

## pH/ORP Sensors

- NEW OPTIONS to meet a variety of application requirements, including:
  - \* Low ionic strength water
  - \* Processes with hydrofluoric acid, high pH, and reference poisoning elements
- QUICK CABLE-TO-SENSOR RELEASE, provided by the water-tight VP multiple-pin connector, eliminates cable twisting.
- EXTENDED SENSOR LIFE provided by double or triple junction reference cell in process solutions containing poisoning ions.
- OPTIMUM VERSITILITY FOR VARIOUS MOUNTING OPTIONS provided by one-piece construction with process threads in two places.
- MAXIMUM CHEMICAL RESISTANCE provided by rugged tefzel<sup>1</sup> body, completely sealed to eliminate sensor leakage.
- ENHANCED PERFORMANCE AND INCREASED LIFE with minimized glass cracking provided by field-proven AccuGLASS<sup>TM2</sup> pH glass formulations.



**MODEL 399**

Insertion/Submersion  
Sensor with integral cable



**MODEL 399VP**

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

<sup>1</sup> Tefzel and Viton are registered trademarks of E.I. du Pont de Nemours and Co.

<sup>2</sup> AccuGLASS is trademark of Rosemount Analytical.

### FEATURES AND APPLICATIONS

**The reference junction aids in the sensor's resistance to poisoning ions and helps prolong sensor life.** Models 399 and 399VP are provided with a double junction reference, which protects the reference element from poisoning ions — such as ammonia, chlorine, cyanides, and sulfides — in the process. When large amounts of poisoning agents are present, an optional triple junction may be ordered to help prolong the sensor life. Both models, in either the double or triple reference configuration, are made with an outer ceramic junction constructed in an annular design around the pH/ORP-sensitive membrane.

**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.

**A choice of pH glass electrodes is available to best meet various application needs.** Four types are available: hemi bulb, flat bulb, HF resistant, and Hi pH glass. The AccuGLASS hemi bulb is the standard glass offered on both models and can be used for most applications. The hemi bulb is also found on the HF resistant and Hi pH glass options. The AccuGLASS flat glass option can be used in abrasive or coating applications that etch or build up on glass, respectively.

*Continued on following page...*

## FEATURES AND APPLICATIONS (cont.)

**NEW - Model 399VP is offered with a watertight sensor-to-cable connector which eliminates re-wiring and cable twisting** when replacing sensors. The Variopol VP multiple pin connector is an integral part of each sensor model and uses a mating VP cable; see page 7 for example. Once the cable is installed and wired to the analyzer, sensors are easily replaced without replacing the cable and without rewiring the analyzer. Also the cable can be disconnected from the sensor before removal from the process which eliminates cable twisting.

**Models 399 and 399VP are housed in a molded Tefzel body with Viton o-rings, making each sensor 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.

**A preamplifier converts the high impedance pH signal into a stable, noise-free signal** and must be used with all pH sensors. The Model 399 offers the choice of an integral sensor preamplifier. Both Models can use a remote preamplifier, integral to the analyzer/transmitter or in a remote junction box. All preamplifiers have a transmission capability of up to three miles. The Rosemount Analytical preamplifier method has become the industry standard for pH/ORP measurement reliability.

**Installation is easily achieved** through the wide variety of mounting configurations. Both Models feature 1 inch (MNPT) front and rear facing connections for insertion, submersion, or flow-through pH and ORP applications.

**New options are available for special application needs**, including high purity/low conductivity water, heavy reference poisoning, and continuous high or low temperature processes. Consult the factory or your local sales representative for more details on these new options.

**Both models are combination sensors (pH, reference, and temperature within sensor body)** and measure pH or ORP (Oxidation/Reduction Potential) of aqueous solutions in pipelines, open tanks, or ponds. Models 399 and 399VP are suitable for virtually all applications and are compatible with Rosemount Analytical and other manufacturers' instruments.

## PHYSICAL SPECIFICATIONS

**Materials of Construction:** Tefzel, glass, ceramic, & Viton

**Materials of ORP:** Platinum

**Process Connections:** 1 in. MNPT, 2 places

**Integral Cable:**

10 or 32 ft cable with integral preamp

(remote preamp) 10 ft cable with remote preamp

**Measured Range:** pH: AccuGLASS 0-14  
ORP: -1500 to +1500 mV

**Maximum Pressure:**

790 kPa [abs] (100 psig) at 65°C (see Graph 1 below)

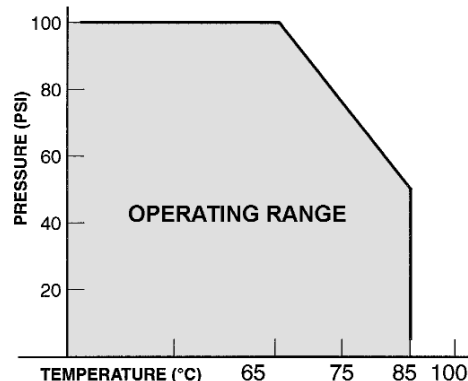
**Weight/Shipping Weight:** 0.45 kg/0.9 kg (1 lb/2 lb)

**Temperature Compensation:** Automatic 0° to 85°C (32° to 185°F), Temperature compensation is not required for 399 ORP when used with Models 1060, 1023 or 1181 ORP

**Percent Linearity Over pH Range:**

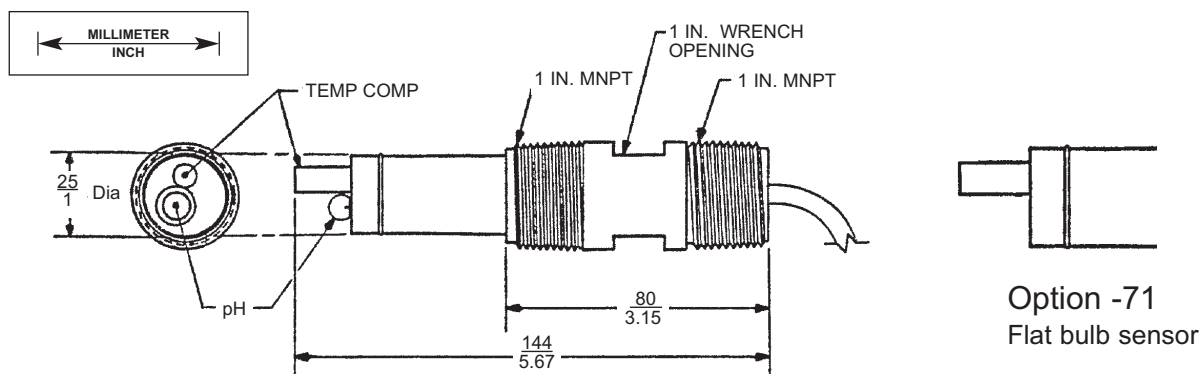
|          | GPLR Hemi Bulb | Flat Bulb |
|----------|----------------|-----------|
| 1-2 pH   | 94%            | 93%       |
| 2-12 pH  | 99%            | 98%       |
| 12-13 pH | 97%            | 95%       |
| 13-14 pH | 92%            | —         |

- High pH glass provides greater accuracy over 12.5 pH
- HF glass provides improved resistance to hydrofluoric acid up to 300 ppm

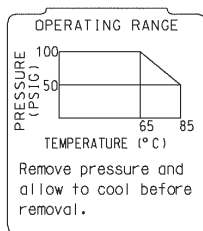


**GRAPH 1. Pressure/Temperature Operating Range for Models 399 and 399VP**

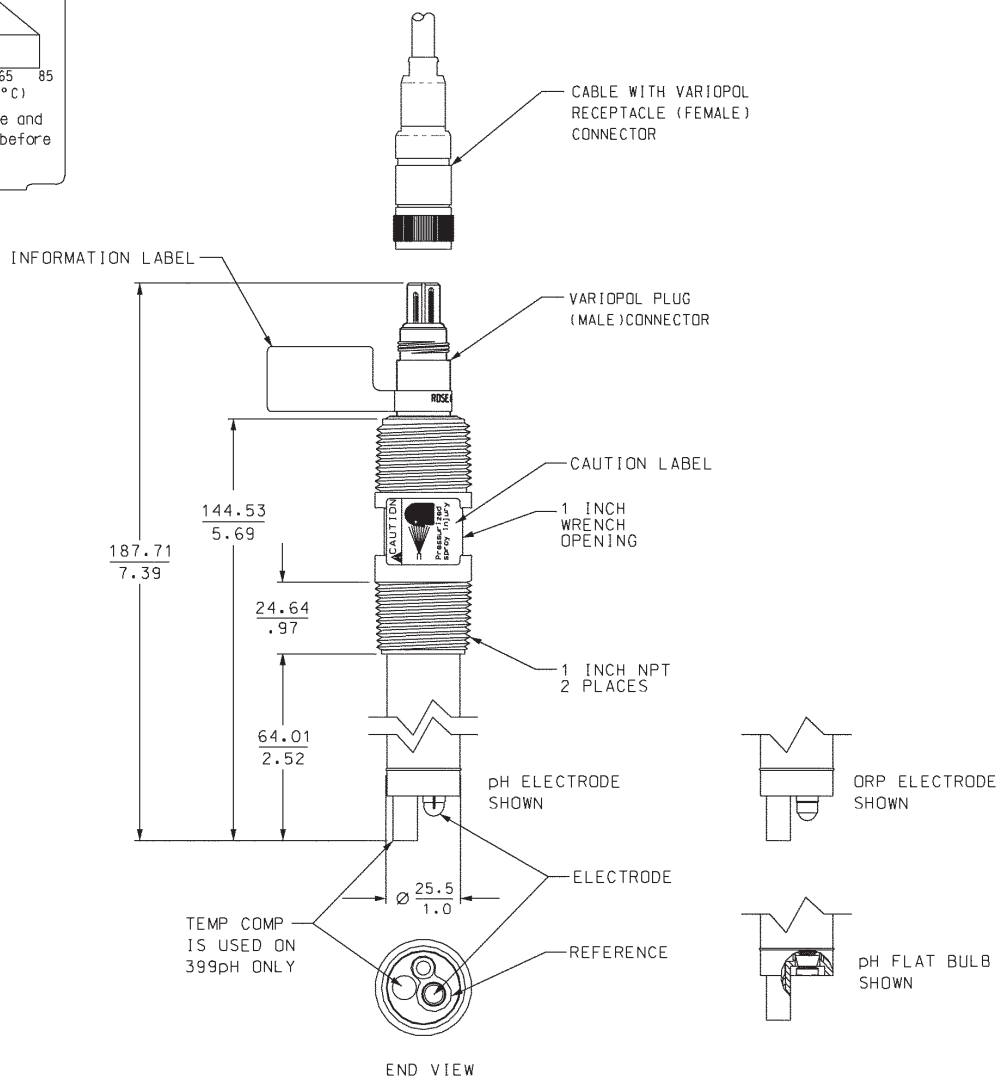
## MOUNTING AND DIMENSIONAL DRAWINGS



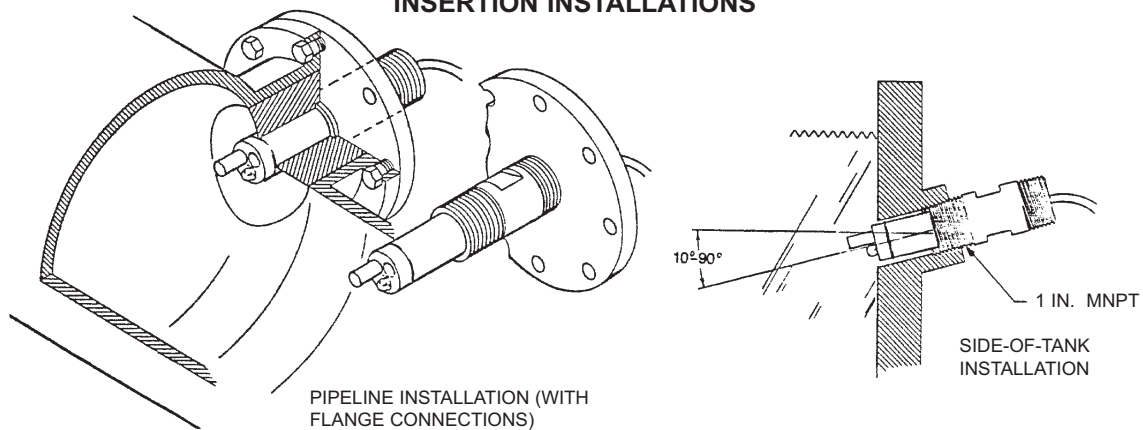
## DIMENSIONAL DRAWING FOR MODEL 399VP



CAUTION LABEL SHOWN ON SENSOR BACK VIEW

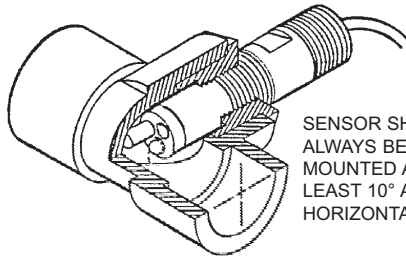


## INSERTION INSTALLATIONS



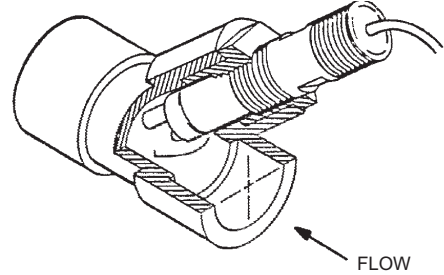
## FLOW THROUGH INSTALLATION

1-1/2 IN. SCHED 80  
CPVC TEE WITH 1 IN.  
FNPT CONNECTIONS  
(PN 2002011)  
STRAIGHT FLOW  
SHOWN



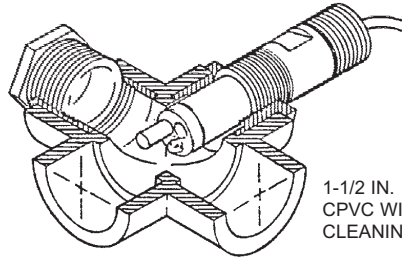
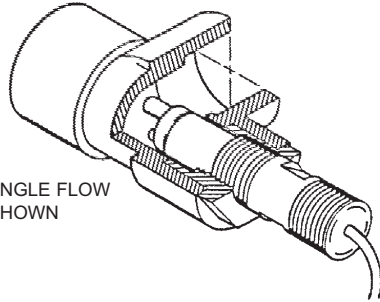
SENSOR SHOULD  
ALWAYS BE  
MOUNTED AT  
LEAST 10° ABOVE  
HORIZONTAL

1-1/2 IN. PIPE "Y"

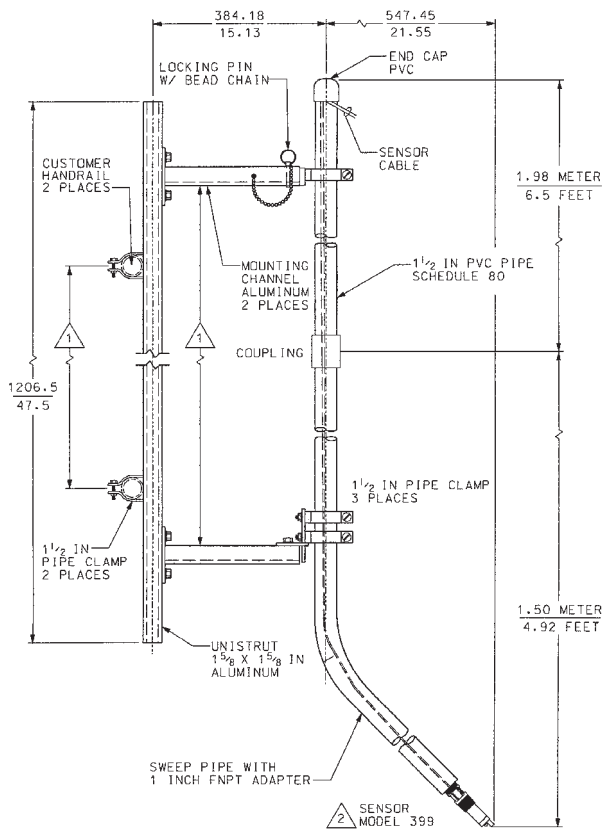


FLOW

ANGLE FLOW  
SHOWN



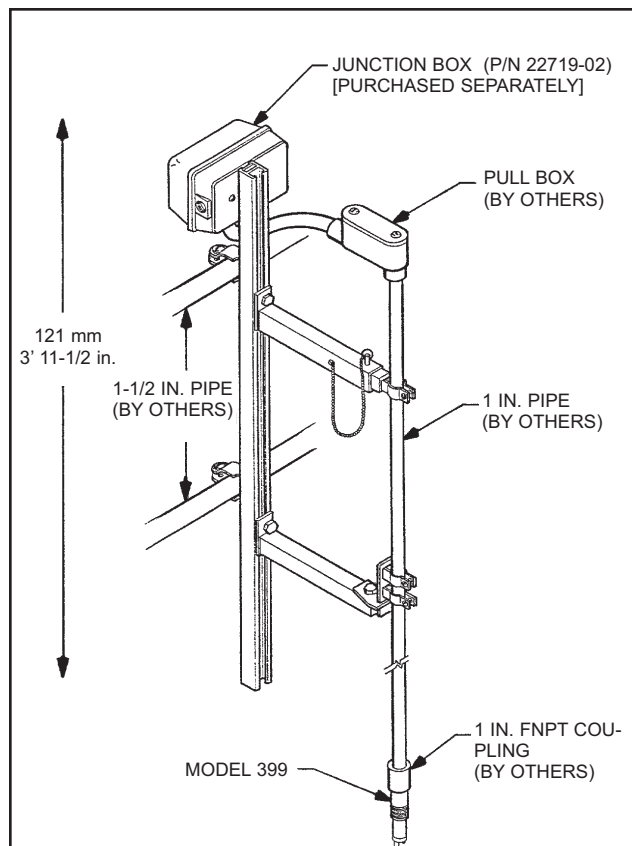
1-1/2 IN. SCHED 80  
CPVC WITH VIEW OR  
CLEANING PORT



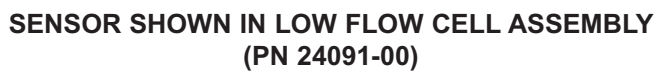
△ REGULARY CHECK TO MAKE SURE  
CONNECTIONS ARE WATER TIGHT  
△ CAN BE ANY CONVENIENT DIMENSION

MILLIMETER  
INCH

**SENSOR SHOWN IN HANDRAIL MOUNTING  
ASSEMBLY (PN 11275-01)**



**HANDRAIL MOUNTING  
ACCESSORY (P/N 1000857)**



## ORDERING INFORMATION

The **Model 399 pH/ORP Sensor** is available with custom glass electrodes housed in a molded Tefzel body with 1 in. MNPT threads suitable for insertion, submersion or flow through installation. The sensor includes a general purpose hemi bulb pH electrode (flat bulb optional) or a platinum ORP electrode and a double junction gel filled reference electrode. The Model 399 pH is available with an optional integral hermetically sealed preamplifier. The Model 399 ORP is only available with an integral preamplifier. Automatic temperature compensation is standard with the Model 399 pH, but is not required on the Model 399 ORP (except when used with the Model 1054A ORP Microprocessor Analyzer). Variable cable lengths are available for both the 399 pH and 399 ORP.



*The Model 399 insertion/submersion sensor with integral cable is offered with or without a built-in preamplifier.*

| MODEL 399 pH SENSOR |                                                                                                       |    |         |
|---------------------|-------------------------------------------------------------------------------------------------------|----|---------|
| Code                | 399 pH (GPLR hemi bulb) Preamplifier/Cable (Required Selection)                                       |    |         |
| 01                  | 10 ft cable with integral preamp for Models 1181pH and 1050                                           |    |         |
| 05                  | 32 ft cable with integral preamp for Models 1181pH and 1050                                           |    |         |
| 03                  | 10 ft cable with integral preamp for Model 1003                                                       |    |         |
| 06                  | 32 ft cable with integral preamp for Model 1003                                                       |    |         |
| 07                  | 10 ft cable with integral preamp for Model 1054A/B and 2081 pH                                        |    |         |
| 08                  | 32 ft cable with integral preamp for Model 1054A/B and 2081 pH                                        |    |         |
| 02                  | 10 ft coax cable for remote preamp, 3K ohm TC (Models 1181, 1050, and 1003)                           |    |         |
| 04                  | 10 ft cable for remote preamp, Pt100 TC (Solu Cube)                                                   |    |         |
| 09                  | 10 ft coax cable for remote preamp, Pt100 TC (Model 1054A/B)                                          |    |         |
| 12                  | 20 ft cable for Model SCL-P (Formerly pH201)                                                          |    |         |
| 13                  | 100 ft cable for Model SCL-P (Formerly pH201-Z100)                                                    |    |         |
| 09-62               | 10 ft coax cable for remote preamp, Pt100 RTD (Models 54e, 1055, 81, 2081, 3081, 4081, 5081, and Xmt) |    |         |
| 10                  | 10 ft cable with integral preamp for Models 54e, 81, 1055, 3081, 4081, 5081, and Xmt                  |    |         |
| 14                  | 32 ft cable with integral preamp for Models 54e, 81, 1055, 3081, 4081, 5081, and Xmt                  |    |         |
|                     |                                                                                                       |    |         |
| Code                | Specialized Glass Types (optional - choose one)                                                       |    |         |
| 73                  | High pH (improved accuracy above 12.5 pH))                                                            |    |         |
| 15                  | HF Resistant (up to 300 ppm)                                                                          |    |         |
| 71                  | GPLR Flat bulb (for abrasives)                                                                        |    |         |
|                     |                                                                                                       |    |         |
| Code                | Specialized Reference Fills - valid only with standard hemi glass (optional - choose one)             |    |         |
| 301                 | Low ionic strength water, greater than 5 μS/cm                                                        |    |         |
| 302                 | Triple reference for improved resistance to poisoning ions (sulfide & heavy metals)                   |    |         |
| 303                 | Low temperature storage (below freezing)                                                              |    |         |
| 399                 | 14                                                                                                    | 73 | EXAMPLE |

| MODEL 399 ORP SENSOR |                                                                                              |  |         |
|----------------------|----------------------------------------------------------------------------------------------|--|---------|
| Code                 | 399 ORP Preamplifier/Cable (Required Selection)                                              |  |         |
| 30                   | 32 ft cable with integral preamp for Models 1181OR and 1060                                  |  |         |
| 31                   | 32 ft cable with integral preamp for Model 1023                                              |  |         |
| 32                   | 32 ft cable with integral preamp for Model 1054A/B ORP                                       |  |         |
| 33                   | 20 ft cable for for remote preamp for Models SCL-Q, 54e, 81, 1055, 3081, 4081, 5081, and Xmt |  |         |
| 34                   | 32 ft cable with integral preamp for Models 54e, 81, 1055, 3081, 4081, 5081, and Xmt         |  |         |
| 399                  | 32                                                                                           |  | EXAMPLE |



## ORDERING INFORMATION

The **Model 399VP pH/ORP Sensor** has similar features to Model 399. However, the Model 399VP is offered with a 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 399VP insertion/submersion sensor with VP (Variopol) Connector.*

| MODEL 399VP pH SENSOR |                                                                                    |
|-----------------------|------------------------------------------------------------------------------------|
| Code                  | Temperature Compensator (GPLR hemi bulb) (Required Selection)                      |
| 02                    | 3K ohm TC (Models 1181, 1050, and 1003)                                            |
| 09                    | Pt100 TC for use with all models not listed above.                                 |
|                       |                                                                                    |
| Code                  | Glass Type (optional - choose one; not valid with special application codes)       |
| 73                    | High pH                                                                            |
| 15                    | HF Resistant                                                                       |
| 71                    | GPLR Flat bulb                                                                     |
|                       |                                                                                    |
| Code                  | Special Applications - valid with only standard hemi glass (optional - choose one) |
| 301                   | Low ionic strength water                                                           |
| 302                   | Heavy reference poisoning ions (triple reference junction)                         |
| 303                   | High temperature spikes or Low temperature storage                                 |
| 399VP                 | 09 EXAMPLE                                                                         |

| MODEL 399VP ORP SENSOR |                                                                                           |
|------------------------|-------------------------------------------------------------------------------------------|
| Code                   | Required Selection                                                                        |
| 33                     | ORP sensor (Pt100 RTD) for Models 54e, 1055, 1054A/B, 2081, 81, 3081, 4081, 5081, and Xmt |
| 399VP                  | 33 EXAMPLE                                                                                |

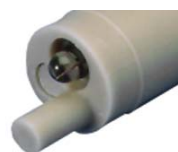
## ACCESSORIES

|          |                                                                           |
|----------|---------------------------------------------------------------------------|
| PN       | Mating VP Connector Cable (required for all new installations)            |
| 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 |



**Variopol connector** shown with mating variopol cable receptacle

### Examples of pH sensing tip offerings



**Standard Hemi Bulb Tip**



**Optional Flat Bulb Tip**

**FOR FIRST TIME 399 OR 399VP\* INSTALLATIONS, WE RECOMMEND USING THE FOLLOWING GUIDE:**

**1. Mounting Accessories (optional)**

PN 23242-02, Mounting adapter kit, 1/2 in. MNPT process connection, 1 in. x 3/4 in. sensor adapter  
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, Acrylic low flow cell  
PN 2002011, 1-1/2 in. CPVC tee with 1-in. FNPT connection  
PN 9320057, Pipe mount union, 1 in. x 1 in. PVC  
PN 11275-01, Sensor handrail assembly  
PN 1000857, Handrail mounting kit (pipe and sensor coupling supplied by others)

**2. Junction Boxes (optional)**

**Remote Junction Boxes** (to extend sensor to analyzer distances)

PN 23555-00, includes preamplifier for Models 54e, 81, 3081, 4081, 5081, and Xmt  
PN 22719-02, NEMA 4X, Weatherproof junction box for cable extension  
PN 23309-03, use with 1181 and 1050 compatible preamplifier  
PN 23309-04, use with 1054A/B, 2081 compatible preamplifier

**3. Preamplifiers (used to amplify signal when mounting sensor further than 15 ft from the analyzer)**

PN 22698-02, Plug in preamplifier, 1181/1050 compatible (use with junction box PN 23309-03)  
PN 22698-03, Plug in preamplifier, 1054/1054A/1054B/2081 compatible (use with junction box PN 23309-04)

**4. Extension cables (used with remote junction boxes)**

PN 23646-01, 11 conductor cable, shielded, prepped  
PN 9200000, 4 conductor cable, shielded, unprepped

**5. Other optional accessories**

PN 12707-00, Jet spray cleaner  
PN 2001492, Stainless steel tag, specify marking (formerly Code -11)  
PN 9210012, Buffer solution, 16 oz, 4.01 pH  
PN 9210013, Buffer solution, 16 oz, 6.86 pH  
PN 9210014, Buffer solution, 16 oz, 9.18 pH  
PN R508-16OZ, Standard, 474 mV, 16 oz, (for ORP only)

\* Also requires mating  
VP cable — see 399VP  
Ordering Information.



Tee PN 915240-03, -04, or -05. Tee is available with 3/4 in., 1 in., or 1-1/2 in. NPT process connection threads.



Side view of Tee PN 915240-03, -04, or -05 with Model 399 or 399VP shown in middle of process flow.



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2400 Barranca Parkway  
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Tel: (949) 757-8500  
Fax: (949) 474-7250  
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