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TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

ILLUSTRATIONS:

PART ONE - INTRODUCTION

SECTION 1 - GENERAL INFORMATION

1.1 Description

Mounting Styles

The measurement capability of the Model CDE-3600-series wide range electrodeless conductivity sensors extends from 0-200 up to 0-1,000,000 microSiemens/cm. These sensors are available in four mounting styles.

- Convertible Style – This sensor may be attached to the end of a pipe for submersion mounting, threaded into a special bushing for pipe-tee mounting or used with special union-mount hardware. Flange or insertion mounting (via tank fitting or ball valve assembly) is also possible.
- Flange-Mount Style – This sensor features metal 5/8-11 UNC threads for fastening into any metal flange. A Viton O-ring provides a leakproof seal between the sensor and flange.
- Sanitary Style – This clean-in-place style sensor has an integral flange for mating to OMEGA's sanitary tee mounting hardware which includes a gasket (EPDM compound) and special cap. The gasket is also available separately for mounting to a 2-inch sanitary clamp-type ferrule or butt-weld tee.
- Perlick Style – This sensor is designed to mount into a Perlick sight-glass fitting. A steel backing plate behind the sensor flange provides an exceptionally strong mounting.

Materials

To simplify chemical resistance problems, these sensors are constructed such that only one material is wetted by the process. Convertible, flange-mount and sanitary style sensors may be provided in polypropylene or PVDF material. The Perlick style sensor is made of polypropylene.

1.2 Operating Precautions

The sensor and mounting hardware components used to install the sensor have independent ratings for temperature and pressure. However, the combination of the sensor and hardware act as an integrated system and must be considered as such for an installation. The mounting hardware material typically limits the temperature and pressure rating of this unified system. Refer to Section 2 for complete specifications.

SECTION 2 - SPECIFICATIONS

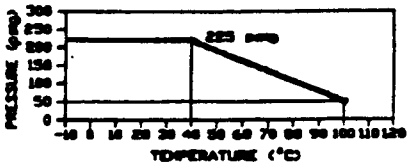
All Sensor Styles

Wetted Materials	Polypropylene or PVDF
Measuring Range	From 0-200 up to 0-1,000,000 microSiemens/cm
Integral Cable	5 conductor (plus shield) with PVC jacket - rated to 200°C (392°F), 4-1/2 ft.(1.4 m) standard length
Max. Flow Rate	10 feet per second
Temperature Compensation	Automatic, 0-125°C (32-257°F)
Weight	311g (11 oz.) approximate
Dimensions	See Figures 2-1, 2-2, 2-3, or 2-4

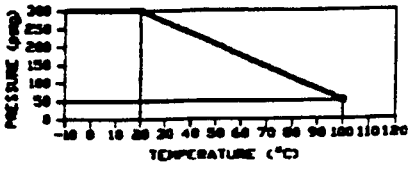
Temperature/Pressure Limits* For Sensor /Mounting Hardware Combinations:

Submersion Mounting — CPVC

With Polypropylene Sensor

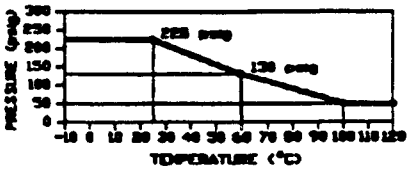


With PVDF Sensor

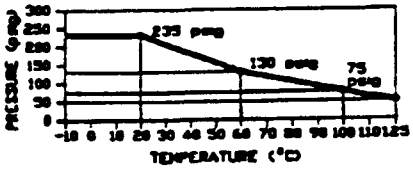


Submersion Mounting — PVDF

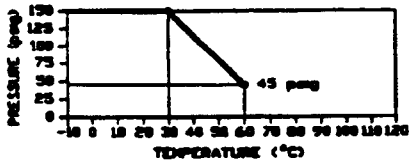
With Polypropylene Sensor



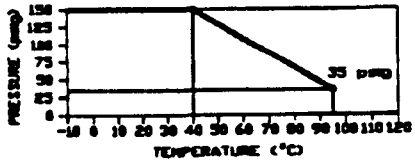
With PVDF Sensor



Union Mounting — PVC
With Polypropylene or PVDF Sensor

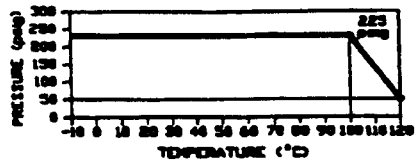


Union Mounting — CPVC
With Polypropylene or PVDF Sensor

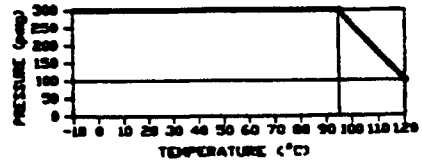


▲ Sanitary Mounting — 304 SS

With Polypropylene Sensor



With PVDF Sensor



* Ratings for these hardware materials are based upon water service. More severe service may require a correction factor.

▲Ratings listed for sanitary mounting are based on CDE-36048 hardware with CDE-36132 sanitary clamp. Other hardware and clamp combinations may reduce the ratings shown.

NOTE: Mounting hardware limits must be considered in combination with sensor limits in determining compatibility for a specific application.

PART TWO - INSTALLATION

SECTION 1 - UNPACKING

Remove the Packing List and verify that you have received all equipment. If you have any questions about the shipment, please call the OMEGA Customer Service Department at 1-800-622-2378 or (203) 359-1660.

When you receive the shipment, inspect the container and equipment for any signs of damage. Note any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE: The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material in event reshipment is necessary.

SECTION 2 - LOCATION REQUIREMENTS

Locate the sensor within 100 feet of the instrument if full scale range is less than 1000 microSiemens/cm (300 feet for 1000 microSiemens/cm and higher full scale ranges).

SECTION 3 - MOUNTING

Use Teflon tape on sensor and mounting hardware threads to avoid leaks. Do not use pipe sealant.

NOTE: If interconnect cable is required for the installation, use only p/n CDE-36103. Any other type of cable will degrade measurement performance.

3.1 Submersion

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

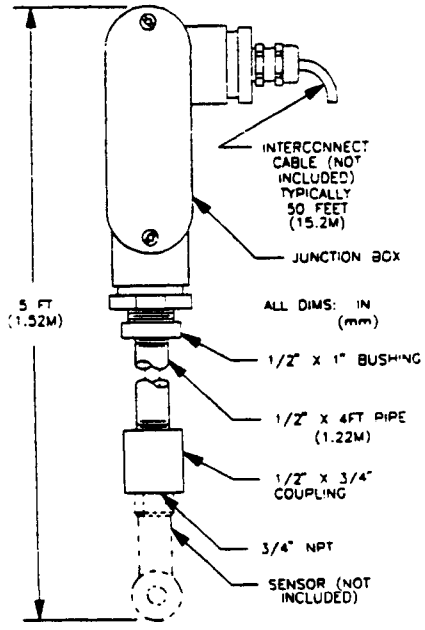


Figure 2-1 Submersion Mounting Details

1. Screw a 3/4" x 1/2-inch NPT reducer coupling onto cable end of sensor. Use a cresent or open-end wrench on the flatted, four-sided section below the sensor threads to carefully snug the connection to prevent leaks.

   CAUTION: Do not tighten sensor connection by holding and turning "doughnut shaped" end of sensor. This may crack the sensor body.

2. Route sensor cable through an appropriate length of 1/2-inch diameter mounting pipe. Screw pipe onto reducer coupling.

3. Fasten pipe-mount junction box onto 1/2-inch NPT threads. Route sensor cable into junction box.

4. Run interconnect cable into junction box. Connect sensor and interconnect cable wires, by matching colors, to terminal strip in junction box. Fasten cover onto junction box.

5. Route interconnect cable to instrument. If cable is too long, cut it to proper length to minimize any interference from inductive pick-up. It is recommended to run this cable in 1/2" or larger flexible, metal conduit for protection against moisture and mechanical damage. Flexible conduit must be long enough to allow removal of the sensor from the process for maintenance and calibration.

   NOTE: Do not run this cable in the same conduit with power or control wiring ("electrical noise" may interfere with sensor signal).

6. Connect interconnect cable wires to instrument in accordance with instrument hook-up instructions.

7. Calibrate system with conductivity reference solution using the procedure in the instrument instruction manual before mounting sensor/hardware assembly into the process.

3.2 Flow-Thru (Pipe Tee)

The convertible style sensor may be tee mounted in an end-of-pipe run location by threading it into a bushing (p/n CDE-36338 for CPVC bushing or p/n CDE-36378 for PVC bushing) that is mounted into a standard 2-inch NPT pipe tee (Figure 2-2).

1. Install a standard 2-inch NPT pipe tee into the process line. The pipe tee and bushing should be made of a material that provides a suitable maximum pressure/temperature rating for the application. Refer to Part One, Section 2 for specifications.

2. Fasten sensor into the bushing. Use an adjustable or

open-end wrench on the flatted, four-sided section below the sensor threads to carefully snug the connection to prevent leaks.

CAUTION: Do not tighten sensor connection by holding and turning "doughnut-shaped" end of sensor. This may crack the sensor body.

3. Electrically connect the sensor directly to the instrument or indirectly with the junction box and interconnect cable.

   A. Direct Hook-Up

      a. Route sensor cable to instrument. Use a watertight connector, such as a cable feed-thru fitting, in the instrument's cable entry hole.

      b. Connect sensor cable wires to instrument in accordance with instrument hook-up instructions.

   B. Indirect Hook-Up With Junction Box

      a. Mount junction box (with terminal strip) on a flat surface such that its cover is removable when installed.

      b. Route sensor cable to junction box through a watertight connector such as a cable feed-thru fitting.

      NOTE: *Keep terminal strip dry to prevent problems caused by wet and/or corroded terminals.*

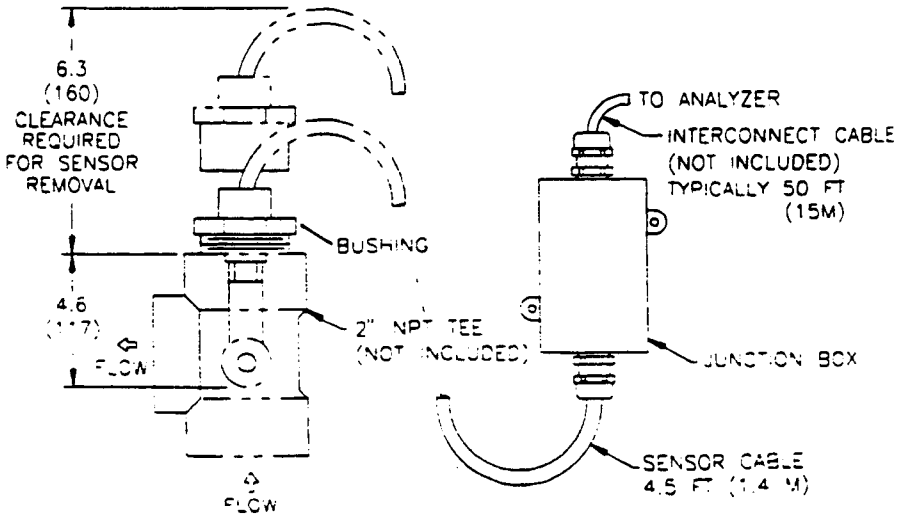


FIGURE 2-2 Tee Mounting Details

c. Route interconnect cable from junction box to instrument. If cable is too long, cut it to proper length to avoid any interference from inductive pick-up. It is recommended to run this cable in 1/2" or larger metal conduit for protection against moisture and mechanical damage. Use conduit hubs where cable enters the junction box and instrument enclosure.

NOTE: Do not run this cable in the same conduit with power or control wiring ("electrical noise" may interfere with sensor signal).

d. Connect sensor and interconnect cable wires, by matching colors, to junction box terminal strip. Fasten cover onto junction box.

e. Connect interconnect cable wires to instrument in accordance with instrument hook-up instructions.

4. Calibrate system with conductivity reference solution using the procedure in the instrument instruction manual before mounting sensor into the process line.

5. Purposely pre-twist the sensor cable by turning the sensor counterclockwise (left) 4 to 5 turns. Now place sensor into end of tee and hand tighten. Use an adjustable or open-end wrench on the flatted-hex section of the bushing to carefully snug the connection to prevent leaks. **Do not overtighten!** This completes the pipe tee installation.

3.3 Union

The convertible style sensor may be union mounted by using a special union coupling and a standard 2-inch NPT pipe tee (Figure 2-3). The mounting hardware is shipped assembled without the sensor, which must be attached.

1. Install tee/mounting hardware assembly into the process line.

2. Unfasten lockring and remove top half of union.

3. Route sensor cable through top half of union and cable grip. Fasten sensor into fitting in top half of union. Use an adjustable or open-end wrench on the flatted, four-sided section below the sensor threads to carefully snug the connection to prevent leaks.

   CAUTION: Do not tighten sensor connection by holding and turning "doughnut-shaped" end of sensor. This may crack the sensor body.

4. Tighten cable grip to secure sensor cable.

5. Electrically connect sensor to instrument as described in Section 3.2, step 3A (direct hook-up) or step 3B (indirect hook-up with junction box).

6. Calibrate system with conductivity reference solution using the procedure in the instrument instruction manual before mounting the sensor into the process line.

7. Carefully place sensor into tee. Align mating union half surfaces. Make sure O-ring is properly seated. Then hand tighten union lockring. This completes the union-mount installation.

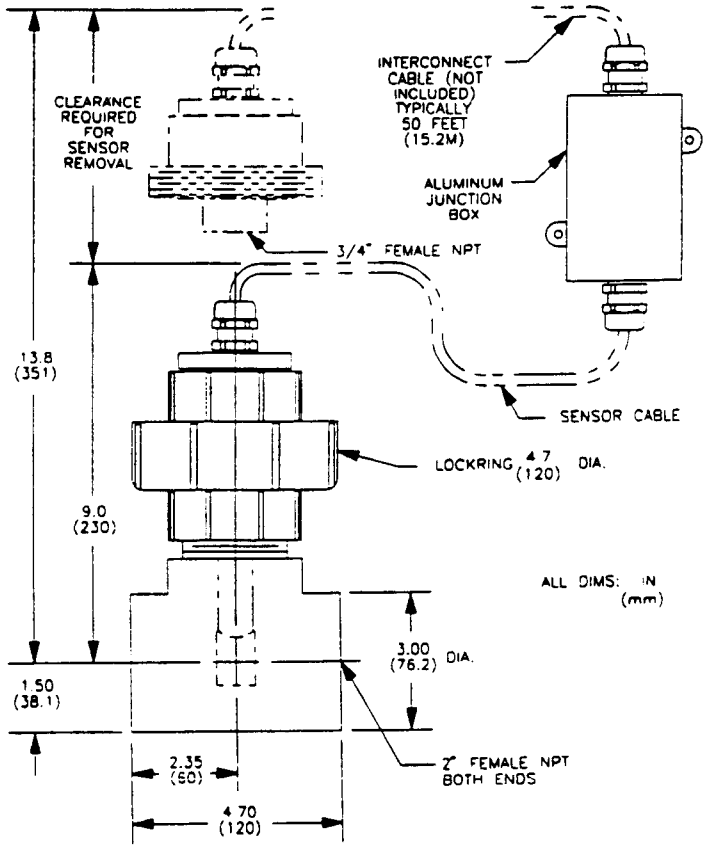


FIGURE 2-3 Union Mounting Details

3.4 Sanitary Clamp-Type Tee Or Ferrule

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 2-4).

1. Install a 2-inch sanitary clamp-type tee or ferrule into the process line or vessel.

2. Route sensor cable through hole in stainless steel endcap such that the endcap's taper faces towards top surface of integral sensor flange.

3. Electrically connect sensor to instrument as described in Section 3.2, step 3A (direct hook-up) or step 3B (indirect

hook-up with junction box).

4. Calibrate system with conductivity reference solution using the procedure in the instrument instruction manual before mounting sensor into the process line or vessel.

5. Place sanitary gasket onto mating surface of tee or ferrule.

6. Carefully place sensor into tee or ferrule, making sure gasket is in place and contacting bottom surface of integral sensor flange.

7. Place stainless steel endcap onto top surface of integral sensor flange and secure sensor onto tee or ferrule with heavy duty clamp (p/n CDE-36132). Tighten wing nut to 25 inch-lbs. torque. If sensor is installed in a temperature cycling process, periodic re-tightening may be required. This completes the sanitary installation.

CAUTION: Steam sterilization is not recommended for cleaning the sanitary style sensor.

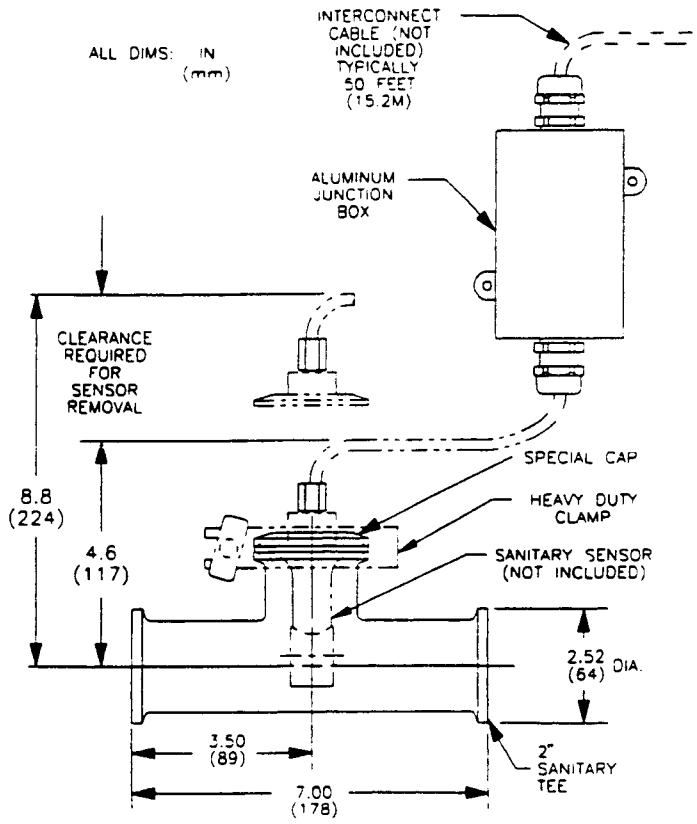


FIGURE 2-4 Sanitary Clamp-Type Tee Or Ferrule Mounting Details

PART THREE - PRINCIPLE OF OPERATION

All solutions containing water conduct electricity to some extent. The ability of a solution to conduct electricity is called "conductance" (the reciprocal of resistance). Addition of electrolytes such as salts, acids or bases, to pure water will increase the ability of the liquid to conduct electricity and hence, increase the solution's conductance (decreases the resistance).

An electrodeless conductivity system measures solution conductance by inducing an alternating current in a closed loop of the solution and measuring its magnitude. The conductivity analyzer drives a torroid in the sensor which induces the alternating current into the solution. This AC signal flows in a closed loop through the sensor bore and surrounding solution. A second torroid in the sensor senses the magnitude of the induced current which is proportional to the solution conductance. This signal is processed in the analyzer to display the corresponding reading.

When the temperature of a solution changes, its conductivity changes. A temperature sensitive resistor inside of the sensor automatically compensates the conductivity measurement for temperature variations by altering the gain of the measuring circuit. This is accomplished such that, regardless of actual solution temperature, the conductivity reading is what the solution conductivity would be if the solution temperature was 25°C (an internationally accepted reference). This temperature compensation may be achieved automatically or manually.

PART FOUR - SERVICE AND MAINTENANCE

SECTION 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 waste water that contains oil and/or grease may require more frequent cleaning.

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. Using a small bristle brush, cotton swab (Q-tip) or pipe cleaner, scrub entire measuring end of the sensor to thoroughly clean the surfaces. If detergent solution cleaning cannot remove deposits on the surfaces, use muriatic (or other **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.

   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.

   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.
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, troubleshoot the sensor in accordance with Section 2.

SECTION 2 - TROUBLESHOOTING

2.1 Checking the Sensor

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

1. Disconnect the sensor from the instrument (or junction box if interconnect cable is used).
2. Clean the sensor in accordance with Part Four, Section 1.
3. Measure the resistance between the red and yellow wires with an ohmmeter. The reading should be between 1090 and 1105 ohms, with the sensor at 25°C, + or - 2°C.
4. Measure the resistance between the white and blue wires. The reading should be less than 1 ohm.
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. If the resistance checks are correct, the sensor may still be defective. In this case, more extensive troubleshooting is required. Please consult OMEGA's Engineering Department for details.

NOTES

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RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

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