

Rosemount™ 3900/3900VP

General Purpose pH/ORP Sensors



High performance for your process pH/ORP needs

The Rosemount 3900 and 3900VP pH/ORP combination sensors are used for reliable pH or oxidation reduction potential measurements of aqueous solutions in pipelines, open tanks, or ponds. Their robust designs allow the Rosemount 3900 and 3900VP sensors to be used in a wide range of applications.

Overview

A robust sensor design



- Extended sensor life and protection against poisoning ions using a double junction reference.
- Enhanced performance and increased life with cracking resistant glass.
- Maximum chemical resistance provided by a rugged polyphenylene sulfide body.
- Operates in sub-zero temperatures down to 14 °F (-10 °C).
- Built-ins solution ground for advanced diagnostics.

Versatile installation options

- The sensor body features a one-piece construction with both front facing and rear facing process threads.
- 3/4-in. and 1-in. male national pipe thread (MNPT) process connections to meet a variety of application installation requirements.
- Variopol (VP8) cable connection option, for quick cable-to-sensor release, eliminates cable twisting.

SMART preamplifier

- Automatic recognition of pH sensors by Rosemount transmitters: 1066, 1057, 1056, and 56.
- 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 3900 and 3900VP General Purpose pH/ORP Sensors feature a chemically resistant Ryton® plastic body, along with a built-in solution ground for advanced diagnostics and a Pt-100 resistance temperature device (RTD) for temperature compensation. These sensors are available with either an integral cable connection (Rosemount 3900) or Variopol (VP8) connector (Rosemount 3900VP). Variopol cables are sold separately (see [Accessories](#)).

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Rosemount 3900 ordering information

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Note

The Rosemount 3900 pH/ORP Sensor is housed in a Ryton® plastic body with built-in solution ground for advanced diagnostics. Pt-100 is offered for a temperature compensator. The sensor is available with an integral cable. You can mount the sensor using a process connector, both ordered separately. You can also order junction box kits with preamplifiers separately if the transmitter does not have an integral preamplifier.

Model

Code	Description
3900	General Purpose pH/ORP Sensor

Preamplifier options

Code	Description
01	SMART preamplifier, 32-ft. (10 m) cable ⁽¹⁾
02	No preamplifier, 15-ft. (5 m) cable
04	SMART preamplifier, 50-ft. (15 m) cable ⁽¹⁾
05	SMART preamplifier, 66-ft. (20 m) cable ⁽¹⁾
06	SMART preamplifier, 100-ft. (30 m) cable ⁽¹⁾
07	No preamplifier, 4-ft. (1 m) cable
08	No preamplifier, 10-ft. (3 m) cable

(1) Standard preamplifier if used with oxidation reduction potential (ORP).

Measuring code

Code	Description
10	General purpose low resistivity (GPLR) pH glass (0-14 pH)
12	Platinum oxidation reduction potential (ORP)

Calibration certificates - optional level

Code	Description
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)

Rosemount 3900VP ordering information

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Model

Code	Description
3900VP	General Purpose pH/ORP Sensor with Variopol connector

Preamplifier options

Code	Description
01	SMART preamplifier ⁽¹⁾
02	No preamplifier

(1) Standard preamplifier if used with oxidation reduction potential (ORP).

Measuring code

Code	Description
10	General purpose low resistivity (GPLR) pH glass (0-14 pH)
12	Platinum oxidation reduction potential (ORP)

Calibration certificates - optional level

Code	Description
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)

Accessories

Part number	Description
11275-01	Handrail mounting assembly
12707-00	Jet spray cleaner
2002011	CPVC flow-through tee, 1½-in. national pipe thread (NPT) process connection
23242-02	Mounting adapter, 1½-in. insertion, 1 x ¾ in.
23555-00	Junction box, Rosemount 54/5081/1055/Xmt compatible preamplifier
24091-00	Cell, low flow, ¼-in. inlet and outlet
33894-00	Adapter, 1-in. NPT low flow cell
24281-00	15-ft. (4.6 m) VP8 cable
24281-01	25-ft. (7.6 m) VP8 cable
24281-02	2.5-ft. (0.8 m) VP8 cable
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
9200273	Extension cable, 11-conduit, shielded, unprepped, per foot
9210012	Buffer solution, pH 4.01, 16 oz. (473 ml)
9210013	Buffer solution, pH 6.86, 16 oz. (473 ml)
9210014	Buffer solution, pH 9.18, 16 oz. (473 ml)
00390-7101-0001	Low flow panel
R508-8OZ	Oxidation reduction potential (ORP) calibration standard 460 ± 10 mV

Specifications

Table 1: Percent Linearity over pH Range

pH range	Linearity
0-7	97%
1-7	98%
4-7	98%
7-10	99%
7-12	97%
7-13	96%
7-14	95%

Table 2: Rosemount 3900/3900VP pH/ORP Sensor Specifications

Measurement range	
pH	0 to 14
Oxidation reduction potential (ORP)	-1500 to +1500 mV
Operating temperature	
14 to 212 °F (-10 to 100 °C), automatic temperature compensation from 14 to 212 °F (-10 to 100 °C)	
Maximum pressure	
100 psig (790 kPa) at 212 °F (100 °C) CRN rating: 60 psig up to 212 °F (100 °C)	
Materials of construction	
Sensor body	Ryton®: polyphenylene sulfide (PPS)
O-ring	EPDM
pH electrode	Glass
ORP electrode	Glass, platinum
Solution ground	Stainless steel
Reference junction	PTFE
Conductivity	
Responds to changes in pH at a minimum conductivity of 0.1 μS/cm when used with the low flow panel. The sample flow rate must be controlled to 2 gallons per hour (7.61 liters per hour).	
Process connection	
Front facing	¾-in. and 1-in. male national pipe thread (MNPT)
Rear facing	1-in. MNPT
Temperature compensation	
Pt-100	

Table 2: Rosemount 3900/3900VP pH/ORP Sensor Specifications (continued)

Cable	
3900	Various cable lengths (see Preamplifier options) with integral preamplifier; 15-ft. (4.6 m) and less without preamplifier
3900VP	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)	

Rosemount pH/ORP sensor(s) product certifications

Rev 0.5

European directive information

A copy of the EU Declaration of Conformity can be found at the end of the Quick Start Guide. The most recent revision of the EU Declaration of Conformity can be found at Emerson.com/Rosemount.

Ordinary location certification

As standard, the transmitter has been examined and tested to determine that the design meets the basic electrical, mechanical, and fire protection requirements by a nationally recognized test laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

Installing equipment in North America

The US National Electrical Code® (NEC) and the Canadian Electrical Code (CEC) permit the use of Division marked equipment in Zones and Zone marked equipment in Divisions. The markings must be suitable for the area classification, gas, and temperature class. This information is clearly defined in the respective codes.

USA

FM Intrinsic Safety

Certificate	FM17US0198X
Standards	FM Class 3600:1998, FM Class 3610:2010, FM Class 3611: 2004, FM Class 3810: 2005
Markings	IS/I,II,III/1/ABCDEFG/T6 Ta = -20 °C to 60 °C I/0/AEx ia IIC/T6 Ta = -20 °C to 60 °C NI/I/2/ABCD/T6 Ta = -20 °C to 60 °C S/II,III/2/EFG/T6 Ta = -20 °C to 60 °C

Specific Conditions for Safe Use (X):

1. Sensors with Model 1700702 preamplifier:
 - a. Model 385+-a-b-c. Triple junction pH/ORP sensor

- b. Model 389-a-b-c-d-e. pH/ORP sensor
- c. Model 389VP-a-b-c-d. pH/ORP sensor
- d. Model 396VP-a-b-c-d. Submersion/insertion pH/ORP sensor
- e. Model 396P-a-b-c-d-e. Submersion/insertion pH/ORP sensor
- f. Model 396PVP-a-b-c-d-e. Submersion/insertion pH/ORP sensor
- g. Model 396RVP-a-b-c-d-e. Retraction/submersion/insertion pH/ORP sensor
- h. Model 398RVP-a-b-c-d-e-f. pH/ORP sensor
- i. Model 3200HP-00. High purity water pH sensor
- j. Model 3300HTVP-a-b-c-d. High performance pH and ORP sensor
- k. Model 3400HTVP-a-b-c-d-e. High performance pH and ORP sensor
- l. 3500P-a-b-c-d-e-f. High performance pH and ORP sensor
- m. 3500VP-a-b-c-d-e-f. High performance pH and ORP sensor
- n. Model 3900-a-b-c. General purpose pH/ORP sensor
- o. Model 3900VP-a-b. General purpose pH/ORP sensor

The polymeric surface of all the apparatus listed above may store electrostatic charge and become a source of ignition. Clean surface should only be done with a damp cloth.

- 2. Sensors without Model 1700702 preamplifier (simple apparatus):
 - a. Model 385-a-b-c-d-e. Retractable pH/ORP sensor
 - b. Model 385+-a-b-c Triple junction pH/ORP sensor
 - c. Model 389-a-b-c-d-e. pH/ORP sensor
 - d. Model 389VP-a-b-c. pH/ORP sensor
 - e. Model 396-a-b-c. Submersion/insertion pH sensor
 - f. Model 396VP-a-b. Submersion/insertion pH sensor
 - g. Model 396P-a-b-c-d-e. Submersion/insertion pH/ORP sensor
 - h. Model 396PVP-a-b-c-d. Submersion/insertion pH/ORP sensor
 - i. Model 396R-a-b-c-d-e. Retraction/submersion/insertion pH/ORP sensor
 - j. Model 396RVP-a-b-c-d. Retraction/submersion/insertion pH/ORP sensor
 - k. Model 397-a-b-c-d-e. pH sensor
 - l. Model 398-a-b-c-d-e. pH/ORP sensor
 - m. Model 398VP-a-b-c. pH/ORP sensor
 - n. Model 398R-a-b-c-d-e-f. pH/ORP sensor
 - o. Model 398RVP-a-b-c-d-e-f. pH/ORP sensor
 - p. Model 3200HP-00. High purity water pH sensor
 - q. Model 3300HT-a-b-c-d. High performance pH and ORP sensor
 - r. Model 3300HTVP-a-b-c-d. High performance pH and ORP sensor
 - s. Model 3400HT-a-b-c-d-e-f. High performance pH and ORP sensor
 - t. Model 3400HTVP-a-b-c-d-e-f. High performance pH and ORP sensor
 - u. Model 3500P-a-b-c-d-e-f. High performance pH and ORP sensor

- v. Model 3500VP-a-b-c-d-e-f. High performance pH and ORP sensor
- w. Model 3800-a. Autoclaveable and steam sterilizable pH sensors
- x. Model 3800VP-a. Autoclaveable and steam sterilizable pH sensors
- y. Model 3900-a-b-c. General purpose pH/ORP sensor
- z. Model 3900VP-a-b. General purpose pH/ORP sensor

The polymeric surface of all the apparatus listed above may store electrostatic charge and become a source of ignition. Clean surface should only be done with a damp cloth.

CSA Intrinsic Safety

Certificate 70164066

Standards C22.2 No 0-10, C22.2 No 0.4-M2004, C22.2 No 94-M1991, C22.2 No 142 – M1987, C22.2 No 157-M1992, CAN/CSA E60079-0:07, CAN/CSA E60079-11:02, UL 50-11th Ed, UL 508-17th Ed, UL 913-7th Ed, UL 60079-0: 2005, UL 60079-11: 2002

Markings Preamplifier assembly:
Class I, Division 1, Groups ABCD; Class II, Division 1, Groups EFG; Class III; Class I, Division 2, Groups ABCD; ambient temperature rating –20 °C to +60 °C; Ex ia IIC; T6: Class I, Zone 0, AEx ia IIC ; T6

Sensor apparatus with preamplifier:
Class I, Division 1, Groups ABCD; Class II, Division 1, Groups EFG; Class III; Class I, Division 2, Groups ABCD; ambient temperature rating –20 °C to +60 °C; Ex ia IIC; T6: Class I, Zone 0, AEx ia IIC ; T6

Sensor apparatus:
Class I, Division 1, Groups ABCD; Class II, Division 1, Groups EFG; Class III; Class I, Division 2, Groups ABCD; Ex ia IIC; T6; ambient temperature rating –20 °C to +60 °C: (simple apparatus)

Canada

CSA Intrinsic Safety

Certificate 70164066

Standards C22.2 No 0-10, C22.2 No 0.4-M2004, C22.2 No 94-M1991, C22.2 No 142 – M1987, C22.2 No 157-M1992, CAN/CSA E60079-0:07, CAN/CSA E60079-11:02, UL 50-11th Ed, UL 508-17th Ed, UL 913-7th Ed, UL 60079-0: 2005, UL 60079-11: 2002





Markings Preamplifier assembly:
Class I, Division 1, Groups ABCD; Class II, Division 1, Groups EFG; Class III; Class I, Division 2, Groups ABCD; ambient temperature rating –20 °C to +60 °C; Ex ia IIC; T6: Class I, Zone 0, AEx ia IIC ; T6

Sensor apparatus with preamplifier:
Class I, Division 1, Groups ABCD; Class II, Division 1, Groups EFG; Class III; Class I, Division 2, Groups ABCD; ambient temperature rating –20 °C to +60 °C; Ex ia IIC; T6: Class I, Zone 0, AEx ia IIC ; T6

Sensor apparatus:
Class I, Division 1, Groups ABCD; Class II, Division 1, Groups EFG; Class III; Class I, Division 2, Groups ABCD; Ex ia IIC; T6; ambient temperature rating –20 °C to +60 °C: (simple apparatus)

Europe

ATEX Intrinsic Safety

Certificate	Baseefa10ATEX0156
Standards	EN 60079-0: 2012+A11: 2013, EN 60079-11: 2012
Markings	<p>pH/ORP sensors with no preamplifier fitted  II 1 G Ex ia IIC T4 Ga (-20 °C to +60 °C)</p> <p>pH sensors with integral smart preamplifier fitted  II 1 G Ex ia IIC T4 Ga (-20 °C to +60 °C)</p> <p>ORP sensors with integral standard preamplifier fitted  II 1 G Ex ia IIC T4 Ga (-20 °C to +80 °C) Ex ia IIC T5 Ga (-20 °C to +40 °C)</p> <p>pH sensors with integral standard preamplifier fitted  II 1 G Ex ia IIC T4 Ga (-20 °C to +80 °C) Ex ia IIC T5 Ga (-20 °C to +40 °C)</p>

Specific Conditions for Safe Use (X):

1. All pH/ORP sensor models with a plastic enclosure or exposed plastic parts may provide an electrostatic ignition hazard and must only be cleaned with a damp cloth to avoid the danger of ignition due to build-up of electrostatic charge.
2. All pH/ORP sensor models with a metallic enclosure may provide a risk of ignition by impact or friction. Care should be taken during installation to protect the sensor from the risk.
3. External connections to the sensor must be suitably terminated and provide a degree of protection of at least IP20.
4. All pH/ORP sensor models are intended to be in contact with the process fluid and may not meet the 500V r.m.s. test to earth. This must be taken into consideration at installation.

International

IECEx Intrinsic Safety

Certificate	IECEx BAS 10.0083X
Standards	IEC 60079-0: 2011, IEC 60079-11: 2011
Markings	<p>pH/ORP sensors with no preamplifier fitted Ex ia IIC T4 Ga (-20 °C to +60 °C)</p> <p>pH sensors with integral smart preamplifier fitted Ex ia IIC T4 Ga (-20 °C to +60 °C)</p> <p>ORP sensors with integral standard preamplifier fitted Ex ia IIC T4 Ga (-20 °C to +80 °C) Ex ia IIC T5 Ga (-20 °C to +40 °C)</p> <p>pH sensors with integral standard preamplifier fitted Ex ia IIC T4 Ga (-20 °C to +80 °C) Ex ia IIC T5 Ga (-20 °C to +40 °C)</p>

Specific Conditions for Safe Use (X):

1. All pH/ORP sensor models with a plastic enclosure or exposed plastic parts may provide an electrostatic ignition hazard and must only be cleaned with a damp cloth to avoid the danger of ignition due to build-up of electrostatic charge.

2. All pH/ORP sensor models with a metallic enclosure may provide a risk of ignition by impact or friction. Care should be taken during installation to protect the sensor from the risk.
3. External connections to the sensor must be suitably terminated and provide a degree of protection of at least IP20.
4. All pH/ORP sensor models are intended to be in contact with the process fluid and may not meet the 500V r.m.s. test to earth. This must be taken into consideration at installation.

China

Nepsi Intrinsic Safety

Certificate	GYB19.1035X
Standards	GB 3836.1-2010, GB 3836.4-2010, GB 3836.20-2010
Markings	Ex ia IIC T4 Ga (-20 °C to +60 °C)

Specific Conditions for Safe Use (X):

1. It is strictly forbidden to rub the plastic shell parts of the product to prevent the risk of static ignition.
2. When the product shell contains light metals, it should be prevented in a zone 0 environment.

Technical Regulations Customs Union (EAC)

EAC Intrinsic Safety

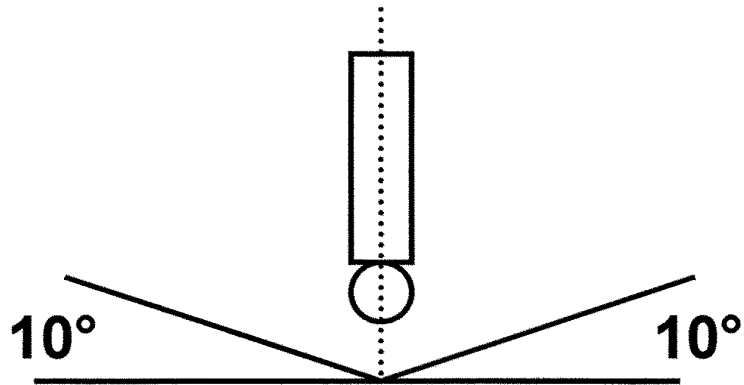
Certificate	TC RU C-US .MIO62. B.06011
Markings	pH/ORP sensors with no preamplifier fitted Ex ia IIC T4 Ga (-20 °C to +60 °C)
	pH sensors with integral smart preamplifier fitted Ex ia IIC T4 Ga (-20 °C to +60 °C)
	ORP sensors with integral standard preamplifier fitted Ex ia IIC T4 Ga (-20 °C to +80 °C)
	Ex ia IIC T5 Ga (-20 °C to +40 °C)
	pH sensors with integral standard preamplifier fitted Ex ia IIC T4 Ga (-20 °C to +80 °C)
	Ex ia IIC T5 Ga (-20 °C to +40 °C)

Specific Condition for Safe Use (X):

See certificate for special conditions.

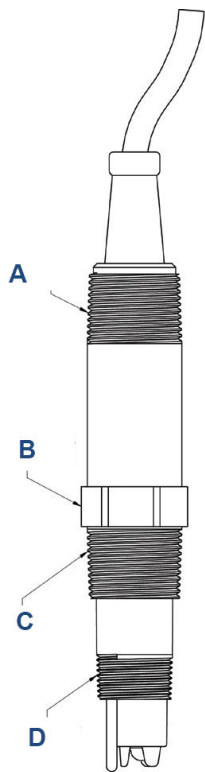
Dimensional and installation drawings

Figure 1: Proper Sensor Installation Orientation



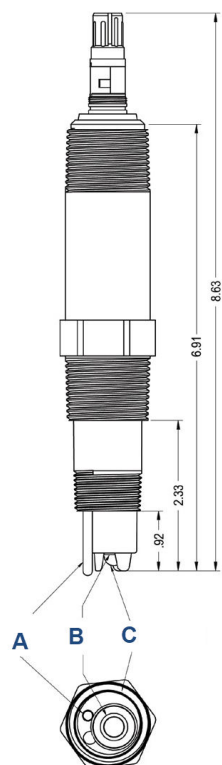
Install sensor within 80 degrees of vertical.

Figure 2: Rosemount 3900 with Integral Cable Connection



- A. 1-in. male national pipe thread (MNPT)
- B. Wrench flats, 1.30 in. across
- C. 1-in. MNPT
- D. 3/4-in. MNPT

Figure 3: Rosemount 3900VP with Variopol Cable Connection

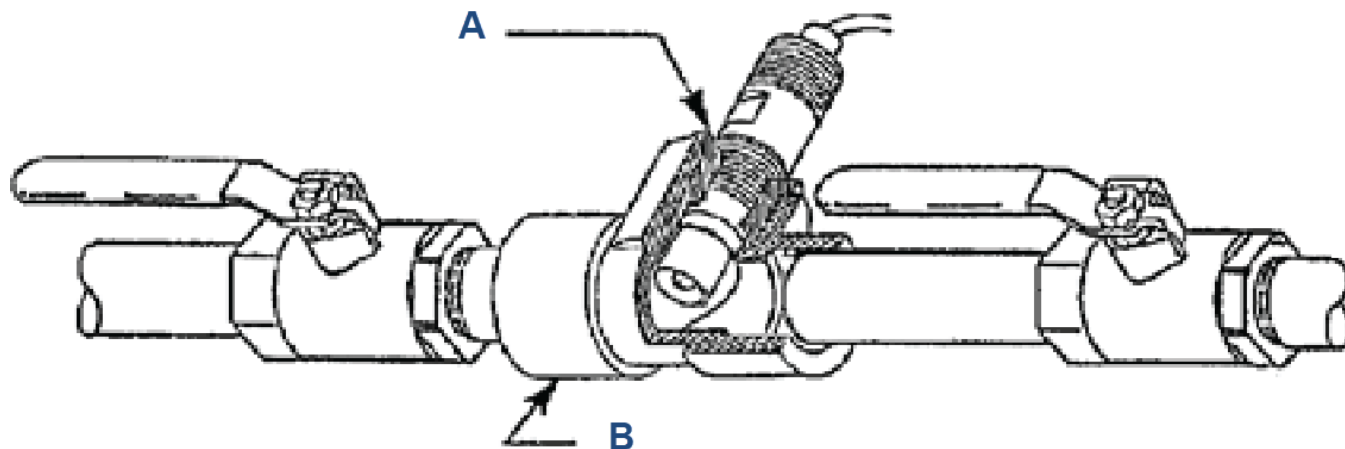


- A. *Temperature compensation solution ground*
- B. *Reference junction*
- C. *pH electrode*

Table 3: Horizontal Pipe Tee (PN 2002011) Pressure/Temperature Ratings

psig (kpa)	°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)

Figure 4: Typical Flow-through Insertion Installation using PN 2002011 Pipe Tee

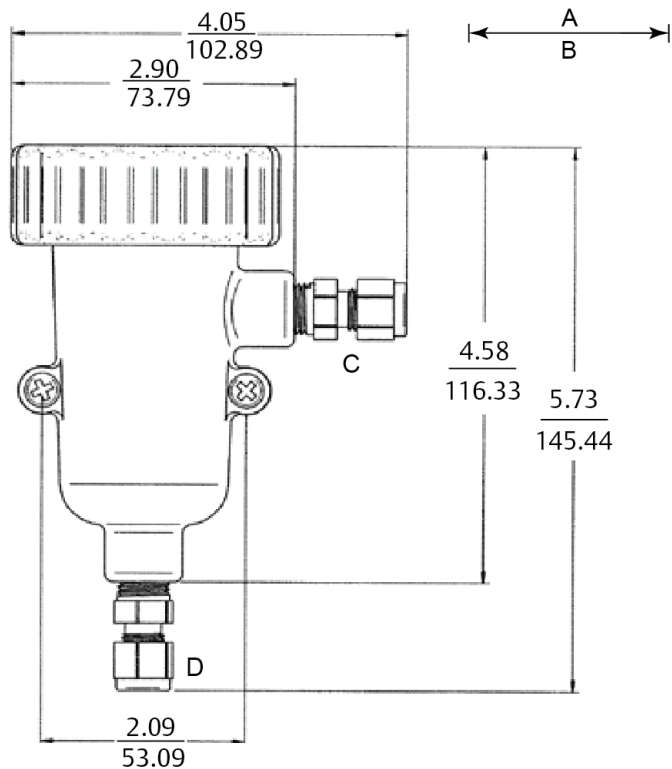


- A. 1½-in. x 1-in. reducing bushing
 B. 1½-in. pipe tee PN 2002011

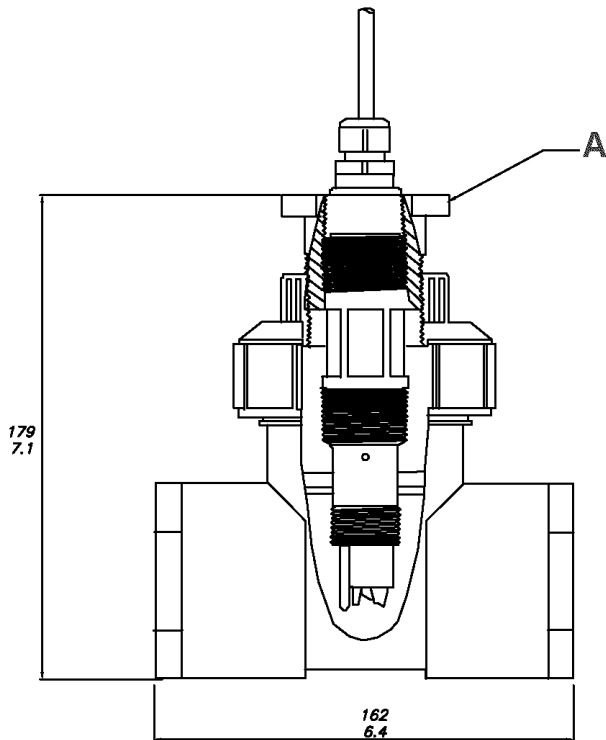
Table 4: Low Flow Cell Specifications PN 24091-00/24091-02

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)
Flow rate	2 to 5 gallons per hour (7.6 to 18.9 liters per hour)
Sensor threaded connection	
24091-00	1-in. national pipe thread (NPT) adapter
24091-02	¾-in. NPT adapter

Figure 5: Low Flow Cell (PN 24091-00)



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

Figure 6: Flow-through Tee (2-in.) (PN 914240-XX)

A. Adapter

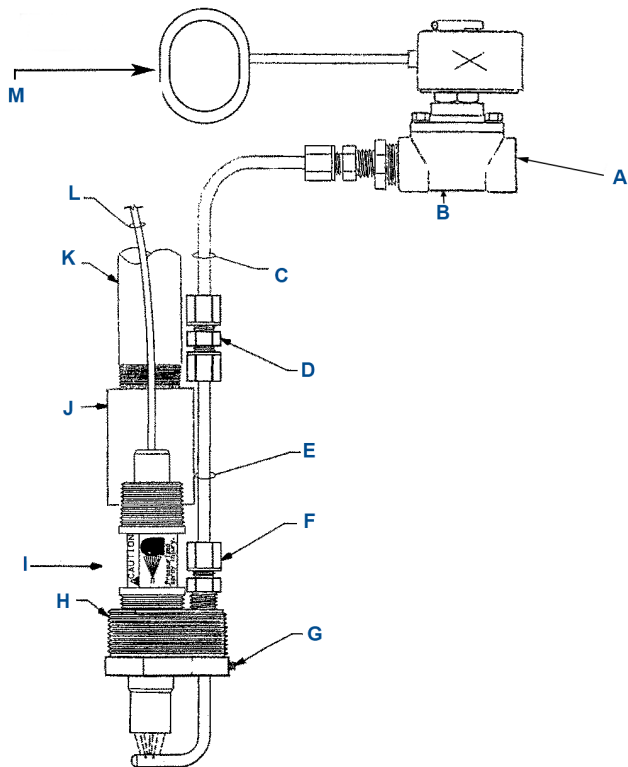
The following flow-through tees are available for the Rosemount 3900/3900VP.

- 915240-03
- 915240-04
- 915240-05

For a new installation, use the appropriate tee above and add the S10283-LQD adapter.

When replacing an existing Rosemount 399 with a Rosemount 3900 sensor, add the S10283-LQD adapter to convert the tee to accept the Rosemount 3900 sensor.

Figure 7: Jet Spray Cleaner



- A. Cleaning solution by others
- B. Solenoid valve or manual valve (supplied by others)
- C. Corrosion resistant tubing (supplied by others)
- D. Polypropylene ¼-in. (6.4 mm) compression fitting
- E. ¼-in. (6.4 mm) 316 stainless steel
- F. ¼-in. (6.4 mm) polypropylene
- G. Stainless set screw for adjustable spray nozzle height
- H. 2-in. (50.8 mm) NPT threads
- I. Sensor
- J. 1-in. (25.4 mm) PVC coupling for submersible applications (supplied by others)
- K. 1-in. (25.4 mm) PVC or stainless conduit (supplied by others)
- L. Cable
- M. Timer supplied by others or use timer feature in Rosemount instrument.

Figure 8: Rosemount 3900 Sensor with Jet Spray Cleaner



The jet spray cleaner eliminates routine, manual sensor maintenance by cleaning the sensor with water or compressed air. You can control flow through the cleaner with a solenoid valve.

Note

You can use the jet spray cleaner with the handrail mounting assembly (PN 11275-01, not shown), or you can mount it through the conduit as shown in [Figure 8](#).

Figure 9: Low Flow Panel PN 00390-7101-0001

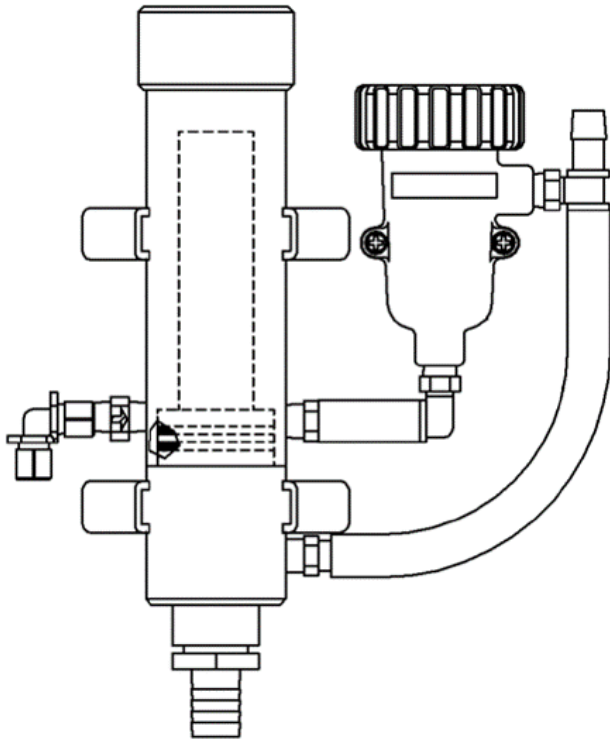


Table 5: Low Flow Panel Specifications

Inlet flow	3 to 80 gallons per hour (11.4 to 304 liters per hour)
Inlet pressure	3 to 65 psig (122 to 549 kPa) ⁽¹⁾
Temperature	32 to 122 °F (0 to 50 °C)

- (1) *The minimum inlet pressure is required to open a check valve, which prevents the flow cell from draining if sample flow is lost. Removing the check valve lowers the inlet pressure requirement to a few feet of water head.*

For more information: www.emerson.com

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