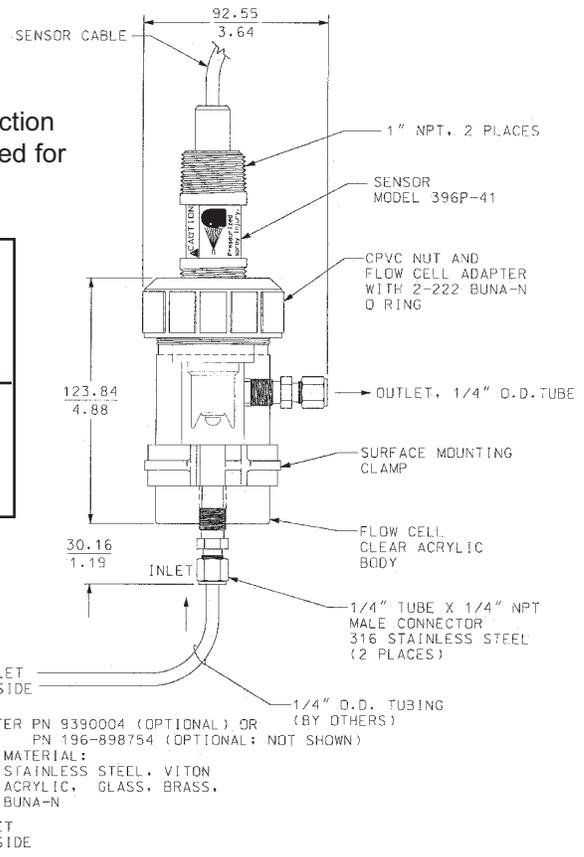
- BODY - ACRYLIC
- NUT - CPVC
- FITTINGS - 316 SST
- SEALS - BUNA N

**FLOW CELL RATINGS**

- TEMPERATURE: 32-122F (50C)
- MAX. PRESSURE: 65 PSIG (549 kPa [abs])
- FLOW RATE: 2-5 GPH (7.6-18.9 LPH)

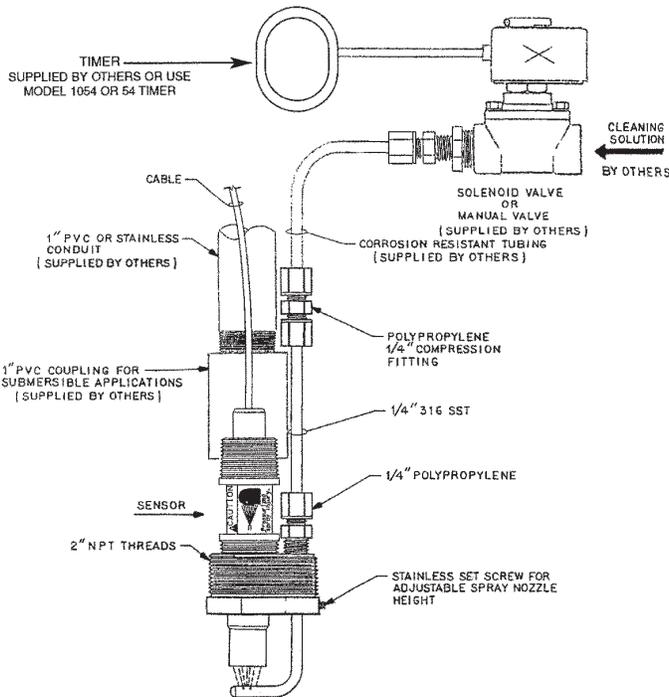


The see-through acrylic Low Flow Cell



### JET SPRAY CLEANER PN 12707-00

The Jet Spray Cleaner eliminates routine, manual sensor maintenance by cleaning the sensor with water or compressed air. Flow through the cleaner can be controlled by a solenoid valve. It is operated by the interval timer relay found in Models 54 and 1054A/B series Analyzers.



JET SPRAY CLEANER SHOWN WITH TUPH MODEL 396P pH SENSOR

NOTE: The Jet Spray Cleaner can be used with the Handrail Mounting Assembly (PN 11275-01, not shown) or can be mounted through conduit as shown 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, Pt 100 or 3K Balco, is standard with the Model 396P.



The Model 396P insertion/submersion sensor with integral cable is offered with or without a built-in preamplifier

| MODEL 396P TU pH 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 (0-14 pH)        |
| 12  | ORP  |
| 13  | GPLR flat bulb, General Purpose Low Resistivity (2 - 13 pH)      |
|   |  |
| CODE  | ANALYZER/TC COMPATIBILITY (Required Selection)                   |
| 50  | For Models 1181 (3K TC)  |
| 54  | For Models 1054A, 1054B, 2081 (Pt 100 RTD)                       |
| 55  | For Models 54, 54e, 1055, 81, 3081, 4081, 5081, Xmt (PT-100 RTD) |
|   |  |
| CODE  | OPTIONAL SELECTION   |
| 41  | Slotted Tip (not available on flat bulb sensors)                 |
|   |  |
| 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 AND 396PVP INSTALLATIONS, ROSEMOUNT ANALYTICAL RECOMMENDS USING THE FOLLOWING ACCESSORY GUIDE:

#### 1. 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
- PN 23728-00, acrylic low flow cell
- PN 2002011, 1-1/2 in. CPVC tee with 1-in. FNPT connection
- PN 11275-01, sensor handrail assembly

#### 2. Junction Boxes (optional)

- 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, 81, 3081, 4081
- 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, 2054, 2081 Analyzers
- Choose one: PN 9120516 BNC Adapter for use with remote junction boxes PNs 23309-03, 23309-04

- Remote Junction Box** (used with option -01 sensors)

- Choose one: PN 23550-00 cable extension board

#### 3. Extension cables (used with remote junction boxes)

- Choose one: PN 23646-01, 11 conductor, shielded, prepped
- PN 9200273, 11 conductor, shielded, unprepped



## ORDERING INFORMATION

The **Model 396PVP Sensor** has similar features to the Model 396P. However, the Model 396PVP is offered with the new Variopol (VP) connector and uses a mating VP cable (purchased separately). A remote preamplifier must be used with this sensor.

**A Variopol cable is required for all new installations. See below for cable selection.**



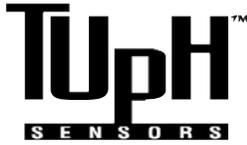
*The Model 396PVP insertion/submersion sensor with the VP (Variopol) connector*

| MODEL 396PVP | TupH INSERTION/SUBMERSION POLYPROPYLENE pH/ORP SENSOR                       |
|--------------|---|
| CODE         | MEASURING ELECTRODE TYPE (Required Selection)                               |
| 10           | GPLR hemi bulb, General Purpose Low Resistivity (0-14 pH)                   |
| 12           | ORP   |
| 13           | GPLR flat bulb, General Purpose Low Resistivity (2 - 13 pH)                 |
| CODE         | ANALYZER/TC COMPATIBILITY (Required Selection)                              |
| 50           | For Models 1181 (3K TC)   |
| 54           | For Models 1054A, 1054B, 2081 (Pt 100 RTD)                                  |
| 55           | For Models 54, 54e, 1055, 81, 3081, 4081, 5081, Xmt (PT-100 RTD)            |
| CODE         | OPTIONAL SELECTION  |
| 41           | Slotted Tip (not available on flat bulb sensors)                            |
| PN           | MATING VP CONNECTOR CABLE ( <b>Required for all new installations</b> )     |
| 23645-06     | 15 ft. cable with mating VP connector, prepped with BNC on analyzer end     |
| 23645-07     | 15 ft. cable with mating VP connector, prepped without BNC on analyzer end* |

\* For use with connections to Models 54, 81, 1181, 1054, 2081, 3081, 4081, 5081, Xmt, and Remote Junction Box PN 23555-00.

## OTHER ACCESSORIES FOR MODELS 396P AND 396VP

| 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, 2054, 2081 |
| 22743-01  | Pt100 preamplifier for Model 1181                                     |
| 22744-01  | 3K Preamplifier for Model 1181  |
| 23557-00  | Preamplifier for junction box for Models 54, 3081, 81, 4081           |
| 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                                 |
| 12707-00  | Jet Spray Cleaner   |

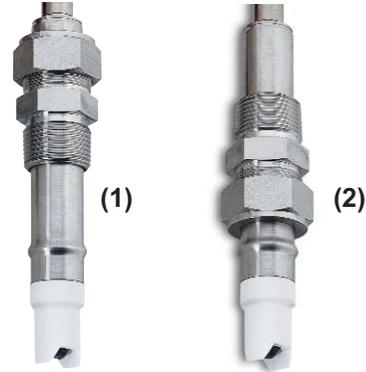


# Retraction/Submersion/Insertion pH/ORP Sensors

Models 396P and 396PVP are part of the Rosemount Analytical family of TUph Sensors. The TUph technology can also be found in different mounting configurations and wetted materials.



**Models 396P and 396PVP:** The one-inch threads on Models 396P and 396PVP are ideal for insertion, submersion, or flow-through installations. The wetted materials for both models include polypropylene and titanium.



**Models 396, 398, 396VP, and 398VP:** The one-inch metal process connector used with Models 396, 398, 396VP, and 398VP give the sensor various insertions depths (see 1) into difference sized process pipes, depending on where the user locates the compression fitting. Also the threads can be switched (see 2) to face the cable end of the sensor for connection to submersion pipes. The wetted materials include a choice of polypropylene or Tefzel, and 316 SST or titanium, depending on the model number.



**The Variopol (VP) connector** (see 1), shown with mating variopol cable receptacle (see 2), is a standard feature on all sensor models designated with a VP at the end of the model number. The VP connector system is watertight and allows for easy sensor replacement without twisting the cable or rewiring to the analyzer.



**Models 396R, 398R, 396RVP, and 398RVP:** The various tube lengths offered on Models 396R & 398R and 396RVP & 398RVP allow for insertion length flexibility of up to 25 inches into the process through a 1-1/4 inch or 1-1/2 inch ball valve kit. Also, the choice of wetted materials, including polypropylene, Tefzel, and titanium, make this an ideal choice for processes with harsh chemicals.



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