Rosemount™ 398/398VP/398R/398RVP

TUpH pH/ORP Sensors

TUpH Sensors for Your Tough pH/ORP Applications

Rosemount 398/398VP/398R/398RVP TUpH pH 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 containing chlorine dioxide.

ROSEMOUNT™

EMERSON™

Overview

A TUpH Sensor Design

- Coating and fouling resistant with large surface area TUpH reference junction.

- Titanium and Tefzel sensor construction for superior chemical resistance to aggressive chemicals such as chlorine dioxide in pulp bleaching towers and most organic solvents.

- Selectable O-ring options of either EPDM, Viton, or Kalrez.

- Optional flat pH glass electrode for abrasive and coating applications.

- Operates in process pressures up to 250 psig.

Versatile Installation Options

- Suitable for insertion/submersion type installations (Rosemount 398/398VP).

- Retractable design allows sensors to be removed for calibration and maintenance without process shutdown (Rosemount 398R/398RVP).

- Compatible for use with a 1-1/2 in. or 1-1/4 in. ball valve (Rosemount 398R/398RVP).

- Variopol (VP8) cable connection option, for quick cable-to-sensor release, eliminates cable twisting.

Contents

Ordering Information

Rosemount 398/398VP sensors are housed in a titanium tube and constructed with a Tefzel reference junction. Sensors can be used with a 1 inch MNPT process connector (sold separately). Rosemount 398 sensors come standard with 15 ft. of integral cable. Rosemount 398VP sensors are used with quick disconnect VP8 interconnecting cables (sold separately).

Table 1. Rosemount 398 TUpH pH/ORP Sensor ordering information

Model	Sensor type
398	pH/ORP sensor
Measuring Electrode	
10	pH – GPHT Hemi Bulb Glass
12	ORP
13	pH – GPLR Flat Glass
O-ring Material	
30	EPDM
31	Viton
32	Kalrez
Temperature Element	
50	3k Balco [1]
54	Pt-100 [2]
Cable Options	
_	No Selection - Cable with BNC
62	Cable without BNC [3]
Typical Model Number: 398-10-32-54-62	

1. For use with legacy transmitter model Rosemount 1181. Not available with option -62.
2. For use with existing transmitter models Rosemount 1056, 1057, 56, 1066, and 5081. Also compatible with legacy transmitter models 54, 1054, 1055, 6081, 81, 2081, 3081, 4081, and XMT.
3. For use with existing transmitter models Rosemount 1056, 1057, 56, 1066, and 5081. Only available with option -54.

Table 2. Rosemount 398VP TUpH pH/ORP Sensor ordering information

Model	Sensor type
398VP	pH/ORP sensor
Measuring Electrode	
10	pH - GPHT Hemi Bulb Glass
12	ORP
13	pH - GPLR Flat Glass
O-ring Material	
30	EPDM
31	Viton
32	Kalrez
Temperature Element	
50	3k Balco [1]
54	Pt-100 [2]
Typical model number: 398VP-10-30-54	

1.   For use with legacy transmitter model Rosemount 1181.
2.   For use with existing transmitter models Rosemount 1056, 1057, 56, 1066, and 5081. Also compatible with legacy transmitter models 54, 1054, 1055, 6081, 81, 2081, 3081, 4081, and XMT.

Rosemount 398R/398RVP sensors are offered in 21 inch and 36 inch titanium tube sensor lengths. Sensors can be used with a ball valve (sold separately) for hot tap applications. Rosemount 398 sensors come standard with 15 ft. of integral or 9.5 in. cable for use with a sensor head junction box (sold separately). Rosemount 398RVP sensors are SMART preamplifier optional and are used with quick disconnect VP8 interconnecting cables (sold separately).

Table 3. Rosemount 398R TUpH pH/ORP Sensor ordering information

Model	Sensor type
398R	pH/ORP sensor
Cell constant	
10	pH - GPHT Hemi Bulb Glass
12	ORP
13	pH - GPHT Flat Glass
O-ring Material	
30	EPDM
31	Viton
32	Kalrez
Temperature Element	
54	Pt-100
Cable Options	
_	No Selection - 15 ft. Cable with BNC
60	9.5 inch Cable with BNC [1]
61	9.5 inch Cable without BNC [1]
62	15 ft. Cable without BNC [2]
Typical Model Number: 398R-10-31-54-62	

1. For use with sensor head junction boxes.
2. For use with existing transmitter models Rosemount 1056, 1057, 56, 1066, and 5081. Also compatible with legacy transmitter models 1055, 54e, 81, 3081, 4081, and XMT.

Table 4. Rosemount 398RVP TUpH pH/ORP Sensor ordering information

Model	Sensor type
398RVP	pH/ORP sensor
Measuring Electrode	
10	pH - GPHT Hemi Bulb Glass
12	ORP
13	pH - GPHT Flat Glass
Sensor Length	
21	21 in. Titanium Tube
25	36 in. Titanium Tube
O-ring Material	
30	EPDM
31	Viton
32	Kalrez
Temperature Element	
50	3k Balco [1]
54	Pt-100 [2]
55	Pt-100 [3]
Preamplifier	
_	No Selection - No Preamplifier
70	SMART Preamplifier [4]
Typical Model Number: 398RVP-10-25-32-55-70	

1. For use with legacy transmitter model Rosemount 1181.
2. For use with existing transmitter models Rosemount 1056, 1057, 56, 1066, and 5081. Also compatible with legacy transmitter models 54, 1054, 1055, 6081, 81, 2081, 3081, 4081, and XMT. Not available with option -70.
3. For use with existing transmitter models Rosemount 1056, 1057, 56, 1066, and 5081. Also compatible with legacy transmitter models 54, 1054, 1055, 6081, 81, 2081, 3081, 4081, and XMT. Only available for pH sensors with option -70.
4. Only available for pH sensors with option -55.

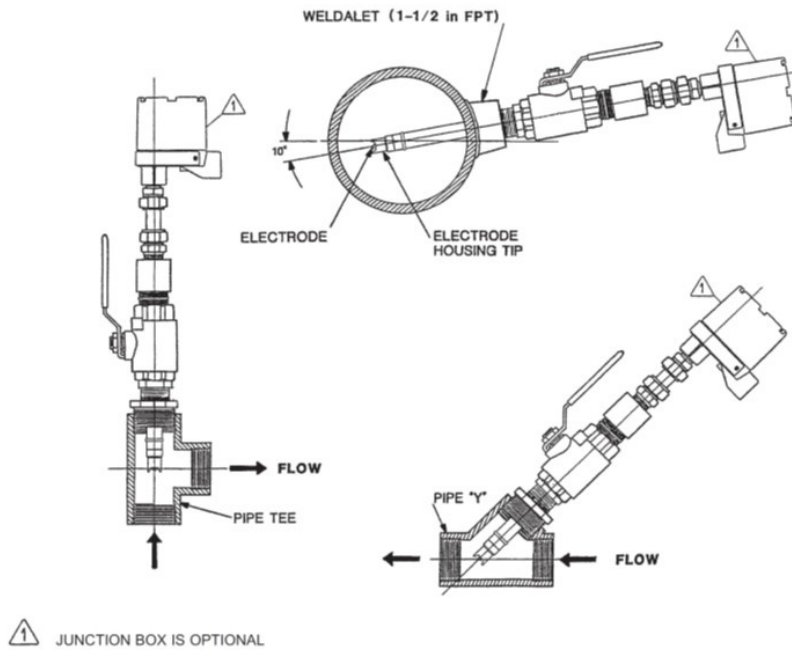# Specifications

Table 5. Percent Linearity Over pH Ranges

pH Range	Hemi Bulb	Flat Bulb
0 to 2 pH	94%	93%
2 to 12 pH	99%	98%
12 to 13 pH	97%	95%
13 to 14 pH	92%	–

Table 6. Rosemount 398/398VP/398R/398RVP sensor specifications

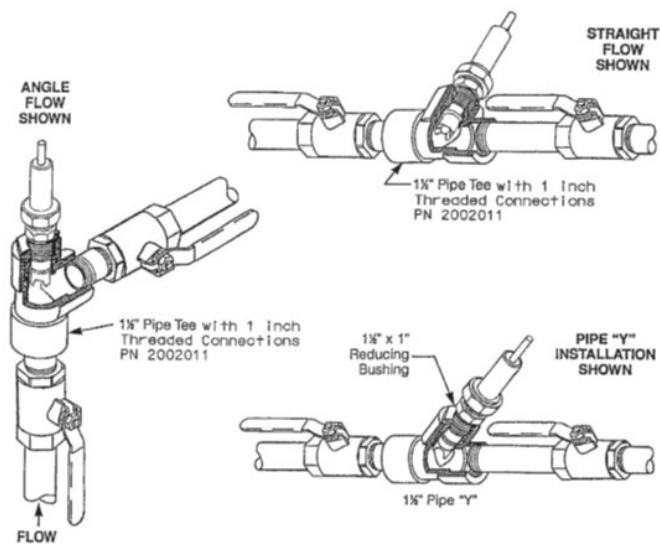| Sensor Model	398	398VP	398R	398RVP
Measurements and Ranges	pH: 0 to 14 ORP: -1500 to +1500 mV			
Wetted Materials	Titanium, Tefzel, glass, and a choice of Kalrez, Viton, or EPDM; platinum for ORP only			
Process Connection	None; Must use 1 inch NPT process connector PN 23166-00 or 23166-01 (sold separately)		None; Must use 1 inch NPT process connector or ball valve kit (1-1/2 in. or 1-1/4 in.) (sold separately)	
Temperature Range	32 to 212°F (0 to 100°C)			
Pressure Range - Hemi Bulb	0 to 250 psig (100 to 1825 kPa [abs])			
Pressure Range - Flat Bulb	0 to 100 psig (100 to 790 kPa [abs])			
Maximum Pressure at Retraction or Insertion	N/A	N/A	Option 21: 64 psig (542 kPa [abs]) Option 25: 35 psig (343 kPa [abs])	
Minimum Conductivity	75 μS/cm, nominal 100 μS/cm			
Weight/Shipping Weight	0.45 kg/0.9 kg (1 lb/2 lbs)		Option 21 Sensors: 0.9 kg/1.40 kg (2.0 lbs/3.0 lbs) Option 25 Sensors: 1.40 kg/1.80 kg (3.0 lbs/4.0 lbs) Ball Valve Kits: 2.25 kg/3.20 kg (5.0 lbs/7.0 lbs)	

Dimensional and Installation Drawings

Figure 1. Typical Mounting Details - Rosemount 398R Retraction Version

WELDALET (1-1/2 in FPT)

10°

ELECTRODE

ELECTRODE HOUSING TIP

FLOW

PIPE TEE

PIPE "Y"

FLOW

⚠ JUNCTION BOX IS OPTIONAL

Typical Mounting Details - Model 398R Retraction Version

Note: Sensor must be mounted at an angle between 10° and 90° above the horizontal.
Pipe tees and weldalets provided by customer.

Figure 2. Recommended Flow-Through and Insertion Installation for Rosemount 398

STRAIGHT FLOW SHOWN

ANGLE FLOW SHOWN

1⅛" Pipe Tee with 1 Inch Threaded Connections PN 2002011

1⅛" Pipe Tee with 1 Inch Threaded Connections PN 2002011

1⅛" x 1" Reducing Bushing

PIPE "Y" INSTALLATION SHOWN

1⅛" Pipe "Y"

FLOW

Recommended Flow-Through and Insertion Installation for Model 398

1-1/2 inch Pipe Tee (PN 2002011) with 1 inch threaded connections

Figure 3. Insertion Installations for Rosemount 398
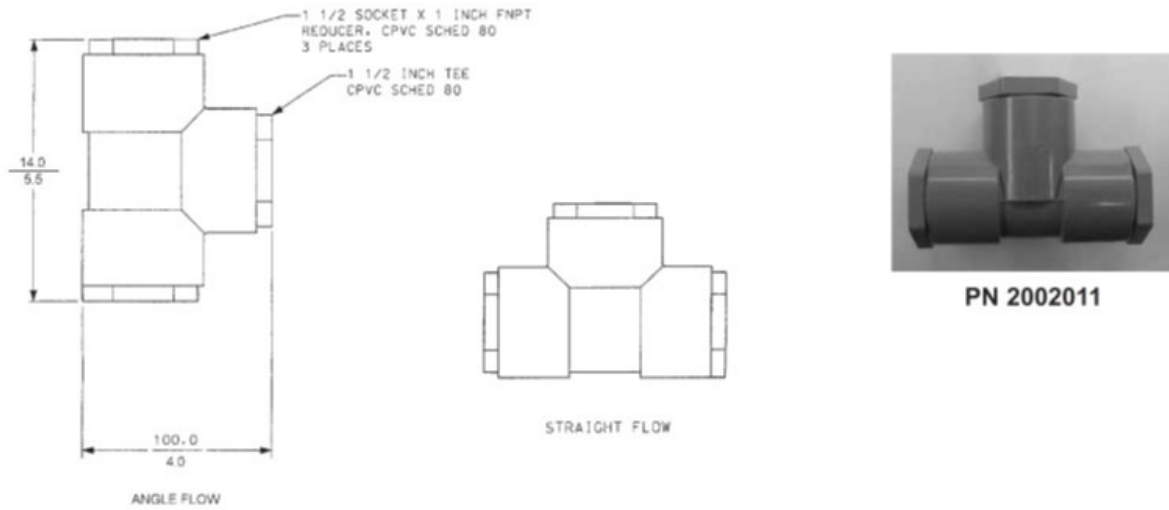
PN 2002011

Insertion Installations for Model 398

Model 398 can be inserted into a tee, such as the one shown here (PN 2002011, 1-1/2 in. tee with 1 in. threaded process connection), for angle or straight process flow. Other tees are available; see page 9 for part numbers.

Figure 4. Rosemount 398 Insertion/Submersion Sensor Dimensional Drawing
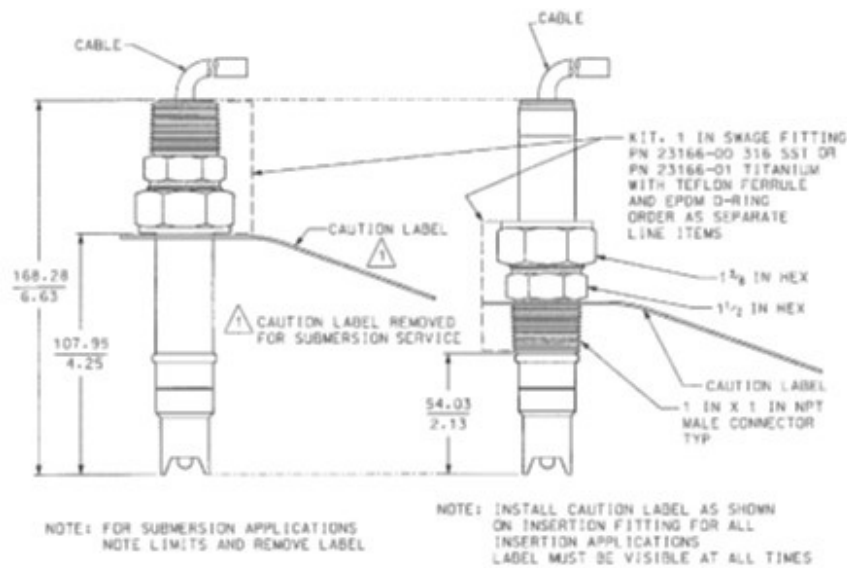
Dimensional Drawing - Model 398 Insertion/Submersion Sensor

The process connector can be placed onto Model 398 with the threads facing down for insertion mounting into a tee or the threads facing up for a submersion pipe mount connection. See page 9 for photos of sensor with the process connector.

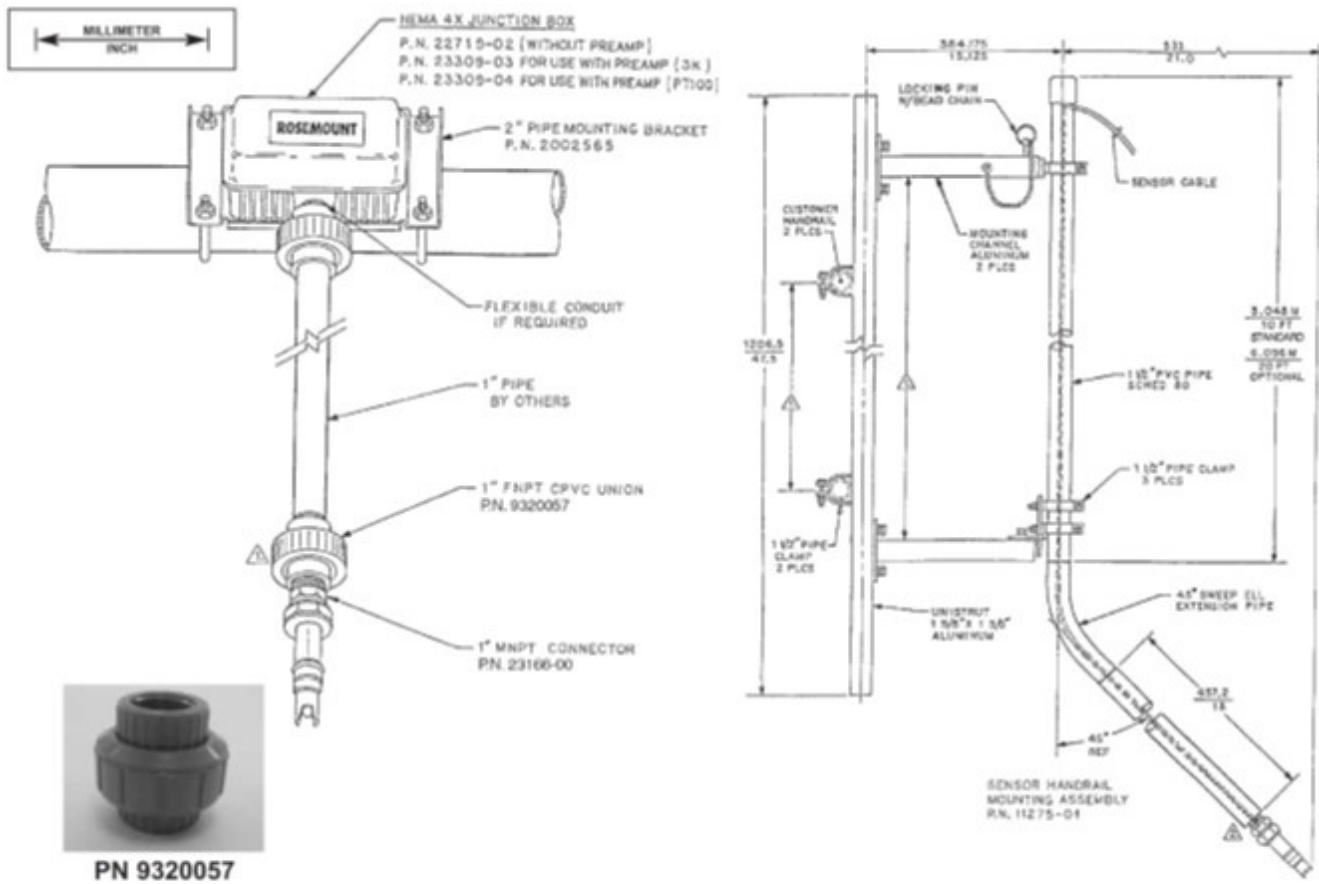**Figure 5. Submersion Installations for Rosemount 398**

Submersion Installations for Model 398

Model 398 can be submersed in ponds or tanks in various ways, including a customer-supplied pipe mount set-up using PN 9330022 pipe mount union. Also the Handrail Mounting Assembly PN 11275-01 can be used and includes all necessary parts to mount the sensor at the end of a pipe using a process connector (PN23166-00 or 23166-01).

Figure 6. Rosemount 398R with and without Optional Ball Valve PN 23765-00 Dimensional Drawing

A		B		
IN / MM		IN / MM		OPTION
21.60/548.64		12.12/307.85		21
36.10/916.94		26.62/676.15		25
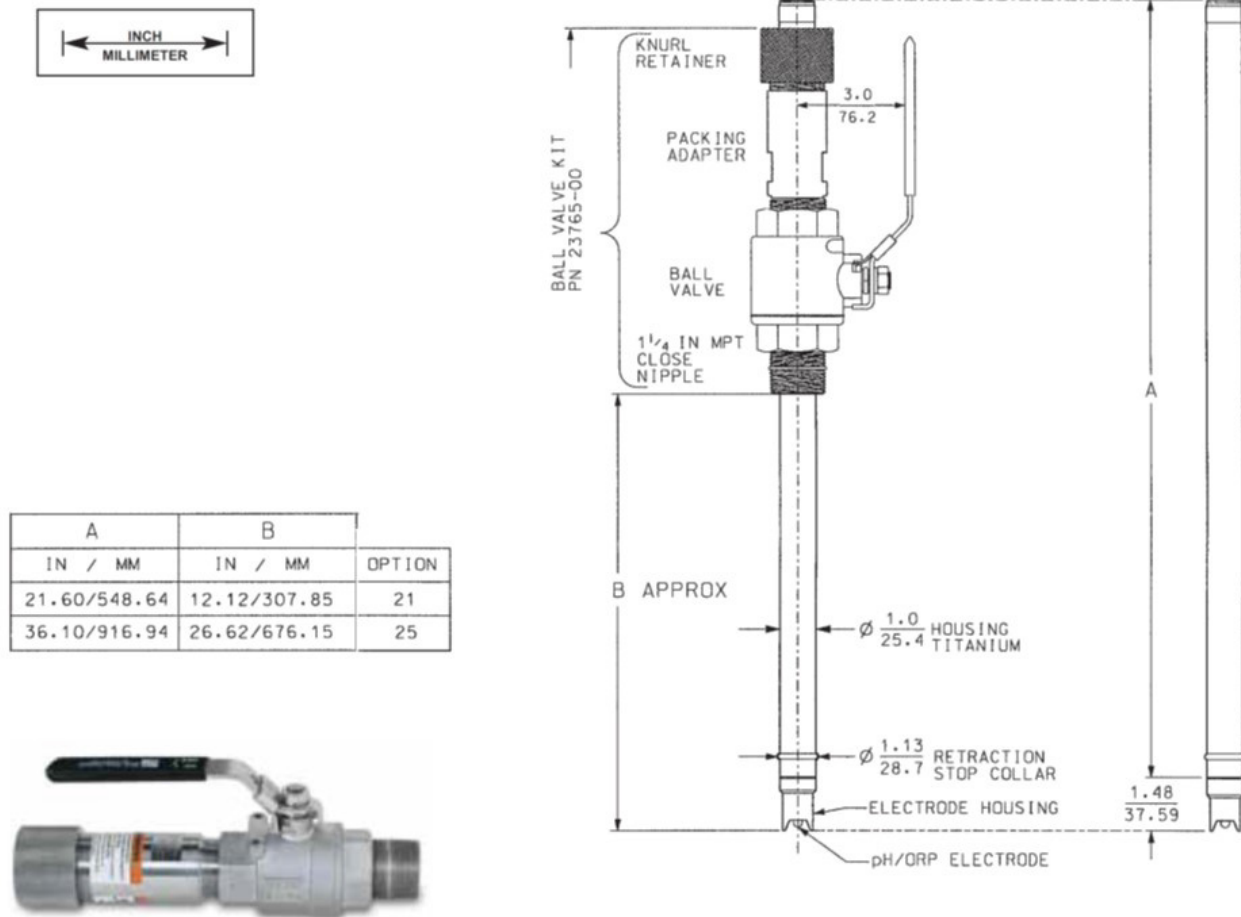
Dimensional Drawing — Model 398R with and without Optional Ball Valve PN 23765-00

Note: Add five (5) inches to dimension A if mounting a sensor head junction box onto the sensor.
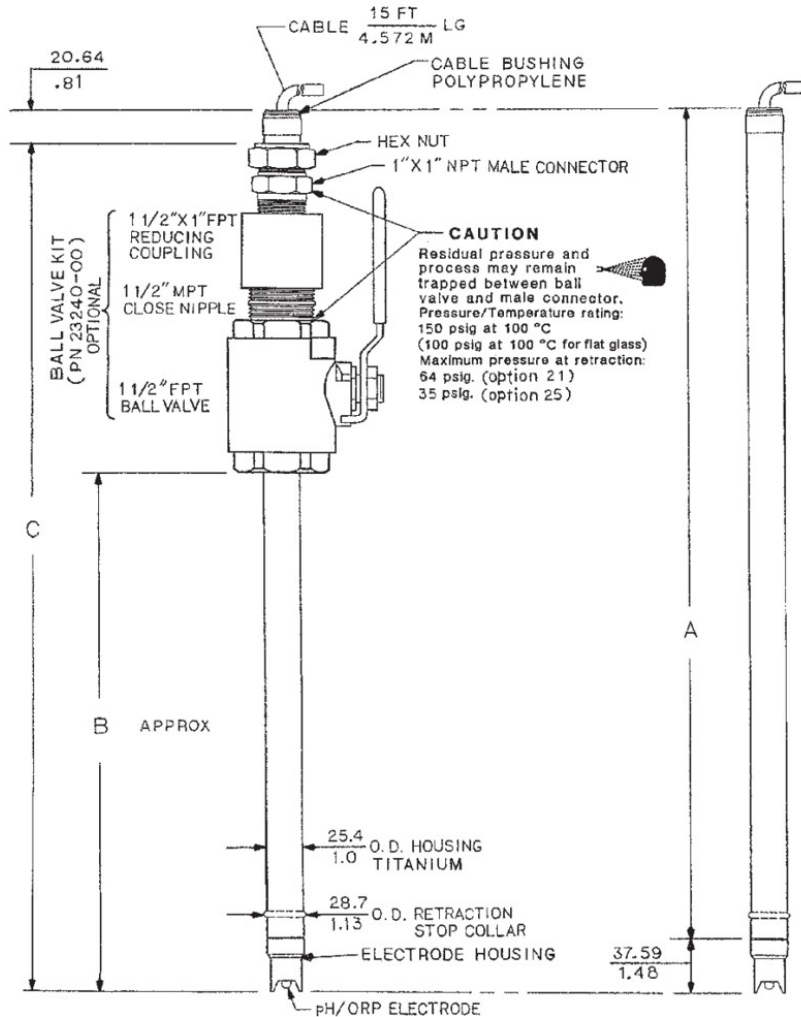
Figure 7. Rosemount 398R with and without 1-1/2 in. Ball Valve PN 23240-00 Dimensional Drawing

Ball Valve Kit (PN 23240-00) used with Model 398R retractable sensor

A process connector (PN 23166-00 or -01) must be used to connect the sensor to Ball Valve Kit 23240-00. Process connector can be purchased separately.

A		B		C		
MM / IN		MM / IN		MM / IN		OPTION
548.64/21.60		327.66/12.90		565.66/22.27		21
916.94/36.10		659.96/27.40		933.96/36.77		25

DWG. NO.	REV.
40396R05	A

Dimensional Drawings of Model 398R shown with and without 1-1/2 in. Ball Valve PN 23240-00

For the ball valve installation shown, the ball valve kit (PN 23240-00) and 1 in. x 1 in. process connector (PN 23166-00 or 23166-01) must be purchased separately.

Note: Add five (5) inches to dimension A if mounting a sensor-head junction box onto the sensor.

Figure 8. Rosemount 396VP and 398VP with Process Connector Dimensional Drawing
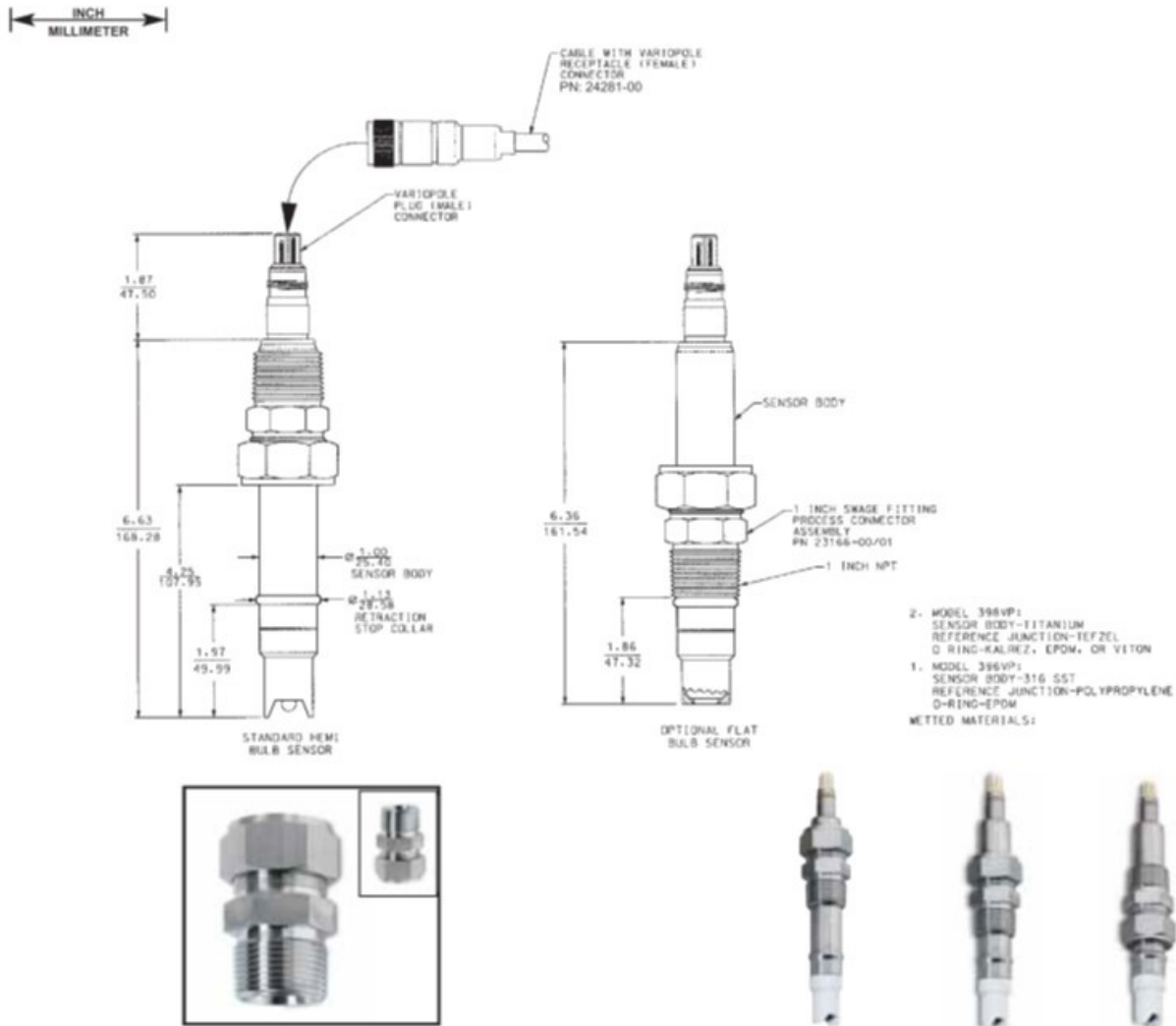
Metal Process Connector PN 23166-xx (xx = 00 for 316 SST and xx = 01 for titanium) can be used for insertion or submersion mounting of Models 396VP or 398VP sensors in 1-inch fittings.

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 9. Typical Flow Thru and Insertion Mounting Configurations for Rosemount 396VP and 398VP
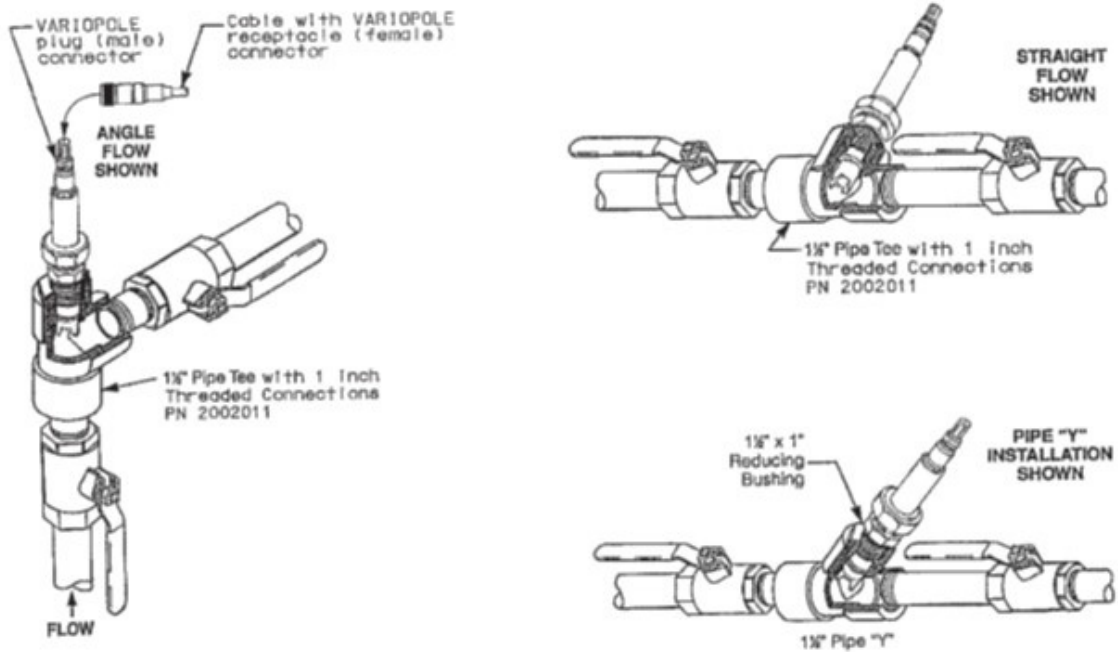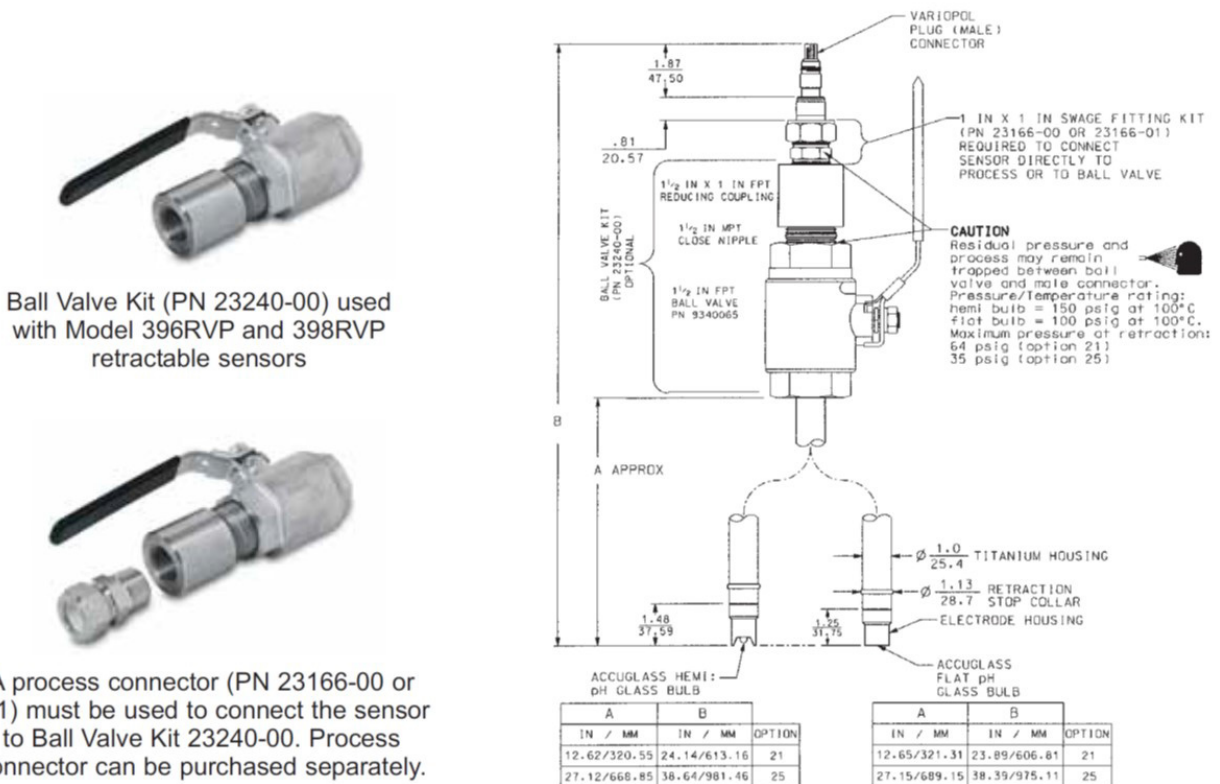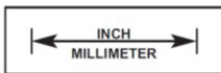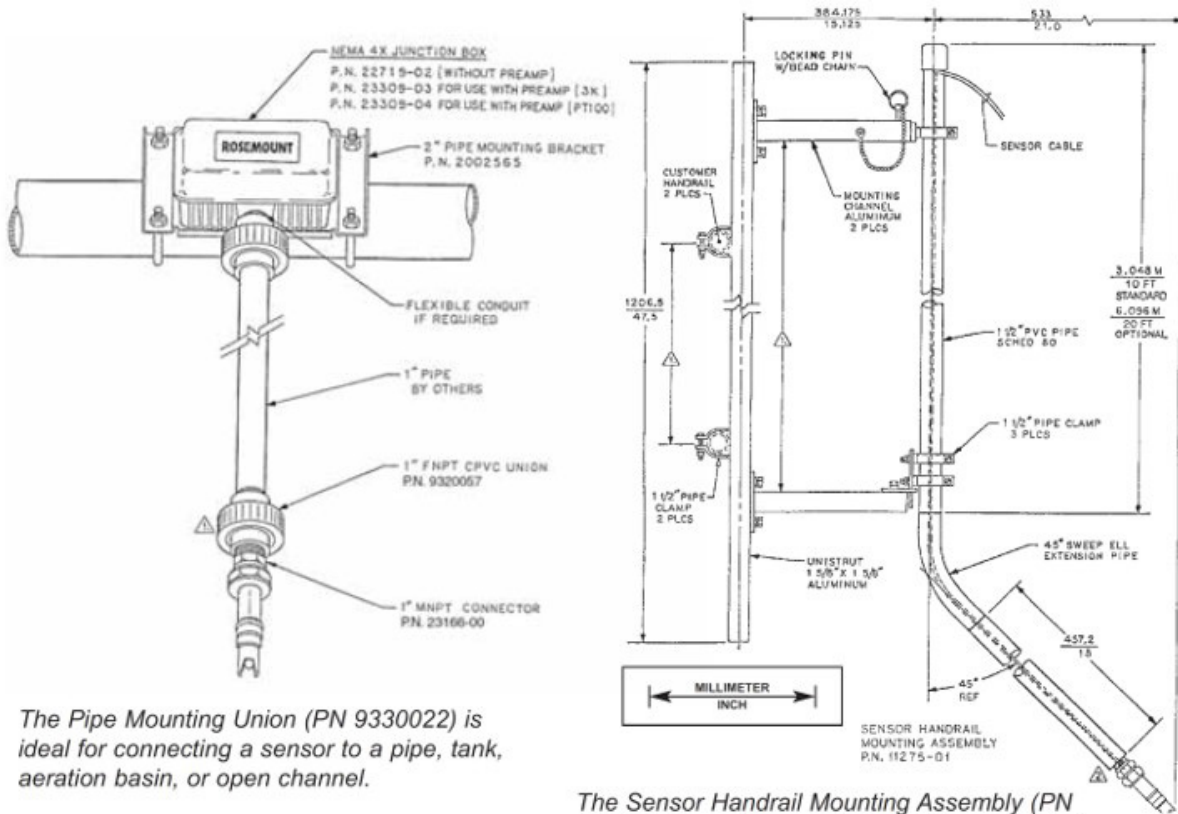

Figure 10. Rosemount 396RVP and 398RVP with Optional 1-1/2 in. Ball Valve PN 23240-00 Dimensional Drawing

Ball Valve Kit (PN 23240-00) used with Model 396RVP and 398RVP retractable sensors

A process connector (PN 23166-00 or -01) must be used to connect the sensor to Ball Valve Kit 23240-00. Process connector can be purchased separately.

A		B		
IN / MM		IN / MM		OPTION
12.62/320.55		24.14/613.16		21
27.12/668.85		38.64/981.46		25

A		B		
IN / MM		IN / MM		OPTION
12.65/321.31		23.89/606.81		21
27.15/689.15		38.39/975.11		25

**Figure 11. Typical Submersion Installations for Rosemount 396VP and 398VP**

The Pipe Mounting Union (PN 9330022) is ideal for connecting a sensor to a pipe, tank, aeration basin, or open channel.

The Sensor Handrail Mounting Assembly (PN 11275-01) can be used to insert the sensor into tanks and ponds, and mounts easily on most handrails.
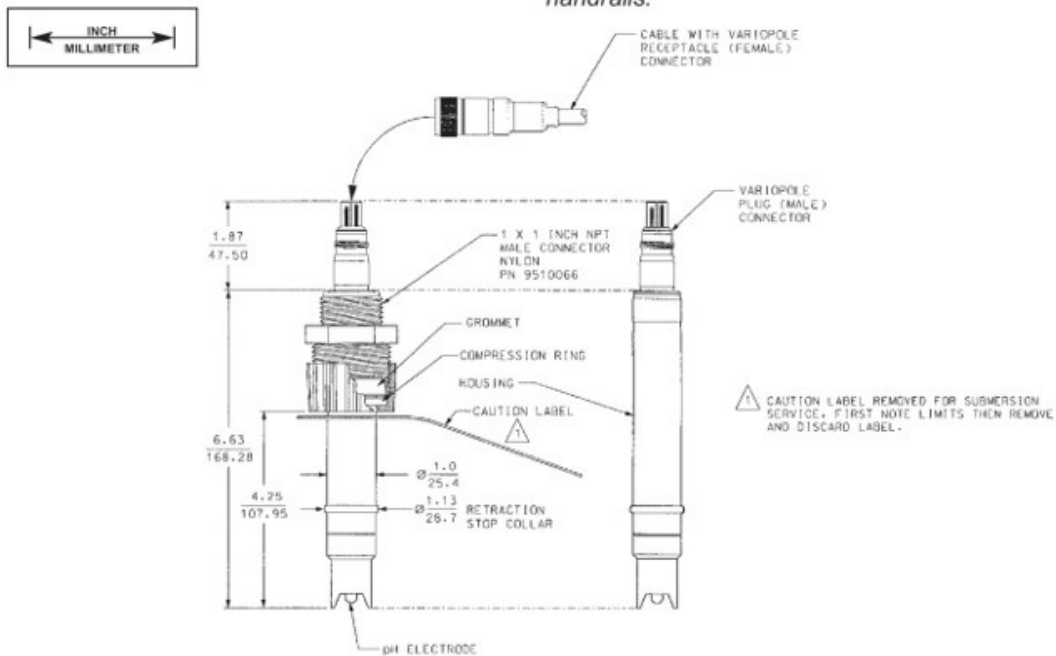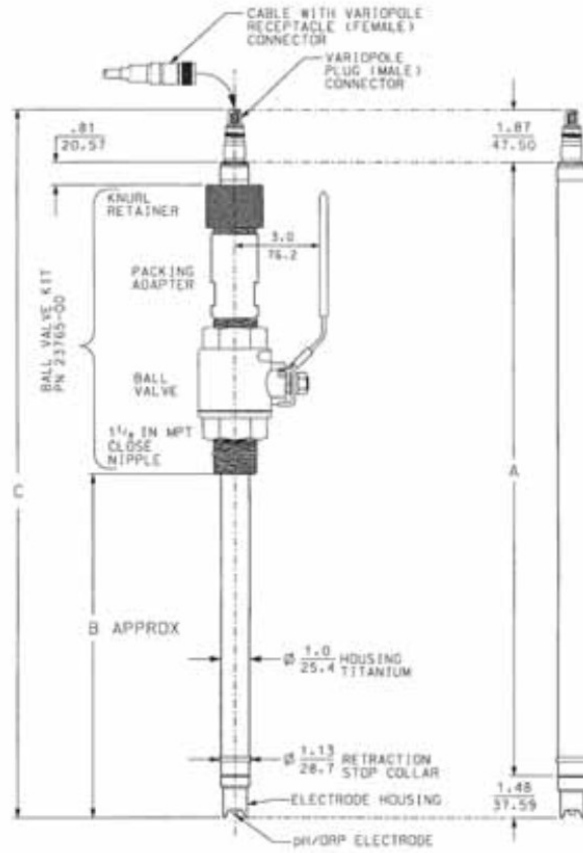
The Nylon Process Connector has process threads that can be used for submersion pipe or in-line tee mounting.

Figure 12. Rosemount 396RVP and 398RVP with Optional 1-1/4 in. Ball Valve PN 23765-00 Dimensional Drawing
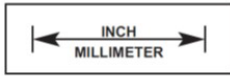
A	B	C	
IN / MM	IN / MM	IN / MM	OPTION
21.60/548.64	12.12/307.85	24.95/633.73	21
36.10/916.94	26.62/676.15	39.45/1002.03	25

Accessories

Table 7. Rosemount 398/398VP/398R/398RVP Sensor accessories information

Part number	Description
23166-00	1 inch MNPT Process Connector, Stainless Steel with EPDM O-ring
23166-01	1 inch MNPT Process Connector, Titanium with EPDM O-ring
9510066	1 inch MNPT Process Connector, Nylon
9550220	Process Connector O-ring, Kalrez
9550099	Process Connector O-ring, Viton
23240-00	1-1/2 inch Ball Valve Assembly, 316 SS (Process Connector Required)
23765-00	1-1/4 inch Ball Valve Assembly, 316 SS
23555-00	Junction Box with Preamplifier
2002565	Mounting Bracket Kit for Junction Box
23646-01	Extension Cable for Junction Box, Shielded, Prepped
9200273	Extension Cable for Junction Box, Shielded, Unprepped
11275-01	Handrail Mounting Assembly
915240-03	PVC Flow Through Tee, 3/4 inch NPT Process Connection
915240-04	PVC Flow Through Tee, 1 inch NPT Process Connection
915240-05	PVC Flow Through Tee, 1-1/2 inch Process Connection
2002011	CPVC Flow Through Tee, 1-1/2 inch NPT Process Connection
24091-00	Low Flow Cell
9210012	4.01 pH Buffer Solution, 16 oz
9210013	6.86 pH Buffer Solution, 16 oz
9210014	9.18 pH Buffer Solution, 16 oz
R508-8OZ	475 mV ORP Standard, 8 oz

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

Linkedin.com/company/Emerson-Automation-Solutions

Twitter.com/Rosemount_News

Facebook.com/Rosemount

Youtube.com/user/RosemountMeasurement

Google.com/+RosemountMeasurement