

Series 5000TC Toroidal (Electrodeless) Conductivity Sensors Operation and Maintenance Manual

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About This Document

Abstract

This manual describes the installation and operation of Series 5000TC Toroidal (electrodeless) Conductivity Sensors.

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Symbol Definitions

The following table lists those symbols used in this document to denote certain conditions.

Symbol	Definition
	This CAUTION symbol on the equipment refers the user to the Product Manual for additional information. This symbol appears next to required information in the manual.
	WARNING PERSONAL INJURY: Risk of electrical shock. This symbol warns the user of a potential shock hazard where HAZARDOUS LIVE voltages greater than 30 Vrms, 42.4 Vpeak, or 60 Vdc may be accessible. Failure to comply with these instructions could result in death or serious injury.
	ATTENTION, Electrostatic Discharge (ESD) hazards. Observe precautions for handling electrostatic sensitive devices
	Protective Earth (PE) terminal. Provided for connection of the protective earth (green or green/yellow) supply system conductor.
	Functional earth terminal. Used for non-safety purposes such as noise immunity improvement. NOTE: This connection shall be bonded to protective earth at the source of supply in accordance with national local electrical code requirements.
	Earth Ground. Functional earth connection. NOTE: This connection shall be bonded to Protective earth at the source of supply in accordance with national and local electrical code requirements.
	Chassis Ground. Identifies a connection to the chassis or frame of the equipment shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.

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1. Introduction

1.1 Description

Mounting Styles

The Model 5000TC-series toroidal (electrodeless) conductivity sensor measures the conductivity of solutions from 0.2 to 2000 millisiemens/cm.

These sensors may be provided in one of two basic forms:

Convertible Style -- The convertible style sensor can be directly fastened to the end of a pipe for immersion mounting or, by using the Honeywell union-mount adapter, it can be mounted into any standard 2-inch NPT fitting (tee, weldolet, pipe saddle, etc.). The convertible style sensor can also be insertion mounted into a 2-inch ball valve assembly.

Sanitary Style -- This clean-in-place style sensor is constructed of 3A-approved materials. It has an integral 2-inch sanitary-mount flange which mates to Honeywell sanitary tee mounting hardware. The sanitary style sensor includes a special cap and EPDM compound gasket. The gasket is also available separately for mounting to a 2-inch sanitary clamp-type ferrule or butt-weld tee.

Mounting Types

The 5000TC sensors are available with a number of different mounting types. These include immersion mounting (CPVC or PVDF materials, also PVC junction box), union adapter mounting (316 SS, CPVC, or PVDF materials with optional 2" tee), sanitary mounting (316 SS 2" tee with heavy-duty clamp), or insertion/removal mounting (316 SS or CPVC materials).

Wetted Materials

To simplify chemical resistance problems, these sensors are constructed so that only one material is wetted by the process. The sanitary style sensor may be provided in polypropylene, PVDF or PFA Teflon material. The convertible style sensor is also available in these same materials, and also in PEEK.

2. Specifications and Model Selection Guide

2.1 Specifications

2.1.1 Sensors

Wetted Materials	Polypropylene, PVDF, or PEEK
Operating Temp. Range	-10 °C to 125 °C (14 °F to 257 °F)
Maximum Flow Rate	10 ft. (3 m) per second
Measuring Range.....	From 0.2 to 2000 millisiemens/cm
Temperature Compensator.....	Pt 1000 RTD
Sensor Cable	5 conductor (plus two isolated shields) cable with XLPE (cross-linked polyethylene) jacket; rated to 150 °C (302 °F); 20 ft. (6 m) long
Pressure/Temperature Limits:	
Sensor Only (no hardware):	
Polypropylene	100 psi at 212 °C (6.9 bar at 100 °C)
PVDF.....	100 psi at 248 °C (6.9 bar at 120 °C)
PEEK.....	200 psi at 302 °F (13.8 bar at 150 °C)
PFA Teflon	200 psi at 302 °F (13.8 bar at 150 °C)

2.1.2 Insertion/Removal Mounting Type*

Wetted Materials.....	Plastic Hardware: Brass, CPVC, Teflon Valve Seats, Viton O-ring Seals Stainless Steel Hardware: 316 Stainless Steel, Teflon Valve seats, Viton O-ring seals
Temperature Limits	Plastic Hardware: 23 °F to 176 °F (-5 °C to 80 °C) unsupported if installed vertically; 23 °F to 203 °F (-5 °C to 95 °C) when supported with a bracket** Stainless Steel Hardware: 23 °F to 203 °F (-5 °C to 95 °C) supported or unsupported
Pressure Limits	Plastic Hardware: 50 psi @ 90 °C Stainless Steel Hardware: 100 psi @ 90 °C
Net Hardware Weight	Plastic Hardware: 7.5 lb. (3.4 kg) Stainless Steel Hardware: 25 lb. (11.3 kg)

*These sensor/mounting hardware assembly temperature ratings are limited by the hardware material, maximum pressure, and whether the assembly is supported or unsupported.

**The CPVC insertion/removal assembly must be supported with a bracket or strap if it is not installed vertically.

2.1.3 Basic Mounting Types

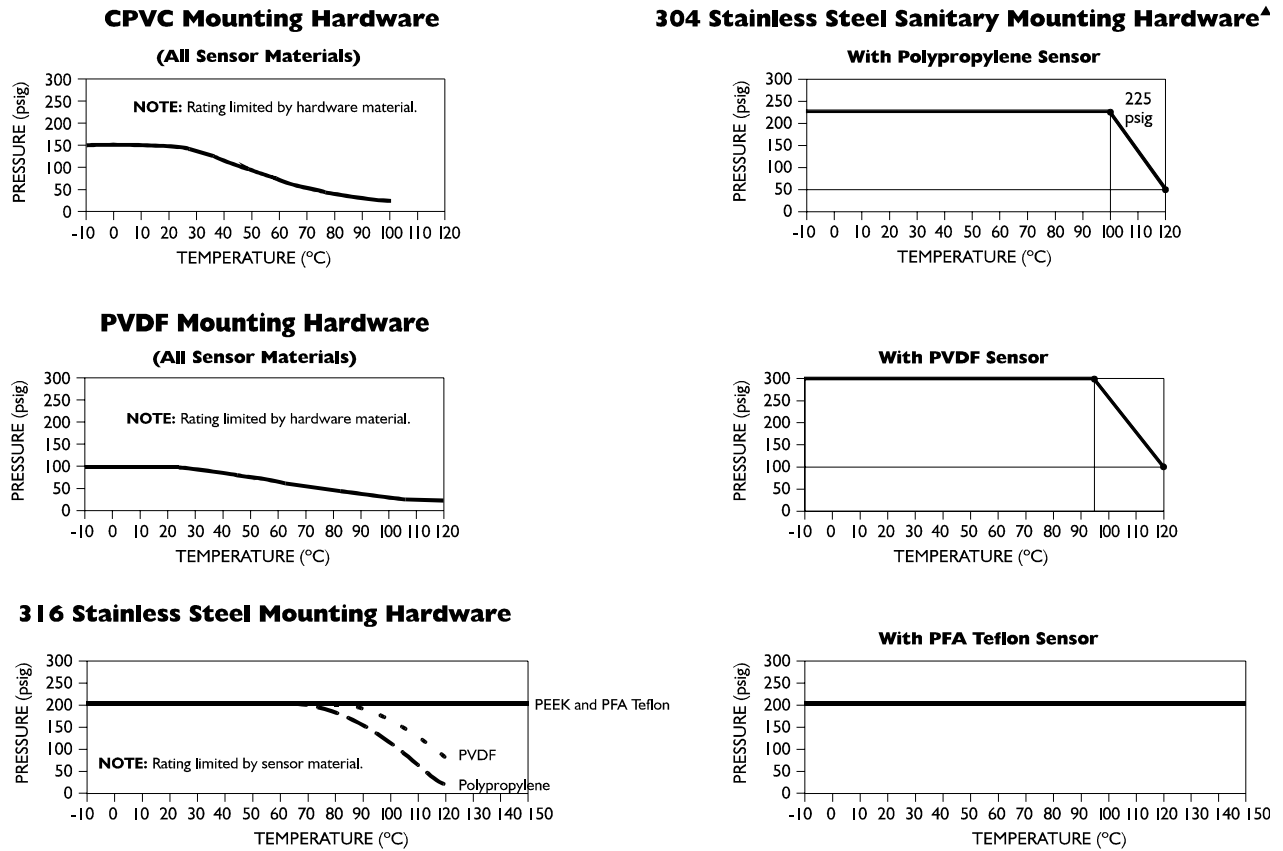


Figure 2-1 HW Sensor and Mounting Hardware Combinations*

*Ratings for the above Honeywell sensor and mounting hardware combinations are based upon water service. More severe service may require a correction factor.

^Sanitary mounting hardware ratings are for 51451248-001 hardware using the 51451257-001 heavy duty sanitary clamp. Other hardware and clamp combinations may reduce the listed ratings.

2.2 Model Selection Guide

51-52-16-54

Issue 1

Instructions

- Make one selection from Table I through IV
- A dot (•) denotes unrestricted availability.

5000TC Series Offers:
 Toroidal (Electrodeless) Conductivity Sensor with 1/2" Nominal Diameter Bore
 Mounting Types:
 Immersion Mount with Pipe and Junction Box
 Union Mount with Optional Pipe Tee
 Sanitary Tee with Clamp
 Insertion/Removal Mounting

Standard CE Approval
 Cable Length - 20 Feet
 1000 Ohm Platinum RTD

Key Number
----- - I - II - III

KEY NUMBER	Selection Availability
Description	
Toroidal (Electrodeless) Conductivity Probe	5000TC ↓

TABLE I

Mounting	No Mounting Assembly	00	•
Material	CPVC Pipe, PVC Junction Box	51451240-001	11 •
Type	PVDF Pipe, PVC Junction Box	51451241-001	12 •
	316 SS Union Adapter & Standard 2" Tee	51451242-001	21 •
	316 SS Union Adapter Only	51451243-001	22 •
	CPVC Union Adapter & Standard 2" Tee	51451244-001	23 •
	CPVC Union Adapter Only	51451245-001	24 •
	PVDF Union Adapter & Standard 2" Tee	51451246-001	25 •
	PVDF Union Adapter Only	51451247-001	26 •
	316 SS Sanitary 2" Tee & Heavy-Duty Clamp	51451248-001	31 •
	316 SS Insertion/Removal Device	51451249-001	41 •
	CPVC Insertion/Removal Device	51451250-001	42 •

TABLE II

Sensor	No Sensor	0	•
Material	Convertible Polypropylene Sensor	51451251-001	1 a
Type	Convertible PVDF Sensor	51451252-001	2 a
	Convertible PEEK Sensor	51451253-001	3 a
	Convertible PFA Teflon Sensor	51451254-001	4 a
	Sanitary Polypropylene Sensor	51500150-001	5 b
	Sanitary PVDF Sensor	51500151-001	6 b
	Sanitary PFA Teflon Sensor	51500152-001	7 b

TABLE III

Future	None	000	•
--------	------	-----	---

ACCESSORIES

51451255-001	6-Conductor Interconnect Cable
51451256-001	6-Conductor Junction Box (comes standard with immersion hardware)
51451257-001	Spare Sanitary Clamp (standard with option 31 from Table I)
51451258-001	Spare Special Cap (standard with option 31 from Table I)
51451259-001	Spare Sanitary Gasket (standard with option 31 from Table I)

RESTRICTIONS

Restriction Letter	Available Only With		Not Available With	
	Table	Selection	Table	Selection
a			I	31
b	I	31		

3. Installation of Mounting Types

3.1 Overview

This section describes the installation requirements and procedures for the 5000 TC toroidal probes and associated mountings.

3.2 Location Requirements

Locate the sensor as close as possible to the measuring instrument in order to minimize electrical interference and signal loss.

REFERENCE

When indirectly wiring the sensor to the instrument with interconnect cable and a junction box, use only Honeywell cable part number 51451255-001. If a different cable is used, it must have equivalent construction: five conductors and two separate isolated shields -- one shielding the signal, and one shielding the overall cable. These specific cable characteristics protect the measurement signal from electromagnetic interference. Using a cable with different construction may interfere with the measurement system's performance.

3.3 Basic Mounting Types

Regardless of the mounting method, always use Teflon tape on the sensor and mounting hardware threads to avoid leaks. Do not use pipe sealant.

Immersion (no adapter needed)

The convertible style sensor may be immersion mounted by threading it onto the end of a pipe of an appropriate length (Figure 3-1).

Table 3-1 Mounting Procedure

Step	Action
1	Screw a 3/4 x 1/2-inch NPT reducer coupling onto the cable end of the sensor. Use an adjustable or open-end wrench on the flatted section below the sensor threads to carefully tighten the connection to prevent leaks.
CAUTION	
Do not tighten the sensor connection by holding and turning the "doughnut-shaped" end of the sensor. This could crack the sensor body.	
2	Route the sensor cable through a 1/2-inch diameter mounting pipe of an appropriate length. Screw the pipe onto the reducer coupling.
3	Fasten the pipe-mount junction box onto the 1/2-inch NPT threads of the mounting pipe.
4	Route the sensor cable into the junction box. If the cable is too long, cut it to just the length needed which minimizes electromagnetic interference. Then <i>very carefully</i> re-terminate the sensor wires and shields by following the procedure described in Section 4.

Step	Action
5	<p>Route the interconnect cable from the junction box to the instrument. If the cable is too long, cut it to just the length needed which minimizes electromagnetic interference. Then <i>very carefully</i> terminate the wires and shields of the interconnect cable by following the procedure described in Section 4.</p> <p>Recommendation: Run the interconnect cable in 1/2-inch or larger flexible, metal conduit to protect it from moisture and mechanical damage. The flexible conduit must be long enough to allow the sensor to be removed from the process for maintenance and calibration.</p>
<p>ATTENTION</p>	
<p>Do not route the interconnect cable in any conduit containing ac power wiring (“electrical noise” may interfere with the sensor signal).</p>	
6	<p>Refer to the instructions in the instrument manual for connecting the sensor and interconnect cable wires in the junction box, and for connecting the other end of the interconnect cable to the instrument.</p>
7	<p>Fasten the cover onto the junction box.</p>
8	<p>Before mounting the sensor/hardware assembly into the process, calibrate the measurement system with conductivity reference solution using the procedure in the instrument instruction manual.</p>

This completes the sensor mounting using the special Honeywell immersion mounting.

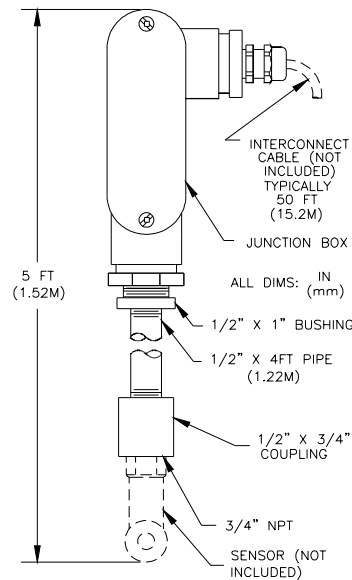


Figure 3-1 Immersion Mounting Details

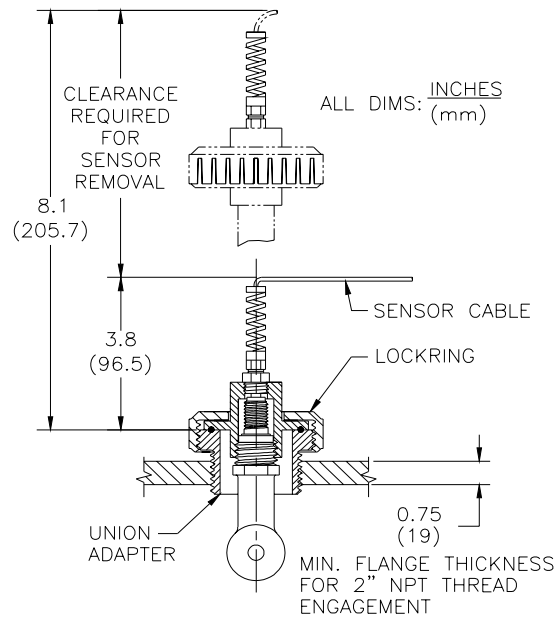
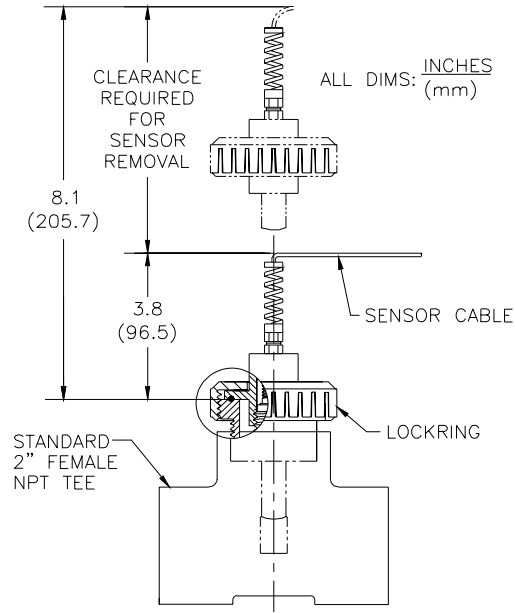
Union Mount (for Tee, Weldolet, Pipe Saddle, etc.)

The convertible style sensor may be mounted in any standard 2-inch NPT fitting (pipe tee, weldolet, pipe saddle, etc.) by using a special Honeywell union-mount adapter.

Table 3-2 Union Mount Procedure

Step	Action	
1	Install a standard 2-inch NPT fitting (pipe tee, weldolet, pipe saddle, etc.) into the process line. Preferably, the fitting should be made of a material to provide a suitable maximum pressure/temperature rating for the application. Refer to Subsection 2.1 for specifications.	
2	Fasten the special short nipple of the Honeywell union-mount adapter into the 2-inch NPT fitting. Carefully tighten the threaded connection to prevent leaks. Figure 3-2 and Figure 3-3 respectively show pipe tee and flange mounting details.	
3	Route the sensor cable through the cord grip of the Honeywell union-mount adapter, and tighten the sensor into the adapter's flanged piece.	
4	Wire the sensor directly to the instrument or indirectly using interconnect cable and a junction box. In either case, make sure that the sensor or interconnect cable is cut to the proper length to minimize electromagnetic interferences.	
	A	Make sure to <i>very carefully</i> terminate the wires and shields of the respective cable(s) by following the procedure described in Section 4.
	B	Refer to the instructions in the instrument manual to electrically connect the sensor to the instrument.
5	Before mounting the sensor into the process line or vessel, calibrate the measurement system with conductivity reference solution using the procedure in the instrument instruction manual.	
6	After calibration, mount the sensor into the installed 2-inch NPT fitting:	
	A	Properly seat the gasket into its mating groove on the special short nipple of the Honeywell union-mount adapter.
	B	Carefully place the sensor into the short nipple, making sure the gasket is in place and contacting the adapter's flanged surface.
	C	Tighten the union-mount adapter lock-ring onto the special short nipple to secure the connection.

This completes the sensor mounting using the special Honeywell union-mount adapter.



Sanitary Flange

The sanitary style sensor may be clamp-mounted for clean-in-place applications by using a sanitary clamp-type tee or ferrule and a heavy duty clamp (Figure 3-4).

Table 3-3 Sanitary Flange Procedure

Step	Action	
1	Install a 2-inch sanitary clamp-type tee or ferrule into the process line or vessel.	
2	Route the sensor cable through the hole in the stainless steel endcap so that the endcap's taper faces towards the top surface of the integral sensor flange.	
3	Wire the sensor directly to the instrument or indirectly using interconnect cable and a junction box. In either case, make sure that the sensor or interconnect cable is cut to the proper length to minimize electromagnetic interference.	
	A	Make sure to <i>very carefully</i> terminate the wires and shields of the respective cable(s) by following the procedure described in Section 4.
	B	Refer to the instructions in the instrument manual to electrically connect the sensor to the instrument.
4	Before mounting the sensor into the process line or vessel, calibrate the measurement system with conductivity reference solution using the procedure in the instrument instruction manual.	
5	After calibration, mount the sensor into the sanitary tee or ferrule:	
	A	Properly seat the sanitary gasket onto the mating surface of the tee or ferrule.
	B	Carefully place the sensor into the tee or ferrule, making sure the gasket is in place and contacting the bottom surface of the integral sensor flange.
	C	Place the stainless steel endcap onto the top surface of the integral sensor flange and secure the sensor onto the tee or ferrule with the heavy duty clamp. Tighten wing nut on the heavy duty clamp to 25 inch-lbs. torque. If the sensor is installed in a temperature cycling process, the wing nut may need to be periodically re-tightened.

CAUTION

Steam sterilization is not recommended for cleaning the Honeywell sanitary style electrodeless conductivity sensor.

This completes the sensor mounting using a sanitary clamp-type tee or ferrule and a heavy duty clamp.

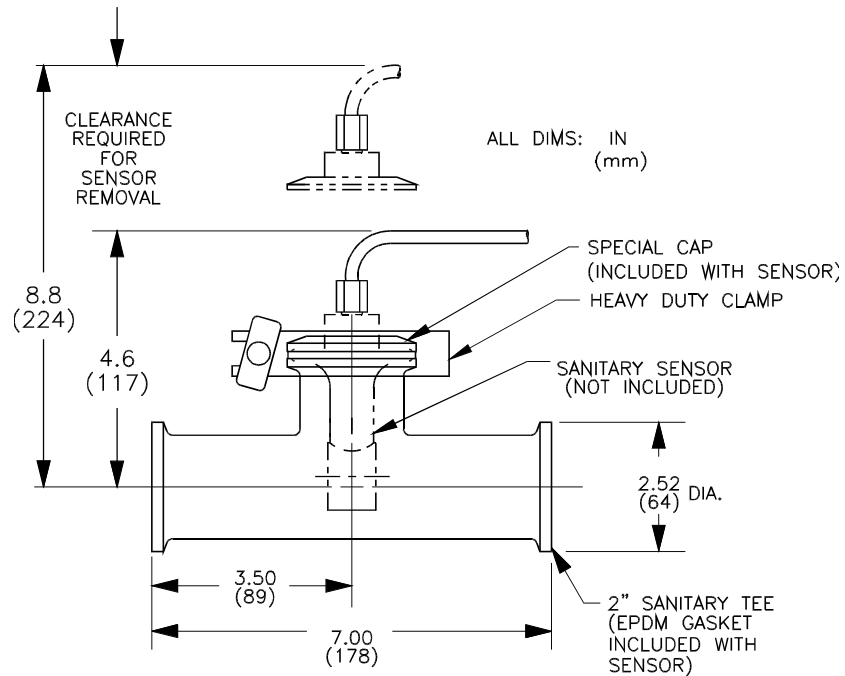


Figure 3-4 Sanitary (CIP) Flange Mounting Details

3.4 Insertion/Removal Sensors Mounting Types

Location Requirements

Mount the sensor vertically with electrodes pointing downward. If the sensor must be installed on an angle, it should be **at least 15° above horizontal**. Other mounting angles may cause erratic measurement readings.

Mounting

When following the instructions in this section, refer to Figure 3-5 or Figure 3-6. The instructions refer to specific component parts that are identified by letter designations in the respective figures.

ATTENTION

Use Teflon tape on all sensor and mounting hardware threads to avoid leaks. (If using pipe sealant with Teflon, Locktite No. 59321 or equivalent, it may not provide an adequate seal at higher solution temperatures.)

Fastening Sensor to Extractor Shaft

Table 3-4 Procedure for Fastening Sensor to Extractor Shaft

Step	Action
1	Remove the extractor shaft from the insertion hardware assembly by unscrewing the retaining cap (item G) and then the lock ring (item F).
2	Disregard the small, plastic cylindrical spacer that is tie-wrapped to the insertion hardware assembly.
3	After loosening the cable grip on the end of the extractor shaft, route the sensor cable through the extractor shaft.
4	Screw the extractor shaft into the sensor, and then tighten the cable grip.

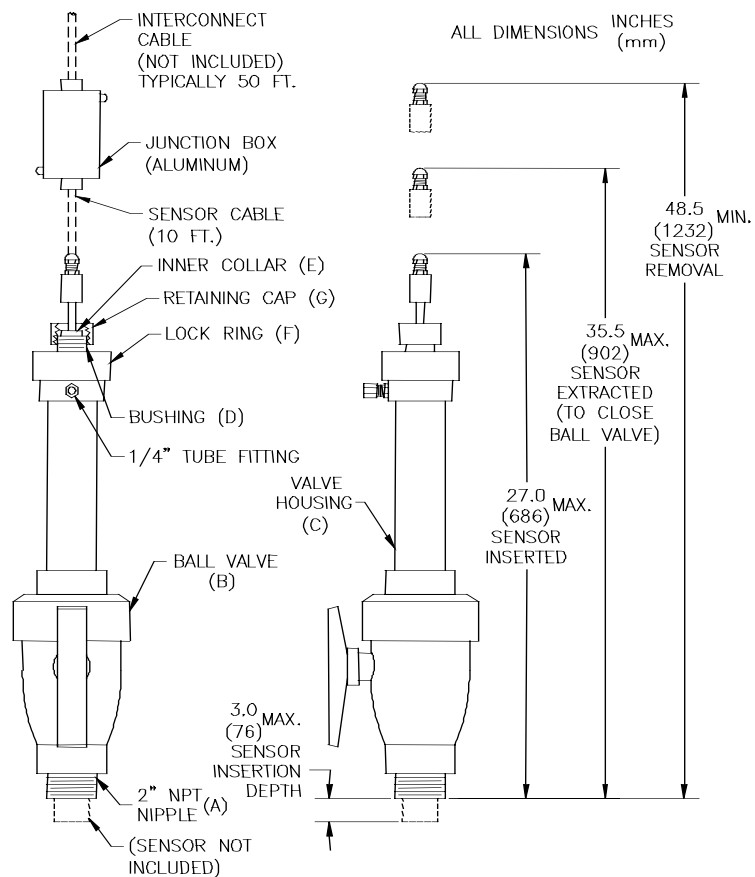


Figure 3-5 Insertion/Removal Mounting Details for Toroidal Sensors

Setting Sensor Insertion Depth

The sensor insertion depth is the distance that the sensor electrodes extend beyond the threaded end of the insertion hardware assembly. The sensor insertion depth, shown in Figure 3-5 or Figure 3-6, is *factory set* to the *maximum* distance of:

- 3.0 inches for standard style sensor/hardware

In some cases the application may require the insertion depth distance to be *reduced*. Carefully determine the required insertion depth before installing the hardware.

CAUTION

Do not exceed the factory-set maximum insertion depth which may damage the sensor.

If the factory-set insertion depth is sufficient, disregard this procedure, and install the insertion hardware assembly into the process pipe/vessel (Table 3-6). If the depth needs adjusting:

Table 3-5 Procedure for Setting Sensor Insertion Depth

Step	Action
1	Loosen the two set screws on the metal inner collar (item E) located at the back end of the extractor shaft.
2	Slide the collar towards the sensor to <i>reduce</i> the insertion depth as needed. NOTE: Reduce the insertion depth minimally. Optimum sensor performance depends upon the sensor electrodes being fully inserted into the process.
3	Tighten the two set screws to secure the metal inner collar (item E) to the extractor shaft.

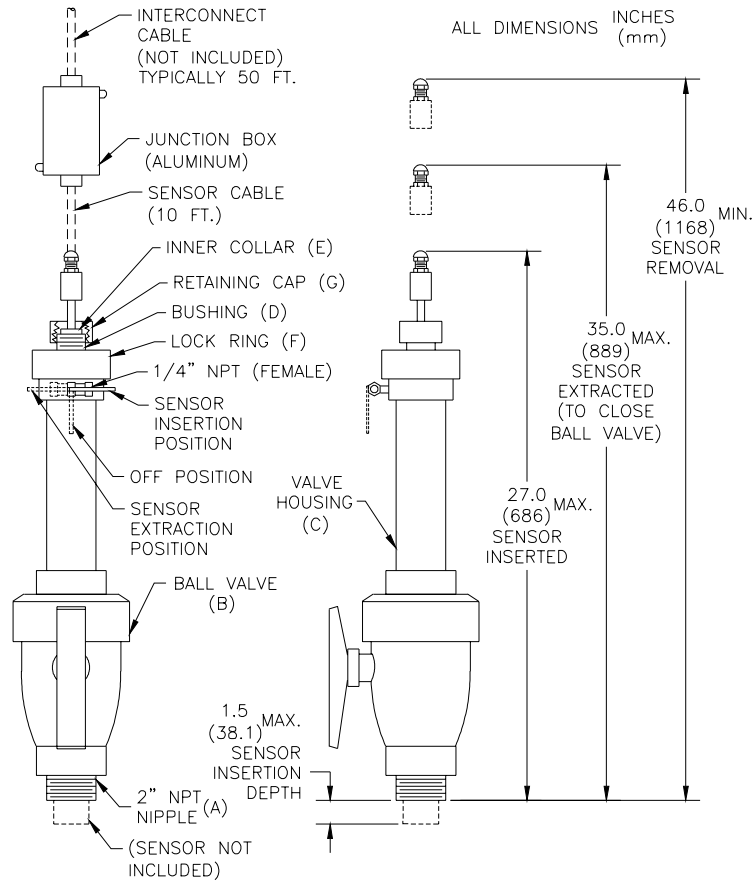


Figure 3-6 Insertion/Removal Mounting Details for Toroidal Sensors

Installing Hardware into Process Pipe/Vessel

Mount the insertion hardware assembly into a portion of the process pipe or vessel where air cannot be trapped and subsequently contact the toroidal sensors.

Table 3-6 Procedure for Installing Hardware into Process Pipe/Vessel

Step	Action
1	Install a 2-inch NPT female fitting (tee or flange) into the process pipe or vessel.
2	Screw the insertion hardware assembly's 2-inch NPT nipple (item A) into the mounted fitting. Securely tighten the connection.
3	Connect a water line to the insertion hardware assembly.
4	Follow steps a through c to counterbalance pressure
	a To help counterbalance the pressure of the process during insertion and extraction, and to clean the insertion assembly with an internal water flush, connect a 1/4-inch water line to the 1/4-inch tube fitting on the insertion hardware assembly.
	b Install a hand-operated shutoff valve upstream of the hardware's 1/4-inch tube fitting to control the flow of water.
	c Install a check valve in the water line to prevent process solution from surging into the water line should the process pressure exceed the water pressure. CAUTION: THE WATER LINE PRESSURE MUST BE GREATER THAN THE PROCESS PRESSURE, BUT CANNOT EXCEED 100 PSI.
5	Turn the insertion hardware ball valve (item B) to the fully closed position.
6	Start the process flow.

Installing Sensor into Hardware Assembly

After calibration, install the sensor/extractor shaft assembly into the mounted insertion hardware assembly.

Table 3-7 Procedure for Installing Sensor into Hardware Assembly

Step	Action
1	With the ball valve (item B) <i>fully closed</i> and the sensor/extractor shaft assembly <i>extracted approximately halfway</i> , insert the sensor/shaft assembly into the valve housing (item C) until the surface of the flanged bushing (item D) presses against the O-ring on the housing. Make sure that the O-ring is properly seated.
2	Tighten the lock ring (item F) onto the valve housing.

Insertion into Pressurized Process

After mounting the insertion hardware assembly, calibrating the sensor with the transmitter and installing the sensor into the hardware, the sensor may be inserted into the pressurized process.

WARNING

Inserting a sensor into a pressurized process may be dangerous. Do not stand directly behind the assembly when opening the ball valve. Depending on the process pressure, the extractor shaft may travel rapidly outward before the retaining cap (item G) can be tightly fastened.

Table 3-8 Procedure for Inserting Sensor into Pressurized Process

Step	Action
1	Turn the ball valve (item B) to the fully open position.
2	Slowly and firmly insert the sensor/extractor shaft assembly into the insertion hardware assembly until the metal inner collar (item E) is pressing against the threaded end of the flanged bushing (item D).
3	Tighten the retaining cap (item G) onto the bushing.

ATTENTION

When a water line is connected to the insertion hardware assembly and the process pressure is high, open the water shutoff valve to help counterbalance the process pressure and minimize the force needed to insert the sensor.

The sensor is now inserted to its preset insertion depth.

Extraction from Pressurized Process

WARNING

Extracting a sensor from a pressurized process may be dangerous. Do not stand directly behind the assembly when removing the retaining cap (item G) to extract the sensor. It is recommended to reduce the process pressure to below 10 psi before extracting the sensor. If this is not possible, use extreme caution. At higher pressures, the sensor/extractor shaft assembly may travel rapidly to its maximum outward position, potentially injuring anyone in its path.

Table 3-9 Procedure for Extracting Sensor from Pressurized Process

Step	Action				
1	If a water line is connected, open the water shut-off valve. Note: If a water line is plumbed to the insertion hardware assembly, it will help counterbalance the pressure of the process and minimize the force need to extract the sensor.				
2	While firmly holding the sensor/extractor shaft assembly in place, loosen and remove the retaining cap (item G). Permit the sensor/extractor shaft assembly to slowly move to its maximum outward travel. This ensures that the sensor has cleared the ball valve opening.				
3	If a water line is connected, close the water shut-off valve, and then immediately close the ball valve (item B).				
4	To remove the sensor for routine maintenance and calibration;				
	<table border="1"> <tr> <td data-bbox="345 1041 428 1094">a</td> <td data-bbox="428 1041 1437 1094">Loosen and remove the lock ring (item F).</td> </tr> <tr> <td data-bbox="345 1094 428 1138">b</td> <td data-bbox="428 1094 1437 1138">Firmly extract the sensor/extractor shaft assembly from the insertion hardware.</td> </tr> </table>	a	Loosen and remove the lock ring (item F).	b	Firmly extract the sensor/extractor shaft assembly from the insertion hardware.
a	Loosen and remove the lock ring (item F).				
b	Firmly extract the sensor/extractor shaft assembly from the insertion hardware.				

4. Sensor/Interconnect Cable Termination

CAUTION

If the sensor or interconnect cable is not terminated exactly as described, the measuring system will not measure properly.

Sensor Cable Details

The sensor may be provided with its integral cable terminated in one of two ways:

- **Standard Termination:** For all applications *except those* using instruments with the European Community “CE” label. The sensor cable is terminated with five colored wires (red, green, yellow, white, and blue) and one shield wire (the signal shield wire and cable shield wire are electrically common).
- **CE Termination:** Only available by special order for applications using instruments with the European Community “CE” label. The sensor cable is terminated with five colored wires (red, green, yellow, white, and blue), and two *separate* isolated shield wires (the signal shield wire and cable shield wire are electrically isolated).

In either case, it may be necessary to shorten the integral sensor cable during installation.

Interconnect Cable Details

The Honeywell interconnect cable (part number 51451255-001) is provided with unfinished ends since it often needs to be shortened during installation. The 51451255-001 cable is identical to the integral sensor cable except that it has unfinished ends.

ATTENTION

Honeywell strongly recommends using only its 51451255-001 interconnect cable. If a different cable is used, it must have equivalent construction: five conductors, and two separate isolated shields -- one shielding the signal, and one shielding the overall cable. These specific cable characteristics protect the measurement signal from electromagnetic interference. Using a cable with different construction may interfere with the measurement system’s ability to properly measure.

Standard Termination Procedure (for all applications except CE)

CAUTION

Use this standard termination procedure to terminate the sensor or interconnect cable unless the measuring instrument has the European community "CE" label. In this case, the CE termination procedure must be used.

Table 4-1 Termination Procedure for All Applications Except CE

Step	Action
1	Strip back the outer cable jacket, outer foil wrap, cellophane wrap, inner foil wrap, and unused black wire to a distance of 3 inches (76 mm) as shown in Figure 4-1. This exposes the signal shield wire, the cable shield wire, and the five colored wires (red, green, yellow, white, and blue).
2	Twist the signal shield wire and cable shield wire together, and insulate the new combined shield wire with shrink wrap or tape.
3	Strip the insulation back from each of the colored wires to a distance of 1/8 inch (3 mm). Then tin each stripped wire.
4	Using shrink wrap or tape, equally cover the outer cable jacket, and the five colored wires/combined shield wire. This secures and completes the terminated assembly.

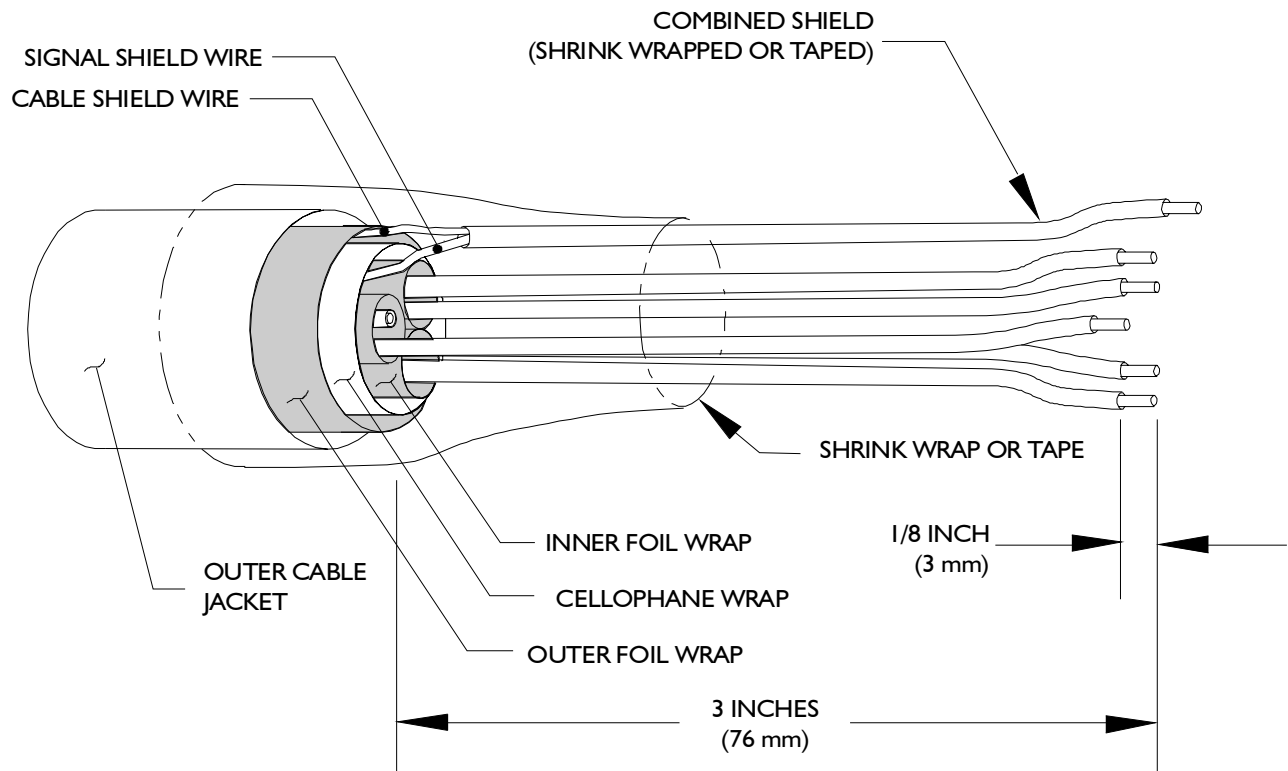


Figure 4-1 Standard Termination Details (for All Applications Except CE)

CE Termination Procedure (For CE-only Applications)

CAUTION

When the measuring instrument has the European community "CE" label, this CE termination procedure must be used. If there is no "CE" label on the instrument, use the standard termination procedure.

Table 4-2 Termination Procedure for CE-only Applications

Step	Action
1	Carefully strip back the outer cable jacket and outer foil wrap to an appropriate length. This exposes the signal shield wire, cable shield wire, and cellophane-wrapped wire bundle.
2	Fold back the cable shield wire (see Figure 4-2). Using shrink wrap or tape, equally cover the outer cable jacket, and the exposed cable shield wire/cellophane-wrapped wire bundle.
3	Carefully clip back the cellophane wrap, inner foil wrap, and unused black wire up to the end of the shrink wrap or tape applied in step 2. This exposes the signal shield wire, and the five colored wires (red, green, yellow, white, and blue).
4	Insulate the signal shield wire with shrink wrap or tape.
5	Strip the insulation back from each of the colored wires to a distance of 1/8 inch (3 mm). Then tin each stripped wire.
6	Using an ohmmeter or test light, verify that the signal shield wire is not shorted to the cable shield wire. If okay, shorten the cable shield wire to an appropriate length. If not, clip cable to get a new unfinished end and start over at step 1.
7	Using shrink wrap or tape, equally overlap the existing shrink wrap or tape applied in step 2, and the five colored wires/signal shield wire. This secures and completes the terminated assembly

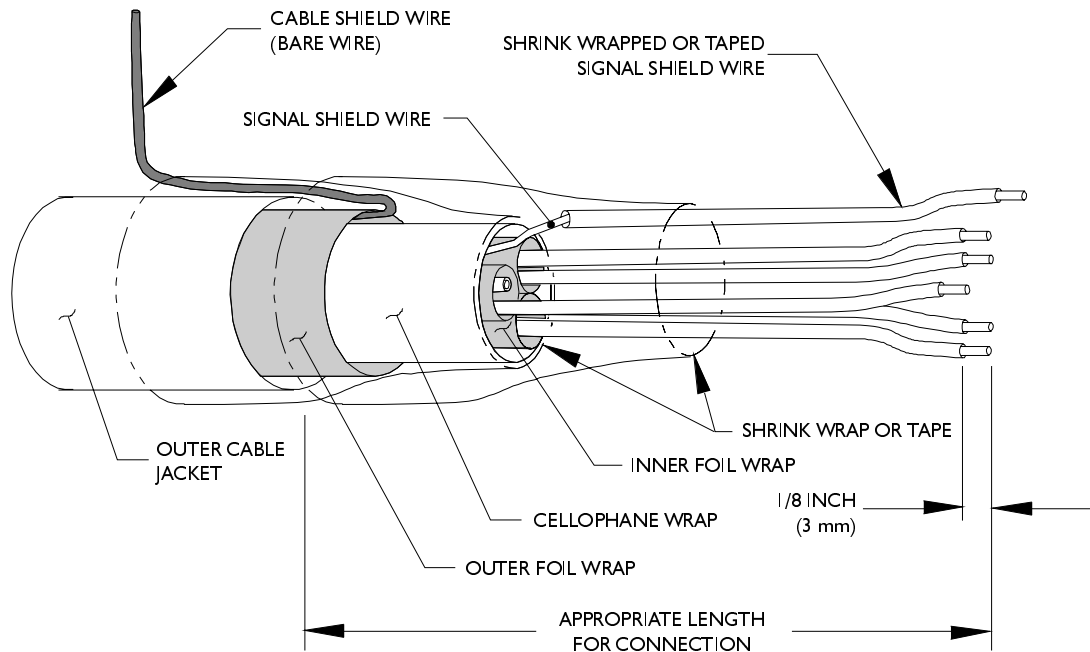


Figure 4-2 CE Termination Details (for CE-only Applications)

5. Troubleshooting

5.1 Overview

This section describes various possible problems and the means to correct them.

5.2 Checking the Sensor

Use the troubleshooting section in the instrument instruction manual to determine whether the sensor or instrument is defective. If the sensor is suspected, check it using the following procedure:

Table 5-1 Sensor Troubleshooting Procedure

Step	Action
1	Disconnect the sensor from the instrument (or junction box if interconnect cable is used).
2	Clean the sensor using the procedure in Section 6.
3	With the sensor at a temperature between 23 °C and 27 °C, measure the resistance between the red and yellow wires with an ohmmeter. The reading should be between 1090 and 1105 ohms.
4	Measure the resistance between the white and blue wires. The reading should be less than 5 ohms. Now measure the resistance between the green and yellow wires. The reading should also be less than 5 ohms.
5	Place the ohmmeter to its highest range and measure the resistance between the shield and white wires. The reading should indicate infinity (open circuit).
6	If any one of the resistance checks in the previous steps is not correct, the sensor is probably defective. Refer to the Honeywell warranty/replacement plan on page ii for details on sensor replacement. If the resistance checks are correct, the sensor may still be defective. In this case, more extensive troubleshooting is required. Please consult the Honeywell Customer Service Department for details.

5.3 Customer Assistance

If you need spare parts, assistance in troubleshooting, or repair servicing, please contact your local Honeywell representative or Technical Support. See front section of this manual for contact information.

6. Maintenance

6.1 Recommended Cleaning Procedure

The sensor must be kept reasonably clean to maintain measurement accuracy. The time period between cleanings (days, weeks, etc.) is affected by the characteristics of the process solution and can only be determined by operating experience. For example, a sensor operating in wastewater that contains oil and/or grease may require more frequent cleaning.

Table 6-1 Cleaning Procedure

Step	Action
1	Rinse the sensor with clean, warm water.
2	Prepare a mild soap solution. Use warm water and dishwashing detergent, Borax hand soap or a similar soap.
3	Soak the sensor for 2 to 3 minutes in the soap solution.
4	<p>Using a small bristle brush, cotton swab (Q-tip) or pipe cleaner, scrub the entire measuring end of the sensor to thoroughly clean the surfaces. If detergent solution cleaning cannot remove deposits on the surfaces, use muriatic acid (or another dilute acid) to dissolve the deposits. The acid should be as dilute as possible, but yet strong enough to clean. Experience will help determine which acid to use and how dilute it can be. Some stubborn coatings may require a different cleaning agent. Contact the factory for assistance in these difficult cases.</p> <p>Before cleaning with acid, determine if any hazardous reaction products could form. For example, a sensor used in a cyanide bath should not be put directly into a strong acid for cleaning because poisonous cyanide gas could be produced. Acids are hazardous and appropriate eye protection and clothing should be worn in accordance with Material Safety Data Sheet recommendations.</p> <p>Soak the sensor in dilute acid for no more than 5 minutes. Rinse the sensor with clean, warm water and then place the sensor back into the mild soap solution for 2 to 3 minutes to neutralize the acid.</p>
5	Rinse the sensor in clean, warm water.
6	Calibrate the system with conductivity reference solution using the procedure in the instrument instruction manual. If calibration cannot be accomplished, check the sensor using the procedure in Section 5.

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