

# Rosemount™ Hx338+

Steam Sterilizable and Autoclavable Pre-Pressurized pH Sensor



## Essential instructions

Read this page before proceeding!

Emerson designs, manufactures, and tests its Rosemount™ 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. The following instructions must be adhered to and integrated into your safety program when installing, using, and maintaining 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 this product. If this instruction manual is not the correct manual, call 1-855-724-2638, and we will provide the requested manual. Save this manual for future reference.
- 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 your equipment as specified in the installation instructions of the appropriate manual and per applicable local and national codes. Connect all products to the proper electrical and pressure sources.
- 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 Rosemount. Unauthorized parts and procedures can affect the product's performance, place the safe operation of your process at risk, and VOID YOUR WARRANTY. Look alike substitutions 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.

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# 1 Plan

## 1.1 Electrode preparation

### Procedure

1. Remove electrode from shipping container.
2. Remove the protective boot covering the electrode bulb.
3. Rinse away salt film with clean water and then shake the electrode so that the internal solution fills the bulb, thus removing any air trapped there.

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### Note

Do not allow lubricant to coat electrode bulb or reference junction. If it does, wipe it clean before installation.

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## 1.2 Storage and handling

Proper storage and handling instructions of the electrodes must be followed to ensure correct measurements.

### Procedure

1. Store the electrodes in their original shipping containers until needed.
2. Do not store at temperatures below -5 °C (23 °F).
3. Store the electrodes with a protective cap containing KCl solution (PN 9210342).
4. For overnight storage, immerse the sensor in tap water or 4 pH buffer solution.
5. Use the startup and calibration procedure described in [Two point buffer calibration](#) to properly calibrate the sensors.
6. The standard sensor shelf life is one year from manufacturing date. Follow the refresh procedure described in [Electrode refresh procedure](#) at one year and eighteen months to extend the shelf life to a maximum of two years.

## 1.3 Specifications

**Table 1-1: Rosemount™ Hx338+ Sensor Specifications**

Specifications	Materials and units
Operating temperature range	32 to 283 °F (0 to 140 °C)
Pressure range	0 to 6 bar

**Table 1-1: Rosemount™ Hx338+ Sensor Specifications (continued)**

Specifications	Materials and units
pH range	0 to 14
<b>Measuring method</b>	
Combination electrode	pH potential measured against reference electrode
<b>Wetted materials</b>	
pH electrode	Glass
O-ring	EPDM (FDA approved)
<b>Operations parameters</b>	
Process connection	PG 13.5
Electrical connector	Variopol (VP 6.0)
Minimum conductivity of sample	100 $\mu$ S/cm
Zero-point	0 $\pm$ 20 mV
Sensitivity	57 to 59 mV / pH at 77 °F (25 °C)
Electrolyte	Pressurized
Temperature sensor	Pt-100

## **⚠ WARNING**

### **Pressure and temperature**

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!

Do not exceed temperature and pressure limitations of 284 °F (140 °C) and 6 bar.

**▲ WARNING****Corrosive substance**

Hydrofluoric acid and the mixture of hydrochloric acid and thiorea is toxic and highly corrosive.

Avoid skin contact; wear protective gloves.

Use only in a well-ventilated area.

Do not inhale fumes.

In case of an accident, consult a doctor immediately.

**▲ CAUTION****Sensor/process application compatibility**

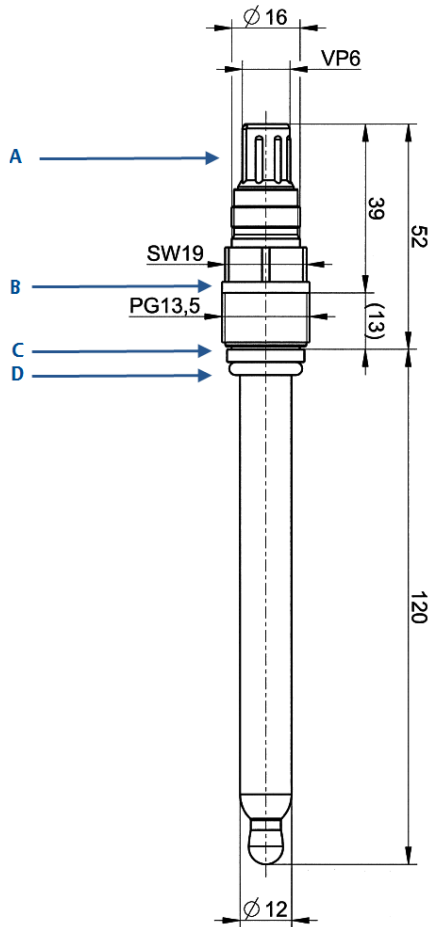
The wetted sensor materials may not be compatible with process composition and operating conditions.

Application compatibility is entirely the operator's responsibility.

## 1.4 Rosemount™ Hx338+ Sensor design specifications

See [Figure 1-1](#) for sensor dimensions.

**Figure 1-1: Rosemount Hx338+-01-72 Dimensional Drawing**



- A. VP 6.0 plug
- B. SW-19 free spinning PG13.5 screw thread
- C. Washer
- D. O-ring

## 1.5 Rosemount Hx338+ pH Sensor ordering information

**Table 1-2: Rosemount Hx338+ pH Sensor Ordering Information**

Model	Sensor type
Hx338+	pH Sensor
Sensor length	
01	4.8 in. (120 mm)
Cable connection	
72	Pt-100 RTD with Variopol (VP6) Connector (Requires accessory mating cable)
<b>Typical model number: Hx338+-01-72</b>	

**Table 1-3: Accessories**

Part number	Description
24281-00	15 ft (4.6 m) VP8 cable
24281-01	25 ft (7.6 m) VP8 cable
24281-02	2.5 ft (0.8 m) VP8 cable
24281-05	4 ft (1.2 m) VP8 cable
24281-06	10 ft (3.0 m) VP8 cable
24281-07	20 ft (6.1 m) VP8 cable
24281-08	30 ft (9.1 m)VP8 cable
Mounting accessories	
Part number	Description
9160478	Insertion assembly, 2.75 in. (70 mm) insertion, for 4.72 in. (120 mm) sensor, G 1-1/4 in.
9160483	15 degree weld-in socket, G 1-1/4 in. thread, 44 mm
9160484	Service kit for insertion mounting assembly
Other accessories	
Part number	Description
9210012	Buffer solution, pH 4.01, 16 oz
9210013	Buffer solution, pH 6.86, 16 oz
9210014	Buffer solution, pH 9.18, 16 oz

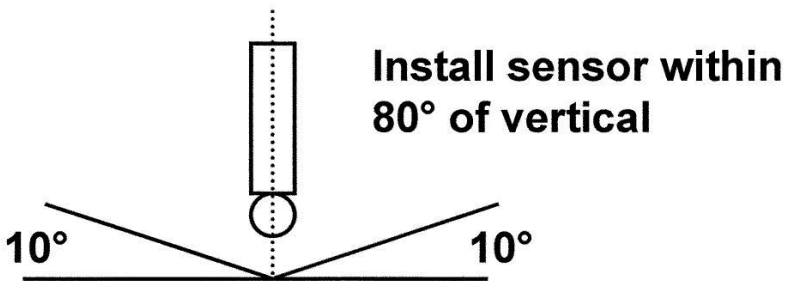
## 2 Install

### 2.1 Install the sensor

#### Procedure

1. Mount the sensor in a vertical pipe run with flow from bottom to top. If the sensor must be mounted in a horizontal pipe run, orient the sensor in the 3 o'clock or 9 o'clock position.
2. Orient the sensor within  $80^\circ$  of vertical. See [Figure 2-1](#).

**Figure 2-1: Sensor Orientation**





## 3 Wiring

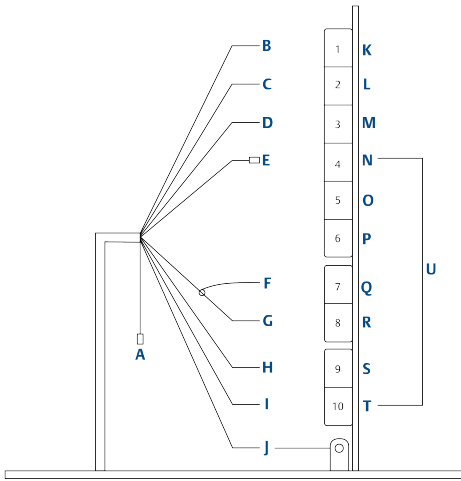
### 3.1 Wire the Rosemount™ Hx338+ Sensor

Use the following wiring diagrams to wire the sensor to the Rosemount 56, Rosemount 1056, Rosemount 1057, Rosemount 1066, and Rosemount 5081 transmitters.

#### Procedure

1. See [Figure 3-1](#) to wire the Rosemount Hx338+ Sensor to the Rosemount 56, 1056, or 1057 Transmitter.

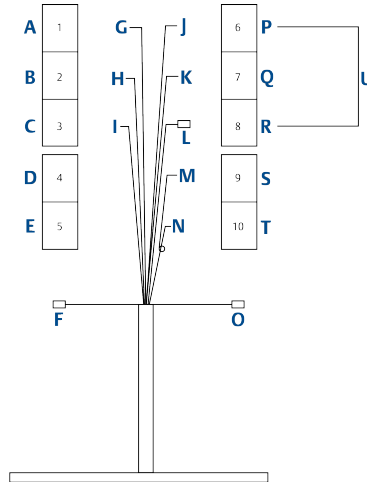
**Figure 3-1: Wire the Rosemount Hx338+ Sensor to the Rosemount 56, 1056, or 1057 Transmitter**



- A. Cap clear inner drain
- B. White
- C. White/red
- D. Red
- E. Cap blue wire
- F. Clear
- G. Orange
- H. Gray/white
- I. Gray
- J. Green
- K. Resistance temperature device return
- L. Resistance temperature device sense
- M. Resistance temperature device in
- N. Ground
- O. +5 Vdc
- P. -5 Vdc
- Q. pH shield
- R. pH in
- S. Reference shield
- T. Reference
- U. Jumper

- See [Figure 3-2](#) to wire the Rosemount Hx338+ Sensor to the Rosemount 1066 Transmitter.

**Figure 3-2: Wire the Rosemount Hx338+ Sensor to the Rosemount 1066 Transmitter**



- A. Resistance temperature device return
- B. Resistance temperature device sense
- C. Resistance temperature device in
- D. -Volts
- E. +Volts
- F. Cap green wire
- G. White
- H. White/red
- I. Red
- J. Gray
- K. Gray/white
- L. Cap blue wire
- M. Clear
- N. Orange
- O. Cap inner drain clear
- P. Reference in
- Q. Reference shield
- R. Solution ground
- S. pH shield
- T. pH in
- U. Jumper

3. See [Figure 3-3](#) to wire the Rosemount Hx338+ Sensor to the Rosemount 5081 Transmitter.



- Y. *Orange*
  - Z. *Cap clear inner drain*
  - AA. *Green*
  - AB. *Hook to chassis*
-

## 4 Calibrate

### 4.1 Two point buffer calibration

#### Prerequisites

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

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#### Note

A pH 7.0 buffer solution reads an mV value of approximately zero, and pH buffers read approximately  $\pm 59.1$  mV for each pH unit above or below pH 7.0. 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.

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#### Procedure

1. Immerse sensor in the first buffer solution. Allow sensor to equilibrate to the buffer temperature (to avoid errors due to temperature differences between the buffer solution and sensor temperature) and wait for reading to stabilize.  
The value of the buffer can now be acknowledged by the transmitter.

2. Once the first buffer has been acknowledged by the transmitter, rinse the buffer solution off of the sensor with distilled or deionized water.

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

The theoretical slope value, according to the Nernst equation for calculating pH, is approximately 59.17 mV/pH. Over time the sensor will age, both in the process and in storage, and this will result in reduced slope values. To ensure accurate readings, Emerson recommends replacing the electrode when the slope value falls below 47 to 49 mV/pH.

### 4.2 Recommended pH sensor standardization

For maximum accuracy, the sensor can be standardized on-line or with a process grab sample after a buffer calibration has been performed and the sensor has been conditioned to the process. Standardization accounts for the sensor junction potential and other interferences. Standardization will not change the sensor's slope, but will simply adjust the transmitter's reading to match that of the known process pH.

## 4.3 Electrode refresh procedure

The pressurized electrode in the Rosemount™ Hx338+ has a storage life of one year without an electrode refresh. At one year of shelf life, all sensors should be refreshed for peak performance. Please follow this procedure for refreshing the sensor.

### Prerequisites

Select the two refresh solutions. A 0.4-4% by weight sodium hydroxide (NaOH) solution for a base and a 0.73-3.65% by weight hydrochloric acid (HCl) solution for an acid are recommended. Also, a potassium chloride (KCl) solution is needed for cleaning and storage.

Record the sensor serial number, lot number, and date of manufacturing on a worksheet. Remove sensor from the package. Inspect the connection, electrode, and glass for any defects or scratches and remove the cap by relieving the rubber gasket.

### Procedure

1. Clean the sensor with water; bottled or mineral water is recommended.
2. Place the sensor electrodes into the NaOH solution for 10 minutes.
3. Rinse the electrodes with water.
4. Place the electrodes into the HCl solution for 10 minutes.
5. Rinse the electrodes with water.
6. Place the electrodes into the KCl solution for a minimum of 60 minutes.

Zero and calibrate the sensor, following the procedure highlighted in [Section](#), after the refresh procedure and replace the cap with fresh KCl solution covering the sensor bulb and reference junction.



## 5 Maintaining and troubleshooting

### 5.1 Cleaning or replacing the electrodes

Electrodes should respond rapidly. Sluggishness, offsets, and erratic readings are indicators that the electrodes may need cleaning or replacement.

#### Procedure

1. Use a mild non-abrasive detergent to clean and remove oil deposits from the electrode.
2. Soak electrodes for 30 to 60 minutes in a 5% hydrochloric acid solution to remove scale deposits.

Temperature effect on life expectancy: If glass electrode life expectancy is 100% at 25 °C (77 °F), then it will be approximately 25% at 80 °C (176 °F), and approximately 5% at 120 °C (248 °F).









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