

Rosemount™ 389/389VP

General Purpose pH/ORP Sensors



Dependable pH/ORP measurements to solve your process needs

Rosemount 389/389VP sensors are suitable for use in a wide variety of applications. Reliably measure pH or oxidation/reduction potential of aqueous solutions in pipelines, open tanks, and ponds. These sensors are ideal for use in process solutions containing poisoning ions.

Overview

Reliability meets robustness.

- A triple junction reference prolongs sensor life and protects against poisoning ions, such as ammonia, chlorine, cyanides, and sulfides.
- Enhanced performance and increased life with cracking resistant glass.
- Available with a glass electrode option for high pH applications.
- Superior chemical resistance provided by a rugged Tefzel® body with Viton® O-rings.

Ease of installation.

- The molded sensor body features 1-in. (25,4 mm) MNPT front and rear facing process connections for insertion, submersion, and flow-through applications.
- Variopol (VP8) cable connection option, for quick cable-to-sensor release, eliminates cable twisting (Rosemount™ 389VP).

Maintenance made simple.

- Automatic recognition of pH sensors by Rosemount transmitters: 56, 1056, 1057, and 1066 with integral SMART preamplifier.
- pH calibration data is stored, which allows sensors to be calibrated in advance for "plug and play" installations in the field.

Ordering information

The Rosemount 389 and 389VP General Purpose pH/ORP Sensors are housed in a molded Tefzel® body with 1-in. (25,4 mm) MNPT forward and rear facing threads suitable for insertion, submersion, or flow through installation.

The sensors can be configured with a general purpose pH, high pH, or platinum ORP electrode. Emerson offers the sensors with SMART preamplifiers for pH measurements and standard integral parameters for ORP measurements. These sensors may be configured without a preamplifier, but must be used with a remote preamplifier (junction box or transmitter). Automatic temperature compensation is standard. The sensors are available with either an integral cable connection (Rosemount 389) or Variopol (VP8) connector (Rosemount 389VP).

Table 1: Rosemount 389 Ordering Information

| Option | Description |
|---------------------------|---|
| 389 | pH/ORP sensor |
| Preamplifier cable | |
| 01 | Integral preamplifier, 25-ft. (7,6 m) cable |
| 02 | No preamplifier, 15-ft. (4,6 m) cable |
| 03 | Integral preamplifier, 33-ft. (10 m) cable |

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Table 1: Rosemount 389 Ordering Information (continued)

| Option | Description |
|--|--|
| 04 | Integral preamplifier, 50-ft. (15 m) cable |
| 05 | Integral preamplifier, 66-ft. (20 m) cable |
| 06 | Integral preamplifier, 100-ft. (30,5 m) cable |
| 07 | No preamplifier, 4-ft. (1,3 m) cable |
| 08 | No preamplifier, 10-ft. (3 m) cable |
| Combination electrode | |
| 10 | pH: general purpose low resistivity glass |
| 11 | pH: high pH glass |
| 12 | Oxidation reduction potential (ORP) |
| Transmitter/thermocouple compatibility | |
| 54 | For Rosemount 1054A/B, 81, and 2081, use -01 or -02. For Rosemount 56, 1056, 1057, 1066, and 5081, use codes -02, -07, and -08 only. |
| 55 | For Rosemount 56, 1056, 1057, 1066, and 5081, use codes -01, -03, -04, -05, and -06 only. |
| Optional | |
| – | No selection |
| 62 | Cable without BNC for Rosemount 56, 1056, 1066, 1057, and 5081 (Codes -02, -07, -08, and -54 only) |
| Calibration and conformance certificates - optional level | |
| CC | Certificate of Calibration (no test data given) |
| LC | Loop Calibration Certificate (sensor and transmitter calibrated together with test data) |
| EC | Electronic Calibration Certificate (Sensor calibrated against factory instrument with test data) |

Note

The Rosemount 389 pH/ORP Sensor is housed in a molded TEFZEL body with 1-in. (25,4 mm) MPT threads suitable for insertion, submersion, or flow-through installation. The sensor includes a general purpose pH or high pH electrode or platinum ORP electrode with a triple junction gel filled reference cell. Automatic temperature compensation is standard with the Rosemount 389pH, but is not required on the Rosemount 389ORP.

Table 2: Rosemount 389VP Ordering Information

| Option | Description |
|---|--|
| Combination electrode | |
| 10 | pH - general purpose low resistivity glass |
| 11 | pH - high pH glass |
| 12 | ORP |
| Transmitter/thermocouple compatibility | |
| 54 | For Rosemount 1056, 1057, 1066, 56, and 5081 (Pt-100 TC) |
| 55 | For Rosemount 1056, 1057, 1066, 56, and 5081 (-70 option only) |

Table 2: Rosemount 389VP Ordering Information (continued)

| Option | Description |
|--|---|
| Preamplifier option | |
| – | No preamplifier |
| 70 | SMART preamplifier (must choose -55 on Level 2. Not allowed with options -12 or -54.) |
| Calibration and conformance certificates - optional level | |
| CC | Certificate of Calibration (no test data given) |
| LC | Loop Calibration Certificate (sensor and transmitter calibrated together, with test data) |
| EC | Electronic Calibration Certificate (sensor calibrated against factory instrument, with test data) |

Note

The Rosemount 389VP pH/ORP Sensor is housed in a molded Tefzel body with 1-in. (25,4 mm) MNPT threads suitable for insertion submersion or flow-through installation. The sensor includes a general purpose pH or high pH electrode or a platinum ORP electrode with a triple junction gel filled reference cell. Automatic temperature compensation is standard for pH, but is not required for ORP. VP8 cable assembly works with both VP6 and VP8 sensor connector.

Specifications

Table 3: Percent Linearity over pH Range

| pH range | GPLR glass (-10) | High pH glass (-11) |
|-------------|------------------|---------------------|
| 0 to 2 pH | 94% | 94% |
| 2 to 12 pH | 99% | 97% |
| 12 to 13 pH | 97% | 98% |
| 13 to 14 pH | 92% | 98% |

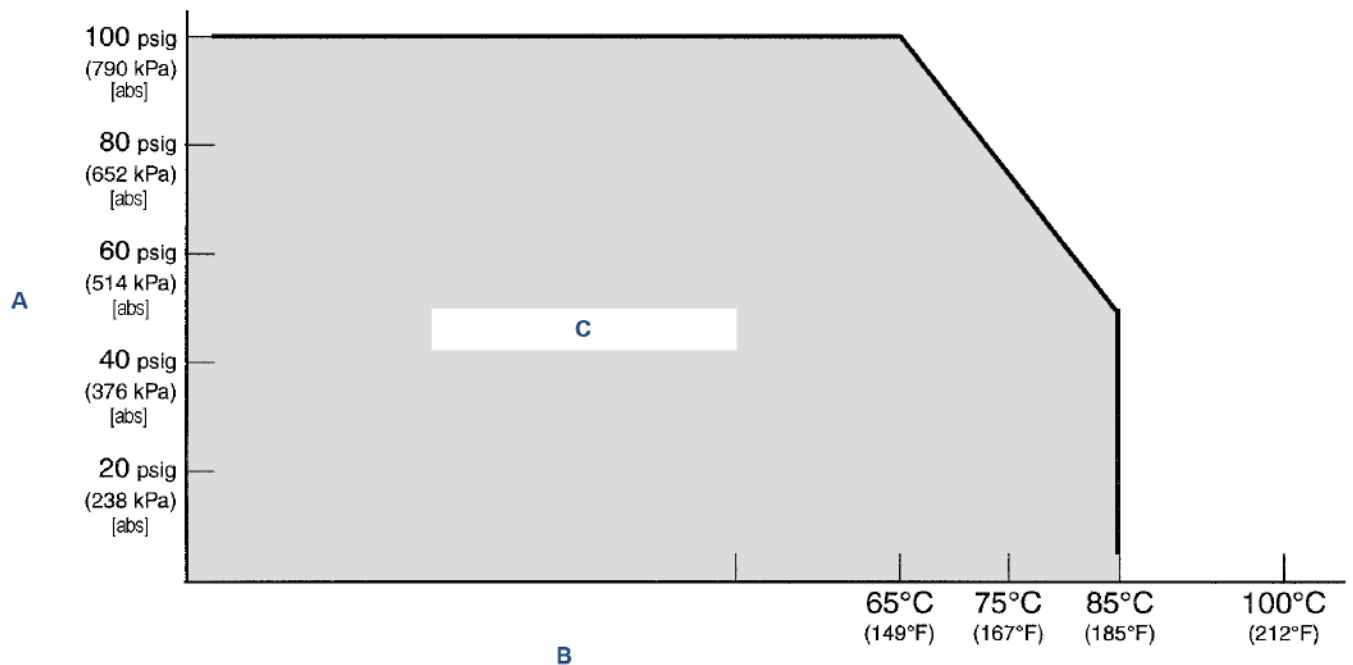
Table 4: Sensor Specifications

| | |
|--|-------------------|
| Measurement range | |
| pH | 0 to 14 |
| ORP | -1500 to +1500 mV |
| Temperature range | |
| 32 to 185 °F (0 to 85 °C) | |
| Automatic temperature compensation : 32 to 185 °F (0 to 85 °C) | |
| Maximum pressure | |
| 100 psig (790 kPa[abs]) at 150 °F (65 °C) - see Figure 1 | |
| Materials of construction | |
| Sensor body | Tefzel® |
| pH electrode | Glass |

Table 4: Sensor Specifications (continued)

| | |
|----------------------------------|---|
| ORP electrode | Platinum |
| Junction | Ceramic |
| O-ring | Viton® |
| Process connections | |
| Front facing | 1-in. MNPT |
| Rear facing | 1-in. MNPT |
| Cable | |
| 389 | Various lengths from 4 to 100 ft. (1,2 to 30,5 m). Maximum length of 15 ft. (4,6 m) for sensors without a preamplifier. |
| 389VP | Use 24281-XX, 2.5 ft. (0,8 m) to 100 ft. (30,5 m) (see Accessories) |
| Weight/shipping weight | |
| 1 lb. / 2 lb. (0,45 kg / 0,9 kg) | |

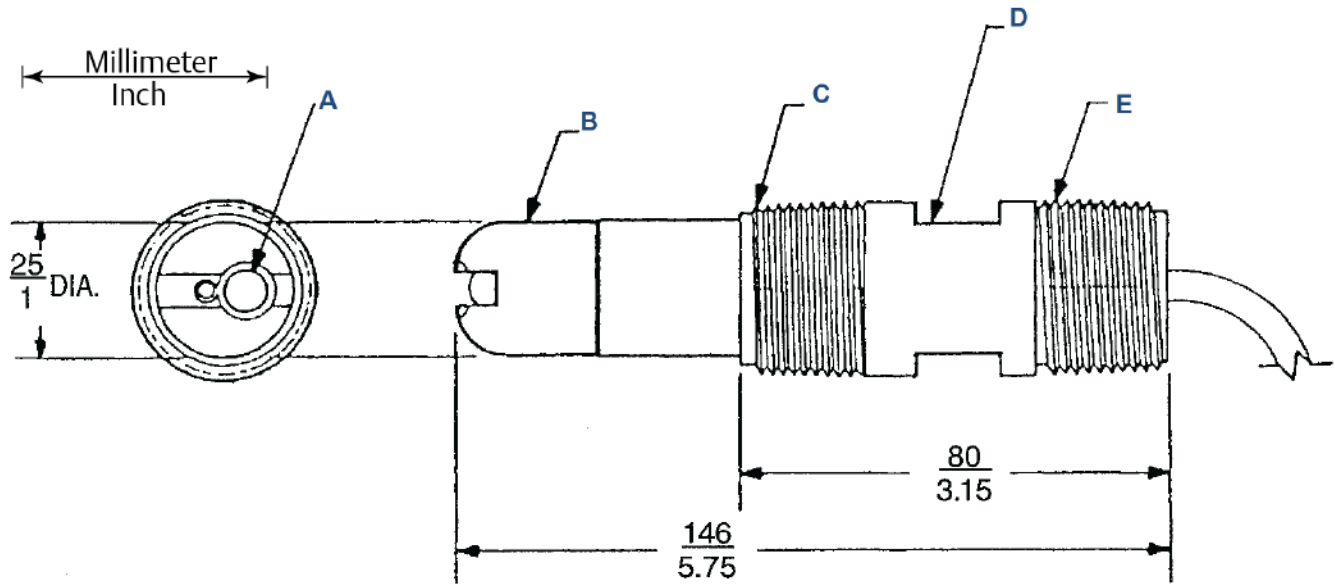
Figure 1: Pressure/Temperature Operating Range



- A. Pressure
- B. Temperature
- C. Operating range

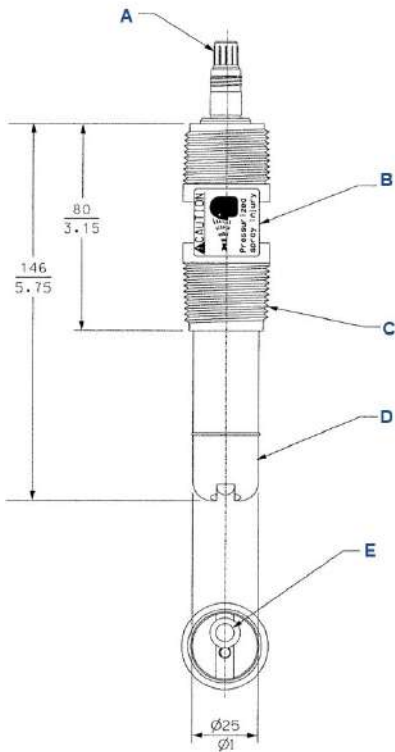
Dimensional drawings

Figure 2: Rosemount™ 389 with Integral Cable Connection



- A. pH/ORP electrode
- B. Thermocouple
- C. 1-in. MNPT
- D. 1-in. wrench opening
- E. 1-in. MNPT

Figure 3: Rosemount 389VP with Variopol Cable Connection

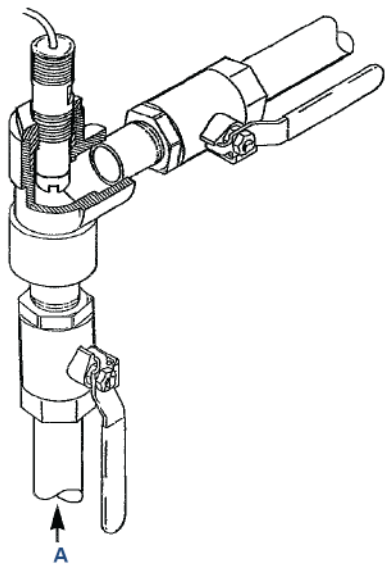


- A. VP (Variopol connection)
- B. 1-in. wrench opening
- C. Two 1-in. MNPT
- D. Thermocouple
- E. pH/ORP electrode

Note

Valves and fittings by others. Mount the sensor at least 10 degrees from horizontal.

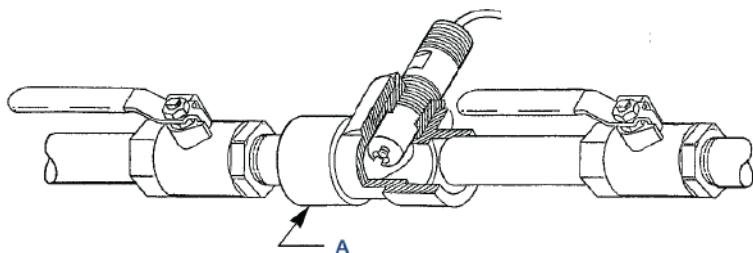
Figure 4: Angle Flow



1 1/2-in. pipe tee PN 2002011

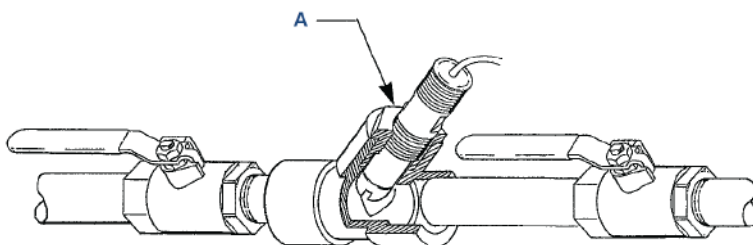
A. Flow

Figure 5: Straight Flow



A. 1 1/2-in. pipe tee PN 2002011

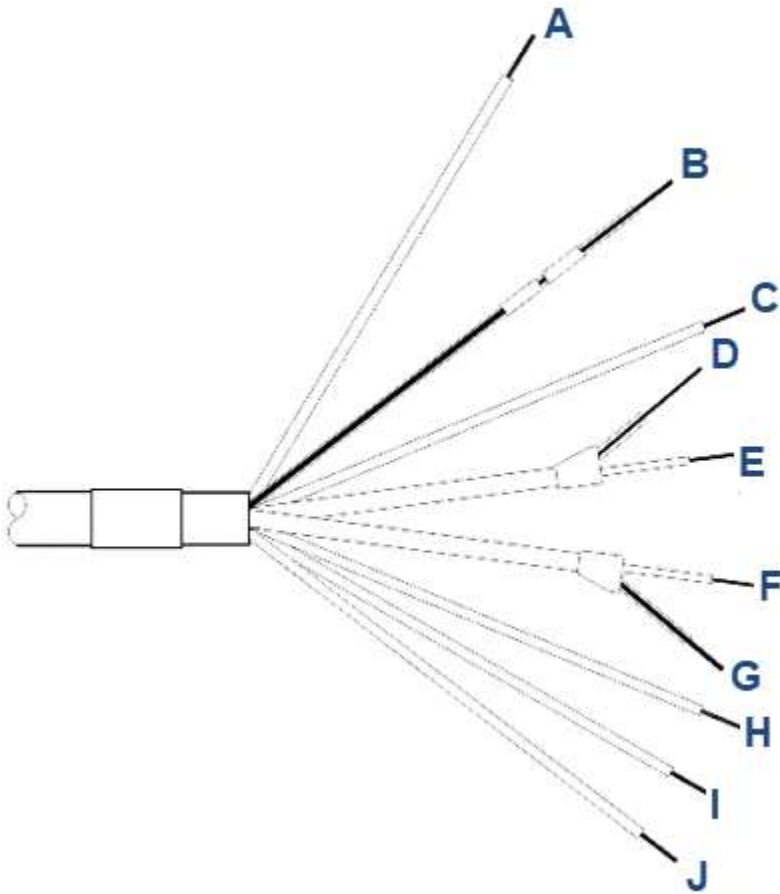
Figure 6: Pipe "Y" Installation



1 1/2-in. pipe "Y"

A. 1 1/2-in. by 1-in. reducing bushing

Figure 7: VP8 Cable, Instrument End



- A. Green: earth ground
- B. ID, clear
- C. Blue: solution ground
- D. Clear
- E. Gray: reference in
- F. Orange: pH/mV in
- G. Clear: pH/mV shield
- H. White: resistance temperature device return
- I. White/red: resistance temperature device sense
- J. Red: resistance temperature device in

Figure 8: VP8 Cable, Sensor End

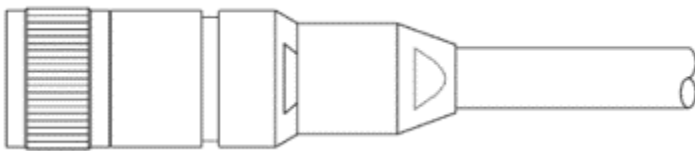
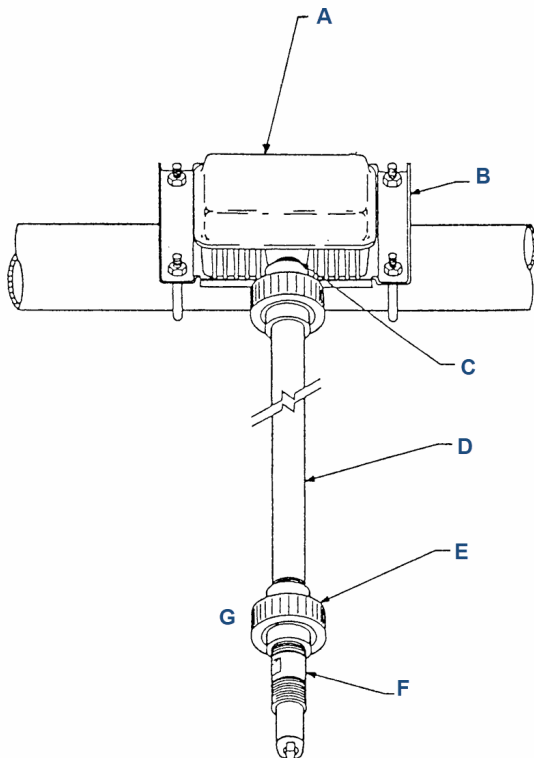


Figure 9: Submersion Installation: Junction Box and Pipe Mounting Accessory

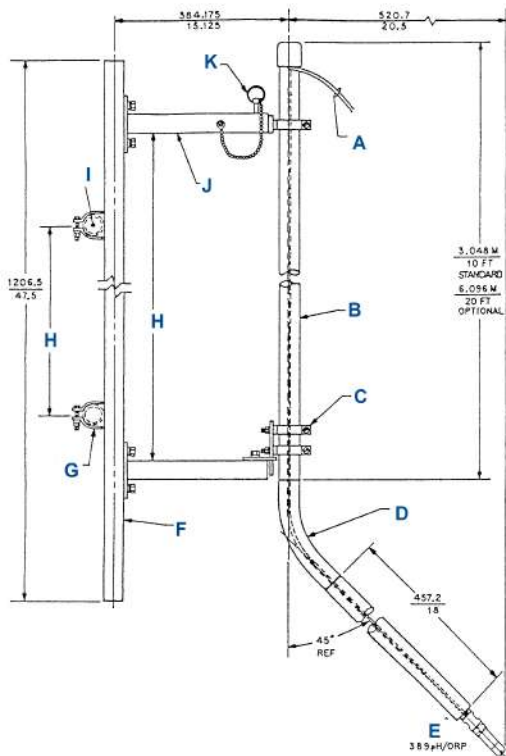


- A. NEMA 4X junction box.
PN 23550-00: junction box with extension board.
PN 23555-00: junction box with internal preamplifier.
- B. 2-in. pipe mounting bracket, PN 2002565.
- C. Flexible conduit if required.
- D. 1-in. pipe by others.
- E. 1-in. FNPT CPVC union, PN 9320057.
- F. Rosemount 389.
- G. Regularly check to make sure connections are water tight.

Note

Unless otherwise specified.

Figure 10: Submersion Installation: Handrail Mounting Accessory (PN 11275-01)



- A. Sensor cable.
- B. 1½-in. PVC pipe schedule 80.
- C. 1½-in. pipe clamp, three places.
- D. 45 degree sweep ell extension pipe.
- E. Regularly check to make sure connections are water tight.
- F. Unistrut 1⅝-in. by 1⅝-in. aluminum.
- G. 1½-in. pipe clamp, two places.
- H. Can be any convenient dimension.
- I. Customer handrail, two places.
- J. Mounting channel aluminum, two places.
- K. Locking pin with bead chain.

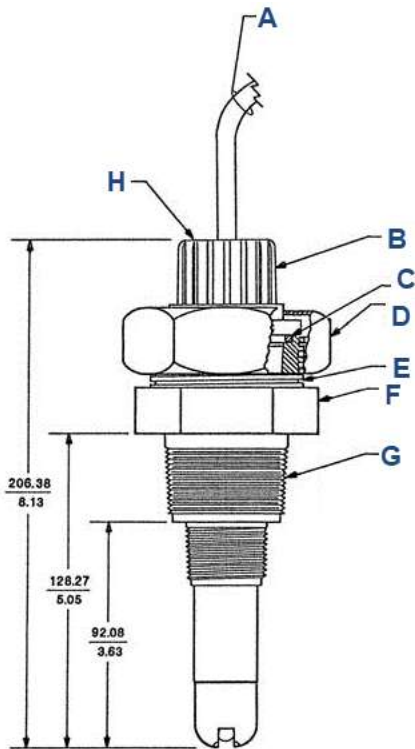
Note

Unless otherwise specified.

Figure 11: Rosemount 389 with Insertion Adapter Photo



Figure 12: Rosemount 389 with Insertion Adapter (PN 23242-02) Dimensional Drawing



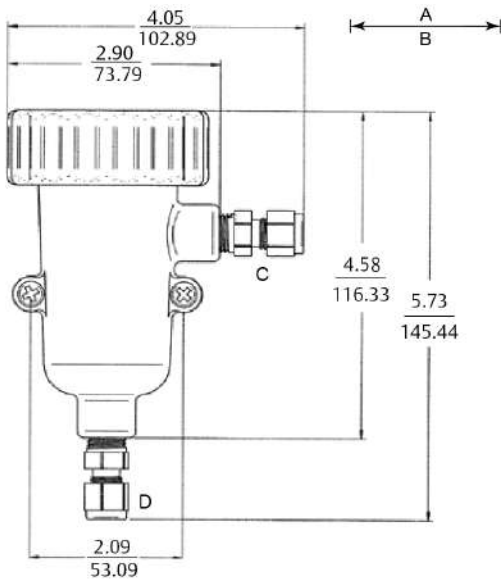
Insertion mounting adapter PN 23242-02 (includes PEEK adapter, 304 stainless steel union fitting).

- A. Cable
- B. PEEK adapter, 1-in. FNPT by 1-in. FNPT (reversible)
- C. 2-135 Viton O-ring⁽¹⁾
- D. Nut, hex union 2-in.
3-in. wrench opening (304 stainless steel)
- E. 2.531.8 Acme thread (typ)
- F. Neck, union fitting (316 stainless steel)
2 $\frac{5}{8}$ -in. wrench opening.
- G. 1 $\frac{1}{2}$ -in. MNPT
- H. $\frac{3}{4}$ -in. FNPT

The insertion adapter mounts the sensor into a 1 $\frac{1}{2}$ -in. NPT process pipe. Unscrewing the hex nut allows easy sensor removal without twisting the sensor cable.

(1) O-ring must be in place prior to use (PN 9550175).

Figure 13: Low Flow Cell (PN 24091-00)



- A. Inches
- B. Millimeters
- C. Outlet
- D. Inlet

Inlet and outlet connections are stainless steel and take ¼-in. OD tubing. Flow cell is polycarbonate with ¼-in. FNPT fittings.

Table 5: Low Flow Cell Specifications (PN 24091-00)

| Wetted materials | |
|-----------------------------------|---|
| Body and nut | Polyester/polycarbonate |
| Fittings | 316 stainless steel |
| Seals | Silicone |
| Flow cell ratings | |
| Temperature | 32 to 158 °F (0 to 70 °C) |
| Maximum pressure | 90 psig (721 kPa [abs]) |
| Flow rate | 2 to 5 gallons per hour (7,6 to 18,9 liters per hour) |
| Sensor threaded connection | |
| 1-in. NPT adapter | |

Accessories

Table 6: Connector Cable (Required for all First Time Installations of Rosemount 389VP)

| Part number | Description |
|--------------------|---------------------------|
| 24281-00 | 15-ft. (4,6 m) VP8 cable |
| 24281-01 | 25-ft. (7,6 m) VP8 cable |
| 24281-02 | 2.5-ft. (7,6 m) VP8 cable |

Table 6: Connector Cable (Required for all First Time Installations of Rosemount 389VP) (continued)

| Part number | Description |
|-------------|----------------------------|
| 24281-03 | 50-ft. (15,2 m) VP8 cable |
| 24281-04 | 100-ft. (30,5 m) VP8 cable |
| 24281-05 | 4-ft. (1,2 m) VP8 cable |
| 24281-06 | 10-ft. (3 m) VP8 cable |
| 24281-07 | 20-ft. (6,1 m) VP8 cable |
| 24281-08 | 30-ft. (9,1 m) VP8 cable |

Table 7: Extension Cables (Requires a Remote Junction Box)

| Part number | Description |
|-------------|--|
| 23646-01 | Extension cable, 11 conduit, shielded, prepped, per foot |
| 9200273 | Extension cable, 11 conduit, shielded, unprepped, per foot |

Table 8: Mounting Assemblies

| Part number | Description |
|-------------|--|
| 11275-01 | Handrail mounting assembly |
| 2002011 | CPVC flow-through tee, 1½-in. NPT process connection |
| 24091-00 | Cell, low flow ¼-in. inlet and outlet |
| 915240-03 | Tee, flow-through, 2-in. PVC, ¾-in. NPT |
| 915240-04 | Tee, flow-through, 2-in. PVC, 1-in. NPT |
| 915240-05 | Tee, flow-through, 2-in. PVC, 1½-in. NPT |

Table 9: Remote Junction Boxes

| Part number | Description |
|-------------|--|
| 2002565 | Mounting bracket kit |
| 23555-00 | Junction box, Rosemount 54/5081/1055/XMT compatible preamplifier |

Table 10: Other Accessories

| Part number | Description |
|-------------|--|
| 12707-00 | Jet spray cleaner |
| 23242-02 | Mounting adapter, 1½-in. insertion, 1-in. by ¾-in. |
| 9120516 | BNC adapter |
| 9210012 | Buffer solution, pH 4.01, 16 oz. (453,6 g) |
| 9210013 | Buffer solution, pH 6.86, 16 oz. (453,6 g) |
| 9210014 | Buffer solution, pH 9.18, 16 oz. (453,6 g) |
| 9320057 | Union, PVC |
| R508-8OZ | ORP standard, 475 mV, 8 oz. (226,8 g) |

Table 11: Spare Parts

| Part number | Description |
|--------------------|--|
| 33081-00 | Adapter insert, PEEK, 1 by $\frac{3}{4}$ -in. for 23242-02 |
| 33946-00 | Shroud, 399/396P |
| 9200254 | Cable, 4 conduit, 22 AWG, 2 shielded pair, per foot |
| 2001492-00 | Tag (label one hole, blank stainless steel) |
| 2001492-01 | Tag (label two holes, blank stainless steel) |

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