

Rosemount™ 396/396VP/396P/396PVP/ 396R/396RVP

TUpH pH/ORP Sensors



TUpH Sensors for Your Tough pH/ORP Applications

Rosemount TUpH pH/ORP sensors are robust sensors designed to meet a number of difficult application requirements. Sensors feature a variety of options suited to meet a number of installation requirements and are ideal for use in dirty, abrasive, coating, and high solid applications.

Overview



Rosemount 396/396VP



Rosemount 396P/396PVP



Rosemount 396R/396RVP

Robust Sensor Design

- TUpH reference technology minimizes sensor maintenance and ensures a steady pH/ORP signal even when sensor is coated.
- Maximize sensor life with poisoning resistant helical reference pathway design.
- Optional flat pH glass electrode for abrasive and coating applications.
- Maximum process pressure 150 psig.
- Maximum process temperature 100 °C.

Versatile Mounting Options to Meet Your Installation Requirements

- Rosemount 396P/396PVP sensors feature 1 in. MNPT front and rear facing process threads.
- Rosemount 396R/396RVP offered in 21 in. and 36 in. lengths suitable for use with retraction assemblies – easily remove sensors for maintenance and calibration without having to shutdown your process.
- Variopol(VP8) cable connection option, for quick cable-to-sensor release, eliminates cable twisting.

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Ordering Information



Rosemount 396 and 396VP_{pH} sensors feature a stainless steel body for use with optional 1 inch threaded process connectors suitable for insertion, submersion, or flow through installation. Sensors are available with either a standard pH hemi glass bulb or optional pH flat glass bulb. Rosemount 396 sensors feature a standard 15 ft. integral cable and Rosemount 396VP sensors feature a Variopol cable connection for use with VP8 quick disconnect interconnecting cables (sold separately; see Accessories [Table 9](#)).

Table 1. Rosemount 396 pH/ORP Sensor ordering information

Model	Sensor type
396	pH Sensor
Temperature element	
50	3k Balco ⁽¹⁾
54	Pt-100
Cable options	
–	15ft. cable with BNC
62	15 ft. cable without BNC ⁽²⁾
Glass options	
–	No selection –pH –GPHT hemi glass bulb
71	pH–GPHT flat glass bulb
Typical model number: 396-54-62	

1. For use with legacy transmitter models 1181pH, 1050, and 1003.

2. For use with existing transmitter models Rosemount 56, 1056, 1057, 1066, and 5081. Also compatible with legacy transmitter models 6081, 81, 1181, 2081, 3081, 4081, 54, 1055, and XMT.

Table 2. Rosemount 396VP pH/ORP Sensor ordering information

Model	Sensor type
396VP	pH Sensor
Temperature element	
50	3k Balco ⁽¹⁾
54	Pt-100 ⁽²⁾
55	Pt-100 ⁽³⁾
Glass Options	
–	No selection –pH –GPHT hemi glass bulb
71	pH –GPHT flat glass bulb

Table 2. Rosemount 396VP pH/ORP Sensor ordering information

Preamplifier Option	
–	No preamplifier
70	SMART preamplifier ⁽⁴⁾
Typical Model Number: 396-54-62	

- For use with legacy transmitter models 1181pH, 1050, and 1003.
- For use with existing transmitter models Rosemount 56, 1056, 1057, 1066, and 5081. Also compatible with legacy transmitter models 6081, 81, 1181, 2081, 3081, 4081, 54, 1055, and XMT.
- For use with existing transmitter models Rosemount 56, 1056, 1057, 1066, and 5081. Only available with option -70.
- Only available with option -55.



Rosemount 396P and 396PVP pH/ORP sensors feature a molded reinforced polypropylene body with forward and rear facing 1 in. MPT threads suitable for insertion, submersion, and flow through type installations. The Rosemount 396P sensor has an integral cable connection and the Rosemount 396PVP sensor has a Variopol cable connection for use with VP8 interconnecting cables (sold separately; see Accessories [Table 9](#)).

Table 3. Rosemount 396P pH/ORP Sensor ordering information

Model	Sensor type
396P	pH/ORP Sensor
Preamplifier/cable	
01	25ft. Integral cable with preamplifier ⁽¹⁾
02	15 ft. Integral cable without preamplifier
Measuring electrode	
10	pH –GPLR hemi Glass Bulb
12	Platinum ORP
13	pH –GPLR Flat Glass Bulb
Temperature element/Transmitter compatibility	
50	3K Balco, for use with model 1181
54	Pt-100, for use with model 1054,2054, and 2081
55	Pt-100, for use with model 56, 1056, 1057,1066, 5081 ⁽²⁾
Sensor tip option	
–	No selection – Standard shrouded tip
41	Slotted tip ⁽³⁾
Typical model number: 396P-01-10-55	

- Preamplifier is SMART for pH electrodes selected with option -55.
- Also compatible with legacy transmitter models 54, 1055, 6081, 81, 3081, 4081, and XMT.
- Not available with option -13.

Table 4. Rosemount 396PVP pH/ORP Sensor ordering information

Model	Sensor type
396PVP	pH/ORP Sensor
Measuring electrode	
10	pH–GPLR hemi glass bulb
12	Platinum ORP
13	pH –GPLR flat glass bulb
Temperature element/Transmitter compatibility	
50	3K Balco, for use with model 1181
54	Pt-100, for use with model 1054,2054, and 2081
55	Pt-100, for use with model 56, 1056, 1057,1066, 5081 ⁽¹⁾
Sensor tip option	
–	No selection –Standard shrouded tip
41	Slotted tip ⁽²⁾
Preamplifier option	
–	No selection -No preamplifier
70	SMART preamplifier ⁽³⁾
Typical model number: 396PVP-10-55-41-70	

1. Also compatible with legacy transmitter models 54, 1055, 6081, 81, 3081, 4081, and XMT.

2. Not available with option -13.

3. Only available for pH electrodes selected with option -55.



Rosemount 396R and 396RVP pH/ORP sensors are available in 21 and 36 inch titanium tube sensor lengths for use with a ball valve (sold separately) for hot tap applications. Rosemount 396RVP sensors feature a Variopol cable connection for use with VP8 quick disconnect interconnecting cables (sold separately; see Accessories [Table 9](#)).

Table 5. Rosemount 396R pH/ORP Sensor ordering information

Model	Sensor type
396R	pH/ORP Sensor
Measuring electrode	
10	pH–GPLR hemi glass bulb
12	Platinum ORP
13	pH –GPLR flat glass bulb
Sensor length	
21	21 in. Titanium tube
25	36 in. Titanium tube
Temperature element	
50	3K Balco ⁽¹⁾
54	Pt-100 ⁽²⁾
Cable options	
–	No selection –Standard 15 ft. cable
60	9.5 in. cable with BNC ⁽³⁾
61	9.5 in. cable without BNC ⁽⁴⁾
Typical model number: 396R-10-21-54	

1. For use with legacy transmitter model 1181pH.
2. For use with existing transmitter models Rosemount 56, 1056, 1057, 1066, and 5081. Also compatible with legacy transmitter models 54, 1054, 1055, 6081, 81, 2081, 3081, 4081, 2700, and XMT.
3. For connection to 1181, 1054, and 2081 sensor head junction boxes.
4. For use with sensor head junction box 23709-00. Not available with option -50.

Table 6. Rosemount 396RVP pH/ORP Sensor Ordering Information

Model	Sensor type
396RVP	pH/ORP Sensor
Measuring electrode	
10	pH–GPLR hemi glass bulb
12	Platinum ORP
13	pH –GPLR flat glass bulb
Sensor length	
21	21 in. Titanium tube
25	36 in. Titanium tube
Temperature element/Transmitter compatibility	
50	3K Balco ⁽¹⁾
54	Pt-100 ⁽²⁾
55	Pt-100 for SMART Preamplifier ⁽³⁾
Preamplifier option	
–	No Selection –No Preamplifier
70	SMART Preamplifier ⁽⁴⁾
Typical model number: 396RVP-10-25-55-70	

1. For use with legacy transmitter model 1181pH.
2. For use with existing transmitter models Rosemount 56, 1056, 1057, 1066, and 5081. Also compatible with legacy transmitter models 54, 1054, 1055, 6081, 81, 2081, 3081, 4081, 2700, and XMT.
3. Recommended for use with existing transmitter models Rosemount 56, 1056, 1057, 1066, and 5081. Only available with pH electrodes selected with option -70
4. Only available with pH electrodes selected with option -55

Specifications

Table 7. Rosemount 396/396VP/396P/396PVP/396R/396RVP Sensors Specifications

Specifications	396/396VP	396P/396PVP	396R/396RVP
			
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 or GPLR flat bulb	GPLR hemi bulb or 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 or 1-1/4 in.) (sold separately)
Temperature range	0-100 °C (32-212 °F)		
Pressure range-hemi bulb	100-1135 kPa (abs) (0-150 psig)		
Pressure range-flat bulb	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		
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 w/BNC Code 61: 9.5 in. coaxial
Preamplifier options	Remote or Integral SMART		
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)
VP Cable	Use cable PN 24281-XX (where XX = -01 thru -08 and designates various cable lengths)		

Table 8. Percent Linearity

pH Range	396 / 396VP		396P / 396PVP		396R / 396RVP	
396RVP	GPHT Hemi	GPHT Flat	GPHT Hemi	GPHT Flat	GPHT Hemi	GPHT Flat
0-2 pH	94%	95%	94%	-	94%	93%
2-12 pH	99%	99%	97%	98%	97%	98%
12-13 pH	97%	96%	98%	95%	98%	95%
13-14 pH	92%	-	98%	-	98%	-

Product Certifications

See online certificates for more details.

IECEX



Sensors without preamp (pH and ORP) – Ex ia IIC T4 Ga (-20 °C ≤ Ta ≤ +60 °C)

Sensors with SMART preamp (pH only) – Ex ia IIC T4 Ga (-20 °C ≤ Ta ≤ +60 °C)

Sensors with standard preamp (396P only) – Ex ia IIC T4 Ga (-20 °C ≤ Ta ≤ +80 °C) or Ex ia IIC T5 Ga (-20 °C ≤ Ta ≤ +40 °C)

Per standards IEC60079-0: 2011, IEC 60079-11: 2011

ATEX

Sensors without preamp (pH and ORP) – Ex II 1 G Ex ia IIC T4 Ga (-20 °C ≤ Ta ≤ +60 °C)

Sensors with SMART preamp (pH only) – Ex II 1 G Ex ia IIC T4 Ga (-20 °C ≤ Ta ≤ +60 °C)

Sensors with standard preamp (396P only) – Ex II 1 G Ex ia IIC T4 Ga (-20 °C ≤ Ta ≤ +80 °C) or Ex II 1 G Ex ia IIC T4 Ga (-20 °C ≤ Ta ≤ +40 °C)

Per standards EN 60079-0: 2012+A11:2013, EN 60079-11:2012

FM



See online FM Certificate of Compliance for applicable sensor options.

Intrinsically Safe for use in Class I, II, and III, Division 1, Groups A, B, C, D, E, F, and G; Temperature Class T6 Ta = -20 °C to +60 °C

Intrinsically Safe for use in Class I, Zone 0, AEx ia IIC T6 Ta = -20 °C to +60 °C

Nonincendive for use in Class I, Division 2, Groups A, B, C, and D; Temperature Class T6 Ta = -20 °C to +60 °C

Suitable for use in Class II and III, Division 2, Groups E, F, and G; Temperature Class T6 Ta = -20 °C to +60 °C Hazardous (Classified) Locations

IS/I,II,III/1/ABCDEFG/T6 Ta = 60 °C - 1400332; Entity; I/0/AEx ia IIC/T6 Ta = 60 °C - 1400332; Entity; NI/I/2/ABCD/T6 Ta = 60 °C; S/II,III/2/EFG/T6 Ta = 60 °C

Per standards 3600:1998, 3610:2010, 3611:2004, 3810:2005

CSA



See online CSA Certificate of Compliance for applicable sensor options.

Sensors with preamp – Intrinsically Safe:

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

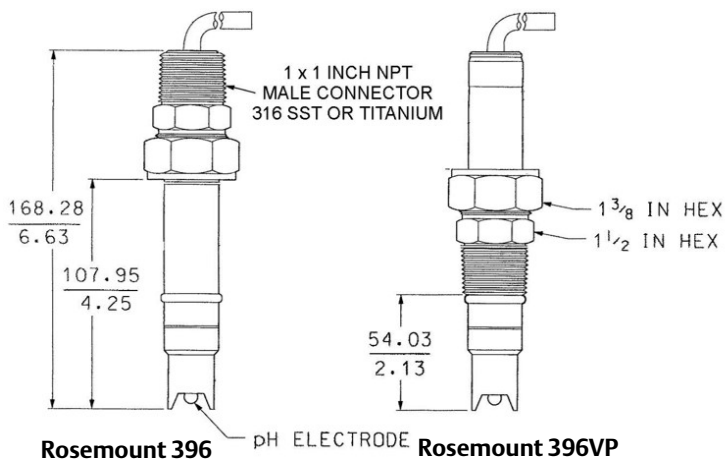
Sensors without preamp – Intrinsically Safe and Non-Incendive:

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)

Per standards C22.2 No. 0-10, C22.2 No. 0.4-M2004, C22.2 No. 94-M1991, C22.2 No. 142 – M198, C22.2 No 157 – M1992, CAN/CSA E60079-0:0, CAN/CSA E60079-11:02, UL50 11th Ed, UL508 17th Ed, UL913 7th Ed, UL 60079-0: 2005, UL 60079-11: 2002

Dimensional and Installation Drawings

Figure 1. Rosemount 396/396VP with optional connector dimensional drawings



Metal Process Connector PN 23166-xx (xx = 00 for 316 SST and xx = 01 for titanium) can be used for insertion or submersion Model 396 sensor connection to 1-inch tee fittings. It also must be used to connect Model 396R to ball valve PN 23240-00 or directly to the process.

The metal process connector gives the sensor various insertions depths, depending on where the user locates the compression fitting. Also the threads can be switched to face the cable end of the sensor for connection to submersion pipes.



Figure 2. Rosemount 396P/396PVP dimensional drawing

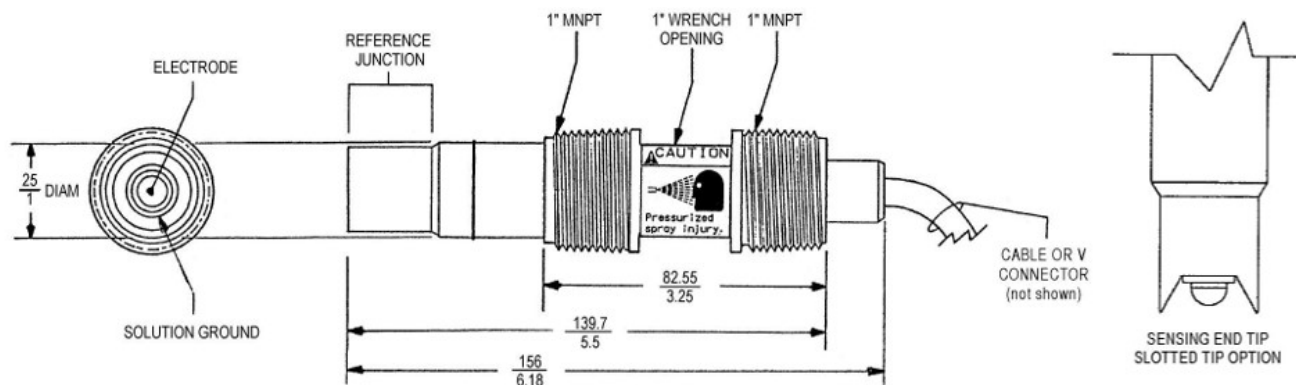
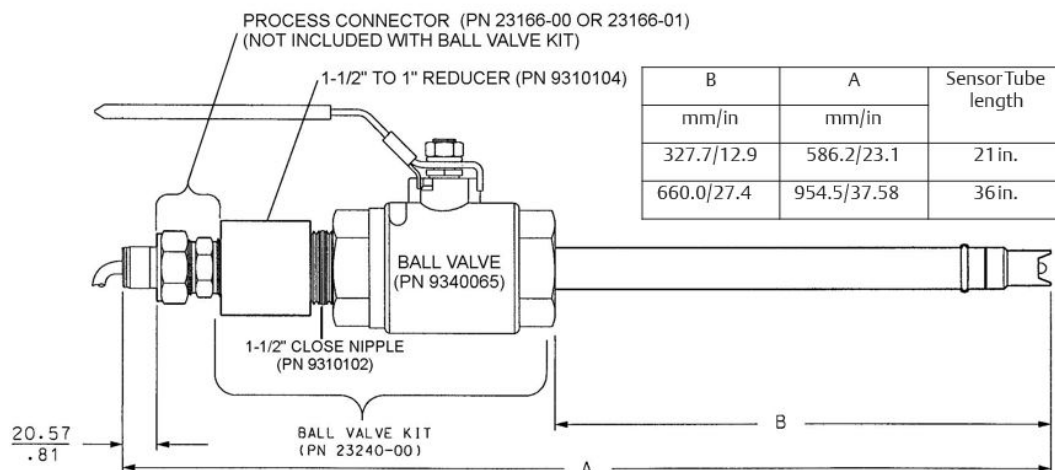
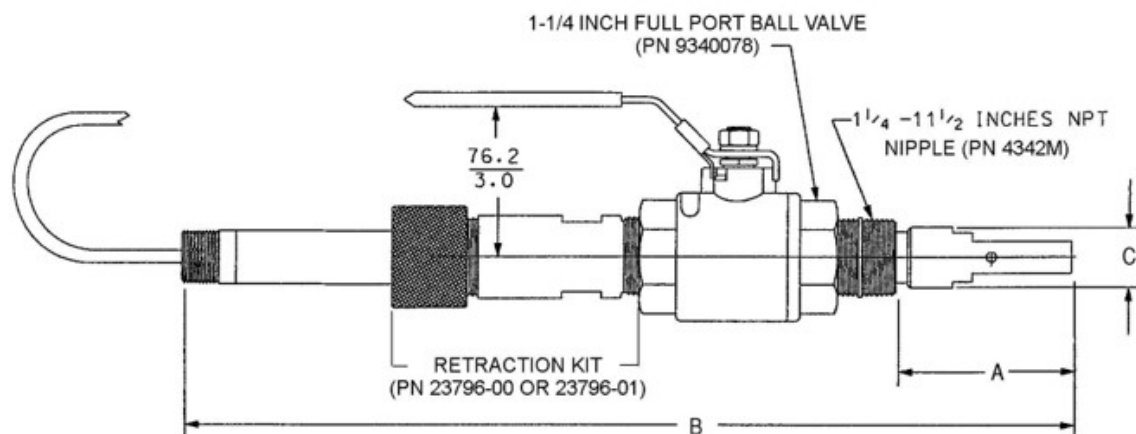


Figure 3. Rosemount 396R pH sensor and 1½ in. FNPT Ball Valve Kit (PN 23240-00) with process connector

1½ in. FNPT Ball Valve Kit (PN 23240-00) shown with process connector (sold separately) and Rosemount 396R pH sensor. Ball valve kit includes a 1½ in. full port ball valve, a 1½ in. FTP to 1 in. FTP reducer (which serves as the retraction chamber) and a 1½ in. close nipple that connects the reducer to the ball valve. A connector (PN 23166-00 or 23166-01) is required to connect sensor to the reducer.

**Figure 4. MNPT Ball Valve Kit 1¼ in. (PN 23765-00 or 23765-01) with retraction kit**

1¼ in. MNPT Ball Valve Kit (PN 23765-00 or 23765-01) shown with retraction kit. Ball valve kit includes a 1¼ in. full port ball valve, a 1¼ in. nipple, and a retraction chamber.

The ball valve kit (PN 23765-00 or -01) has all parts needed to install the sensor. The retraction chamber (PN 23796-00) can be purchased separately.



Figure 5. Typical flow through installation (sensor must be installed at least 10 ° above the horizon)

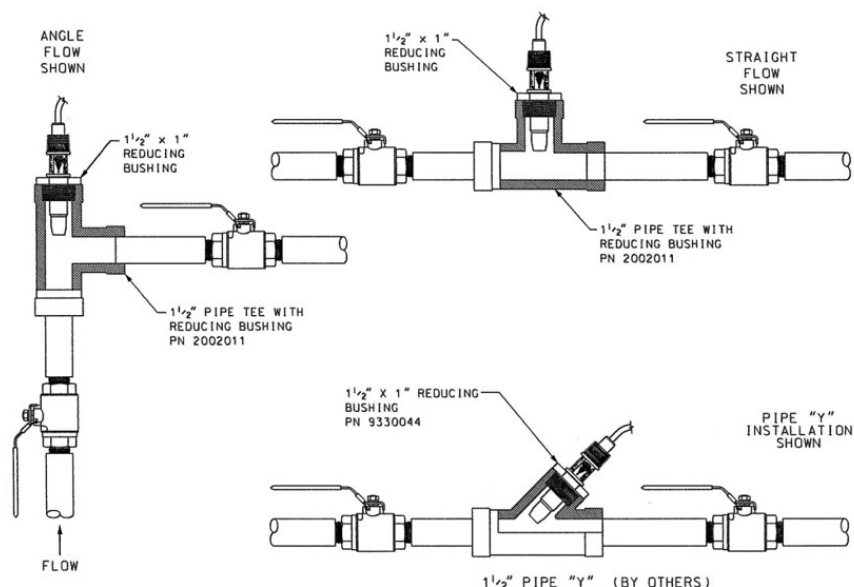


Figure 6. Rosemount 396P and 396PVP pH sensor with Spray Cleaner (PN 12707-00)

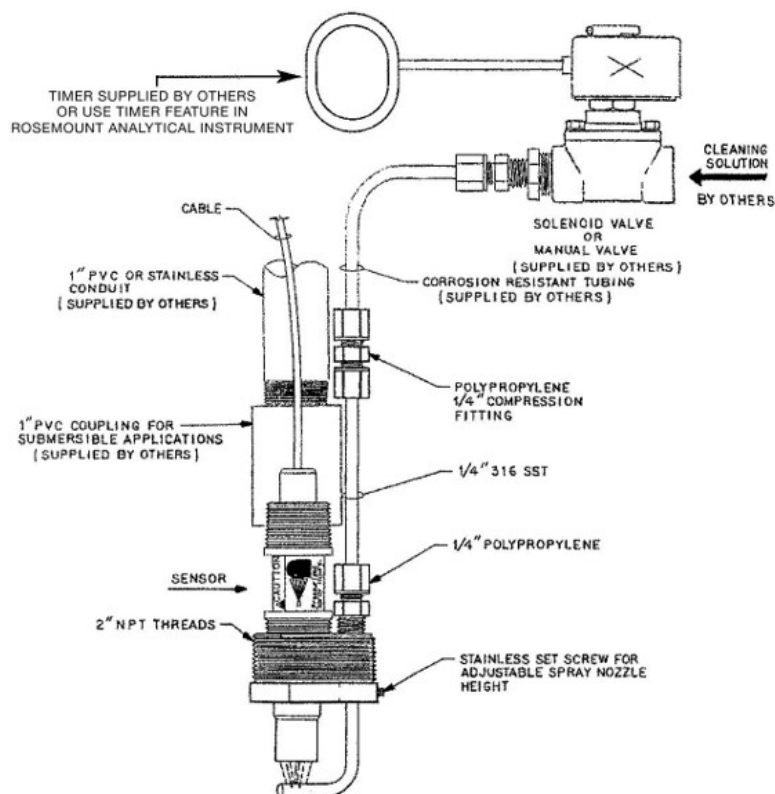
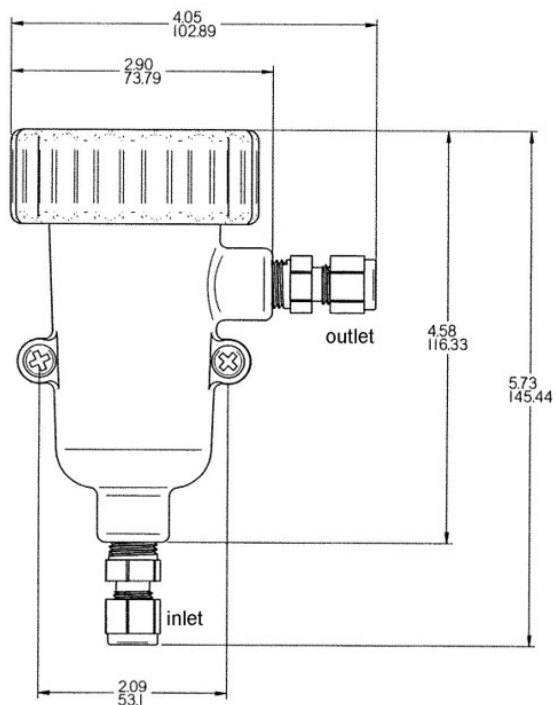


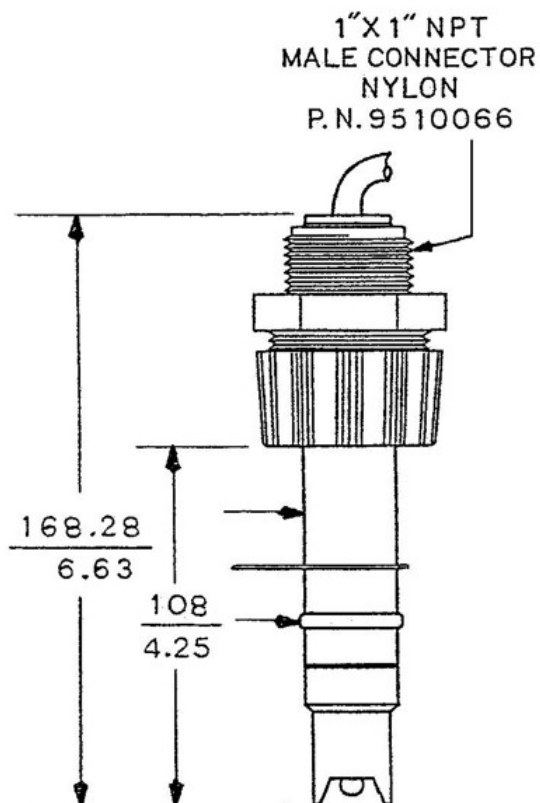
Figure 7. Low flow cell (PN 24091-00) for Rosemount 396 and 396P-41 sensor



Maximum pressure: 65 psig (549 kPa abs).

Maximum temperature: 122 °F (50 °C)

Figure 8. Submersion accessory (PN 9510066) for Rosemount 396/396VP Sensors



Accessories

Table 9. Rosemount 396/396VP, 396P/396PVP, 396R/396RVP Sensors accessories information

Part number	Description
Process connectors (required for all first time installations of Rosemount 396, 396VP, 396R, and 396RVP)	
23166-00	Connector, 1 in. x 1 in. 316 SS, with O-ring groove
23166-01	Connector, 1 in. x 1 in. Titanium, with O-ring groove
Connector cable, VP8 (required for all first time installations of VP sensors)	
24281-00	15 ft. (4.6m) VP8 cable
24281-04	100 ft (30.5m) VP8 cable
24281-06	10 ft (3.0m) VP8 cable
24281-07	20 ft (6.1m) VP8 cable
24281-08	30 ft (9.1m) VP8 cable
Retraction mounting assemblies for Rosemount 396R and 396RVP	
23240-00	1 ½ in. Ball valve assembly, 316 Stainless steel; 1 ½ in. full port ball valve, 1 ½ x 1 ½ in. nipple, and retraction chamber. Process connector 23166-00/-01 required; sold separately
23765-00	1 ¼ inch Ball valve assembly, 316 Stainless steel; 1 ¼ in. full port ball valve, 1 ¼ to 1 ½ in. nipple, and custom retraction kit with graphite packing gland for smooth sensor insertion/removal
Remote junction boxes and mounting brackets; for use when standard cable lengths need to be extended	
23555-00	Junction box with preamplifier
23550-00	Junction box without preamplifier
23709-00	Sensor head junction box for Rosemount 396R and 396RVP; contains preamplifier for 54, 56, 1055, 1056, 1057, 1066, 3081, 4081, 5081, XMT
2002565	Mounting bracket kit with mounting plate and U-bolts; use with PN 23555-00 or 23550-00 junction boxes
Extension cables (required when using a remote junction box)	
23646-01	Extension cable for junction box, shielded, prepped
9200273	Extension cable for junction box, shielded, unprepped
Calibration accessories	
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)
R508-80Z	ORP standard, 475 mV, 8oz (236 ml)
Mounting assemblies	
11275-01	Handrail mounting assembly; includes a 6 ft straight pipe, pipe coupling, 6 ft long sweep pipe, unistrut, pipe clamps, and mounting channels
2002011	CPVC flow through Tee, 1–½ in. NPT process connections
24091-00	Low Flow Cell with ¼ in. inlet and outlet
915240-03	Tee, Flow-through, 2 in. PVC tee with ¾ in. NPT process connections and mounting adapter to eliminate cable twisting

Table 9. Rosemount 396/396VP, 396P/396PVP, 396R/396RVP Sensors accessories information

915240-04	Tee, Flow-through, 2 in. PVC tee with 1 in. NPT process connections and mounting adapter to eliminate cable twist
915240-05	Tee, Flow-through, 2 in. PVC tee with 1 ½ in. NPT process connections and mounting adapter to eliminate cable twisting
12707-00	Jet Spray Cleaner; for use with water or air cleaning using interval timer from instrument

Global Headquarters

Emerson Automation Solutions

8200 Market Blvd

Chanhassen, MN 55317

 +1 800 999 9307 or +1 952 906 8888

 +1 952 949 7001

 Liquid.CSC@Emerson.com

North America Regional Office

Emerson Automation Solutions

8200 Market Blvd.

Chanhassen, MN 55317, USA

 +1 800 999 9307 or +1 952 906 8888

 +1 952 949 7001

 RMT-NA.RCCRFQ@Emerson.com

Latin America Regional Office

Emerson Automation Solutions

1300 Concord Terrace, Suite 400

Sunrise, FL 33323, USA

 +1 954 846 5030

 +1 954 846 5121

 RFQ.RMD-RCC@Emerson.com

Europe Regional Office

Emerson Automation Solutions GmbH

Neuhofstrasse 19a P.O. Box 1046

CH 6340 Baar

Switzerland

 +41 (0) 41 768 6111

 +41 (0) 41 768 6300

 RFQ.RMD-RCC@Emerson.com

Asia Pacific Regional Office

Emerson Automation Solutions Asia Pacific Pte Ltd

1 Pandan Crescent

Singapore 128461

 +65 6777 8211

 +65 6777 0947

 Enquiries@AP.Emerson.com

Middle East and Africa Regional Office

Emerson Automation Solutions

Emerson FZE P.O. Box 17033,

Jebel Ali Free Zone - South 2

Dubai, United Arab Emirates

 +971 4 8118100

 +971 4 8865465

 RFQ.RMTMEA@Emerson.com



Analyticexpert.com



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