English

GF 2870 - 2874 Conductivity/Resistivity Electrodes

3-2870.090 Rev. 3 08/23

Operating Instructions

3-2870

3-2872

3-2873

3-2874

Description

The GF 2870-2874 contact conductivity electrodes are ideally suited for measuring resistivity/conductivity of liquids ranging from pure and ultrapure water to seawater, rinse water and chemical solutions.

The 2870-2873 conductivity probes are two-electrode flow-through cell design coaxially arranged made of 316L stainless steel material, PTFE insulator and Polypropylene process connection. A platinum RTD (Pt1000) located within the electrode allows for optimal temperature sensing. With a reversible process connection, these electrodes are designed to provide installation versatility in submersible and in-line configurations.

The 2874 conductivity probes have a two-electrode parallel path flow though cell design made of CPVC body, 316L stainless steel electrodes, PTFE insulator and 316L stainless steel thermowell to allow for optimal temperature sensing.

Constructed of high-precision, extremely accurate stainless tubing, the GF 287X electrodes deliver outstanding measurement accuracy and repeatability. Units with and without certificate of calibration are available. The calibrated electrodes meet a ±1% cell constant accuracy.

Features

- Process connection
  - ¾" NPT Polypropylene (standard for 0.01, 0.1 and 1.0 cell)
  - ¾" NPT 316L SS (standard for 10.0 cell)
  - ¾" NPT 316L SS (optional for 0.01, 0.1 and 1.0 cell)
- 316L SS electrodes material
- In-line or submersible mounting
- Option for NIST traceable certified cell constant ±1%

Table of Contents

- English
- 中文

Warranty Information

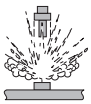
Refer to your local GF Sales office for the most current warranty statement.

All warranty and non-warranty repairs being returned must include a fully completed Service Form and goods must be returned to your local GF Sales office or distributor. Product returned without a Service Form may not be warranty replaced or repaired.

GF electrodes, are warranted out of box but not warranted against any damage due to process or application failures (e.g. high temperature, high pressure, chemical attack) or mishandling.

Safety Information

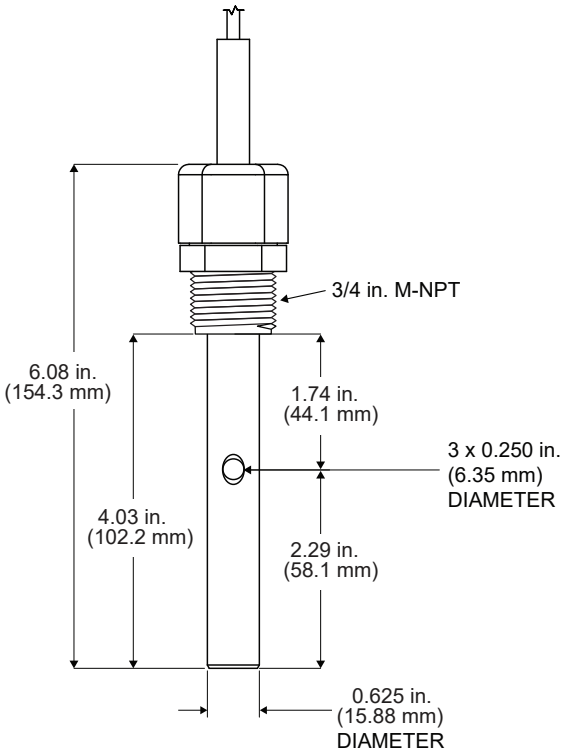
- Do not remove from pressurized lines.
- Do not exceed max. temperature/pressure specifications.
- Wear safety goggles or face shield during installation/service.
- Do not alter product construction.
- Disconnect instrument power before wiring this sensor.
- Failure to follow safety instructions may result in severe personal injury!

	**Warning / Caution / Danger** Indicates a potential hazard. Failure to follow all warnings may lead to equipment damage, injury or death
	**Personal Protective Equipment (PPE)** Always utilize the most appropriate PPE during installation and service of GF products.
	**Pressurized System Warning** Sensor may be under pressure, take caution to vent system prior to installation or removal. Failure to do so may result in equipment damage and/or serious injury.
	**Hand Tighten Only** Overtightening may permanently damage product threads and lead to failure of the retaining nut.
	**Do Not Use Tools** Use of tool(s) may damage product beyond repair and potentially void product warranty.
	**Note / Technical Notes** Highlights additional information or detailed procedure.

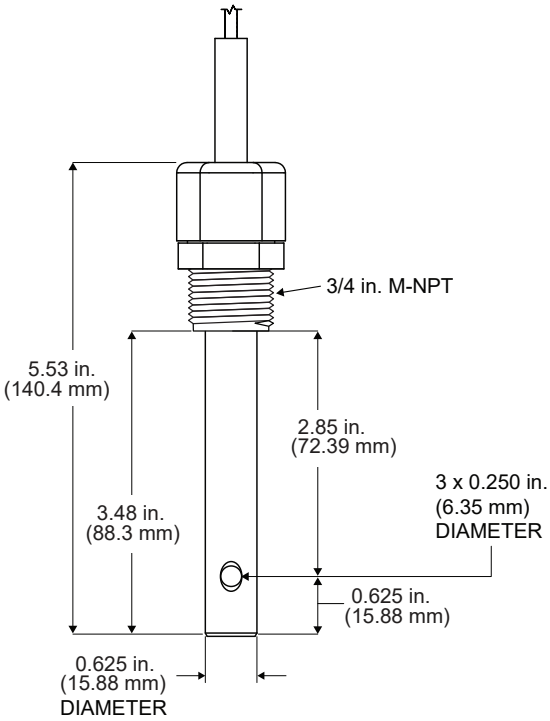
Dimensions

If 2870 is required with shorter insertion depth, use fitting part number: 3-2870.392 to shorten the insertion dimension to 3.47 in. (88.3 mm)

3-2870

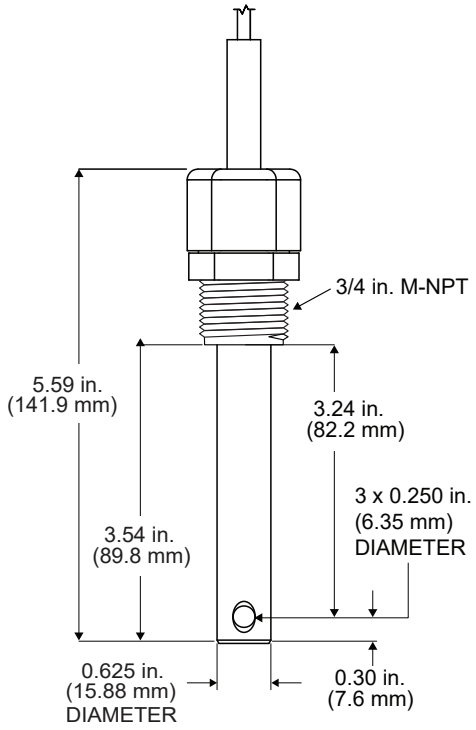


3-2872

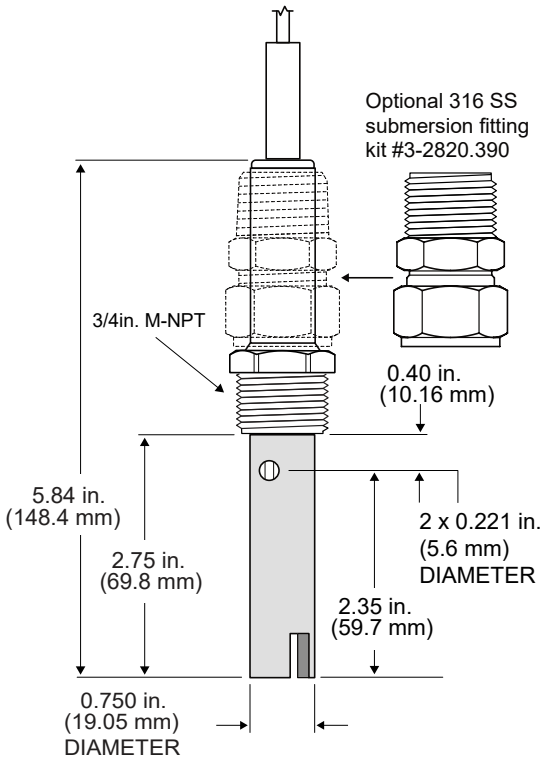


Dimensions

3-2873



3-2874



Specifications

General

Operating Range

3-2870

Conductivity.....0.055 µS/cm to 100 µS/cm at 25°C (77°F)
Resistivity .....10 kΩ*cm to 18.2 MΩ*cm at 25°C (77°F)
TDS .....0.02 to 50 ppm

3-2872

Conductivity.....1 µS/cm to 1,000 µS/cm at 25°C (77°F)
Resistivity .....1 MΩ*cm to 1 kΩ*cm at 25°C (77°F)
TDS .....0.5 to 500 ppm

3-2873

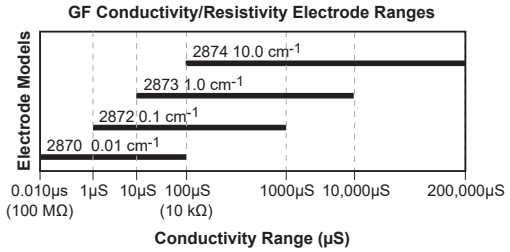
Conductivity.....10 µS/cm to 10,000 µS/cm at 25°C (77°F)
TDS .....5 to 5,000 ppm

3-2874

Conductivity.....100 µS/cm to 200,000 µS/cm at 25°C (77°F)
TDS .....50 to 100,000 ppm

Nominal Cell Constant

3-2870 .....0.01 cm^{-1}
3-2872 .....0.1 cm^{-1}
3-2873 .....1.0 cm^{-1}
3-2874 .....10.0 cm^{-1}



Cell Constant Accuracy.....± 2%
Certified Cell Constant .....± 1%

Conductivity Response Time

3-287X.....< 5 s for 90% of change at 25°C (77°F)

Temperature

Temp. Compensation.....Pt1000
Temperature Accuracy.....0.3°C
Temperature Range.....-20 to 95°C (- 4 to 203°F)
Temperature Response Time
3-2870.....< 40 s for 90% of change
3-2872.....< 47 s for 90% of change
3-2873.....< 89 s for 90% of change
3-2874.....< 15 s for 90% of change

Max Pressure/Temperature Rating*

2870/2872/2873 Fittings:
Standard Polypropylene.....6.4 bar at 95°C (93 psi at 203° F)
(3-2870.391) ¾" NPT 316 SS ...13.8 bar at 120 °C (200 psi at 248° F)

* Proof Pressure in accordance with DIN 16962-5 standard and PED (Pressure Equipment Directive is 2014/68/EG)

Specifications

2874 Fitting:
¾" NPT 316L SS.....6.9 bar @ 95 C (100 psi @ 203° F)

Cable Length
Standard.....4.6 m (15 ft.) and 7.6 m (25 ft.)
Maximum
- 30 m (100 ft.) with 3-9900 and 3-9950 direct conductivity resistivity modules*
- 4.6 m (15 ft.) with 3-2850 conductivity electronics

Do not splice cable. If longer cable is needed, contact factory.

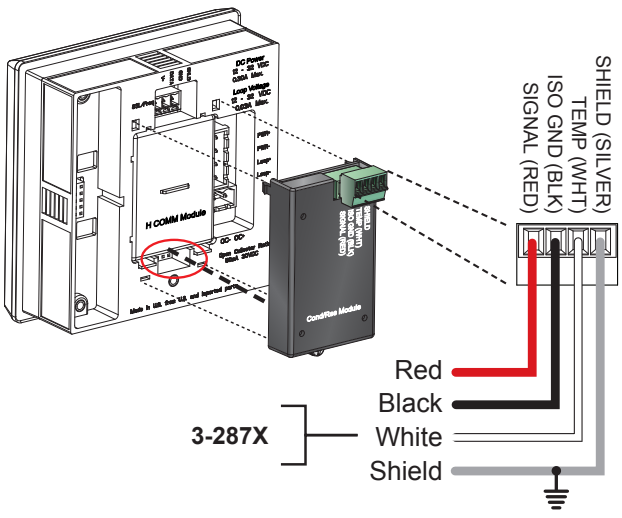
Wetted Materials
2870, 2872, 2873:
O-Rings .....EPR (EPDM)
Electrodes.....316L Stainless Steel (1.4404, DIN 17440)
Insulator Material.....PTFE
Process Connection .....¾" NPT Polypropylene
2874:
Body .....CPVC
Electrodes.....316L Stainless Steel (1.4404, DIN 17440)
Insulator Material.....PTFE
Process Connection ..... ¾" NPT 316L Stainless Steel

Shipping Weight
3-2870-A115.....0.25 kg (0.54 lb.)
3-2870-A125.....0.32 kg (0.69 lb.)
3-2872-A115.....0.18 kg (0.40 lb.)
3-2872-A125.....0.25 kg (0.56 lb.)
3-2873-A115.....0.21 kg (0.47 lb.)
3-2873-A125.....0.28 kg (0.62 lb.)
3-2874-A515 .....0.27 kg (0.60 lb.)
3-2874-A525.....0.34 kg (0.75 lb.)

Standards and Approvals
CE, UKCA, RoHS Compliant
China RoHS (Go to www.gfps.com for details)
Manufactured under ISO 9001, ISO 14001 and ISO 45001

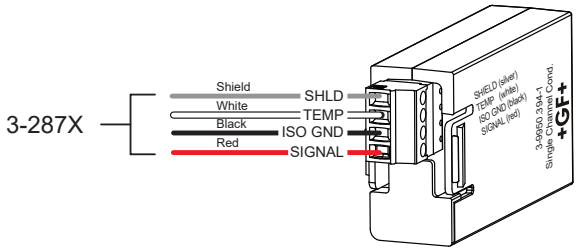
Wiring

3-9900.394 Direct Conductivity/Resistivity Module

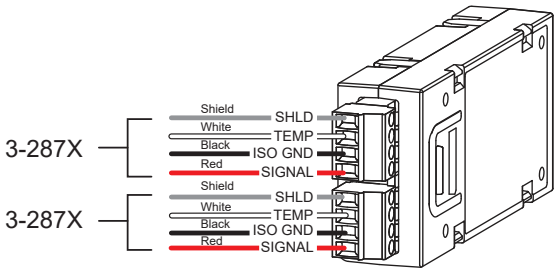


Wiring

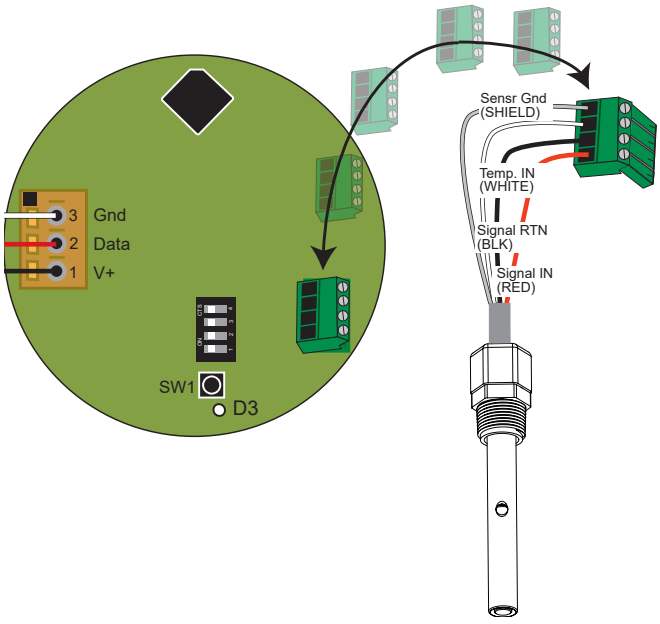
3-9950.394-1 Single Channel Conductivity Module



3-9950.394-2 Dual Channel Conductivity Module



2850 Conductivity/Resistivity Sensor Electronics



For resistivity measurements above 10 MΩ*cm and/or below 20 °C when using SmartPro 3-9900, 3-9950 with direct conductivity/resistivity modules, the maximum cable length should not exceed 15 ft. (4.6 m)

When using the GF 3-2850 conductivity electronics, the maximum cable length probe to electronics should not exceed 15 ft. (4.6 m)

*Calibrate the temperature to offset the resistance of the cable

In-line Installation

Installing the probe

See installation Instructions below for the figures depicted on the right (Recommended Position) section.

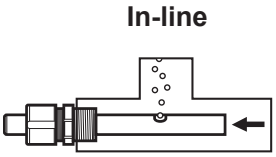
- The electrode must be completely submerged in the process liquid - to the level of the process connection. The probe should be mounted so the cavity does not trap air or solids. See Figure 1a through 1e.
- Trapped bubbles will cause errors. As bubbles accumulate, the conductivity reading becomes inaccurate or will fluctuate.
- The preferred installation for 3-2870 and 3-2872 electrodes in 3/4 in. to 3 in. pipes is in a 90 degree angle using a pipe tee and the adequate bushing (Figure 1a). The solution flow should be directed into the tip of the sensor and allowed to pass out of the circulation holes.
- For larger pipe sizes, vertical mounting is possible if the pipe is full and air is not trapped between the electrodes (Figure 1b and 1d). The top of the fitting to the ID of the pipe must be < 1.5 in. The solution must circulate inside the outer electrode for accurate measurement.
- The preferred installation for the 3-2873 probe is in-line horizontal or in-line vertical. Flow perpendicular to the probe will help clear trapped bubbles. See Figure 1c and 1d.
- Maintain at least 1/4 in. (6 mm) clearance between electrode and pipe wall at the tip of the sensor. This is applicable for all probes and all cell constants.

For UPW applications or when high purity is required, electrode cleaning prior to installation may be necessary. After cleaning, the electrode must be throughly flushed with distilled or deionized water prior to installation.

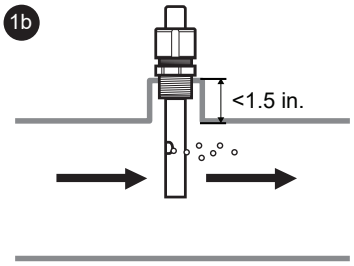
Recommended Position

2870 and 2872 preferred installation orientations

1a

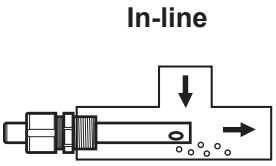


1b

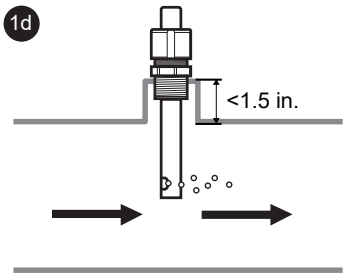


2873 preferred installation orientations

1c

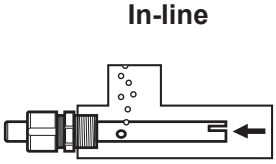


1d

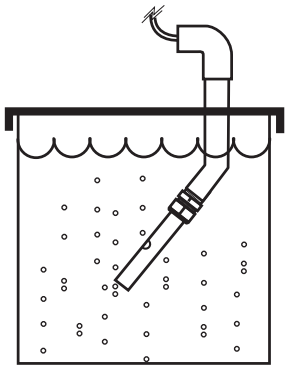


2874 preferred installation orientation

1e



Submersible (all cell constants)

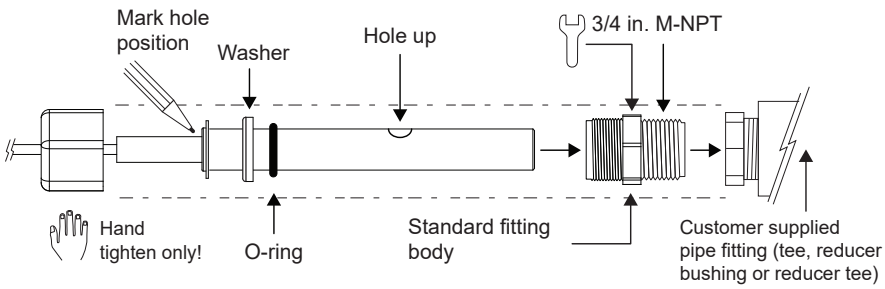


Install electrode at 45˚ to 90˚angle

Use caution to avoid air bubbles or sediment trapping inside the electrode cavity.

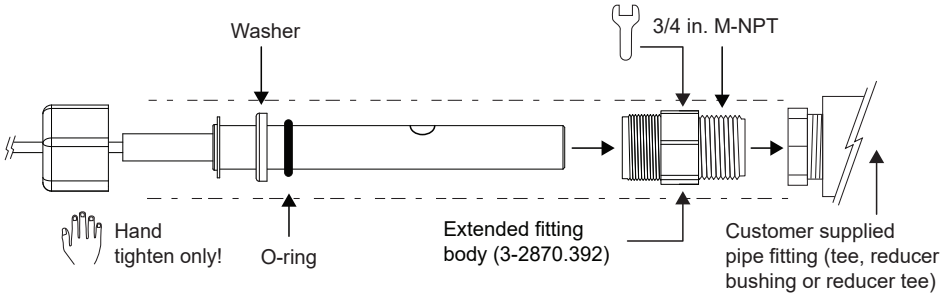
In-line Installation

Installation tip for the 2870 in fluids with low flow velocity
Mark the sensor body to indicate the position of the vent hole. During installation, align the vent hole mark so it faces upward or against the process flow to prevent air bubble entrapment.



Installation tip for the 2870 with shorter insertion length
When shorter insertion length is required to match the 3-2819 insertion depth (88.3 mm; 3.475 in.), replace the standard plastic fitting on the process connection with the extended fitting, part number: 3-2870.392.

O-ring and washer should stay on the electrode body during fitting replacement. If the washer is removed, ensure it will be placed back in the correct orientation: flat side against the o-ring. If the washer is placed incorrectly, the electrode could leak.



2870, 2872, 2873 Submersible Installation

Step 1

1. Unscrew the retaining nut and reverse the process connection together with the o-ring and washer. **Ensure the correct washer orientation: flat side against the O-ring (Illustration 1)**.
2. Hand-tighten the retaining nut to secure the process connection.

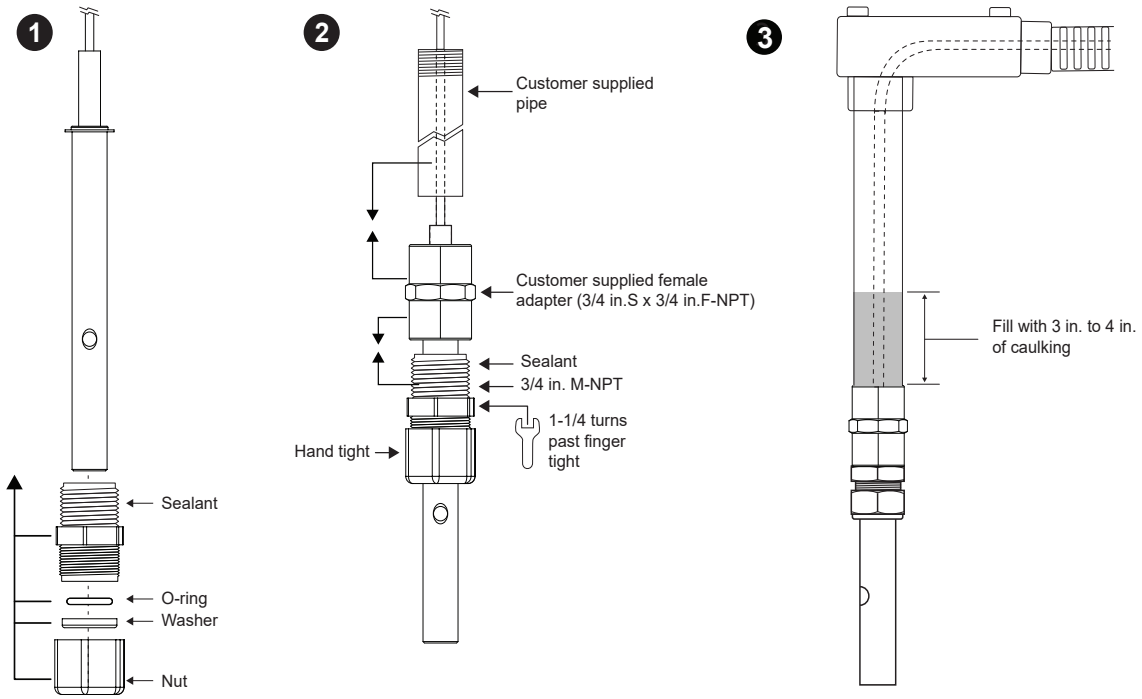
Step 2

1. Use a coupling and conduit (customer supplied) to connect 3/4 in. watertight pipe to the top of the electrode **(Illustration 2)**.
2. Secure the threaded connection to prevent any leakage.

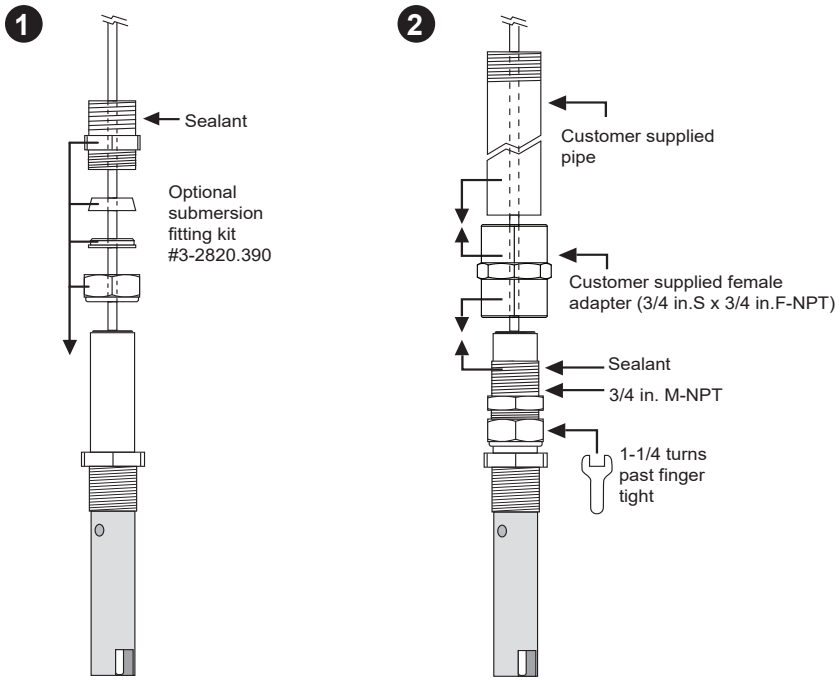
Step 3

1. For additional defense against possible accumulation of condensation at the back seal area of the sensor, fill the lower 75 mm to 100 mm (3 in. to 4 in.) of conduit or extension pipe with a flexible sealant such as caulking or silicone. **(Illustration 3)**. Ensure the electrode will be installed with 45° or 90° pipe to avoid air bubbles trapping inside the electrode cavity.

2870, 2872, 2873 Submersible Installation



2874 Submersible Installation



Maintenance

Any coatings on electrodes will cause readings to drift or show poor response. If needed, clean the metallic surfaces with a mild detergent solution and a soft brush with special attention being paid to the ID of the outer tube and the inner electrode. The electrode must be throughly flushed with distilled or deionized water prior to re-installation. Following cleaning, it can take up to several hours until the sensor delivers an accurate measurement.

Ordering Information

Mfr. Part No.	Code	Cell Constant	Description
3-2870-A115	159 001 999	0.01 cm^{-1}	k=0.01 cm^{-1}, ¾ in. NPT fitting, polypro, 15-ft cable, no certificate
3-2870-A115C	159 002 000	0.01 cm^{-1}	k=0.01 cm^{-1}, ¾ in. NPT fitting, polypro, 15-ft cable, with certificate
3-2870-A125	159 002 001	0.01 cm^{-1}	k=0.01 cm^{-1}, ¾ in. NPT fitting, polypro, 25-ft cable, no certificate
3-2870-A125C	159 002 002	0.01 cm^{-1}	k=0.01 cm^{-1}, ¾ in. NPT fitting, polypro, 25-ft cable, with certificate
3-2872-A115	159 002 003	0.1 cm^{-1}	k=0.1 cm^{-1}, ¾ in. NPT fitting, polypro, 15-ft cable, no certificate
3-2872-A115C	159 002 004	0.1 cm^{-1}	k=0.1 cm^{-1}, ¾ in. NPT fitting, polypro, 15-ft cable, with certificate
3-2872-A125	159 002 005	0.1 cm^{-1}	k=0.1 cm^{-1}, ¾ in. NPT fitting, polypro, 25-ft cable, no certificate
3-2872-A125C	159 002 006	0.1 cm^{-1}	k=0.1 cm^{-1}, ¾ in. NPT fitting, polypro, 25-ft cable, with certificate
3-2873-A115	159 002 009	1.0 cm^{-1}	k=1.0 cm^{-1}, ¾ in. NPT fitting, polypro, 15-ft cable, no certificate
3-2873-A115C	159 002 010	1.0 cm^{-1}	k=1.0 cm^{-1}, ¾ in. NPT fitting, polypro, 15-ft cable, with certificate
3-2873-A125	159 002 011	1.0 cm^{-1}	k=1.0 cm^{-1}, ¾ in. NPT fitting, polypro, 25-ft cable, no certificate
3-2873-A125C	159 002 012	1.0 cm^{-1}	k=1.0 cm^{-1}, ¾ in. NPT fitting, polypro, 25-ft cable, with certificate
3-2874-A515	159 002 014	10.0 cm^{-1}	k=10.0 cm^{-1}, ¾ in. NPT fitting 316L SS, 15 ft. cable, no certificate
3-2874-A525	159 002 015	10.0 cm^{-1}	k=10.0 cm^{-1}, ¾ in. NPT fitting 316L SS, 25 ft. cable, no certificate

Accessories and Replacement Parts

Mfr. Part No.	Code	Description
3-2850.101-1	159 001 392	Plug-in NIST Traceable Recertification Tool, 1.0 µS Simulated, for use with 9900, 9950, and the 2850-5x/6x
3-2850.101-2	159 001 393	Plug-in NIST Traceable Recertification Tool, 2.5 µS Simulated, for use with 9900, 9950, and the 2850-5x/6x
3-2850.101-3	159 001 394	Plug-in NIST Traceable Recertification Tool, 10.0 µS Simulated, for use with 9900, 9950, and the 2850-5x/6x
3-2850.101-4	159 001 395	Plug-in NIST Traceable Recertification Tool, 18.2 MΩ Simulated, for use with 9900, 9950, and the 2850-5x/6x
3-2850.101-5	159 001 396	Plug-in NIST Traceable Recertification Tool, 10.0 MΩ Simulated, for use with 9900, 9950, and the 2850-5x/6x
3-2850-61	159 001 400	Universal Junction Box, Conductivity Electronics, digital (S^3L) output
3-2850-62	159 001 401	Universal Junction Box, Conductivity Electronics, 4-20mA output
3-2850-63	159 001 402	Universal Junction Box, Conductivity Electronics, dual digital (S^3L) outputs
3-2820.390	198 840 223	¾ in. NPT fitting, 316 SS for use with 2874 for submersible mounting
3-2870.390	159 002 007	¾ in. NPT fitting, polypropylene replacement for use with 2870, 2872 and 2873
3-2870.391	159 002 008	¾ in. NPT fitting, 316 SS for use with 2870, 2872 and 2873
3-2870.392	159 002 016	¾ in. NPT Extended fitting polypropylene

+GF+

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3-2870.090 Rev. 3 08/23 English