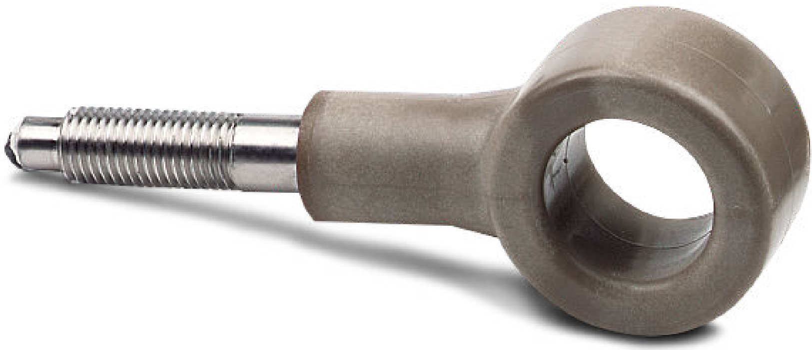
Quick Start Guide
00825-0100-3226, Rev AC
April 2024

Rosemount™ 226

Toroidal Conductivity Sensors



ROSEMOUNT™

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Safety information

⚠ WARNING

High pressure and temperature hazard

Failure to reduce the pressure and temperature may cause serious injury to personnel.

Before removing the sensor, reduce the process pressure to 0 psig and cool down the process temperature.

⚠ 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 in 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

Equipment damage

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

Application compatibility is entirely the operator's responsibility.

Contents

1 Description and specifications

1.1 Overview

The Rosemount 226 Sensor is a toroidal (inductive) conductivity sensor. These sensors work well for measuring in highly conductive liquids up to 2 S/cm (2,000,000 µS/cm). Unlike metal electrode based conductivity sensors, toroidal conductivity sensors, like the Rosemount 226, are resistant to fouling, coating, and chemical attack.

Sensors are molded with highly corrosion-resistant glass-filled PEEK (polyetheretherketone). The sensors include an integral Pt-100 RTD for temperature compensation. With a large bore hole opening, the Rosemount 226 greatly resists plugging when used in liquids containing high amounts of suspended solids. PEEK is not recommended for greater than 50 percent concentrations (at 77 °F [25 °C]) of H_2SO_4, HNO_3, and H_3PO_4. PEEK is not recommended for use with HF.

1.2 Specifications

Table 1-1: Rosemount 226 Toroidal Conductivity Sensor Specifications

Description	Material and units
Conductivity range	Refer to transmitter Product Data Sheet.
Wetted materials	Glass-filled PEEK, EPDM Gasket
Operating temperature	32 to 248 °F (0 to 120 °C)
Maximum pressure	295 psig (2135 kPa [abs])
Standard cable length	20 ft. (6.1 m)
Maximum cable length	200 ft. (61 m)
Process connections	⅞-in. 9 UNC threads for flange mounting and 1-in. MNPT (with -80 option)
Weight/shipping weight	2 lb./3 lb. (1.0 kg/1.5 kg)

2 Installation

2.1 Unpack and inspect

Procedure

1. Inspect the shipping container(s). If there is damage, then contact the shipper immediately for instructions.
2. If there is no apparent damage, then unpack the container(s).
3. Ensure that all items shown on the packing list are present.

   If items are missing, then contact Emerson.com/global.

4. Save the shipping container and packaging.

   They can be used to return the instrument to the factory in case of damage.

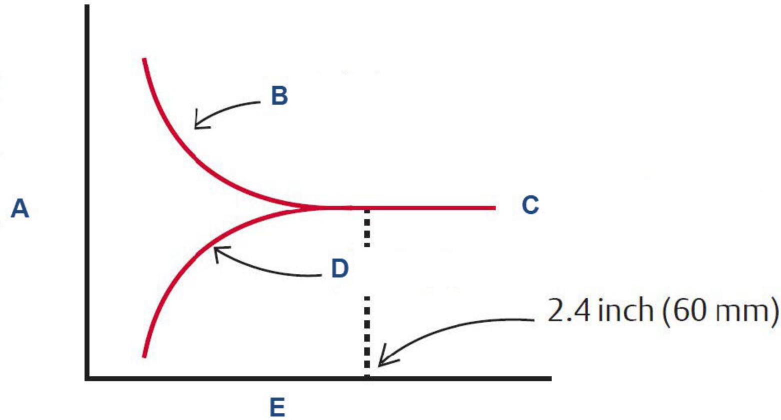
2.2 Installing the sensor

To ensure accurate readings, it is recommended the sensor be installed so that there is at least 2.4 in. (60 mm) of clearance between the sensor and tank or pipe walls. If installed too closely to the walls, an error in readings will be induced by wall effects. Wall effects arise from the interaction between the current induced in the sample by the sensor and nearby pipe or vessel walls.

As Figure 2-1 shows, the measured conductivity can either increase or decrease depending on the wall material. This effect can be seen by watching the conductivity readings change as the sensor is moved closer to the sides of the pipe, tank, or beaker.

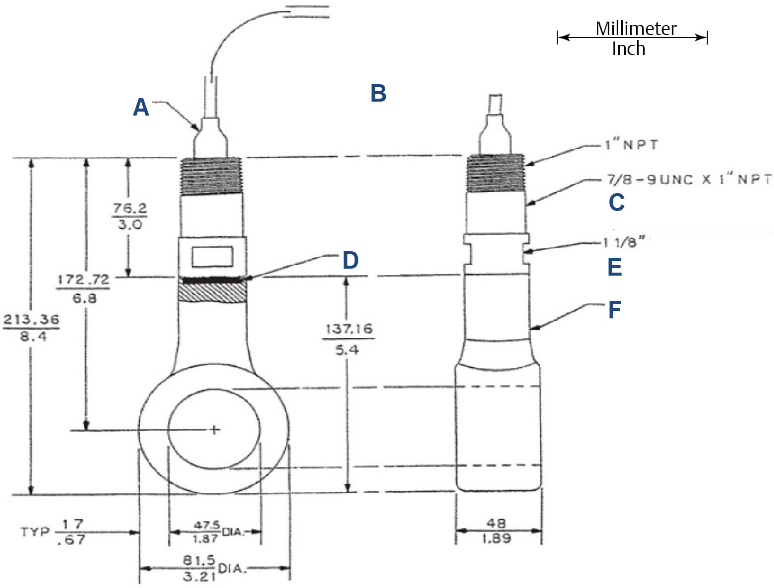
Ensure that the sensor is completely submerged in the process liquid. Mounting the sensor in a vertical pipe run with flow running from bottom to top is recommended. If the sensor must be installed in a horizontal pipe run, mount the sensor in the 3 o’clock or 9 o’clock position.

Figure 2-1: Measured Conductivity as a Function of Clearance between Sensor and Walls



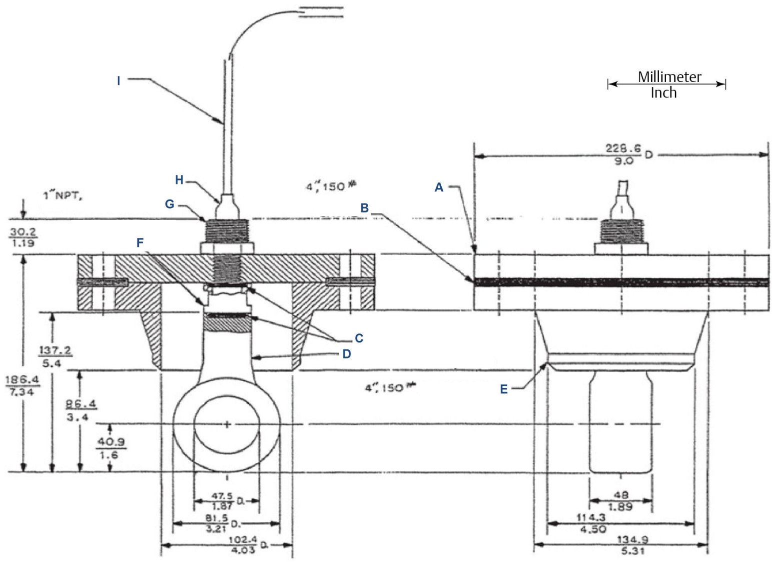
A. Measured conductivity
B. Metal pipe
C. True conductivity
D. Plastic pipe
E. Distance to wall

Figure 2-2: Rosemount 226 with 1-in. MNPT Process Connection Mounting Adapter (-80 option) Dimensional Drawing



A. Boot
B. 20-ft. (6.1 m) cable
C. Adapter, PEEK, PN 33185-01 (included with code 80)
D. EPDM gasket
E. Wrench opening
F. One piece molded housing, PEEK

Figure 2-3: Rosemount 226 with ⅞-in. 9 UNC Thread and Insertion through Flange Mounting Adapter (-81 option) Dimensional Drawing



- *A. Steel flange*
- *B. Gasket*
- *C. EPDM gaskets*
- *D. One piece molded housing, PEEK*
- *E. Welding neck steel flange*
- *F. PEEK flange spacer 1-in. long*
- *G. 304 stainless steel adapter for conduit*
- *H. Boot*
- *I. 20-ft. (6.1 m) cable*

2.2.1 Submersion mounting

The sensor must be mounted in conduit or stand pipe to protect the back end from process leakage. Use PTFE tape for a good seal.

2.2.2 Insertion Mounting

The sensor is designed to be mounted through any user-supplied flange. The user is responsible for cutting a hole through the flange to fit the sensor. The flange may be drilled and tapped for the sensor's ⅞-in. 9 UNC thread. Alternatively, a simple 15/16-in. (2.4 cm) drilled hole will accommodate the ⅞-in. 9 UNC thread.

2.2.3 Sensor cable precautions

⚠ CAUTION

ELECTRICAL HAZARD

Cables run in the same conduit with power wiring or near heavy electrical equipment may cause measurement errors and damage the sensor.

Do not run sensor cable in same conduit as the AC power wiring or near heavy electrical equipment.

⚠ CAUTION

MOISTURE DAMAGE

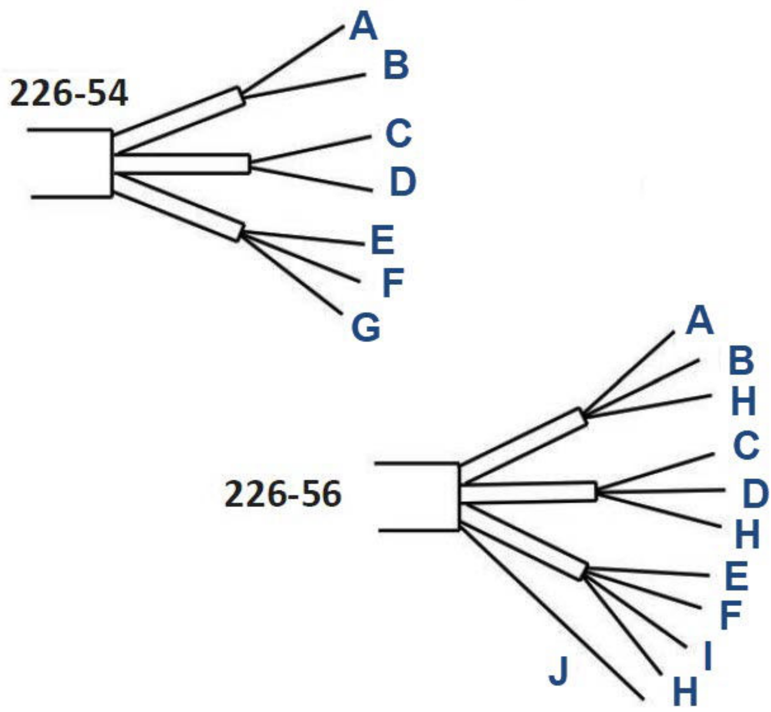
Failure to properly seal the conduit may allow accumulated moisture in the transmitter housing and damage the sensor and the transmitter.

Sensor cables routed in conduit must be sealed or plugged with sealing compound.

2.3 Wire the sensor

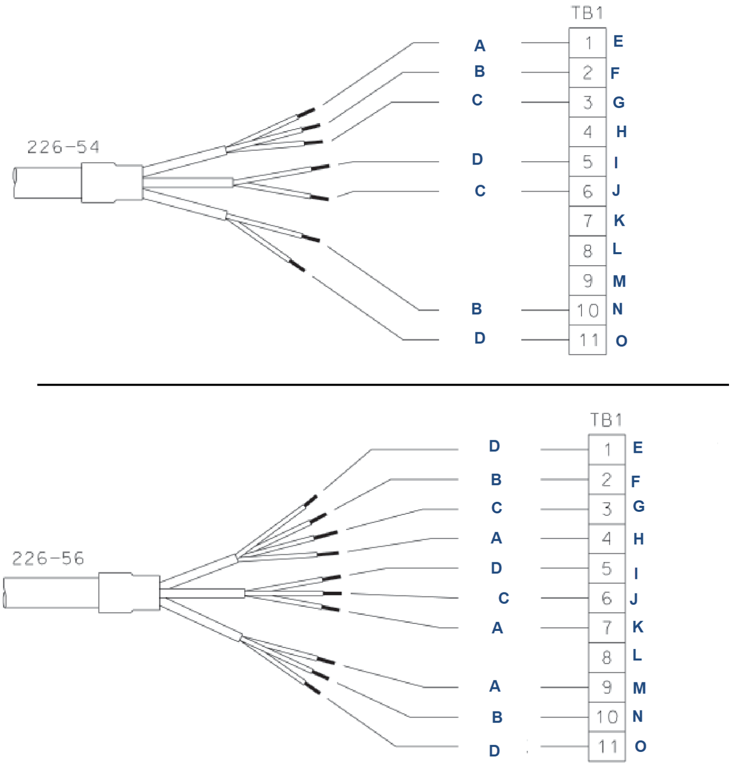
For additional wiring information on this product, including sensor combinations not shown here, please refer to Emerson.com/ Rosemount-Liquid-Analysis-Wiring.

Figure 2-4: Wire Functions



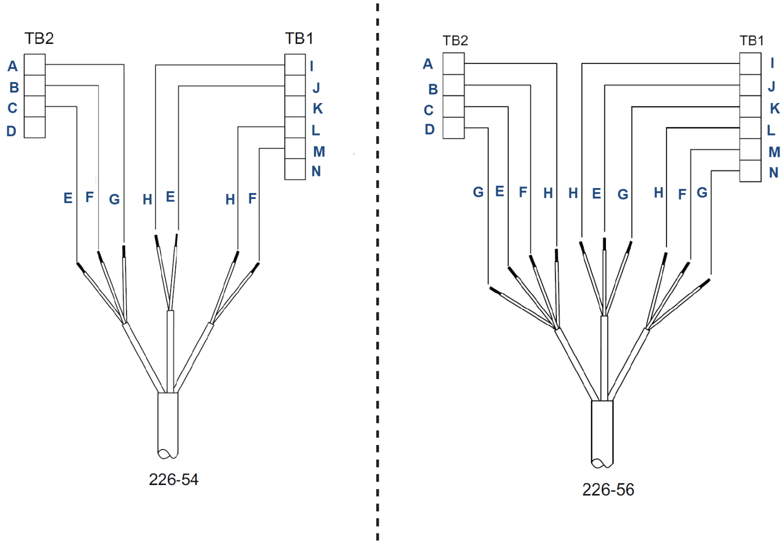
A. Green - receive
B. Black - receive common
C. White - drive
D. Black - drive common
E. Green - resistance temperature device (RTD) in
F. White - RTD sense
G. Clear - RTD common
H. Clear - shield
I. Black - RTD common
J. Clear - shield

Figure 2-5: Wiring for Rosemount 226-54 and 226-56 Sensors to Rosemount 1056 and 56 Transmitters



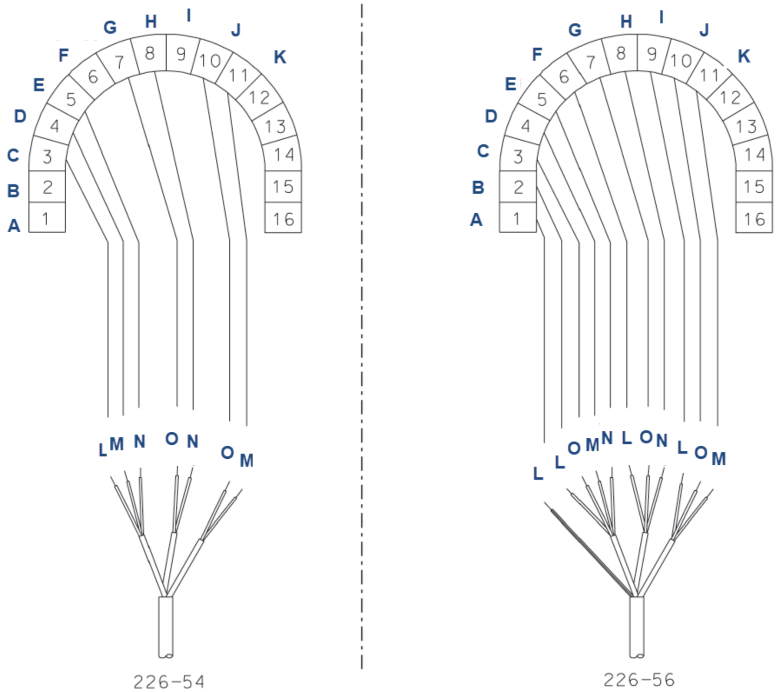
A. Clear
B. White
C. Green
D. Black
E. RTD return
F. RTD sense
G. RTD in
H. RTD shield
I. Receive common
J. Receive
K. Receive shield
L. Outer shield
M. Drive shield
N. Drive
O. Drive common

Figure 2-6: Wiring for Rosemount 226-54 and 226-56 Sensors to Rosemount 1066 Transmitter



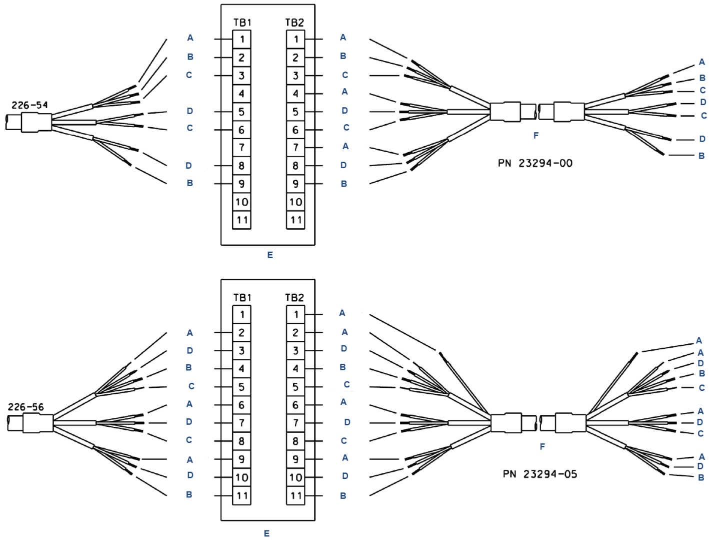
A. *RTD return*
B. *RTD sense*
C. *RTD in*
D. *RTD shield*
E. *Green*
F. *White*
G. *Clear*
H. *Black*
I. *Receive B*
J. *Receive A*
K. *Receive shield*
L. *Drive B*
M. *Drive A*
N. *Drive shield*

Figure 2-7: Wiring for Rosemount 226-54 and 226-56 Sensors to Rosemount 5081-T transmitter



A. Reserved
B. RTD shield
C. RTD common
D. RTD sense
E. RTD in
F. Receive shield
G. Receive common
H. Receive
I. Drive shield
J. Drive common
K. Drive
L. Clear
M. White
N. Green
O. Black

Figure 2-8: Wiring Sensors through a Remote Junction Box



A. Clear
B. White
C. Green
D. Black
E. Junction box
F. Interconnect cable

3 Calibration

3.1 Sensor calibration

The nominal cell constant of the sensor is 1.2/cm. The error in cell constant is about ± 10%, so conductivity readings made using the nominal cell constant will have an error of at least ± 10%.

Wall effects as shown in Figure 2-1 will likely make the error greater.

There are two basic ways to calibrate a toroidal sensor: against a standard solution or against a referee meter and sensor. A referee meter and sensor is an instrument that has been previously calibrated and is known to be accurate and reliable.

The referee instrument can be used to perform either an in-process or a grab sample calibration. Regardless of the calibration method used, the connected transmitter automatically calculates the cell constant once the known conductivity is entered.

3.2 Calibrating against a standard solution

Calibration against a standard solution requires removing the sensor from process piping. This calibration method is practical only if wall effects are absent or if the sensor can be calibrated in a container identical to the process piping. Ideally, the conductivity of the standard used should be close to the middle of the range that the sensor will be used in. Generally, toroidal conductivity sensors have good linearity and so standards greater than 5000 µS/cm at 77 °F (25 °C) may also be used.

Prerequisites

⚠ CAUTION

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!

Immerse the rinsed sensor in the standard solution and adjust the transmitter reading to match the conductivity of the standard. For an accurate calibration several precautions are necessary:

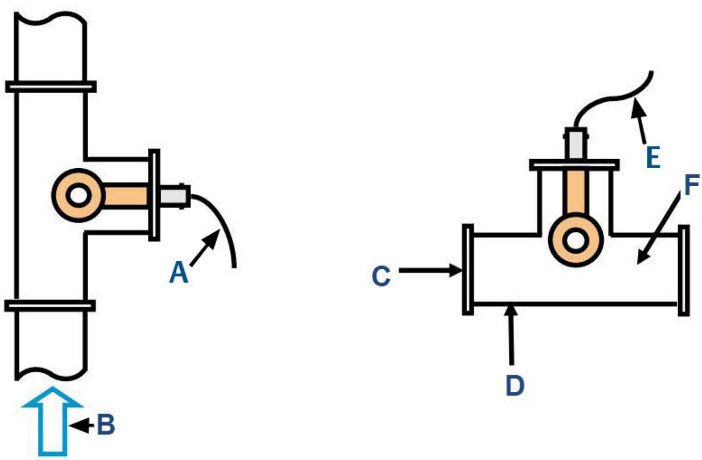
Procedure

1. If wall effects are absent in the process installation, use a sufficiently large container for calibration to ensure that wall effects are absent.

2. To check for wall effects, fill the container with solution and place the sensor in the center submerged at least ¾ of the way up the stem.
3. Note the reading. Then move the sensor small distances from the center and note the reading in each position.

   The readings should not change.
4. If wall effects are present, be sure the vessel used for calibration has exactly the same dimensions as the process piping.
5. Also, ensure that the orientation of the sensor with respect to the piping is exactly the same in the process and calibration vessels.

Figure 3-1: Calibration Installation Orientation



A. Sensor in process piping
B. Flow
C. Blank flange
D. Pipe tee identical to process pipe tee
E. Sensor being calibrated
F. Standard solution

6. Turn off automatic temperature compensation in the transmitter. This eliminates error in the cell constant.
7. Use a good quality calibrated thermometer to measure the temperature of the standard solution.

The thermometer error should be less than 32 °F (0.1°C).

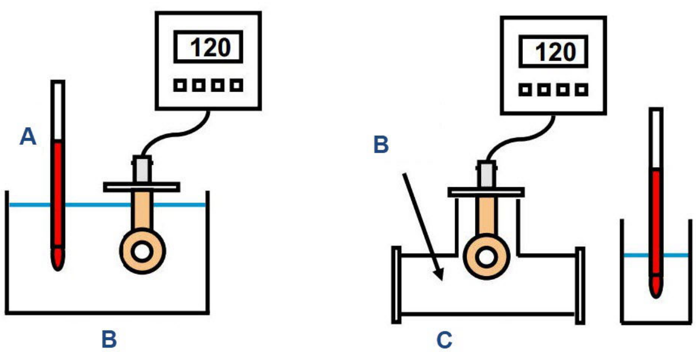
8. Allow adequate time for the solution and sensor to reach thermal equilibrium.

   If the sensor is being calibrated in an open beaker, keep the thermometer far enough away from the sensor so it does not introduce wall effects.

   If the sensor is being calibrated in a pipe tee or similar vessel, it will probably be impractical to place the thermometer in the standard solution.

9. Instead, put the thermometer in a beaker of water placed next to the calibration vessel.
10. Let both come to thermal equilibrium with the ambient air before continuing calibration.

Figure 3-2: Measuring Standard Temperature



A. Standard thermometer
B. Standard solution
C. Pipe tee

11. Make sure that the air bubbles are not adhering to the sensor.

    An air bubble trapped in the toroid opening has a particularly severe effect on the reading.

3.3 Calibrating against a referee – In process

This method involves connecting the process and referee sensors in series and allowing the process liquid to flow through both sensors. The process sensor is calibrated by adjusting the process analyzer reading to match the conductivity measured by the referee instrument.

Prerequisites

For a successful calibration, several precautions are necessary:

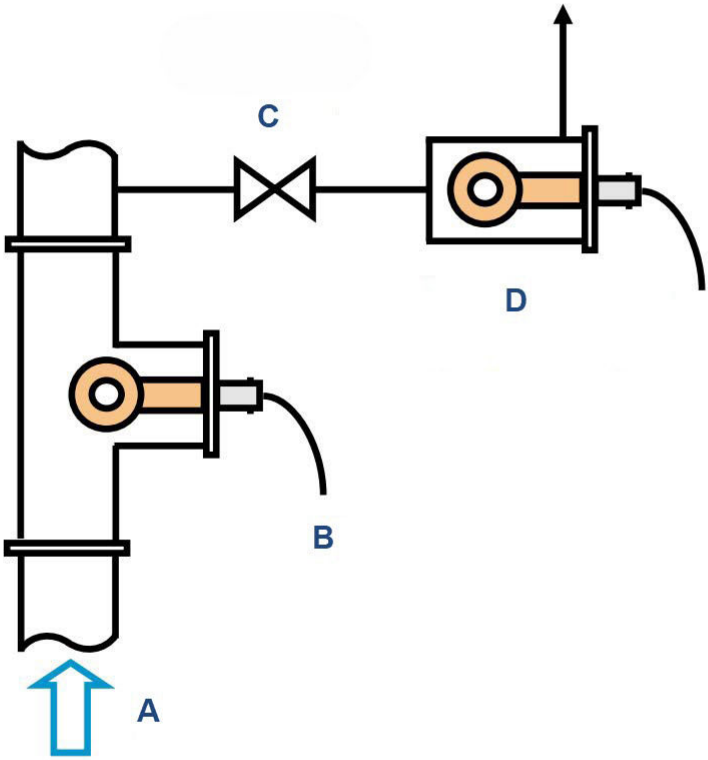
Procedure

1. If possible, adjust the conductivity of the process liquid so that it is near the midpoint of the operating range.

   If this is not possible, adjust the conductivity so that it is at least 5,000 µS/cm.

2. Orient the referee sensor so that air bubbles always have an easy escape path and cannot get trapped.

Figure 3-3: Calibration with a Referee Instrument Example



A. Flow
B. Sensor in process piping
C. Sample valve
D. Referee sensor in flow cell

3. Tap and hold the flow cell in different positions to allow bubbles to escape.
4. Turn off automatic temperature compensation in the transmitter.

   This eliminates error in the cell constant.
5. Keep tubing runs between the sensors short and adjust the sample flow to as high a rate as possible.

   Short tubing runs and high flow ensure that the temperature of the liquid does not change as it flows from one sensor to another.

6. Wait for readings to stabilize before starting the calibration.

3.4 Calibrating against a referee - Grab sample

This method is useful when calibration against a standard is impractical or when in-process calibration is not feasible because the sample is hot, corrosive, or dirty, making handling the waste stream from the referee sensor difficult.

Prerequisites

The method involves taking a sample of the process liquid, measuring its conductivity using a referee instrument, and adjusting the reading from the process analyzer to match the measured conductivity. For a successful calibration, several precautions are necessary:

Procedure

1. If possible, adjust the conductivity of the process liquid so that it is near the midpoint of the operating range.

   If this is not possible, adjust the conductivity so that it is at least 5,000 µS/cm.

2. Take the sample from a point as close to the process sensor as possible.

   Be sure the sample is representative of what the sensor is measuring.

3. Keep temperature compensation with the transmitter turned on.
4. Confirm that the temperature measurements in both the process and referee instruments are accurate, ideally to within 32 °F (0.5 °C).
5. Wait until readings are stable before starting the calibration.

4 Maintenance and troubleshooting

4.1 Maintaining the sensor

Generally, the only maintenance required is to keep the opening of the sensor clear of deposits. Cleaning frequency is best determined by experience.

⚠ CAUTION

Make sure that the sensor is cleaned of process liquid before handling.

4.2 Troubleshooting the sensor

4.2.1 Off-scale reading

Potential cause

Wiring is incorrect.

Recommended action

Verify and correct wiring.

Potential cause

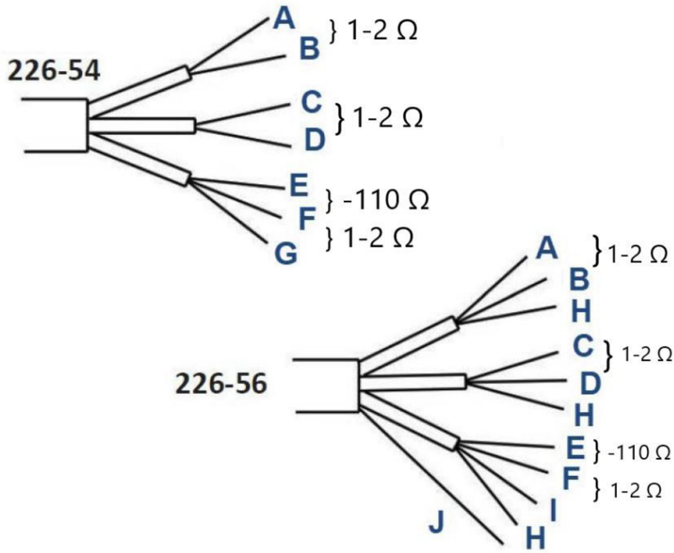
Temperature element is open or shorted.

Recommended action

Check temperature element for open or short circuits.

See Figure 4-1.

Figure 4-1: Wire Functions



Note
Resistance between shield and any other wire: > 40 MΩ

A. Green - receive
B. Black - receive common
C. White - drive
D. Black - drive common
E. Green - resistance temperature device (RTD) in
F. White - RTD sense
G. Clear - RTD common
H. Clear - shield
I. Black - RTD common
J. Clear - shield

Potential cause

Sensor is not in process stream.

Recommended action

Submerge sensor completely in process stream.

Potential cause

Sensor is damaged.

Recommended action

Perform isolation checks.

4.2.2 Noisy reading

Potential cause

Sensor is improperly installed in process stream.

Recommended action

Submerge sensor completely in process stream.

See Installation.

Potential cause

Sensor cable is run near high voltage process stream.

Recommended action

Move cable away from high voltage conductors.

Potential cause

Sensor cable is moving.

Recommended action

Keep sensor cable stationary.

4.2.3 Reading seems wrong (lower or higher than expected)

Potential cause

Bubbles trapped in sensor.

Recommended actions

1. Install the sensor in a vertical pipe run with the flow against the toroidal opening.
2. Increase flow if possible.

Potential cause

Sensor is not completely submerged in the process stream.

Recommended action

Confirm that the sensor is fully submerged in the process stream.

See Installation.

Potential cause

Wrong temperature correction algorithm is being used.

Recommended action

Check that the temperature correction is appropriate for the sample.

See transmitter Reference Manual for more information.

Potential cause

Temperature reading is inaccurate.

Recommended action

Disconnect the resistance temperature device leads and measure the resistance between the in and common leads.

See Figure 4-1.

Resistance should be close to the value in Table 4-1.

Table 4-1: Resistance vs. Temperature for Temperature Compensation (PT-100 RTD)

Temperature	Resistance
50 °F (10 °C)	103.9 Ω
68 °F (20 °C)	107.8 Ω
77 °F (25 °C)	109.7 Ω
86 °F (30 °C)	111.7 Ω
104 °F (40 °C)	115.5 Ω
122 °F (50 °C)	119.4 Ω

Potential cause

The temperature response to sudden changes in temperature is slow.

Recommended action

Use a Resistance Temperature Device (RTD) in a metal thermowell for temperature compensation.

4.2.4 Sluggish response

Potential cause

Sensor is installed in dead area in piping.

Recommended action

Move sensor to a location more representative of the process liquid.

Potential cause

Slow temperature response to sudden changes in temperature.

Recommended action

Use a resistance temperature device in a metal thermowell for temperature compensation.

5 Accessories

Table 5-1: Accessory list

Part number	Description
23550-00	Remote junction box without preamplifier
23294-00	Unshielded interconnecting cable for Rosemount 1054A, 1054B, and 2054C. Can also be used with Rosemount 1056, 56, 5081, and 1066-T, but not recommended. Prepped, specify length, per ft.
23294-05	Shielded interconnecting cable with additional shield wire for -03 option. For use with Rosemount 1056, 1066-T, 56, and 5081T. Prepped, specify length, per ft.
33151-00	Gasket, EPDM (standard)
33151-01	Gasket, Viton®, Rosemount 226
33185-01	Mounting adapter, submersion, 9.8 ft. (3 m) length, 3.3 ft. (1 m) Male National Pipe Thread (MNPT), PEEK
33185-02	Mounting adapter, insertion, 3.3 ft. (1 m) length, PEEK (with gasket)
33219-00	Mounting adapter, 304 stainless steel flange nut, 3.3 ft. (1 m) MNPT for conduit
9200276	Extension cable, unprepped (specify length) per foot

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For more information: **Emerson.com/global**

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