**Quick Start Guide**
00825-0100-3096, Rev AA
November 2020

# Rosemount™ 396P/396PVP

## pH/ORP Sensors

ROSEMOUNT™

EMERSON.

## Essential instructions

Read this page before proceeding!

Emerson designs, manufactures, and tests its products to meet many national and international standards. Because these instruments are sophisticated technical products, you must properly install, use, and maintain them to ensure they continue to operate within their normal specifications. You must adhere to the following instructions and integrate them into your safety program when installing, using, and maintaining Emerson's Rosemount™ products. Failure to follow the proper instructions may cause any one of the following situations to occur: loss of life, personal injury, property damage, damage to this instrument, and warranty invalidation.

- Read all instructions prior to installing, operating, and servicing the product.
- If you do not understand any of the instructions, contact your Emerson representative for clarification.
- Follow all warnings, cautions, and instructions marked on and supplied with the product.
- Inform and educate your personnel in the proper installation, operation, and maintenance of the product.
- Install equipment as specified in the Installation section of this Quick Start Guide. Follow appropriate local and national codes. Only connect the product to electrical and pressure sources specified in this Quick Start Guide.
- To ensure proper performance, use qualified personnel to install, operate, update, program, and maintain the product.
- When replacement parts are required, ensure that qualified people use replacement parts specified by Emerson. Unauthorized parts and procedures can affect the product's performance, place the safe operation of your process at risk, and may result in fire, electrical hazards, or improper operation.
- Ensure that all equipment doors are closed and protective covers are in place, except when maintenance is being performed by qualified people, to prevent electrical shock and personal injury.

**Note**
The information contained in this document is subject to change without notice.

## ⚠ WARNING

**Hazardous area installation**

Installations near flammable liquids or in hazardous area locations must be carefully evaluated by qualified on site safety personnel.

To secure and maintain intrinsically safe installation, use an appropriate transmitter/safety barrier/sensor combination. The installation system must be in accordance with the governing approval agency (FM, CSA, or BASEEFA/CENELEC) hazardous area classification requirements. Consult your transmitter Reference Manual for details.

Proper installation, operation, and servicing of this sensor in a hazardous area installation are entirely the operator's responsibility.

## ⚠ WARNING

**Physical access**

Unauthorized personnel may potentially cause significant damage to and/or misconfiguration of end users' equipment. This could be intentional or unintentional and needs to be protected against.

Physical security is an important part of any security program and fundamental to protecting your system. Restrict physical access by unauthorized personnel to protect end users' assets. This is true for all systems used within the facility.

## ⚠ CAUTION

**Sensor/process application compatibility**

The wetted sensor materials may not be compatible with process composition and operating conditions.

Application compatibility is entirely the operator's responsibility.

## ⚠ CAUTION

**Sensor/process application compatibility**

All pH/ORP sensors have a plastic enclosure which must only be cleaned with a damp cloth to avoid the danger due to a build up of electrostatic charge.

All pH/ORP sensor models are intended to be in contact with the process fluid and may not meet the 500 r.m.s.a.c. test to earth.

Take this into consideration at the time of installation.

## Contents

# 1 Install

## 1.1 Unpack and inspect

### Procedure

1. Inspect the outside of the carton for any damage. If you detect damage, contact the carrier immediately.
2. Inspect the hardware. Make sure all the items in the packing list are present and in good condition. Notify the factory if any part is missing.

**Note**
Save the original packing cartons and materials as most carriers require proof of damage due to mishandling, etc. Also, if it is necessary to return the sensor to the factory, you must pack the sensor in the same manner as it was received. Refer to Return of material for return instructions.

**⚠ WARNING**

Buffer solution in the vinyl boot may cause skin or eye irritation.

Wear personal protective equipment.
Avoid contact with skin and eyes.

**⚠ CAUTION**

Glass electrode must be wetted at all times (in storage and in line) to maximize sensor life.

### Postrequisites

If the sensor appears to be in satisfactory condition, proceed to Mount sensor.

## 1.2 Mount sensor

Emerson has designed the sensor to be located in industrial process environments.

Do not exceed temperature and pressure limitations at any time. A caution label regarding this matter is attached to the sensor. Please do not remove the label.

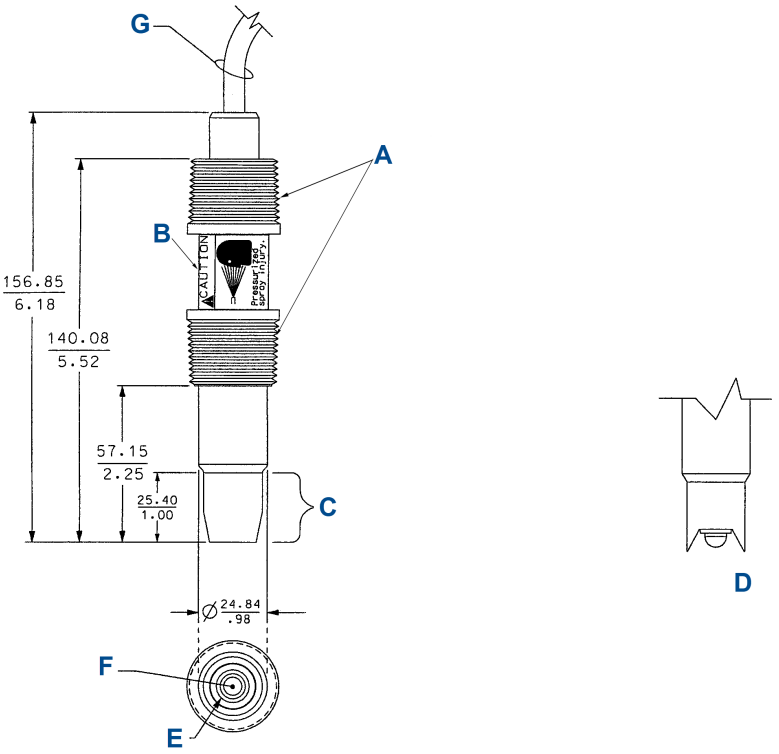
See Figure 1-1 for dimensional information to ensure proper installation into your process.

## ⚠ WARNING

**Pressurized spray injury**

US and foreign patents pending.
Do not exceed pressure and temperature specifications: 0 to 150 psig (0 to 1135 kPa), 32 to 212 °F (0 to 100 °C).
Remove pressure and allow to cool before removal.
Read and follow Quick Start Guide.

**Figure 1-1: Dimensional Drawing**




*A. 1-in. (25.4 mm) male national pipe thread (MNPT), two places*
*B. 1-in. (25.4 mm) wrench opening*
*C. Reference junction*
*D. End tip option -41*
*E. Solution ground*
*F. Electrode*
*G. Sensor cable (or Variopol connector - not shown)*

**⚠ WARNING**

Internal electrolyte fill solution may cause skin or eye irritation.

Wear personal protection equipment (PPE).
Avoid contact with skin and eyes.

1. Shake the sensor in a downward motion to remove any air bubbles that may be present inside the tip of the pH glass.
2. Do not install the sensor on the horizontal. The sensor must be 10 degrees off the horizontal to ensure accuracy.
3. Do not install the sensor upside down.
4. Air bubbles may become trapped in the sensor end between the glass bulb and the sensor body. This problem is most commonly encountered in areas of low flow or during calibration. Shake the probe while immersed in solution to remove bubbles. To avoid this problem, order the sensor with the slotted tip (option -41).

In most cases, you can simply install the pH sensor as shipped and obtain readings with an accuracy of ±0.6 pH. To obtain greater accuracy or to verify proper operation, calibrate the sensor as a loop with its compatible transmitter.

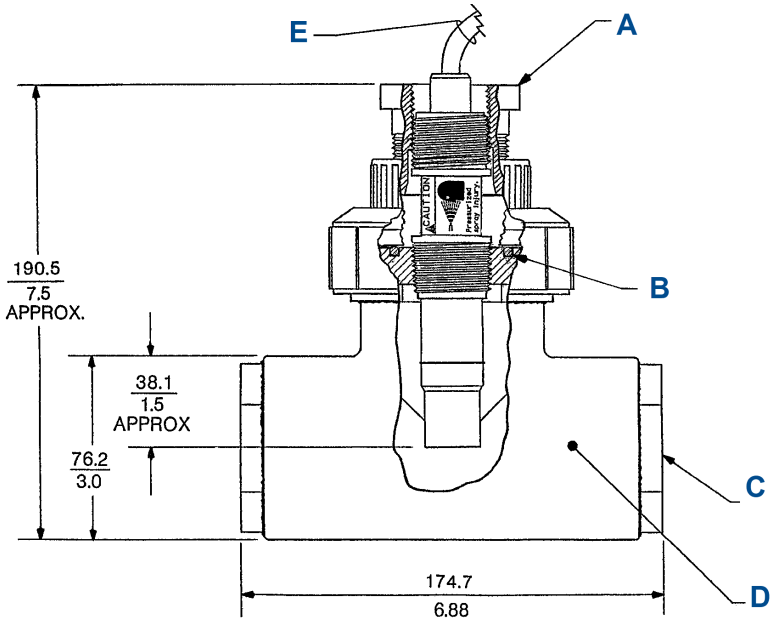
### 1.2.1 Flow through and insertion mounting

Rosemount 396P and 396PVP Sensors have a 1-in. (25.4 mm) male national pipe thread (MNPT) process connection at the front of the sensor for mounting into a 1½-in. (38.1 mm) tee or the process pipes.

See Figure 1-2 through Figure 1-8 for installation configurations.

**Note**
Do not use large pipe wrenches to tighten the sensor into a flange or other type of mounting.

**Figure 1-2: Flow-Through Tee with Adapter (PN 915240-xx)**

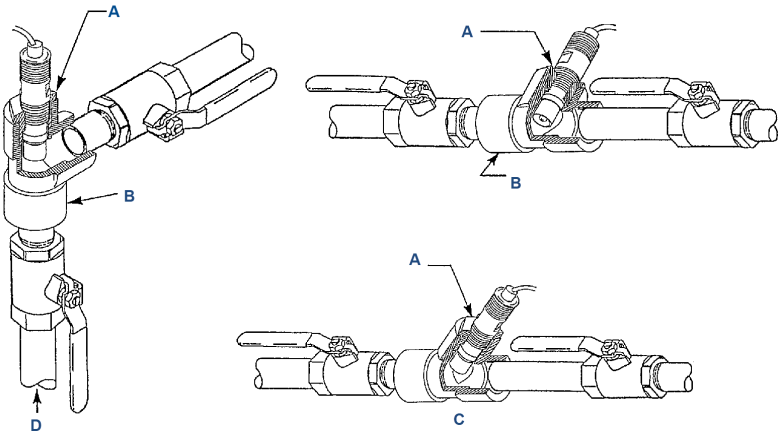



Pressure/temperature: 60 psig at 120 °F (514 kPa at 49 °C)

*A. Adapter retrofit PN 33211-00*
*B. O-ring must be in place prior to use*
*C. Process connection threads - two places*
*D. 2-in. (50.8 mm) sched. 80 T*
*E. Sensor cable*

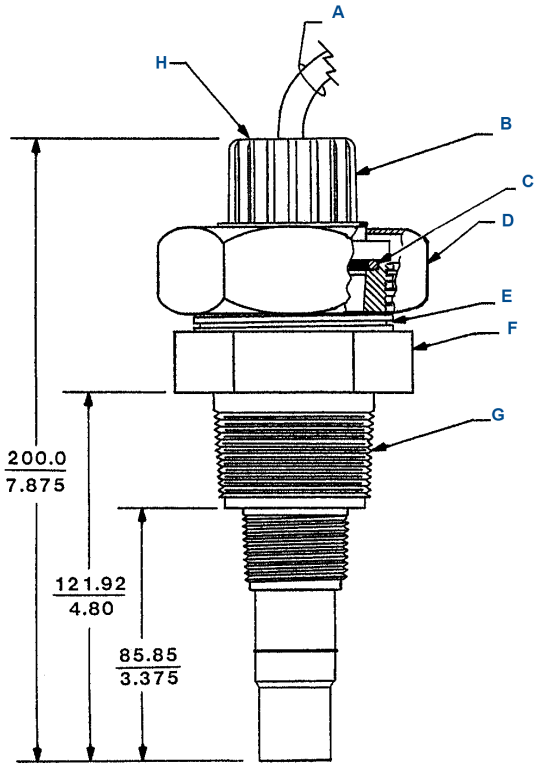
| Ordering option (xx) | Process connection threads |
|---|---|
| 03 | ¾ in. (19.1 mm) |
| 04 | 1 in. (25.4 mm) |
| 05 | 1½ in. (38.1 mm) |

**Figure 1-3: Flow-Through and Insertion Installations**




*A. 1½-in. x 1-in. (38.1 mm x 25.4 mm) reducing bushing*
*B. 1½-in. (38.1 mm) pipe tee PN 2002011*
*C. 1½-in. (38.1 mm) pipe Y*
*D. Flow*

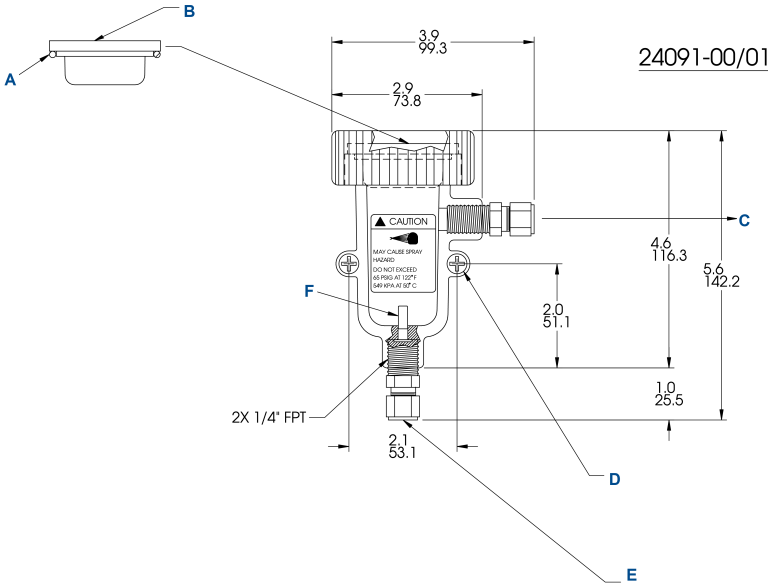
**Figure 1-4: Rosemount 396P with Insertion Mounting Adapter (PN 23242-02)**




Not for use with Rosemount 396PVP. Mounting adapter allows for sensor removal without twisting or disconnecting interconnecting cable for ease of maintenance.

A. *Cable or Variopol connector (not shown)*
B. *Peek adapter 1-in. (25.4 mm) female national pipe thread (FNPT) x ¾-in. (19.1 mm) FNPT*
C. *2-135 Viton™ O-ring. O-ring must be in place prior to use (PN 9550175).*
D. *Nut, hex union 2-in. (50.8 mm); 3-in. (76.2 mm) wrench opening (304 stainless steel)*
E. *3.531.8 acme thread (typ)*
F. *Neck, union fitting (316 stainless steel) 2⅝-in. (66.7 mm) wrench opening*
G. *1½-in. (38.1 mm) male national pipe thread (MNPT). Insertion mounting adapter PN 23242-02 (includes polyetheretherketone [PEEK] adapter, 304 stainless steel union fitting)*
H. *¾-in. (19.1 mm) FNPT*

**Figure 1-5: Low Flow Cell (PN 24091-00)**




A. *O-ring PN 9550298*
B. *Adapter with one national pipe thread (NPT) thread*
C. *¼-in. (6.4 mm) O.D. tubing outlet*
D. *Supplied hardware:*
   *10-32 x 2.5-in. (63.5 mm) stainless steel (two)*
   *10-32 hex nut, stainless steel (two)*
   *#10 flat washer, stainless steel (two)*
   *10-32 cap nut, nylon (two)*
E. *¼-in. (6.4 mm) O.D. tubing inlet*
F. *Nozzle PN 33822-00, -01 only*

**Note**

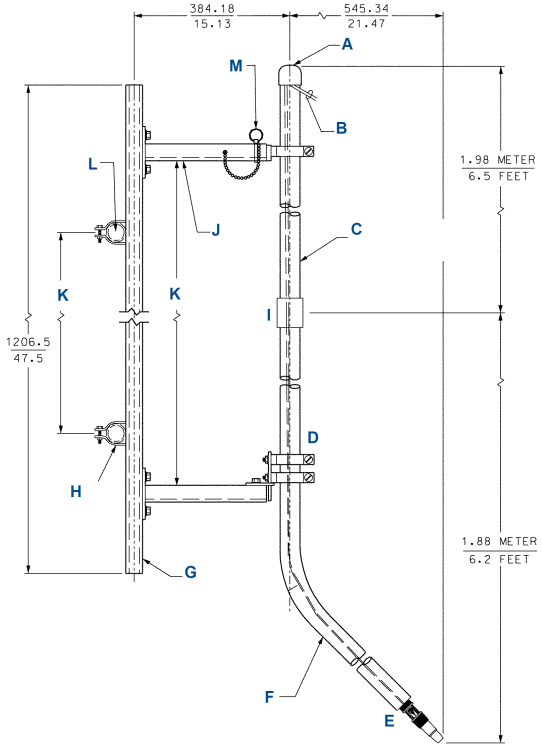
1. Materials of construction:
   Flow cell, adapter, and nut: polycarbonate/polyester
   Nozzle: Noryl™
   O-ring: Silicone
   ¼-in. (6.4 mm) male connectors: stainless steel
   Mounting hardware: stainless steel

2. Pressure/temperature rating: Maximum: 65 psig at 122 °F (549 kPa at 50 °C)

3. This flow cell assembly is used for pressurized applications. See 2 for limitations.

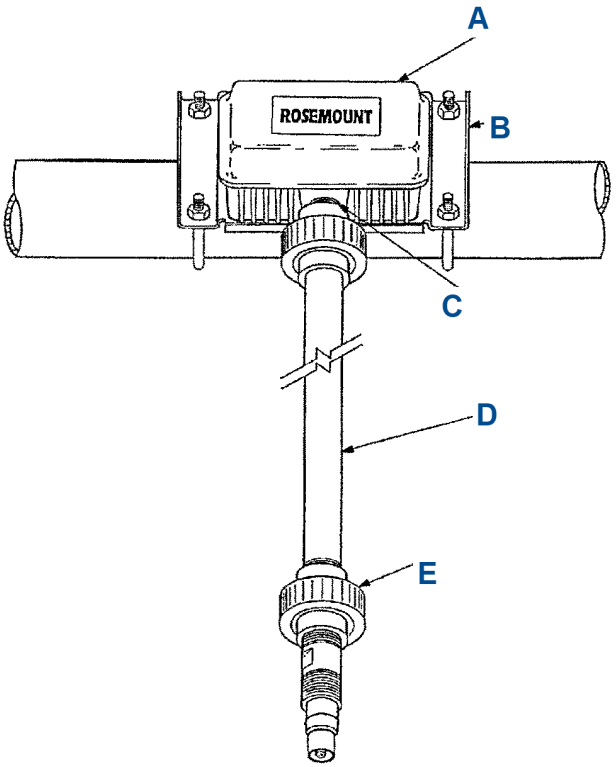
Unless otherwise specified.

**Figure 1-6: Handrail Mounting Assembly (PN 11275-01)**



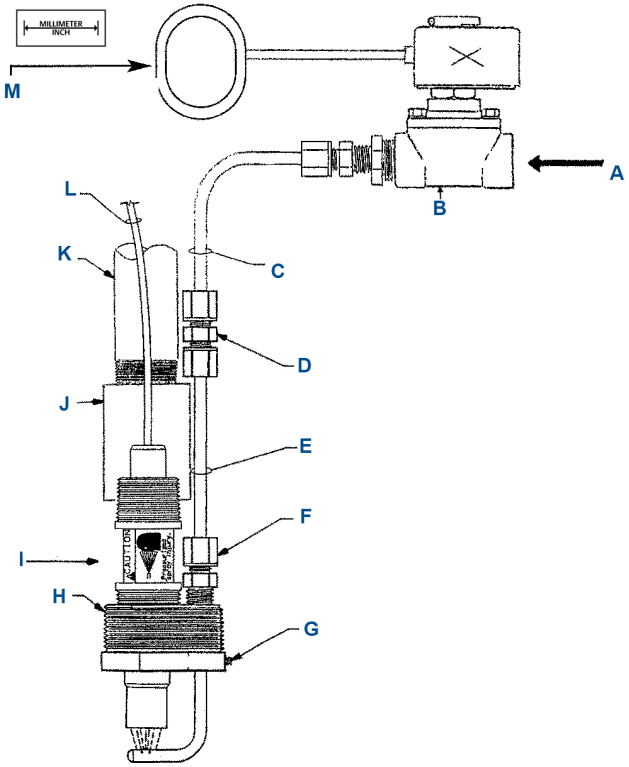

A. *End cap PVC*
B. *Sensor cable*
C. *1½-in. (38.1 mm) PVC pipe schedule 80*
D. *1½-in. (38.1 mm) pipe clamp, three places*
E. *Sensor model Rosemount 396P. Regularly check to make sure connections are water tight.*
F. *Sweep pipe with 1-in. (25.4 mm) FNPT adapter*
G. *Unistrut 1⅝ x 1⅝-in. (41.3 x 41.3 mm) aluminum*
H. *1½-in. (38. mm) pipe clamp, two places*
I. *Coupling*
J. *Mounting channel aluminum, two places*
K. *Can be any convenient dimension*
L. *Customer handrail, two places*
M. *Locking pin with bead chain*

**Figure 1-7: Junction Box**




*A. Junction box*
*B. 2-in. (50.8 mm) pipe mounting bracket (PN 2002565)*
*C. Flexible conduit if required*
*D. 1-in. (25.4 mm) pipe by others*
*E. 1-in. (25.4 mm) FNPT CPVC union (PN 9320057)*

**Figure 1-8: Jet Spray Cleaner (PN 12707-00)**




*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 couping 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*

### 1.2.2 Submersion mounting

Rosemount 396P and 396PVP sensors also have a 1-in. (25.4 mm) male national pipe thread (MNPT) process connection at the back of the sensor. Using a standard 1-in. (25.4 mm) union, you can mount the sensor to a 1-in. (25.4 mm) schedule 80 CPVC or PVDF standpipe.

Tapered pipe threads in plastic tend to loosen after installation. Therefore, Emerson recommends using PTFE tape on the threads and checking the tightness of the connection frequently to assure that no loosening has occurred. To prevent rain water or condensation from running into the sensor, Emerson recommends using a weatherproof junction box. Run the sensor cable through a protective conduit for isolation from electrical interference or physical abuse from the process. Install the sensor within 80 degrees of vertical, with the electrode facing down. Do not run the sensor's cable with power or control wiring.

# 2 Wire

## 2.1 General wiring guidelines

Figures in Wiring diagrams provide guidelines for wiring the Rosemount 396P sensor to various transmitters.

To determine which wiring diagram to use, locate the model number of the sensor to be installed.

If you need to extend the cable, use a high quality eleven conductor double-shielded instrument cable (part number 9200273) available from Emerson.

**Note**
If the cable is too long, loop up the excess cable. If you need to shorten the cable, cut and terminate each conductor neatly and make sure that the overall (outermost) drain wire is not shorted out with either of the two inner drain wires (shields).

Run signal cable in a dedicated conduit (preferably an earth grounded metallic conduit) and keep it away from AC power lines. For your convenience, Emerson has furnished a wire nut kit (in a plastic bag wrapped around the cable).

**⚠ CAUTION**

For maximum electromagnetic interference/radio frequency interference (EMI/RFI) protection when wiring from the sensor to the junction box, connect the outer braid of the sensor to the outer braided shield of the extension cable. Terminate the outer braid of the extension cable to the instrument at earth ground or use an appropriate metal cable gland fitting to provide a secure connection to the instrument cable.

## 2.2 Wiring diagrams

The Rosemount 396P has an optional built-in preamplifier and comes with a shielded cable.

**⚠ WARNING**

Serious injury may result.

Do not connect sensor cable to power lines.

## ⚠ CAUTION

Handle the cable carefully and keep it dry and free of corrosive chemicals at all times.

Take extreme care to prevent it from being twisted, damaged, or scraped by rough, sharp edges or surfaces.

**Note**

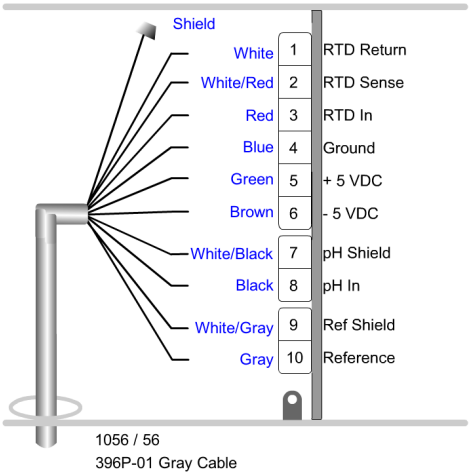
Remove electrical tape or shrink sleeve away from gray reference wire before connecting wire to terminal.

**Note**

For additional information on this product, including sensor combinations not shown here, please refer to our website Wiring Diagrams.

Figure 2-1 and Table 2-1 are applicable to option codes -01, -03, -04, and -05.

**Figure 2-1: Wiring for Rosemount 396P (Gray Cable) and Rosemount 1056, 56, or 1057**



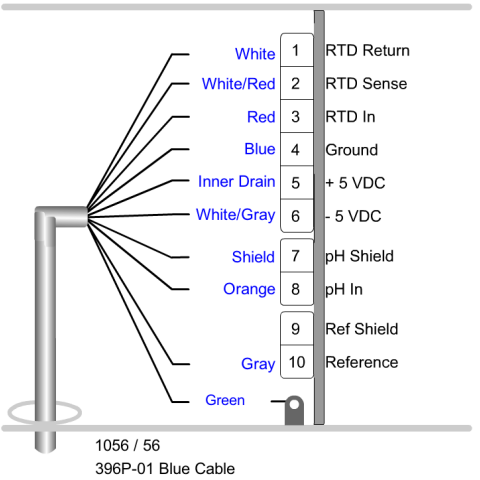

If there is a shrink sleeve on the gray reference wire, remove it before connecting the wire to the terminal. For Rosemount 1056, terminate inner drain with a wire nut.

**Table 2-1: Wiring for Rosemount 396P (Gray Cable) and Rosemount 1056, 56, or 1057**

| Terminal number | Wire color | Connects to |
|---|---|---|
| N/A | Shield | N/A |
| 1 | White | Resistance temperature device (RTD) return |
| 2 | White/red | RTD sense |
| 3 | Red | RTD in |
| 4 | Blue | Solution ground |
| 5 | Green | +5 Vdc |
| 6 | Brown | -5 Vdc |
| 7 | White/black | pH shield |
| 8 | Black | pH in |
| 9 | White/gray | Reference shield |
| 10 | Gray | Reference |

Figure 2-2 and Table 2-2 are applicable to option codes -01, -03, -04, and -05.

**Figure 2-2: Wiring for Rosemount 396P (Blue Cable) and Rosemount 1056, 56, or 1057**



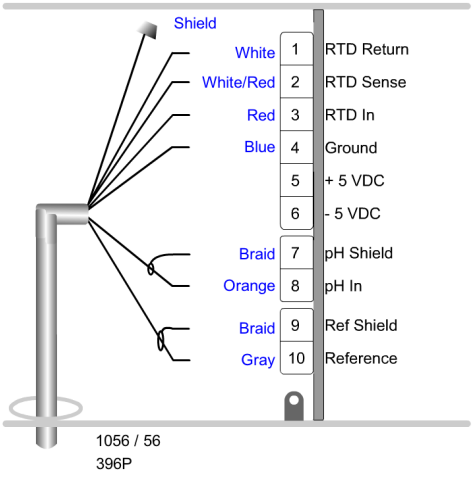

If there is a shrink sleeve on the gray reference wire, remove it before connecting the wire to the terminal. For Rosemount 1056, terminate inner drain with a wire nut.

**Table 2-2: Wiring for Rosemount 396P (Blue Cable) and Rosemount 1056, 56, or 1057**

| Terminal number | Wire color | Connects to |
|---|---|---|
| 1 | White | RTD return |
| 2 | White/red | RTD sense |
| 3 | Red | RTD in |
| 4 | Blue | Solution ground |
| 5 | Inner drain | +5 Vdc |
| 6 | White/gray | -5 Vdc |
| 7 | Shield | pH shield |
| 8 | Orange | pH in |
| 9 | N/A | Reference shield |
| 10 | Gray | Reference |
| N/A | Green | N/A |

Figure 2-3 and Table 2-3 are applicable to option codes -02, -07, and -0.8

**Figure 2-3: Wiring for Rosemount 396P and Rosemount 1056, 56, or 1057**



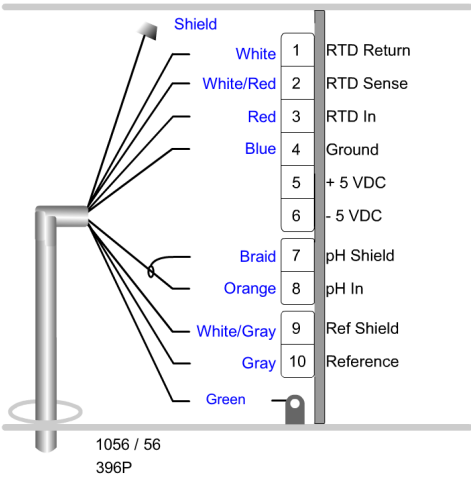

If there is a shrink sleeve on the gray reference wire, remove it before connecting the wire to the terminal. For Rosemount 1056, terminate inner drain with a wire nut.

**Table 2-3: Wiring for Rosemount 396P and Rosemount 1056, 56, or 1057**

| Terminal number | Wire color | Connects to |
|---|---|---|
| N/A | Shield | N/A |
| 1 | White | RTD return |
| 2 | White/red | RTD sense |
| 3 | Red | RTD in |
| 4 | Blue | Solution ground |
| 5 | N/A | +5 Vdc |
| 6 | N/A | -5 Vdc |
| 7 | Braid | pH shield |
| 8 | Orange | pH in |
| 9 | Braid | Reference shield |
| 10 | Gray | Reference |

Figure 2-4 and Table 2-4 are applicable to option codes -02, -07, and -08.

**Figure 2-4: Wiring for Rosemount 396P (Blue Cable) and Rosemount 1056, 56, or 1057**

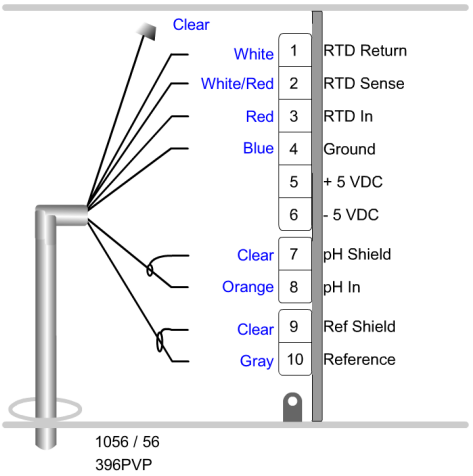



If there is a shrink sleeve on the gray reference wire, remove it before connecting the wire to the terminal. For Rosemount 1056, terminate inner drain with a wire nut.

**Table 2-4: Wiring for Rosemount 396P (Blue Cable) and Rosemount 1056, 56, or 1057**

| Terminal number | Wire color | Connects to |
|---|---|---|
| N/A | Shield | N/A |
| 1 | White | RTD return |
| 2 | White/red | RTD sense |
| 3 | Red | RTD in |
| 4 | Blue | Solution ground |
| 5 | N/A | +5 Vdc |
| 6 | N/A | -5 Vdc |
| 7 | Braid | pH shield |
| 8 | Orange | pH in |
| 9 | White/gray | Reference shield |
| 10 | Gray | Reference |
| N/A | Green | Ground |

**Figure 2-5: Wiring for Rosemount 396PVP without Integral Preamplifier and Rosemount 1056, 56, or 1057**

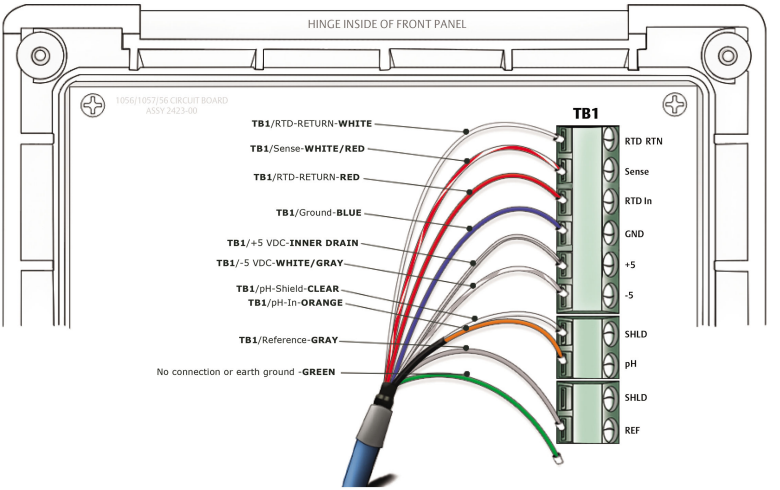



If there is a shrink sleeve on the gray reference wire, remove it before connecting the wire to the terminal. For Rosemount 1056, terminate inner drain with a wire nut.

**Table 2-5: Wiring for Rosemount 396PVP without Integral Preamplifier and Rosemount 1056, 56, or 1057**

| Terminal number | Wire color | Connects to |
|---|---|---|
| N/A | Clear | N/A |
| 1 | White | RTD return |
| 2 | White/red | RTD sense |
| 3 | Red | RTD in |
| 4 | Blue | Solution ground |
| 5 | N/A | +5 Vdc |
| 6 | N/A | -5 Vdc |
| 7 | Clear | pH shield |
| 8 | Orange | pH in |
| 9 | Clear | Reference shield |
| 10 | Gray | Reference |

### Figure 2-6: Wiring for Rosemount 396PVP-70 and Rosemount 1056, 56, or 1057

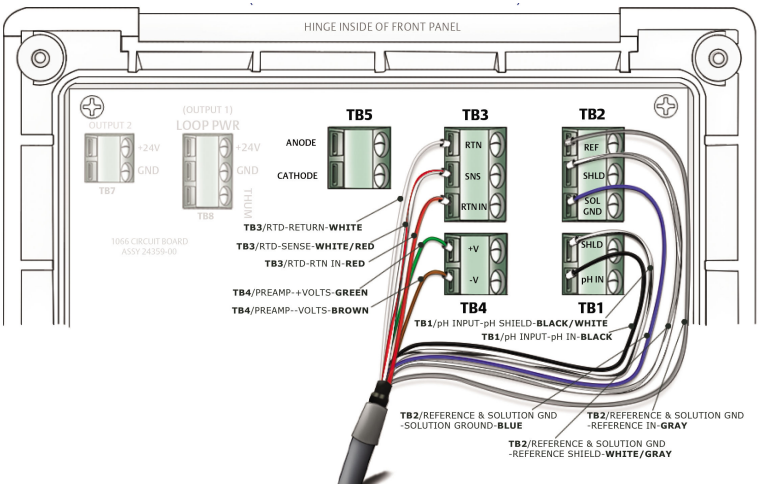



### Table 2-6: Wiring for Rosemount 396PVP-70 and Rosemount 1056, 56, or 1057

| Terminal number | Wire color | Connects to |
|---|---|---|
| 1 | White | RTD return |
| 2 | White/red | Sense |
| 3 | Red | RTD in |
| 4 | Blue | Solution ground |
| 5 | Inner drain | +5 Vdc |
| 6 | White/gray | -5 Vdc |
| 7 | Clear | pH shield |
| 8 | Orange | pH in |
| 9 | N/A | Reference shield |
| 10 | Gray | Reference |
| N/A | Green | No connection or earth ground |

Figure 2-7 and Table 2-7 are applicable to option codes -01, -03, -04, -05, and -06.

### Figure 2-7: Wiring for Rosemount 396P (Gray Cable) and Rosemount 1066




**Note**

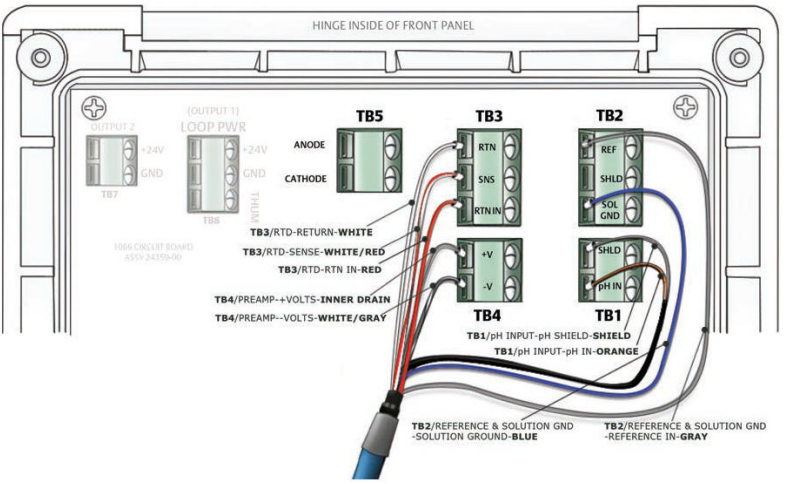
- If ground lead is present, terminate it to green ground screw on inner enclosure.
- TB5, TB7, and TB8 not used for pH/ORP sensor wiring.

### Table 2-7: Wiring for Rosemount 396P (Gray Cable) and Rosemount 1066

| Terminal number | Wire color | Connects to |
|---|---|---|
| TB3 | White | RTD return |
| TB3 | White/red | RTD sense |
| TB3 | Red | RTD in |
| TB4 | Green | Preamplifier: +volts |
| TB4 | Brown | Preamplifier: -volts |
| TB1 | Black/white | pH shield |
| TB1 | Black | pH in |
| TB2 | Blue | Solution ground |
| TB2 | White/gray | Reference shield |
| TB2 | Gray | Reference in |

Figure 2-8 and Table 2-8 are applicable to option codes -01, -03, -04, -05, and -06.

**Figure 2-8: Wiring for Rosemount 396P (Blue Cable) and Rosemount 1066**




**Note**

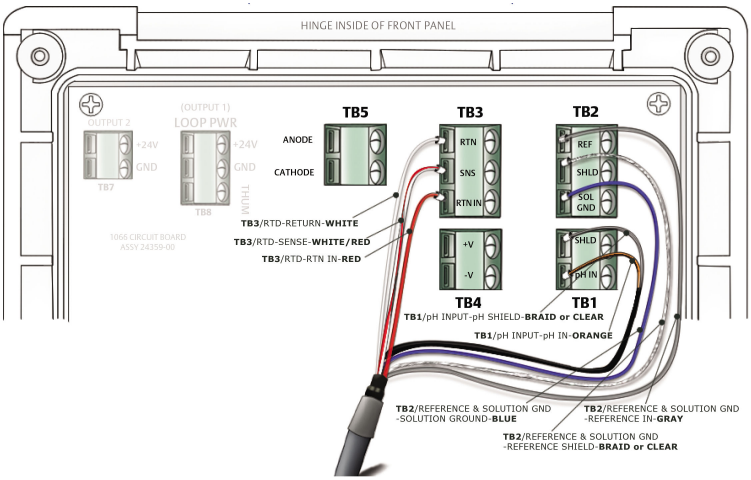
- If ground lead is present, terminate it to green ground screw on inner enclosure.
- TB5, TB7, and TB8 not used for pH/ORP sensor wiring.

**Table 2-8: Wiring for Rosemount 396P (Blue Cable) and Rosemount 1066**

| Terminal number | Wire color | Connects to |
|---|---|---|
| TB3 | White | RTD return |
| TB3 | White/red | RTD sense |
| TB3 | Red | RTD return in |
| TB4 | Inner drain | Preamplifier: +volts |
| TB4 | White/gray | Preamplifier: -volts |
| TB1 | Shield | pH shield |
| TB1 | Orange | pH in |
| TB2 | Blue | Solution ground |
| TB2 | Gray | Reference in |

Figure 2-9 and Table 2-9 are applicable to option codes -02, -07, and -08.

**Figure 2-9: Wiring for Rosemount 396P (Gray Cable) and Rosemount 1066**




**Note**

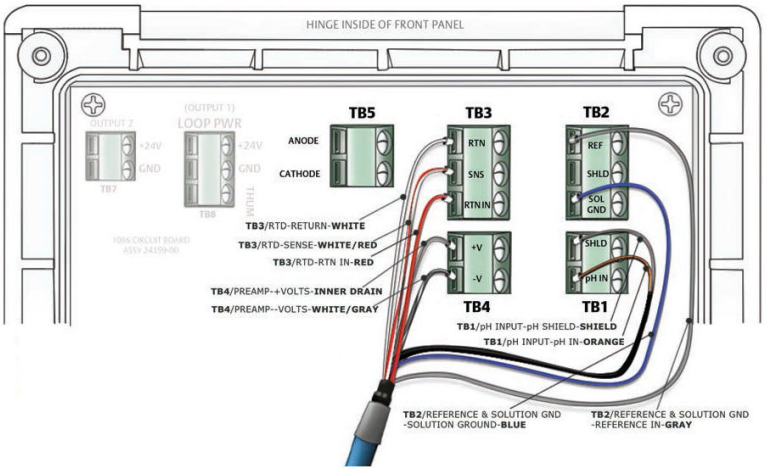
- If ground lead is present, terminate it to green ground screw on inner enclosure.
- TB5, TB7, and TB8 not used for pH/ORP sensor wiring.

**Table 2-9: Wiring for Rosemount 396P (Gray Cable) and Rosemount 1066**

| Terminal number | Wire color | Connects to |
|---|---|---|
| TB3 | White | RTD return |
| TB3 | White/red | RTD sense |
| TB3 | Red | RTD return in |
| TB1 | Braid or clear | pH shield |
| TB1 | Orange | pH in |
| TB2 | Blue | Solution ground |
| TB2 | Braid or clear | Reference shield |
| TB2 | Gray | Reference in |

Figure 2-10 and Table 2-10 are applicable to option codes -02, -07, and -08.

**Figure 2-10: Wiring for Rosemount 396P (Blue Cable) and Rosemount 1066**



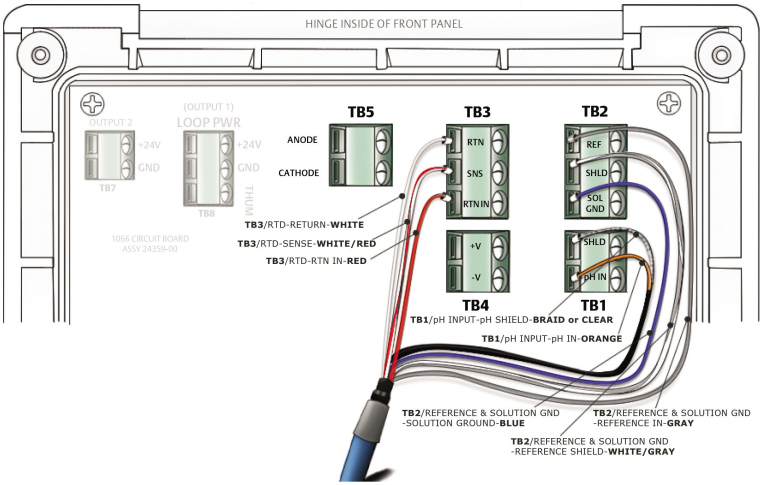

**Note**

- If ground lead is present, terminate it to green ground screw on inner enclosure.
- TB5, TB7, and TB8 not used for pH/ORP sensor wiring.

**Table 2-10: Wiring for Rosemount 396P (Blue Cable) and Rosemount 1066**

| Terminal number | Wire color | Connects to |
|---|---|---|
| TB3 | White | RTD return |
| TB3 | White/red | RTD sense |
| TB3 | Red | RTD return in |
| TB4 | Inner drain | Preamplifier: +volts |
| TB4 | White/gray | Preamplifier: -volts |
| TB1 | Shield | pH shield |
| TB1 | Orange | pH in |
| TB2 | Blue | Solution ground |
| TB2 | Gray | Reference in |

### Figure 2-11: Wiring for Rosemount 396PVP and Rosemount 1066



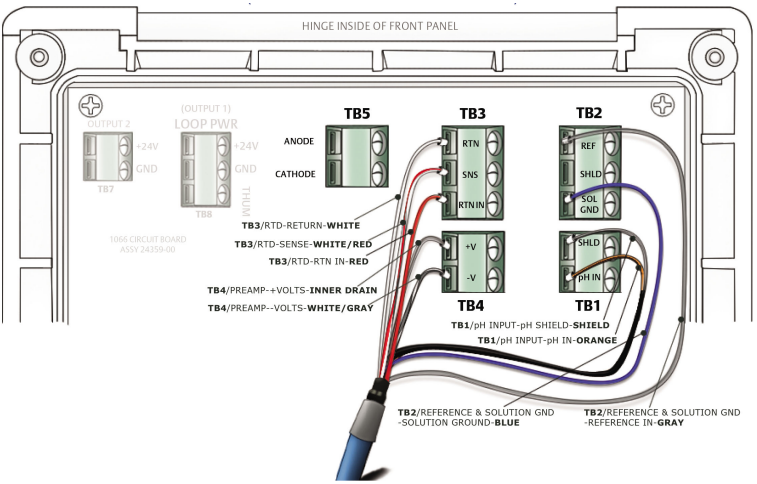

### Note

- If ground lead is present, terminate it to green ground screw on inner enclosure.
- TB5, TB7, and TB8 not used for pH/ORP sensor wiring.

### Table 2-11: Wiring for Rosemount 396PVP and Rosemount 1066

| Terminal block | Wire color | Connects to |
|---|---|---|
| TB3 | White | RTD return |
| TB3 | White/red | RTD sense |
| TB3 | Red | RTD return in |
| TB1 | Braid or clear | pH input - pH shield |
| TB1 | Orange | pH input - pH in |
| TB2 | Blue | Solution ground |
| TB2 | White/gray | Reference shield |
| TB2 | Gray | Reference in |

## Figure 2-12: Wiring for Rosemount 396PVP-70 and Rosemount 1066




### Note

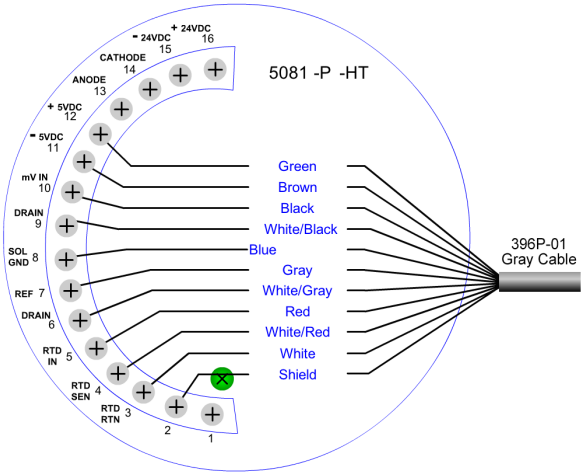
- If ground lead is present, terminate it to green ground screw on inner enclosure.
- TB5, TB7, and TB8 not used for pH/ORP sensor wiring.

## Table 2-12: Wiring for Rosemount 396PVP-70 and Rosemount 1066

| Terminal block | Wire color | Connects to |
|---|---|---|
| TB3 | White | RTD return |
| TB3 | White/red | RTD sense |
| TB3 | Red | RTD return in |
| TB4 | Inner drain | Preamplifier: +volts |
| TB4 | White/gray | Preamplifier: -volts |
| TB1 | Shield | pH shield |
| TB1 | Orange | pH in |
| TB2 | Blue | Solution ground |
| TB2 | Gray | Reference in |

Figure 2-13 and Table 2-13 are applicable to option codes -01, -03, -04, -05, and -06.

**Figure 2-13: Wiring for Rosemount 396P (Gray Cable) and Rosemount 5081-P-HT**



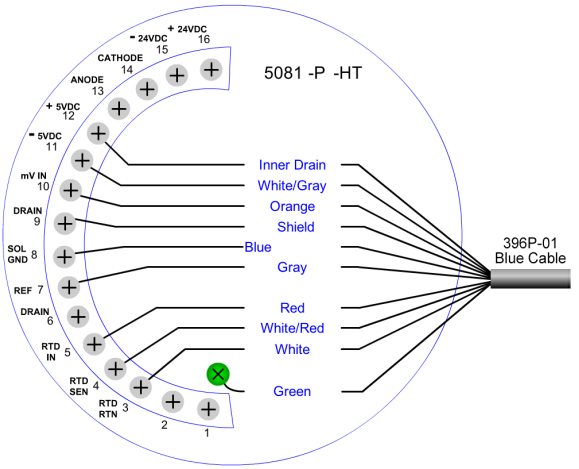

If there is a shrink sleeve on the gray reference wire, remove it before connecting the wire to the terminal.

**Table 2-13: Wiring for Rosemount 396P (Gray Cable) and Rosemount 5081-P-HT**

| Terminal number | Wire color | Connects to | Terminal number | Wire color | Connects to |
|---|---|---|---|---|---|
| 1 | N/A | N/A | 9 | White/black | Drain |
| 2 | Shield | N/A | 10 | Black | mV in |
| 3 | White | RTD return | 11 | Brown | -5 Vdc |
| 4 | White/red | RTD sense | 12 | Green | +5 Vdc |
| 5 | Red | RTD in | 13 | N/A | Anode |
| 6 | White/gray | Drain | 14 | N/A | Cathode |
| 7 | Gray | Reference | 15 | N/A | -24 Vdc |
| 8 | Blue | Solution ground | 16 | N/A | +24 Vdc |

Figure 2-14 and Table 2-14 are applicable to option codes -01, -03, -04, -05, and -06.

**Figure 2-14: Wiring for Rosemount 396P (Blue Cable) and Rosemount 5081-P-HT**



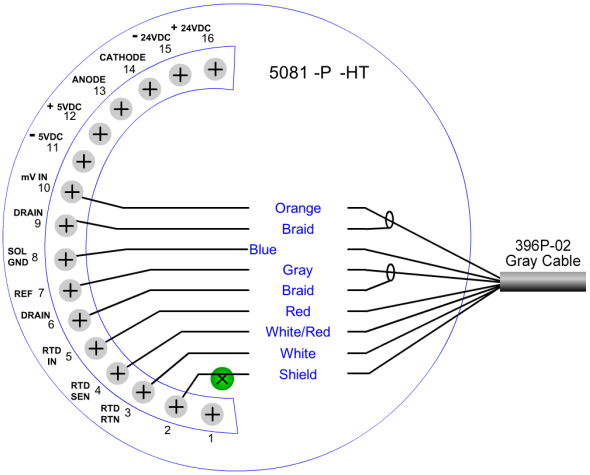

If there is a shrink sleeve on the gray reference wire, remove it before connecting the wire to the terminal.

**Table 2-14: Wiring for Rosemount 396P (Blue Cable) and Rosemount 5081-P-HT**

| Terminal number | Wire color | Connects to | Terminal number | Wire color | Connects to |
|---|---|---|---|---|---|
| N/A | Green | N/A | 9 | Shield | Drain |
| 1 | N/A | N/A | 10 | Orange | mV in |
| 2 | N/A | N/A | 11 | White/gray | -5 Vdc |
| 3 | White | RTD return | 12 | Inner drain | +5 Vdc |
| 4 | White/red | RTD sense | 13 | N/A | Anode |
| 5 | Red | RTD in | 14 | N/A | Cathode |
| 6 | N/A | Drain | 15 | N/A | -24 Vdc |
| 7 | Gray | Reference | 16 | N/A | +24 Vdc |
| 8 | Blue | Solution ground | | | |

Figure 2-15 and Table 2-15 are applicable to models -02, -07, and -08.

**Figure 2-15: Wiring for Rosemount 396P (Gray Cable) and Rosemount 5081-P-HT**



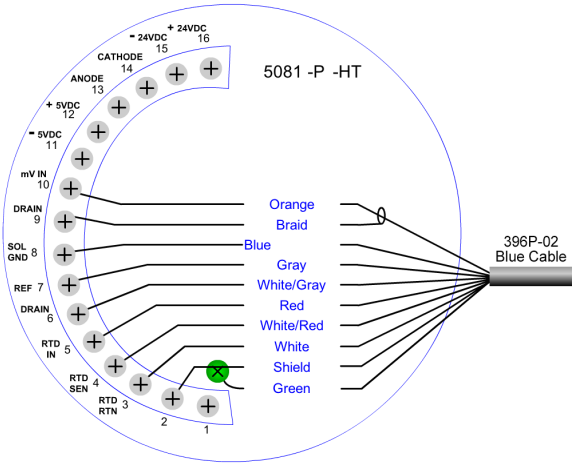

If there is a shrink sleeve on the gray reference wire, remove it before connecting the wire to the terminal.

**Table 2-15: Wiring for Rosemount 396P (Gray Cable) and Rosemount 5081-P-HT**

| Terminal number | Wire color | Connects to | Terminal number | Wire color | Connects to |
|---|---|---|---|---|---|
| 1 | N/A | N/A | 9 | Braid | Drain |
| 2 | Shield | N/A | 10 | Orange | mV in |
| 3 | White | RTD return | 11 | N/A | -5 Vdc |
| 4 | White/red | RTD sense | 12 | N/A | +5 Vdc |
| 5 | Red | RTD in | 13 | N/A | Anode |
| 6 | Braid | Drain | 14 | N/A | Cathode |
| 7 | Gray | Reference | 15 | N/A | -24 Vdc |
| 8 | Blue | Solution ground | 16 | N/A | +24 Vdc |

Figure 2-16 and Table 2-16 are applicable to models -02, -07, and -08.

**Figure 2-16: Wiring for Rosemount 396P (Blue Cable) and Rosemount 5081-P-HT**

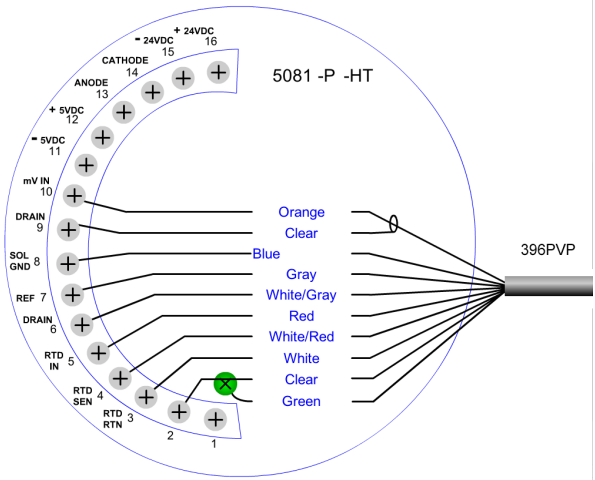



If there is a shrink sleeve on the gray reference wire, remove it before connecting the wire to the terminal.

**Table 2-16: Wiring for Rosemount 396P (Blue Cable) and Rosemount 5081-P-HT**

| Terminal number | Wire color | Connects to | Terminal number | Wire color | Connects to |
|---|---|---|---|---|---|
| N/A | Green | N/A | 9 | Braid | Drain |
| 1 | N/A | N/A | 10 | Orange | mV in |
| 2 | Shield | N/A | 11 | N/A | -5 Vdc |
| 3 | White | RTD return | 12 | N/A | +5 Vdc |
| 4 | White/red | RTD sense | 13 | N/A | Anode |
| 5 | Red | RTD in | 14 | N/A | Cathode |
| 6 | White/gray | Drain | 15 | N/A | -24 Vdc |
| 7 | Gray | Reference | 16 | N/A | +24 Vdc |
| 8 | Blue | Solution ground | | | |

### Figure 2-17: Wiring for Rosemount 396PVP and Rosemount 5081-P-HT

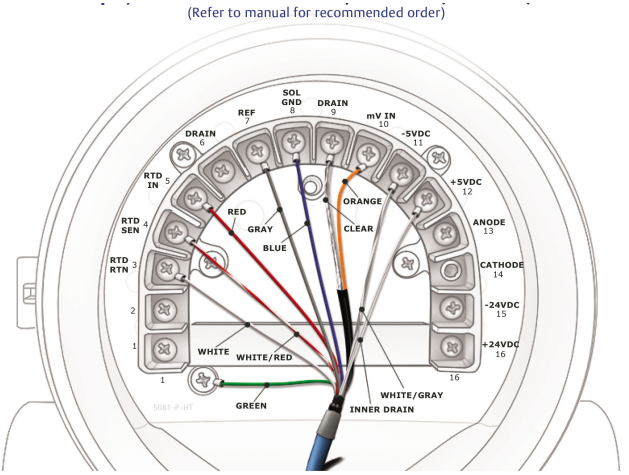



If there is a shrink sleeve on the gray reference wire, remove it before connecting the wire to the terminal.

### Table 2-17: Wiring for Rosemount 396PVP and Rosemount 5081-P-HT

| Terminal number | Wire color | Connects to | Terminal number | Wire color | Connects to |
|---|---|---|---|---|---|
| N/A | Green | N/A | 9 | Clear | Drain |
| 1 | N/A | N/A | 10 | Orange | mV in |
| 2 | Clear | N/A | 11 | N/A | -5 Vdc |
| 3 | White | RTD return | 12 | N/A | +5 Vdc |
| 4 | White/red | RTD sense | 13 | N/A | Anode |
| 5 | Red | RTD in | 14 | N/A | Cathode |
| 6 | White/gray | Drain | 15 | N/A | -24 Vdc |
| 7 | Gray | Reference | 16 | N/A | +24 Vdc |
| 8 | Blue | Solution ground | | | |

## Figure 2-18: Wiring for Rosemount 396PVP-70 and Rosemount 5081




## Table 2-18: Wiring for Rosemount 396PVP-70 and Rosemount 5081

| Terminal number | Wire color | Connects to | Terminal number | Wire color | Connects to |
|---|---|---|---|---|---|
| N/A | Green | N/A | 9 | Clear | Drain |
| 1 | N/A | N/A | 10 | Orange | mV in |
| 2 | N/A | N/A | 11 | White/gray | -5 Vdc |
| 3 | White | RTD return | 12 | Inner drain | +5 Vdc |
| 4 | White/red | RTD sense | 13 | N/A | Anode |
| 5 | Red | RTD in | 14 | N/A | Cathode |
| 6 | N/A | Drain | 15 | N/A | -24 Vdc |
| 7 | Gray | Reference | 16 | N/A | +24 Vdc |
| 8 | Blue | Solution ground | | | |

# 3 Start up and calibrate

## 3.1 Calibrate Rosemount 396P and 396PVP pH sensors

### 3.1.1 Prepare sensor

**Procedure**

1. Shake down the sensor to remove any air bubbles that may be present at the tip of the pH glass bulb.
2. To obtain greater accuracy or to verify proper operation, calibrate the sensor as a loop with its compatible transmitter.

### 3.1.2 Calibrate pH

1. Establish a temporary connection between the sensor and the transmitter.
2. Perform a buffer calibration.
3. Consult the appropriate pH/ORP transmitter Reference Manual for specific calibration and standardization procedures, or see Calibrate with two buffer solutions for the recommended two-point buffer calibration procedure.

#### Calibrate with two buffer solutions

**Prerequisites**

Select two stable buffer solutions, preferably pH 4.0 and 7.0. (You can use pH buffers other than pH 4.0 and pH 7.0 as long as the pH values are at least two pH units apart).

**Note**
A pH 7 buffer solution reads an mV value of approximately zero, and pH buffers read approximately ±59.1 mV for each pH unit above or below pH 7. Check the pH buffer manufacturer specifications for millivolt values at various temperatures, as it may affect the actual value of the buffer solution mV/pH value.

**Procedure**

1. Immerse the sensor in the first buffer solution. Allow the sensor to adjust to the buffer temperature (to avoid errors due to temperature differences between the buffer solution and sensor temperature) and wait for readings to stabilize.
   The transmitter can now acknowledge the value of the buffer.
2. Once the first buffer has been acknowledged by the transmitter, rinse the buffer solution off the sensor with distilled or deionized water.

3. Repeat Step 1 and Step 2 using the second buffer solution.

Once the transmitter has acknowledged both buffer solutions, a sensor slope (mV/pH) is established (the slope value can be found within the transmitter). The slope value should read about 59.1 mV/pH for a new sensor and will decrease over time to approximately 47-49 mV/pH.

**Postrequisites**

Once the slope reads below the 47-49 mV/pH range, install a new sensor to maintain accurate readings.

### Standardize pH sensor

For maximum accuracy, you can standardize the sensor in-line or with a process grab sample after performing a buffer calibration and conditioning the sensor to the process. Standardization accounts for the sensor junction potential and other interferences. Standardization does not change the sensor's slope, but simply adjusts the transmitter's reading to match that of a known process pH.

**Procedure**

1. While obtaining a process solution sample, record the pH value that is shown on the transmitter display.

   Emerson recommends taking the sample close to the sensor.

2. Measure and record the pH of the process solution sample with another temperature compensated, calibrated pH instrument.

   For best results, perform standardization at the process temperature.

3. Adjust the transmitter to the standardized value.

## 3.2 Calibrate Rosemount 396P and 396PVP oxidation reduction potential (ORP) sensors

Most industrial applications have a number of ORP reactions occuring in sequence or simultaneously. Reagents can oxidize or reduce several components. Theoretically, the ORP potential is absolute, because it is the result of the oxidation/reduction equilibrium. However, the actual measured potential is dependent on many factors, including the condition of the surface of the ORP platinum electrode. Therefore, allow the sensor one to two hours to become conditioned to the stream when it is first set up or after cleaning it.

**Procedure**

1. Make a temporary electrical connection between the sensor and the instrument.
2. Obtain an ORP standard solution (PN R508-8OZ) or make one by adding a few crystals of quinhydrone to either pH 4 or pH 7 buffer.

Quinhydrone is only slightly soluble; therefore, use only a few crystals.

3. Immerse the sensor in the standard solution. Allow one to two minutes for the ORP sensor to stabilize.
4. Adjust the standardized control of the transmitter to the solution value shown in Table 3-1.
   The resulting potentials, measured with a clean platinum electrode and saturated KCl/AgCL reference electrode, should be within ±20 millivolts of the value shown in Table 3-1. Note solution temperature to ensure accurate interpretation of results. The ORP value of saturated quinhydrone solution is not stable over long periods of time. Therefore, make these standards fresh each time they are used.

**Table 3-1: ORP of Saturated Quinhydrone Solution**

| | **pH 4** | | | **pH 7** | | |
|---|---|---|---|---|---|---|
| Temp ºF (°C) | 68 (20) | 77 (25) | 86 (30) | 68 (20) | 77 (25) | 86 (30) |
| mV potential | 268 | 264 | 260 | 94 | 87 | 80 |

5. Remove the sensor from the buffer, rinse, and install in the process.

# 4 Maintenance

## 4.1 General maintainence information

The sensors require mimimal maintenance.

Keep the sensor clean and free of debris or sediment at all times. The nature of the solution measured determines the frequency of cleaning. To clean, wipe with a soft cloth or brush with a brush. Remove the sensor from the process periodically and check it in buffer solutions.

**⚠ WARNING**

Before removing the sensor, be absolutely certain that the process pressure is reduced to 0 psig and the process temperature is lowered to a safe level.

## 4.2 Automatic temperature compensator

The temperature compensator element is a temperature sensitive resistor and can be checked with an ohmeter. Resistance increases with temperature.

PT-100 reads 110 ohms. Resistance varies with temperature and can be determined according to Table 4-2 or the following formula:

$R_T = R_O [1 + R_1(T-20)]$

Where $R_T$ = Resistance and T = Temperature in °C

Refer to Table 4-1 for $R_O$ and $R_1$ values.

**Table 4-1: $R_O$ and $R_1$ Values for Temperature Compensation Elements**

| Temperature element | $R_O$ | $R_1$ |
|---|---|---|
| PT-100 | 107.7 | 0.00385 |

**Table 4-2: Temperature vs. Resistance of Automatic Temperature Compensation Elements**

| Temperature °F (°C) | Resistance (Ohms) ±1% PT-100 |
|---|---|
| 32 (0) | 100.0 |
| 50 (10) | 103.8 |
| 68 (20) | 107.7 |
| 77 (25) | 109.6 |
| 86 (30) | 111.5 |

**Table 4-2: Temperature vs. Resistance of Automatic Temperature Compensation Elements *(continued)***

| Temperature °F (°C) | Resistance (Ohms) ±1% PT-100 |
|---|---|
| 104 (40) | 115.4 |
| 122 (50) | 119.2 |
| 140 (60) | 123.1 |
| 158 (70) | 126.9 |
| 176 (80) | 130.8 |
| 194 (90) | 134.6 |
| 212 (100) | 138.5 |

## 4.3 Clean electrode

If the electrode is coated or dirty, clean as follows:

### Procedure

1. Remove the sensor from process.
2. Wipe the glass bulb with a soft, clean, lint free cloth or tissue. If this does not remove the dirt or coating, go to Step 3.

   Detergents clean oil and grease; acids remove scale.
3. Wash the glass bulb in a mild detergent solution. If this does not clean the glass bulb, go to Step 4.
4. **⚠ WARNING**

   **Corrosive substance**

   The solution used during the following step is an acid.

   Handle with care.
   Follow the directions of the acid manufacturer.
   Wear the proper protective equipment.
   Do not let the solution come in contact with skin or clothing.
   If contact with skin is made, immediately rinse with clean water.

   Wash the bulb in a dilute five percent hydrochloric acid solution and rinse with clean water.

   Soaking the sensor overnight in the acid solution can improve cleaning action.

**Note**
You may get erroneous pH results immediately after acid soak due to reference junction potential buildup. Replace the sensor if cleaning does not restore sensor operation.

## 4.4 Check platinum electrode

Check the platinum electrode as follows. There are two types of standard solutions which may be used to check the oxidation reduction potential (ORP) electrode/transmitter system.

Type 1: One type of commonly used ORP standard solution is the saturated quinhydrone solution (PN R508-8OZ). Refer to Calibrate Rosemount 396P and 396PVP oxidation reduction potential (ORP) sensors.

**⚠ WARNING**

The solution used during the following check is an acid.

Handle the solution with care.

Follow the manufacturer's directions.

Wear the proper protective equipment.

If contact with skin or clothing is made, immediately rinse with plenty of clean water.

Type 2: A second ORP standard solution can be prepared from the following recipe:

**Procedure**

1. Dissolve 39.2 grams of reagent grade ferrous ammonium sulfate, $Fe(NH_4)_2(SO_4)_2 \bullet 6H_2O$ and 48.2 grams of reagent grade ferric ammonium sulfate, $FeNH_4(SO_4)_2 \bullet 12\ H_2O$ in approximately 23.7 oz. (700 ml) of water.

   Distilled water is preferred, but tap water is acceptable.

2. Slowly and carefully add 1.9 oz. (56.2 ml) of concentrated sulfuric acid.
3. Add sufficient water to bring the total solution volume up to 33.8 oz. (1000 ml).

This standard ORP solution, although not as simple to prepare as the quinhydrone recipe, is much more stable and will maintain its millivolt value for approximately one year when stored in glass containers. This solution (ferric/ferrous ammonium sulfate) produces a nominal ORP of 476 +20 mV at 77 °F (25 ºC) when used with a saturated KCL/AgCl reference electrode and platinum measuring electrode. Expect some tolerance in mV values due to the rather large liquid reference junction potentials that can arise when

measuring this strongly acidic and concentrated solution. However, if you keep measuring electrodes clean and in good operating condition, you can carry out consistently repeatable calibrations using this standard solution.

## 4.5 Clean platinum electrode

To restore the electrode to normal operation, clean the platinum electrode with baking soda. Polish it by rubbing it with a damp paper towel and baking soda until it appears bright and shiny.

# 5 Diagnostics and troubleshooting

## 5.1 Transmitter troubleshooting

Many Rosemount instruments and transmitters automatically search for fault conditions that would cause an error in the measured pH value. Refer to the applicable Reference Manual for a complete description of the transmitter's fault conditions.

The sections below list some of the diagnostic messages that indicate a possible sensor problem as well as a description of the problem and a suggested remedy.

### 5.1.1 Calibration warning

**CALibrAte**

**Potential cause**

Aged glass.

**Recommended action**

Perform buffer calibration.

**Potential cause**

Sensor not immersed.

**Recommended action**

Make sure electrode measuring tip is fully submerged in the process liquid.

### 5.1.2 Cracked glass failure

**GLASS fAIL**

**Potential cause**

Broken or cracked glass.

**Recommended action**

Replace sensor.

### 5.1.3 High reference impede

**rEF fAIL or rEF WArn**

**Potential cause**

Liquid junction coated.

**Recommended action**

Clean sensor; replace if necessary.

**Potential cause**

Reference cell gel depleted.

**Recommended action**

Replace sensor.

**Potential cause**

Sensor not fully immersed.

**Recommended action**

Make sure electrode tip is fully immersed in the process solution.

### 5.1.4 Input voltage high or input voltage low

**Potential cause**

pH input shorted or sensor miswired.

**Recommended action**

Check wiring. Replace sensor if necessary.

### 5.1.5 Old glass warning

**GLaSSWArn**

**Potential cause**

Glass electrode worn out.

**Recommended action**

Replace sensor.

**Potential cause**

Sensor not fully immersed.

**Recommended action**

Make sure electrode tip is fully immersed in the process solution.

### 5.1.6 Reference offset err

**Std Err**

Offline only.

**Potential cause**

Reference electrode poisoned.

**Recommended action**

Replace the sensor.

### 5.1.7 Ref voltage high or ref voltage low

**Potential cause**

Reference shorted or miswired.

**Recommended actions**

1. Check wiring and installation.
2. Replace sensor if necessary.

**Potential cause**

Sensor not fully immersed.

**Recommended action**

Make sure electrode tip is fully immersed in the process solution.

### 5.1.8 Sensor miswired

**Potential cause**

Open wire between sensor and transmitter.

**Recommended action**

Check wiring.

**Potential cause**

Bad preamplifier.

**Recommended action**

Replace preamplifier (code -01 only).

### 5.1.9 Temp error high or temp error low

**tEMP HI or tEMP LO**

**Potential cause**

Open or shorted resistance temperature device (RTD).

**Recommended action**

Replace the sensor.

**Potential cause**

Temperature out of range.

**Recommended action**

Check process temperature.

## 5.2 Troubleshooting without advanced diagnostics

The sections below list common problems, causes, and remedies typically encountered in process measurement.

### 5.2.1 Reading is off scale

Display reads overrange.

**Potential cause**

Defective preamplifier.

**Recommended action**

For code -02 sensors, replace preamplifier. For code -01 sensors, replace sensor.

**Potential cause**

Temperature element shorted.

**Recommended action**

Check temperature element and replace sensor if defective.

**Potential cause**

Sensor not in process. Sample stream is low or air bubbles are present.

**Recommended action**

Make sure sensor is in process with sufficient sample stream.

Refer to Install for installation details.

**Potential cause**

Open glass electrode.

**Recommended action**

Replace the sensor.

**Potential cause**

Reference element open: no contact.

**Recommended action**

Replace the sensor.

### 5.2.2 Display reads between 3 and 6 pH regardless of actual pH of solution or sample

**Potential cause**

Electrode cracked.

**Recommended action**

Replace the sensor.

### 5.2.3 Meter or display swings or jumps widely in AUTO T.C. mode

**Potential cause**

Temperature element open.

**Recommended action**

Ohm out temperature element and replace sensor if defective.

### 5.2.4 Span between buffers extremely short in AUTO T.C. mode

**Potential cause**

Temperature element open.

**Recommended action**

Ohm out temperature element and replace sensor if defective.

### 5.2.5 Sluggish or slow meter indication for real changes in pH level

**Potential cause**

Electrode coated.

**Recommended actions**

1. Clean sensor as recommended in Clean electrode or Clean platinum electrode.
2. Replace sensor if cracked.

**Potential cause**

Electrode defective.

**Recommended action**

Replace the sensor.

### 5.2.6 Transmitter cannot be standardized

**Potential cause**

Electrode coated.

**Recommended actions**

1. Clean sensor as recommended in Clean electrode or Clean platinum electrode.
2. Replace sensor if cracked.

**Potential cause**

Defective preamplifier.

**Recommended action**

Replace preamplifier.

### 5.2.7 Transmitter short spans between two different buffer values

**Potential cause**

Aged glass electrode or high temperature exposure.

**Recommended action**

Replace the sensor.

**Potential cause**

Electrode coated.

**Recommended actions**

1. Clean sensor as recommended in Clean electrode or Clean platinum electrode.
2. Replace sensor if cracked.

**Potential cause**

Air bubbles trapped in sensor end between glass bulb and sensor body.

**Recommended action**

Shake the sensor in solution.

See Install for mounting guidelines.

# 6 Return of material

For all repair or warranty inquiries, please contact our Customer Care department at 800-999-9307.

# 7 Rosemount pH/ORP sensor(s) product certifications

Rev 0.5

## 7.1 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.

## 7.2 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).

## 7.3 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.

## 7.4 USA

### 7.4.1 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.

### 7.4.2 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)

## 7.5 Canada

### 7.5.1 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)

## 7.6 Europe

### 7.6.1 ATEX Intrinsic Safety

**Certificate** Baseefa10ATEX0156

**Standards** EN 60079-0: 2012+A11: 2013, EN 60079-11: 2012

**Markings** pH/ORP sensors with no preamplifier fitted
Ⓔx II 1 G Ex ia IIC T4 Ga (–20 °C to +60 °C)

pH sensors with integral smart preamplifier fitted
II 1 G Ex ia IIC T4 Ga (–20 °C to +60 °C)
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)
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)

**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.

## 7.7 International

### 7.7.1 IECEx Intrinsic Safety

**Certificate** IECEx BAS 10.0083X

**Standards** IEC 60079-0: 2011, IEC 60079-11: 2011

**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 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.

## 7.8 China

### 7.8.1 Nepsi Intrinsic Safety

**Certificate** GYB19.1035X

**Standards** GB 3836.1-2010, GB 3836.4-2010, GB 3836.20-2010

**Markings** Ex ia II C 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.

## 7.9 Technical Regulations Customs Union (EAC)

### 7.9.1 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.

# 8 Declaration of Conformity

EMERSON

CE

## EU Declaration of Conformity

**No: RAD 1119 Rev. C**

pH/ORP Sensors

We,

**Rosemount Inc.**
**8200 Market Boulevard**
**Chanhassen, MN 55317-9685**
**USA**

declare under our sole responsibility that the product,

**Rosemount™ Sensor Model Series:**
**328A, 385, 385+, 389, 389VP, 396, 396P, 396PVP, 396VP, 396R, 396RVP, 397, 398, 398VP, 398R, 398RVP, 3200HP, 3300HT, 3300HTVP, 3400HT, 3400HTVP, 3500P, 3500VP, 3800, 3800VP, 3900, 3900VP**

manufactured by,

**Rosemount Inc.**
**8200 Market Boulevard**
**Chanhassen, MN 55317-9685**
**USA**

to which this declaration relates, is in conformity with the provisions of the European Union Directives, including the latest amendments, as shown in the attached schedule.

Assumption of conformity is based on the application of the harmonized standards and, when applicable or required, a European Union notified body certification, as shown in the attached schedule.

| | |
|---|---|
| (signature) | Vice President of Global Quality (function) |
| Chris LaPoint (name) | 23-Mar-20; Shakopee, MN USA (date of issue & place) |

Page 1 of 2

EMERSON

CE

# EU Declaration of Conformity

**No: RAD 1119 Rev. C**

**ATEX Directive (2014/34/EU)**

**Baseefa10ATEX0156X– Intrinsically Safe**

**Equipment Group II, Category 1 G Ex ia IIC T4 Ga (-20°C ≤ Ta ≤ +60°C)**

Models with no Pre-amplifier Fitted or with Integral Smart Pre-amplifier fitted:
328A, 385, 385+, 389, 389VP, 396, 396P, 396VP, 396PVP, 396R, 396RVP, 397, 398, 398VP, 398R, 398RVP, 3200HP, 3300HT, 3300HTVP, 3400HT, 3400HTVP, 3500P, 3500VP, 3800, 3800VP, 3900, 3900VP

**Equipment Group II, Category 1 G Ex ia IIC T4 Ga (-20°C ≤ Ta ≤ +80°C) or T5 (-20°C ≤ Ta ≤ +40°C)**

for these model strings: 385+-XX-12, 389-XX-12, 389-XX-XX-54, 396P-XX-12, 396P-XX-XX-54, 3500P-XX-12, 3500VP-XX-12
(Excludes No Preamplifier Options: Preamplifier/Cable Options -02/-07/-08)

Special conditions for safe use:
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 a buildup 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 this risk.
3) External connections to the sensor must be suitably terminated and provide a degree of protection of at least IP20. 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.

Harmonized Standards:
EN 60079-0:2012+A11:2013
EN 60079-11:2012

**ATEX Notified Body for EC Type Examination Certificate & Quality Assurance**

**SGS FIMKO OY** [Notified Body Number: 0598]
P.O. Box 30 (Särkiniementie 3)
00211 HELSINKI
Finland

Page 2 of 2

# 9 China RoHS table

*含有China RoHS管控物质超过最大浓度限值的部件型号列表 396*
*List of 396 Parts with China RoHS Concentration above MCVs*

| 部件名称 Part Name | 有害物质 / Hazardous Substances | | | | | |
|---|---|---|---|---|---|---|
| | 铅 Lead (Pb) | 汞 Mercury (Hg) | 镉 Cadmium (Cd) | 六价铬 Hexavalent Chromium (Cr +6) | 多溴联苯 Polybrominated biphenyls (PBB) | 多溴联苯醚 Polybrominated diphenyl ethers (PBDE) |
| 传感器组件 Sensor Assembly | X | O | O | O | O | O |

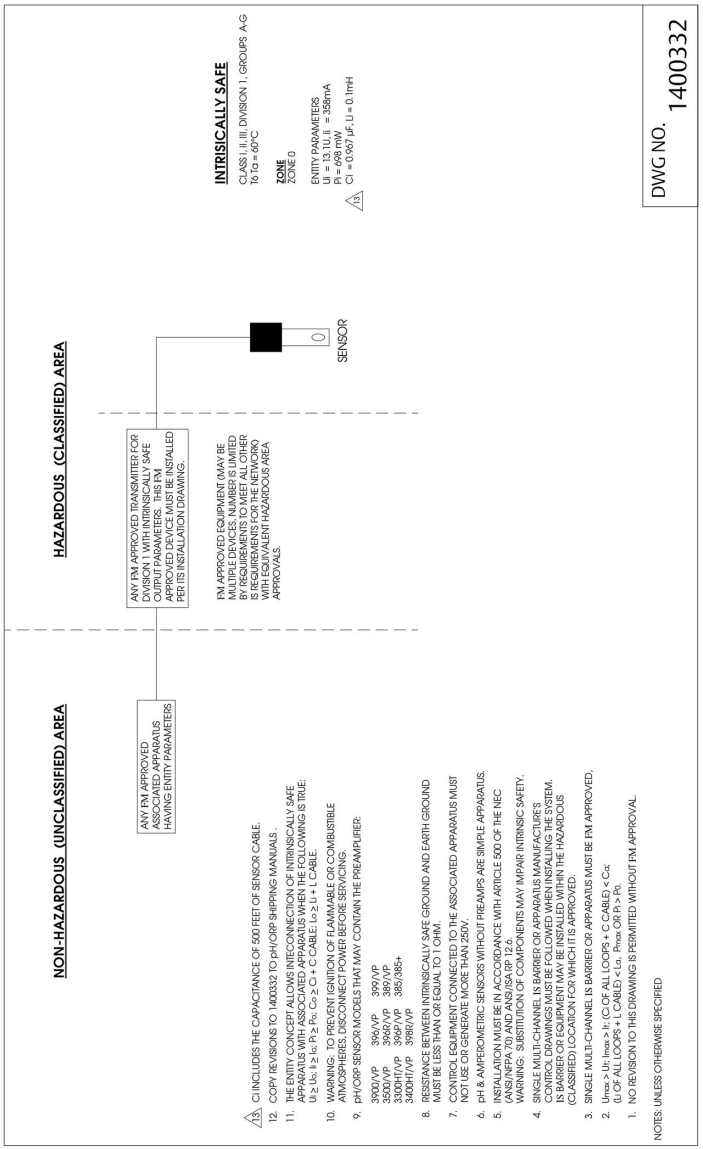
*本表格系依据SJ/T11364的规定而制作.*
*This table is proposed in accordance with the provision of SJ/T11364.*

*O: 意为该部件的所有均质材料中该有害物质的含量均低于GB/T 26572所规定的限量要求.*
*O: Indicate that said hazardous substance in all of the homogeneous materials for this part is below the limit requirement of GB/T 26572.*

*X: 意为在该部件所使用的所有均质材料里，至少有一类均质材料中该有害物质的含量高于GB/T 26572所规定的限量要求.*
*X: Indicate that said hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement of GB/T 26572.*

| 部件名称 Part Name | 组装备件说明 Spare Parts Descriptions for Assemblies |
|---|---|
| 传感器组件 Sensor Assembly | 传感器模块 Sensor Module |

# 10 Intrinsically safe sensor installation drawing - FM



Quick Start Guide
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