

# OPERATING MANUAL

## Model 3700E-series Electrodeless Conductivity Sensors

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## HELPFUL IDENTIFIERS


In addition to information on installation and operation, this instruction manual may contain WARNINGS pertaining to user safety, CAUTIONS regarding possible instrument malfunction, and NOTES on important, useful operating guidelines.

### WARNING:

**A WARNING LOOKS LIKE THIS. IT WARNS YOU OF THE POTENTIAL FOR PERSONAL INJURY.**

### CAUTION:

**A CAUTION LOOKS LIKE THIS. IT ALERTS YOU TO POSSIBLE INSTRUMENT MALFUNCTION OR DAMAGE.**

 **NOTE:** *A note looks like this. It alerts you to important operating information.*

# TABLE OF CONTENTS

## PART ONE - INTRODUCTION

<b>SECTION 1</b>	<b>GENERAL INFORMATION</b>	
	1.1 Mounting Styles.....	5
	1.2 Wetted Materials .....	5
	1.3 Operating Precautions.....	5
<b>SECTION 2</b>	<b>SPECIFICATIONS .....</b>	<b>6</b>

## PART TWO - INSTALLATION

<b>SECTION 1</b>	<b>LOCATION REQUIREMENTS .....</b>	<b>7</b>
<b>SECTION 2</b>	<b>IMMERSION MOUNTING .....</b>	<b>7-8</b>
<b>SECTION 3</b>	<b>TEE, WELDOLET OR PIPE SADDLE MOUNTING (requires GLI union-mount adapter) .....</b>	<b>9-11</b>
<b>SECTION 4</b>	<b>INSERTION (BALL VALVE) MOUNTING</b>	
	4.1 Fastening Sensor to Extractor Shaft.....	11-12
	4.2 Setting Sensor Insertion Depth.....	13
	4.3 Mounting Ball Valve into Non-pressurized Process Pipe/Vessel .....	14
	4.4 Installing Sensor into Non-pressurized Ball Valve Hardware.....	15
	4.5 Inserting Sensor into Pressurized Process Pipe/Vessel .....	15-16
	4.6 Extracting Sensor from Pressurized Process Pipe/Vessel .....	16
<b>SECTION 5</b>	<b>SANITARY FLANGE MOUNTING .....</b>	<b>17-18</b>
<b>SECTION 6</b>	<b>SENSOR/INTERCONNECT CABLE TERMINATION</b>	
	6.1 Sensor Cable Details.....	18-19
	6.2 Interconnect Cable Details .....	19
	6.3 Standard Termination Procedure (for all applications except CE) ....	19-20
	6.4 CE Termination Procedure (for CE-only applications) .....	20-21

## PART THREE - SERVICE AND MAINTENANCE

<b>SECTION 1</b>	<b>RECOMMENDED CLEANING PROCEDURE .....</b>	<b>22</b>
<b>SECTION 2</b>	<b>TROUBLESHOOTING</b>	
	2.1 Checking the Sensor .....	23
	2.2 Customer Assistance.....	24

# TABLE OF CONTENTS (continued)

## ILLUSTRATIONS

<b>Figure 2-1</b>	Immersion Mounting Details .....	7
<b>Figure 2-2</b>	Tee Mounting Details.....	9
<b>Figure 2-3</b>	Flange Mounting Details.....	9
<b>Figure 2-4</b>	Insertion (Ball Valve) Mounting Hardware Details.....	13
<b>Figure 2-5</b>	Sanitary (CIP) Flange Mounting Details.....	17
<b>Figure 2-6</b>	Standard Termination Details (for all applications except CE) .....	20
<b>Figure 2-7</b>	CE Termination Details (for CE-only applications) .....	21

### SENSOR WARRANTY/REPLACEMENT PLAN

GLI International, Inc. will replace or repair any sensor which fails due to defects in materials or workmanship for a period of 1 year (12 months) from the date of shipment of this product from our facility. A warranty claim will not be honored if defects are not reported within the warranty period, or if GLI International determines that defects or damages are due to normal wear, misapplication, lack of maintenance, abuse, improper installation, alteration, or abnormal conditions. GLI International's obligation under this warranty shall be limited to, at its option, replacement or repair of this product. The product must be returned to GLI International, freight prepaid, for examination. The product must be thoroughly cleaned and any process chemicals removed before it will be accepted for replacement or repair. GLI International's liability shall not exceed the cost of the product. Under no circumstances will GLI International be liable for any incidental or consequential damages, whether to person or property. GLI International will not be liable for any loss, damage or expense of any kind, including loss of profits, resulting from the installation, use, or inability to use this product.

# PART ONE - INTRODUCTION

## SECTION 1

### GENERAL INFORMATION

#### 1.1 Mounting Styles

The Model 3700E-series electrodeless conductivity sensor measures the conductivity of solutions from 0-200 up to 0-2,000,000 microSiemens/cm. These sensors are available in two mounting styles:

- **Convertible Style** which can be directly fastened to the end of a pipe for immersion mounting or, by using the GLI 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 GLI 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.

#### 1.2 Wetted Materials

To simplify chemical resistance problems, these sensors are constructed of only one wetted material. The convertible style sensor is available in polypropylene, PVDF, PFA Teflon or PEEK material. The sanitary style sensor is available in these same materials, but not PEEK.

#### 1.3 Operating Precautions

Always consider the temperature/pressure ratings of the mounting hardware used to install the sensor. The sensor and hardware combine to become an integrated system. The hardware material usually limits the system's temperature/pressure rating. Refer to Section 2 for complete specifications.

# SECTION 2

## SPECIFICATIONS

Wetted Materials ..... Polypropylene, PVDF, PEEK® or PFA Teflon®  
 Operating Temperature Range..... 14 to 392°F (-10 to 200°C); limited only by sensor body material and mtg. hardware (see below)  
 Maximum Flow Rate ..... 10 ft. (3 m) per second  
 Measuring Range..... From 0-200 to 0-2,000,000 microSiemens/cm  
 Temperature Compensator..... Pt 1000 RTD

**Sensor Cable:**

Polypropylene and PVDF Sensors..... 5 conductor (plus two isolated shields) cable with XLPE (cross-linked polyethylene) jacket; rated to 150°C (302°F); 20 ft. (6 m) long  
 PEEK® and PFA Teflon® Sensors ..... 5 conductor (plus two isolated shields) cable with Teflon-coated jacket; rated to 200°C (392°F); 20 ft. (6 m) long

**Pressure/Temperature Limits:**

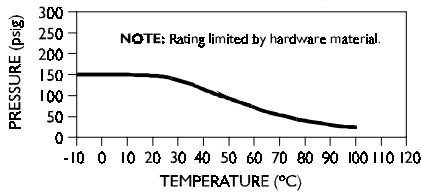
Sensor Only (no hardware): ..... Polypropylene: 100 psi at 212°C (6.9 bar at 100°C)  
 PVDF 100 psi at 248°C (6.9 bar at 120°C)  
 PEEK® 200 psi at 392°F (13.8 bar at 200°C)  
 PFA Teflon® 200 psi at 392°F (13.8 bar at 200°C)

**Sensor with Hardware:**

Immersion and Union\* ..... See graphs below for specific GLI sensor and mounting hardware combinations:

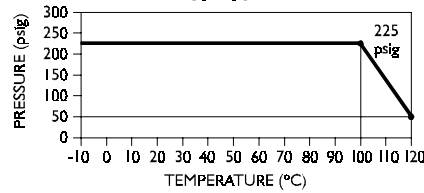
**CPVC Mounting Hardware**

(All Sensor Materials)



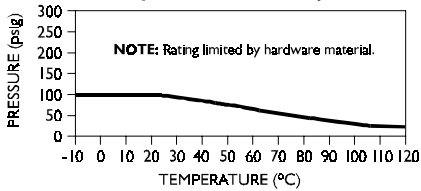
**304 Stainless Steel Sanitary Mounting Hardware<sup>^</sup>**

With Polypropylene Sensor

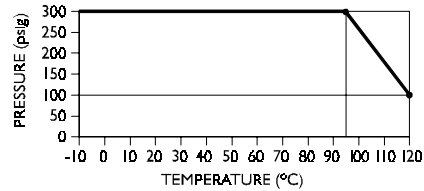


**PVDF Mounting Hardware**

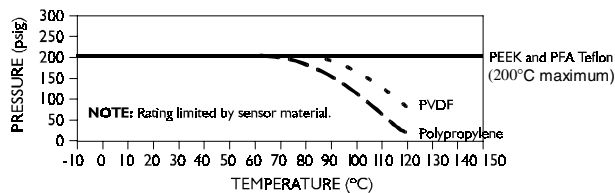
(All Sensor Materials)



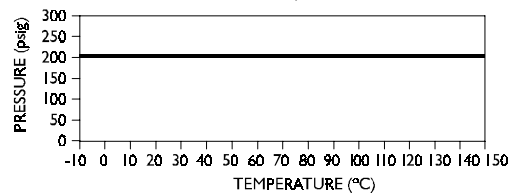
With PVDF Sensor



**316 Stainless Steel Mounting Hardware**



With PFA Teflon Sensor



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

<sup>^</sup>Sanitary mounting hardware ratings are for MH048S8S hardware using the 9H1132 heavy duty sanitary clamp. Other hardware and clamp combinations may reduce the listed ratings.

**Insertion Hardware only:**

	MH118M9NZ	MH138M9NZ
Wetted Materials.....	316 stainless steel, Teflon valve seats, and Viton O-rings	CPVC, brass, Teflon valve seats, and Viton O-ring seals
Temperature Range** .....	23 to 203°F (-5 to 95°C) supported or unsupported	23 to 176°F (-5 to 80°C) supported if installed vertically; 23 to 203°F (-5 to 95°C) when supported with bracket
Maximum Pressure** .....	80 psig at 203°F (5.5 bar at 95°C)	50 psig at 194°F (3.5 bar at 90°C)

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

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Teflon® is a registered DuPont Co. Trademark.

# PART TWO - INSTALLATION

## SECTION 1

### LOCATION REQUIREMENTS

Locate the sensor as close as possible to the instrument. Depending on the instrument model and full-scale range, the maximum allowable distance between sensor and instrument varies (refer to instrument manual for distances).



**NOTE:** When indirectly wiring the sensor to the instrument with interconnect cable and a junction box, use only GLI 1W1100 cable. When using a different cable, 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 measuring system's performance.

## SECTION 2

### IMMERSION MOUNTING

The convertible style sensor may be immersion mounted by threading it onto the end of a pipe of an appropriate length (Figure 2-1).

1. Apply Teflon tape to the 3/4 x 1/2-inch NPT reducer coupling and sensor thread connection to avoid leaks. (Pipe sealant with Teflon, Locktite No. 59321 or equivalent, may not provide adequate sealing at higher solution temperatures).
2. Use an adjustable or open-end wrench on the sensor flattened-hex section below its threads to carefully fasten the reducer coupling onto the sensor (cable end) to prevent leaks.

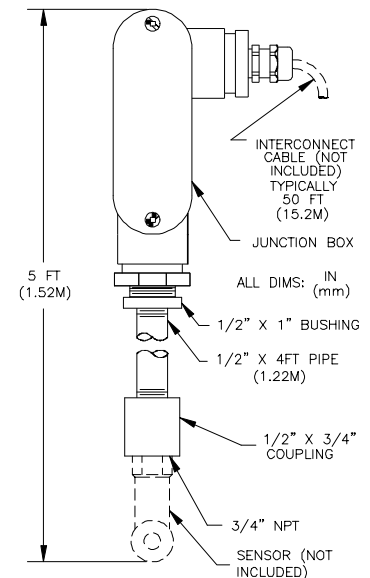


FIGURE 2-1 Immersion Mounting Details

**CAUTION:**

**DO NOT HOLD AND TURN THE “DOUGHNUT-SHAPED” END OF THE SENSOR TO TIGHTEN THIS CONNECTION. THIS COULD CRACK THE SENSOR BODY.**

3. Route the sensor cable through an appropriate length of 1/2-inch diameter mounting pipe.
4. Apply Teflon tape to mounting pipe and 3/4 x 1/2-inch NPT reducer coupling connection, and fasten the pipe into the coupling.
5. Fasten the pipe-mount junction box onto the 1/2-inch NPT threads of the mounting pipe.
6. Route sensor cable wires into the junction box through a watertight fitting. If the cable is too long, cut it to an appropriate length to reduce electromagnetic interference. Then carefully re-terminate the sensor wires and shields (follow procedure in Section 6.3 or 6.4).
7. Route interconnect cable into the junction box through a watertight fitting. Then carefully terminate interconnect cable wires and shields (follow procedure in Section 6.3 or 6.4).
8. Connect sensor and interconnect cable wires by matching colors and their inner and outer shields. Fasten the cover onto the junction box.
9. Route the interconnect cable through 1/2-inch or larger, grounded metal conduit from the junction box to the instrument to protect it from moisture and mechanical damage. Use a watertight fitting at the instrument cable entry hole. If the cable is too long, cut it to an appropriate length to reduce electromagnetic interference.



**NOTE:** *Do not route the interconnect cable in any conduit containing AC or DC power wiring. Electrical noise may interfere with the sensor signal.*

10. Connect interconnect cable wires to the instrument. Refer to the instrument operating manual for details.
11. Before installing the sensor into the process, calibrate the measuring system with conductivity reference solution using the procedure in the instrument operating manual.

## SECTION 3

## TEE, WELDOLET OR PIPE SADDLE MOUNTING

The convertible style sensor may be mounted in any standard 2-inch NPT pipe tee, weldolet or pipe saddle **by using a special GLI union-mount adapter**.

1. Install a standard 2-inch NPT pipe tee (or weldolet or pipe saddle) into the process line. Preferably, the hardware should be made of a material to provide a suitable maximum pressure/temperature rating for the application. Refer to PART ONE, Section 2 for specifications.
2. Apply Teflon tape to the connection of the special short nipple of the GLI union-mount adapter and pipe tee (or weldolet or pipe saddle) to avoid leaks. (Pipe sealant with Teflon, Locktite No. 59321 or equivalent, may not provide adequate sealing at higher solution temperatures). Fasten the short nipple into the 2-inch NPT pipe tee (or weldolet or pipe saddle). Figures 2-2 and 2-3 respectively show pipe tee and flange mounting details.
3. Route the sensor cable through the cord grip of the GLI union-mount adapter.
4. Apply Teflon tape to the sensor thread and adapter connection, and tighten the sensor into the adapter.

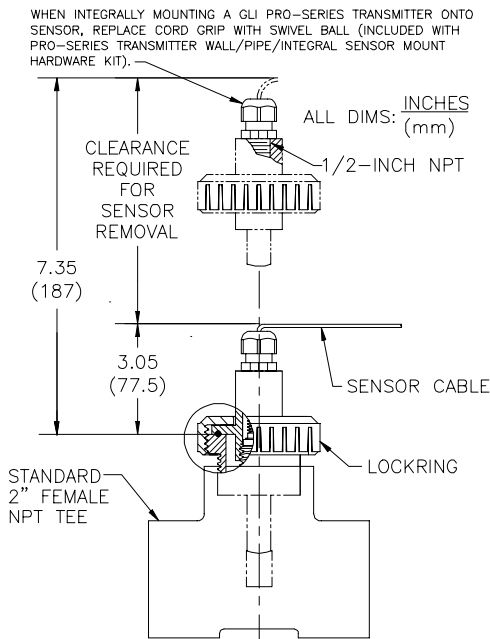


FIGURE 2-2 Tee Mounting Details

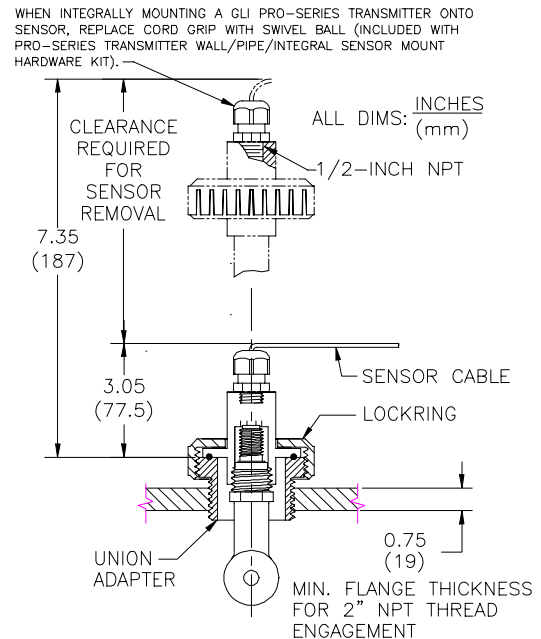


FIGURE 2-3 Flange Mounting Details

5. Connect the sensor cable wires to the instrument:
  - A. Direct Connection
    - a) Route sensor cable into the instrument through a watertight fitting in a cable entry hole.
    - b) Connect sensor wires to the instrument. Refer to the instrument operating manual for details.
  - B. Indirect Connection with Junction Box
    - a) Mount a junction box that has a terminal strip onto a flat surface. Make sure the junction box cover can be removed after installation.
    - b) Route sensor cable wires into the junction box through a watertight fitting. If the cable is too long, cut it to an appropriate length to reduce electromagnetic interference. Then carefully re-terminate the sensor wires and shields (follow procedure in Section 6.3 or 6.4).
    - c) Route interconnect cable into the junction box through a watertight fitting. Then carefully terminate interconnect cable wires and shields (follow procedure in Section 6.3 or 6.4).
    - d) Connect sensor and interconnect cable wires by matching colors and their inner and outer shields. Fasten the cover onto the junction box.
    - e) Route the interconnect cable through 1/2-inch or larger, grounded metal conduit from the junction box to the instrument to protect it from moisture and mechanical damage. Use a watertight fitting at the instrument cable entry hole. If the cable is too long, cut it to an appropriate length to reduce electromagnetic interference.

**NOTE:** *Do not route the interconnect cable in any conduit containing AC or DC power wiring. Electrical noise may interfere with the sensor signal.*
    - f) Connect interconnect cable wires to the instrument. Refer to the instrument operating manual for details.



6. Before installing the sensor into the process line or vessel, calibrate the measurement system with conductivity reference solution using the procedure in the instrument operating manual.
7. After calibration, mount the sensor into the installed 2-inch NPT pipe tee (or weldolet or pipe saddle):
  - A. On the special short nipple of the GLI union-mount adapter, properly seat the gasket into its mating groove.
  - B. Carefully place the sensor into the short nipple, making sure the gasket is in place and contacting the flanged surface of the adapter.
  - C. Tighten the union-mount adapter locking onto the special short nipple to secure the connection.

## SECTION 4

### INSERTION (BALL VALVE) MOUNTING

These instructions refer to specific component parts identified by letter designations that are shown in Figure 2-4.



**NOTE:** Use Teflon tape on all sensor and mounting hardware threads to avoid leaks. (Pipe sealant with Teflon, Loctite No. 59321 or equivalent, may not provide adequate sealing at higher solution temperatures.)

#### 4.1 Fastening Sensor to Extractor Shaft

1. Unscrew the retaining cap (item G) and lock ring (item F) to remove the extractor shaft from the insertion hardware assembly.
2. Loosen the cord grip on the end of the extractor shaft. Route the sensor cable through the extractor shaft and out the cord grip.
3. Fasten the sensor onto the extractor shaft.
4. Pull any excess slack cable through the cable grip, and tighten the cord grip.

5. Connect the sensor cable wires to the instrument:
  - A. Direct Connection
    - a) Route sensor cable into the instrument through a watertight fitting in a cable entry hole.
    - b) Connect sensor wires to the instrument. Refer to the instrument operating manual for details.
  - B. Indirect Connection with Junction Box
    - a) Mount a junction box that has a terminal strip onto a flat surface. Make sure the junction box cover can be removed after installation.
    - b) Route sensor cable wires into the junction box through a watertight fitting. If the cable is too long, cut it to an appropriate length to reduce electromagnetic interference. Then carefully re-terminate the sensor wires and shields (follow procedure in Section 6.3 or 6.4).
    - c) Route interconnect cable into the junction box through a watertight fitting. Then carefully terminate interconnect cable wires and shields (follow procedure in Section 6.3 or 6.4).
    - d) Connect sensor and interconnect cable wires by matching colors and their inner and outer shields. Fasten the cover onto the junction box.
    - e) Route the interconnect cable through 1/2-inch or larger, grounded metal conduit from the junction box to the instrument to protect it from moisture and mechanical damage. Use a watertight fitting at the instrument cable entry hole. If the cable is too long, cut it to an appropriate length to reduce electromagnetic interference.

**NOTE:** *Do not route the interconnect cable in any conduit containing AC or DC power wiring. Electrical noise may interfere with the sensor signal.*
    - f) Connect interconnect cable wires to the instrument. Refer to the instrument operating manual for details.

### 4.2 Setting Sensor Insertion Depth

The sensor insertion depth is the distance that the sensor “doughnut” extends beyond the threaded nipple on the end of the ball valve. If the factory-set insertion depth is sufficient, disregard this procedure, and mount the ball valve hardware into the process pipe/vessel (Section 4.3). To change the insertion depth:

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 reduce the insertion depth or away from the sensor to increase depth.



**NOTE:** Reduce the insertion depth minimally. Optimum sensor performance depends upon the sensor “doughnut” being fully inserted into the process.

3. Tighten the two set screws to secure the metal inner collar (item E) to the extractor shaft.

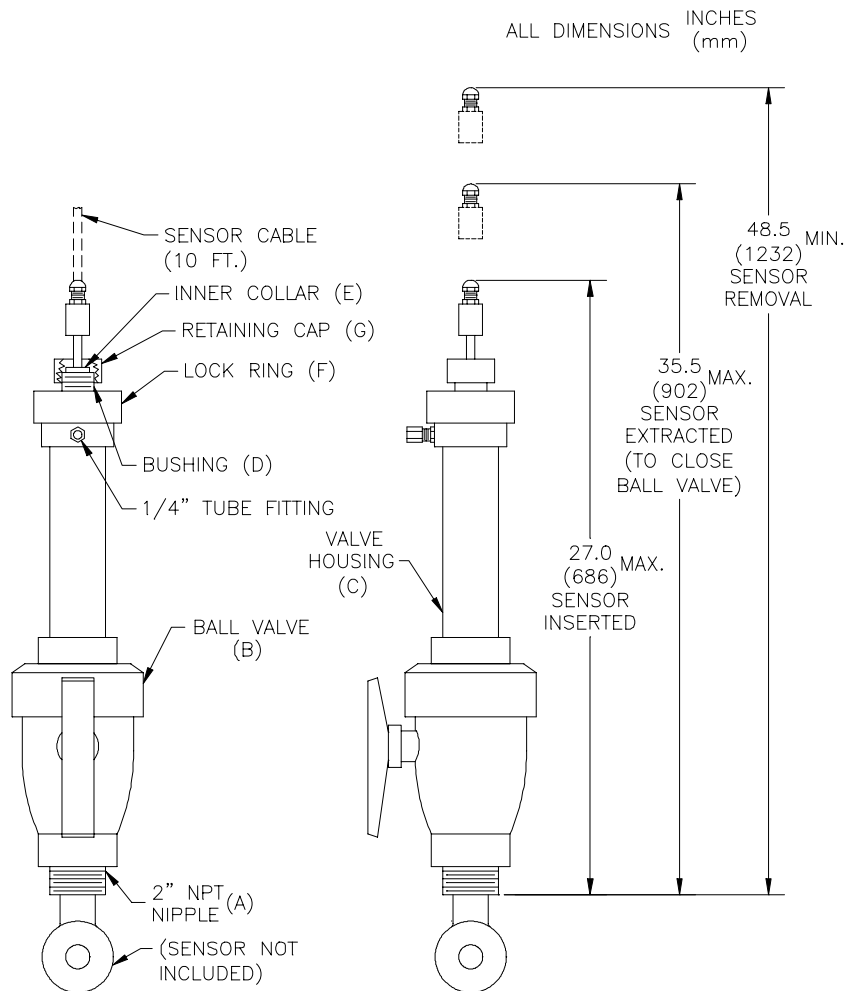


FIGURE 2-4 Insertion (Ball Valve) Mounting Hardware Details

### 4.3 Mounting Ball Valve into Non-pressurized Process Pipe/Vessel

With the extractor shaft assembly removed, mount the ball valve hardware into a portion of the process pipe or vessel where air cannot be trapped and subsequently contact the sensor “doughnut.”

1. Apply Teflon tape to the 2-inch NPT close nipple (A) threads on the end of the ball valve to avoid leaks. (Pipe sealant with Teflon, Loctite No. 59321 or equivalent, may not provide adequate sealing at higher temperatures.)
2. Fasten the 2-inch ball valve hardware into the non-pressurized pipe or vessel at the desired location.
3. Turn the ball valve to its full **CLOSED** position.
4. Connect a water line to the insertion hardware assembly:
  - 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.



**NOTE:** *If you do not want to connect a water line to the insertion hardware assembly, remove the hardware’s 1/4-inch tube fitting and replace it with a 1/4-inch plug.*

- B. Install a hand-operated shutoff valve upstream of the hardware’s 1/4-inch tube fitting to control the flow in the water line.
- C. Install a check valve in the water line to prevent process solution from surging into the line if the process pressure would ever exceed the water pressure.

**CAUTION:**

**THE WATER LINE PRESSURE MUST BE GREATER THAN THE PROCESS PRESSURE, BUT CANNOT EXCEED 100 PSI.**

#### 4.4 Installing Sensor into Non-pressurized Ball Valve Hardware

After electrically connecting the sensor to the instrument, setting the sensor insertion depth (if needed), and mounting the ball valve hardware, install the sensor into the non-pressurized process pipe or vessel.

1. Before installing the sensor into the process, calibrate the measuring system with conductivity reference solution using the procedure in the instrument operating manual.
2. After calibration, apply a small amount of silicone grease onto the two small shaft O-rings at the back end of the valve housing (C) to ease movement.
3. With the ball valve (item B) closed and the sensor/extractor shaft assembly extracted about halfway, insert the sensor/shaft assembly into the valve housing (item C) until the surface of the flanged bushing (item D) presses against the large O-ring on the housing. Make sure that the O-ring is properly seated in its groove.
4. Tighten the lock ring (item F) onto the valve housing.

#### 4.5 Inserting Sensor into Pressurized Process Pipe/Vessel

After installing the sensor into the ball valve hardware, it can be inserted into a pressurized process pipe or vessel.

#### WARNING:

**INSERTING A SENSOR INTO A PRESSURIZED PROCESS PIPE OR VESSEL MAY BE DANGEROUS. DO NOT STAND DIRECTLY BEHIND THE ASSEMBLY WHEN OPENING THE BALL VALVE. DEPENDING ON PROCESS PRESSURE, THE EXTRACTOR SHAFT MAY RAPIDLY TRAVEL OUTWARD BEFORE THE RETAINING CAP (ITEM G) CAN BE TIGHTLY FASTENED.**

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). Then tighten the retaining cap (item G) onto the bushing.



**NOTE:** When a water line is connected to the insertion hardware assembly and the process pressure

*is high, open the water shut-off 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.

#### 4.6 Extracting Sensor from Pressurized Process Pipe/Vessel

##### **WARNING:**

**EXTRACTING A SENSOR FROM A PRESSURIZED PROCESS PIPE OR VESSEL MAY BE DANGEROUS. DO NOT STAND DIRECTLY BEHIND THE INSERTION 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.**

If a water line is plumbed to the insertion hardware assembly, it will help counterbalance the pressure of the process and minimize the force needed to extract the sensor.

1. If a water line is connected, open the water shut-off valve to provide water to the insertion hardware.
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 “doughnut” 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:
  - A. Loosen and remove the lock ring (item F).
  - B. Firmly extract the sensor/extractor shaft assembly from the insertion hardware.

## SECTION 5

## SANITARY FLANGE MOUNTING

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 2-5).

1. Install a 2-inch sanitary clamp-type tee or ferrule into the process line or vessel.
2. Route the sensor cable through the stainless steel endcap hole so that the endcap's taper faces towards the top surface of the integral sensor flange.
3. Connect the sensor cable wires to the instrument.

#### A. Direct Connection

- a) Route sensor cable into the instrument through a watertight fitting in a cable entry hole.
- b) Connect sensor wires to the instrument. Refer to the instrument operating manual for details.

#### B. Indirect Connection with Junction Box

- a) Mount a junction box that has a terminal strip onto a flat surface. Make sure the junction box cover can be removed after installation.

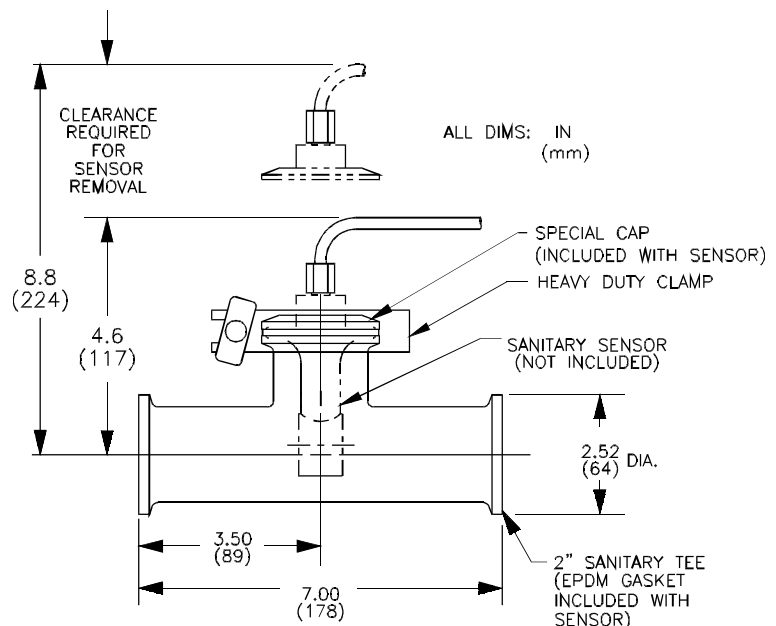


FIGURE 2-5 Sanitary (CIP) Flange Mounting Details

4. Before installing the sensor into the process line or vessel, calibrate the measuring system with conductivity reference solution using the procedure in the instrument operating 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 the wing nut of the heavy duty clamp to 25 inch-lbs. torque.



**NOTE:** *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 GLI SANITARY STYLE ELECTRODELESS CONDUCTIVITY SENSOR.**

SECTION 6

**SENSOR/INTERCONNECT CABLE TERMINATION**

**CAUTION:**

**IF THE SENSOR OR INTERCONNECT CABLE IS NOT TERMINATED EXACTLY AS DESCRIBED IN THIS SECTION, THE MEASURING SYSTEM WILL NOT OPERATE PROPERLY.**

**6.1 Sensor Cable Details**

Depending on how the sensor was ordered, its integral cable is terminated one of two ways:

## 6.2 Interconnect Cable Details



- **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 (signal shield wire and cable shield wire are electrically common).
- **CE Termination:** 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 (signal shield wire and cable shield wire is electrically isolated).

In either case, the integral sensor cable may require shortening during installation. When doing this, refer to the appropriate subsection (6.3 or 6.4) for the procedure to re-terminate the sensor cable.

The GLI 1W1100 interconnect cable, which is the same cable as the integral sensor cable, is provided with unfinished ends since it often needs to be shortened during installation. Use the appropriate procedure in subsection 6.3 or 6.4 to terminate either cable.

**NOTE:** *GLI strongly recommends using only its 1W1100 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 measuring system’s ability to operate properly.*

## 6.3 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, USE THE CE TERMINATION PROCEDURE DESCRIBED IN SECTION 6.4.**

1. Refer to Figure 2-6 and strip back 3 inches (76 mm) of the outer cable jacket, outer foil wrap, cellophane wrap, inner foil wrap, and unused black wire. This exposes the signal shield wire, the cable shield wire, and 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 1/8 inch (3 mm) from each of the colored wires. Then tin each stripped wire.
4. Using shrink wrap or tape, secure the terminated bundle (outer cable jacket, five colored wires and combined shield wire). This completes the standard termination.

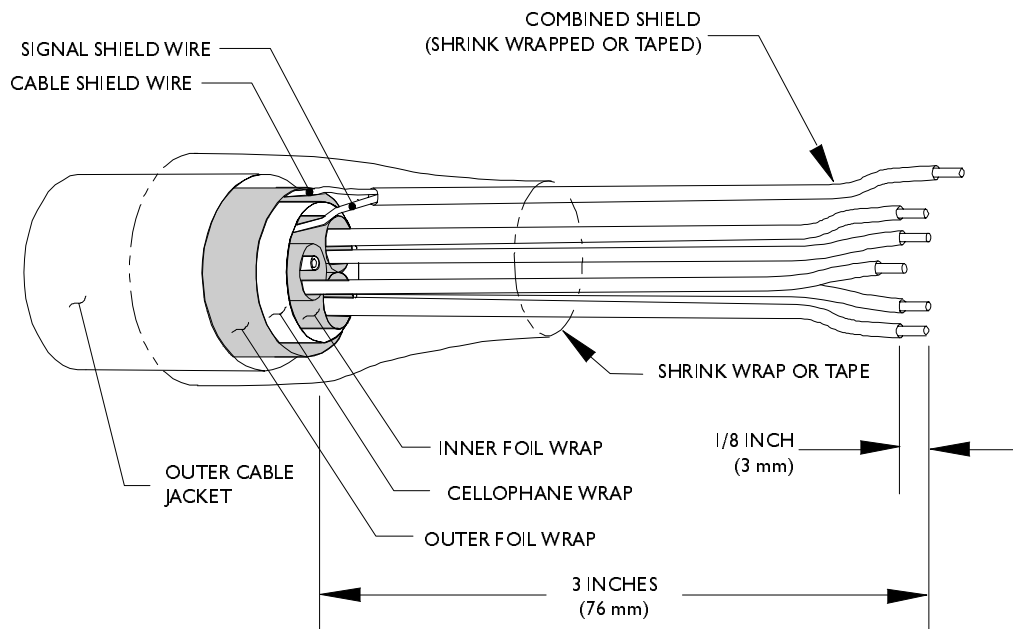


FIGURE 2-6 Standard Termination Details (for all applications except CE)

#### 6.4 CE Termination Procedure (for CE-only applications)

##### CAUTION:

USE THE FOLLOWING CE TERMINATION PROCEDURE WHEN THE MEASURING INSTRUMENT HAS THE EUROPEAN COMMUNITY "CE" LABEL. IF THE INSTRUMENT IS NOT "CE CERTIFIED," USE THE STANDARD TERMINATION PROCEDURE DESCRIBED IN SECTION 6.3.

1. Refer to Figure 2-7 and carefully strip back an appropriate length of the outer cable jacket and outer foil wrap. This exposes the signal shield wire, cable shield wire, and cellophane-wrapped wire bundle.
2. Fold back the cable shield wire. 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 1/8 inch (3 mm) from each of the colored wires. 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 entire cable back 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.

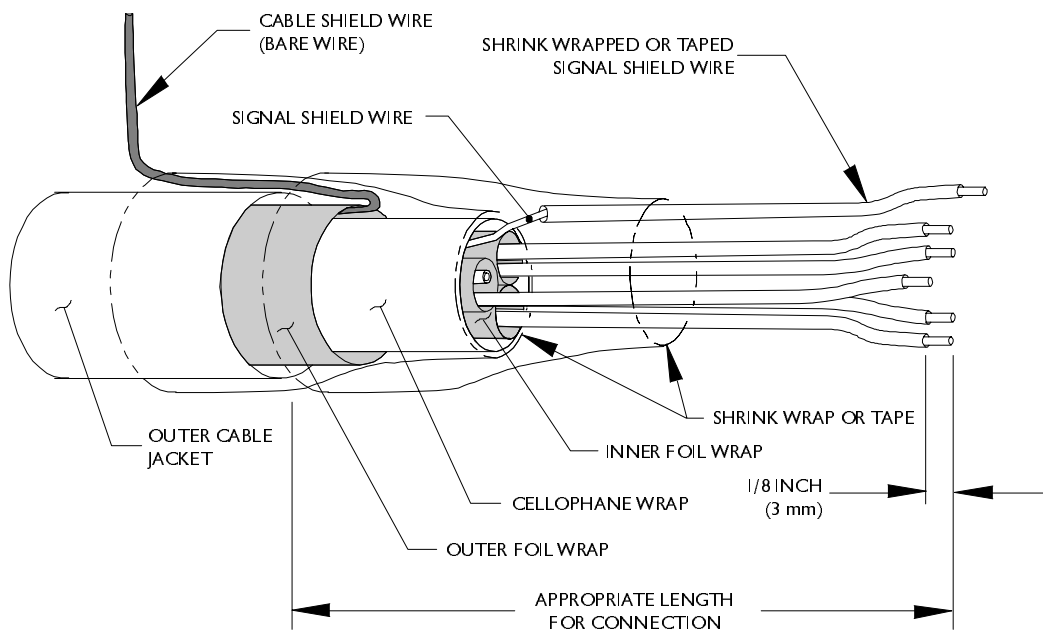


FIGURE 2-7 CE Termination Details (for CE-only applications)

# PART THREE - SERVICE AND MAINTENANCE

## SECTION 1

### RECOMMENDED CLEANING PROCEDURE

Keep the sensor reasonably clean to maintain measurement accuracy. The time between cleanings (days, weeks, etc.) is affected by the characteristics of the process solution and can only be determined by operating experience.

1. Rinse the sensor with clean, warm water.
2. Prepare a mild soap solution. Use warm water and dish-washing detergent, Borax hand soap or a similar soap.
3. Soak the sensor for 2 to 3 minutes in the soap solution.
4. Use a small bristle brush to scrub the entire measuring end of the sensor, thoroughly cleaning the surfaces. If surface deposits cannot be removed by detergent cleaning, use muriatic (or another dilute) acid to dissolve them. 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. For assistance, contact the GLI Customer Service Dept.

Before cleaning with acid, determine if this would create a hazardous chemical reaction. (Example: Do not put a sensor that is used in a cyanide bath directly into a strong acid for cleaning because this chemical combination may produce poisonous cyanide gas.)

#### WARNING:

**ACIDS ARE HAZARDOUS. ALWAYS WEAR APPROPRIATE EYE PROTECTION AND CLOTHING IN ACCORDANCE WITH MATERIAL SAFETY DATA SHEET RECOMMENDATIONS.**

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 any remaining acid.

5. Rinse the sensor again in clean, warm water.
6. After cleaning, always calibrate the measuring system. If calibration cannot be accomplished, check the sensor using the procedure in Part Three, Section 2.1.

## SECTION 2

### TROUBLESHOOTING

#### 2.1 Checking Sensor Operation

Determine whether the sensor or instrument is defective by using the troubleshooting section in the instrument operating manual. If the sensor is suspect, check it using this procedure:

1. Disconnect the sensor from the instrument (or junction box if interconnect cable is used).
2. Clean the sensor using the procedure in PART THREE, Section 1.
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).
  - If any one of the resistance checks in the previous steps is incorrect, the sensor is probably defective. Refer to the GLI warranty/replacement plan on page 4 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 GLI Customer Service Department for details.

## 2.2 Customer Assistance

If you need assistance in troubleshooting or repair service, please contact your local GLI representative, or the GLI Customer Service Department at:

GLI International, Inc.                      Phone: [800] 543-8907  
 9020 West Dean Road                      Fax:     [414] 355-8346  
 Milwaukee, WI 53224                      E-mail: info@gliint.com

### — GLI SERVICE DEPARTMENT HOURS —

	Eastern Std. Time	Central Std. Time	Mountain Std. Time	Pacific Std. Time
Monday through Thursday	8:30 a.m. to 5:30 p.m.	7:30 a.m. to 4:30 p.m.	6:30 a.m. to 3:30 p.m.	5:30 a.m. to 2:30 p.m.
Friday	8:30 a.m. to 4:00 p.m.	7:30 a.m. to 3:00 p.m.	6:30 a.m. to 2:00 p.m.	5:30 a.m. to 1:00 p.m.

All sensors returned for repair or replacement must be freight prepaid and include the following information:

1. A clearly written description of the malfunction.
2. Name of person to contact and the phone number where they can be reached.
3. Proper return address for shipping sensor(s) back. Include preferred shipping method (UPS, Federal Express, etc.) if applicable.
4. A purchase order if sensor(s) is out of warranty to cover costs of repair.



**NOTE:** *If the sensor is damaged during return shipment because of inadequate packaging, the customer is responsible for any resulting repair costs. (Recommendation: Use the original GLI shipping carton or an equivalent.)*

*Also, GLI will not accept sensors returned for repair or replacement unless they are thoroughly cleaned and all process chemicals are removed.*