

1 YEAR
WARRANTY

Ω OMEGA® **User's Guide**



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CDTX-285X **Conductivity/Resistivity** **Sensor Electronics**



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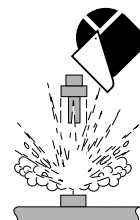
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SAFETY PRECAUTIONS

1. Depressurize and vent system prior to installation or removal.
2. Confirm chemical compatibility before use.
3. Do not exceed maximum temperature/pressure specifications.
4. Wear safety goggles or faceshield during installation/service.
5. Do not alter product construction.
6. When using chemicals or solvents, care should be taken and appropriate eye, face, hand, body, and/or respiratory protection should be used.



1. Description

- CDTX-285X Series Conductivity/Resistivity Sensor Electronics provides either a two-wire 4 to 20 mA output.
- The 4 to 20 mA output models provide eight ranges for each electrode cell constant, plus the ability to invert each range.
- The EasyCal feature allows the devices to automatically recognize standard conductivity test solution values for simple field calibration.
- The Conductivity sensor provided with integral systems will have its custom cell constant information programmed into the electronics at the factory to provide a 2% sensor accuracy. See Section 8 for details.

2. Specifications

General

Compatible Electrodes Omega Conductivity/Resistivity electrodes series CDCE-90 and CDE-285X

Temperature Compensation PT-1000 RTD (2% per °C)

Pure Water Compensation Auto-switching when using 0.01 cell and raw conductivity value < 0.5 µS

EasyCal:

Automatic recognition of the following conductivity values:

- 146.93 µS, 1408.8 µS, 12856 µS (@ 25 °C)
(Test solutions per ASTM D1125-95)
- 10 µS, 100 µS, 200 µS, 500 µS, 1000 µS, 5000 µS, 10,000 µS, 50,000 µS, 100,000 µS (@ 25 °C)

Electrical

Power 12 to 24 VDC (4 to 20 mA output)
(Reverse polarity and short circuit protected)

Current Output:

Field-selectable ranges

Factory set span:

0.01 cell.....	4 to 20 mA = 0 to 100 µS
0.10 cell.....	4 to 20 mA = 0 to 1000 µS
1.0 cell.....	4 to 20 mA = 0 to 10,000 µS
10.0 cell.....	4 to 20 mA = 0 to 200,000 µS
20.0 cell.....	4 to 20 mA = 0 to 400,000 µS

Max. Loop Resistance 50 Ω @ 12 VDC

325 Ω @ 18 VDC

600 Ω @ 24 VDC

Accuracy ±2% of output span

Resolution..... 7 µA

Update Rate <600 ms

Error Indication 22 mA

Environmental

Material..... PBT

Enclosure Rating NEMA 4X/IP65

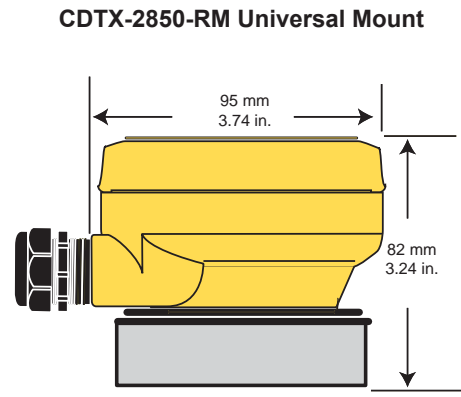
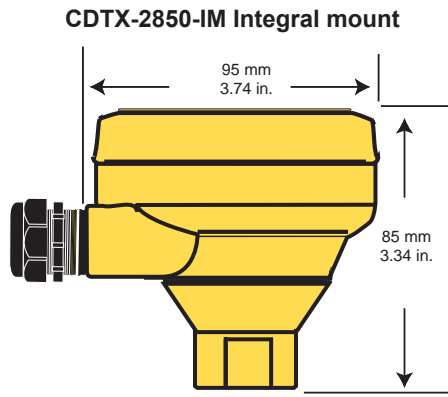
Operating Temperature..... -10 °C to 85 °C
(14 °F to 185 °F)

Storage Temperature..... -20 °C to 85 °C
(-4 °F to 185 °F)

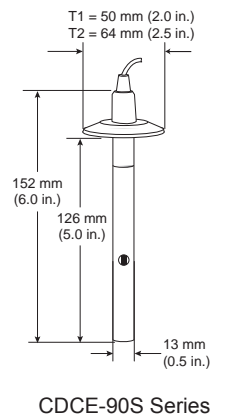
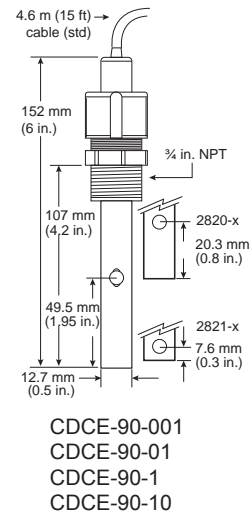
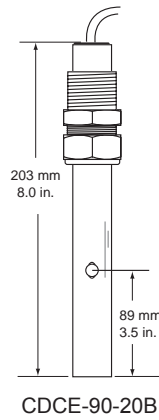
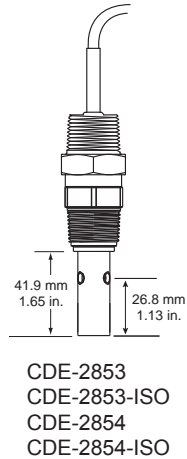
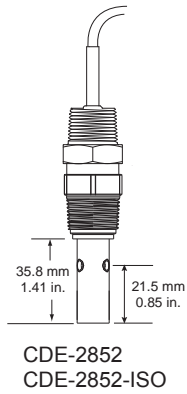
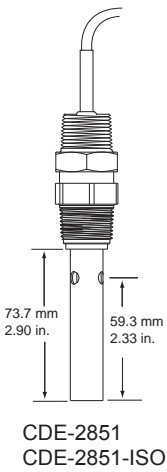
Relative Humidity..... 0 to 95%, non-condensing

Shipping Weight 0.75 kg (1.75 lb.)

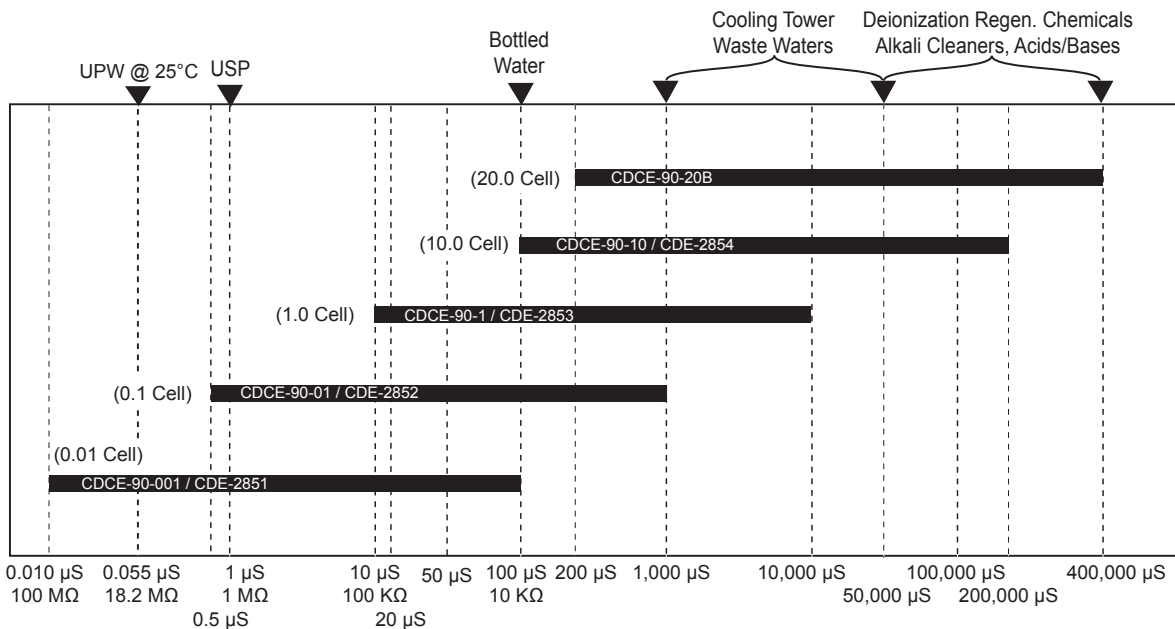
3. CDTX-2850 Dimensions



4. Conductivity Sensor Dimensions



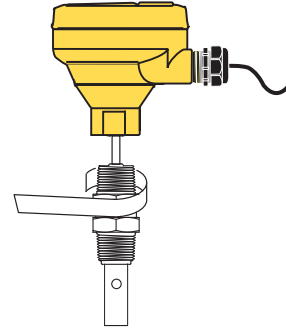
5. Operating Range Chart



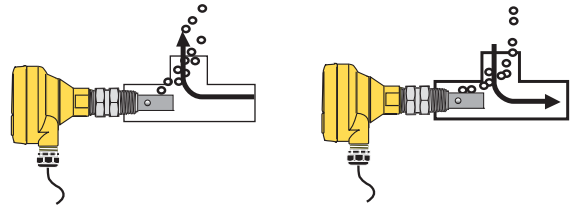
6. In-Line Installation

Most of the Conductivity/Resistivity electrodes used with the CDTX-285X can be installed into standard $\frac{3}{4}$ in. (NPT or ISO 7-R $\frac{3}{4}$) fittings.

The CDTX-285X models are designed for integral systems, where the electronics are attached directly to the sensor.

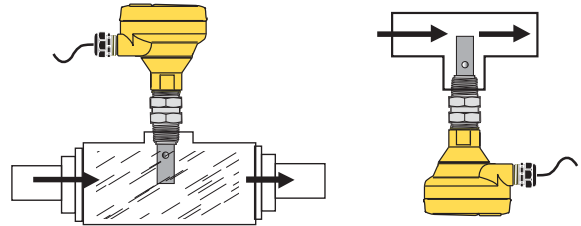


The preferred installation for in-line applications directs flow straight into the electrode. This configuration reduces the probability of entrapped air bubbles, and provides the best continuous sampling of the fluid content.

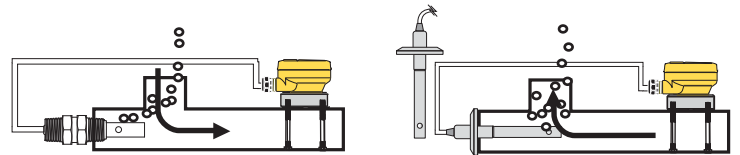


If the electrode is mounted vertically in a tee, do not recess the electrode orifices inside the tee. Mounting upside down may help prevent air entrapment.

An oversized tee or flow cell may be helpful for inline installations. At least 4 threads (ANSI B1.20.1) must be engaged to meet the pressure rating as published in the specifications.



Use the CDTX-285X-RM models for in-line installations where the electronics must be separated from the electrode. Conductivity electrodes with sanitary flange fittings must be installed using this option.



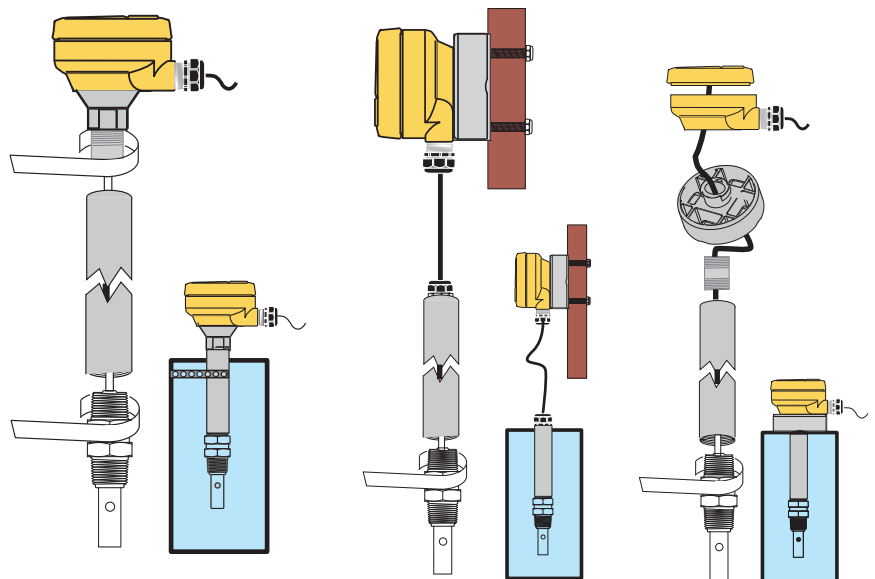
7. Submersible Installation

While the CDTX-285X and CDTX-2850-RM electronics cannot be submerged, either model will accommodate tank installation.

Select any electrode with a 5 m (15 ft.) cable. The cable may be cut to length, but it CANNOT BE EXTENDED.

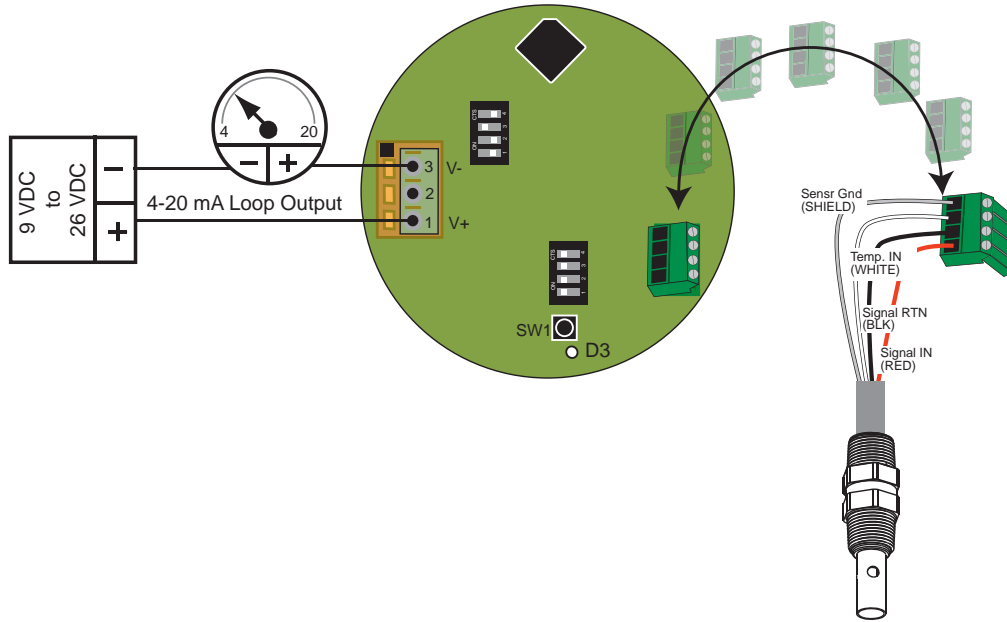
The universal adapter included with CDTX-285X-RM models can be attached to the top of a tank or mounted to a surface near the tank.

Adapt the CDTX-285X models to tank installations by attaching a clamp to the conduit.



8. Wiring 4 to 20 mA Output

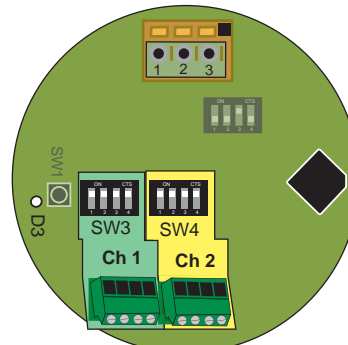
- Maximum length of 4 to 20 mA loop is 300 meters (1000 ft)



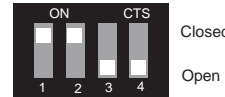
9. Cell Constant Selection

Cell Constant Selection

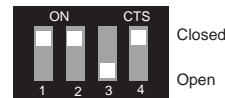
- The CDTX-285X is shipped from the factory with the custom cell constant and temperature offset programmed into the single-input electronics. SW3 will be preset to "Custom cell constant".
- Switch banks SW3 and SW4 are used to select the cell constant of the electrode. The Dual Input model is illustrated. Single input models use only SW3.
- Make all switch settings before connecting power. Switch changes made with the power ON will take 15 to 20 seconds before becoming effective.
- Use SW3 #1-3 to select the cell constant for the first sensor.
- Use SW3 #4 to disable the PT1000 Temp Compensation function in the CDTX-285X (as required for USP applications). This disables the function for BOTH INPUTS.
- Use SW4 #1-3 to select the cell constant for the second sensor.
- Set SW4 #4 to OPEN to disable the second input.



Example: 1.0 cell constant, temp comp ON



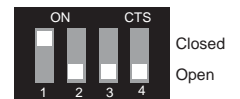
Example: 1.0 cell constant, temp comp OFF



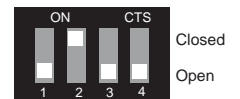
Custom Cell Constant



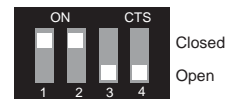
0.01/cm⁻¹



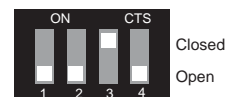
0.1/cm⁻¹



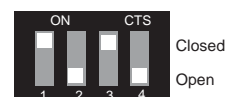
1.0/cm⁻¹



10.0/cm⁻¹



20.0/cm⁻¹



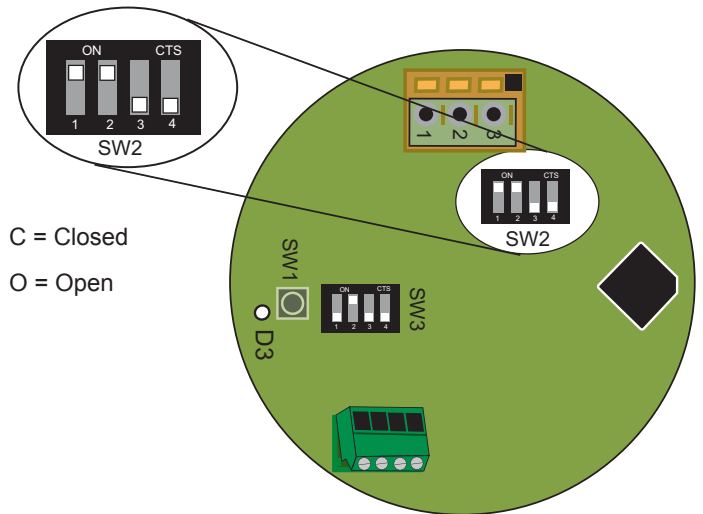
SW3 Cell Constant and Temp Compensation				
#1	#2	#3	#4	For Cell Constant
C	C	C	O	Custom
C	O	O	O	0.01 cm ⁻¹
O	C	O	O	0.1 cm ⁻¹
C	C	O	O	1.0 cm ⁻¹
O	O	C	O	10.0 cm ⁻¹
C	O	C	O	20.0 cm ⁻¹
#4:				Open = Temp Comp ON Closed = Temp Comp OFF
SW4: #1, #2 and #3 operate the same as SW3. #4 turns input 2 OFF when set to OPEN. (Open = Off, Closed = On)				

10. Range Selection for 4 to 20 mA Output

- The Range selection switch bank (SW2) provides eight range selections for each cell constant. Each range can be inverted, making a total of 16 range options.
- Select a range from the table below and set SW2 as indicated.

Example (refer to shaded selections of chart):

- The electrode installed is the CDE-2852, with a 0.10 cell constant.
- The required output is 4 to 20 mA = 0 to 100 μ S.
- Set SW2 switch bank to C-C-O-O.
- To invert range (4 to 20 mA = 100 to 0 μ S), close switch #4.



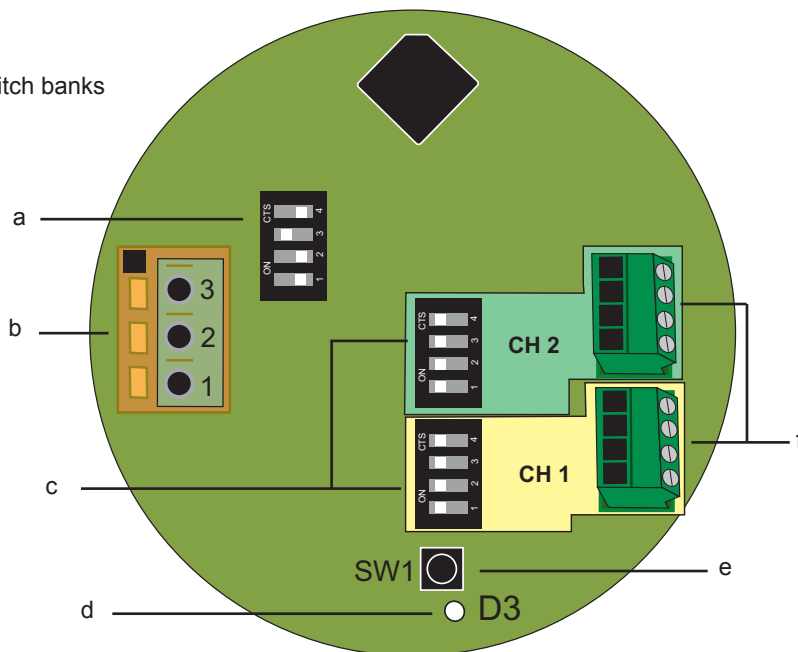
SW2 Switch Setting				0.01 Cell	0.10 Cell	1.0 Cell	10.0 Cell	20.0 Cell
#1	#2	#3	#4	Resistivity Ranges in BOLD				
C	C	C	O	10 to 20 MΩ	0 to 2 μ S	0 to 20 μ S	0 to 200 μ S	0 to 400 μ S
C	C	C	C	20 to 10 MΩ	2 to 0 μ S	20 to 0 μ S	200 to 0 μ S	400 to 0 μ S
O	C	C	O	2 to 10 MΩ	0 to 5 μ S	0 to 50 μ S	0 to 500 μ S	0 to 1000 μ S
O	C	C	C	10 to 2 MΩ	5 to 0 μ S	50 to 0 μ S	500 to 0 μ S	1 000 to 0 μ S
C	O	C	O	0 to 2 MΩ	0 to 10 μ S	0 to 100 μ S	0 to 1 000 μ S	0 to 2 000 μ S
C	O	C	C	2 to 0 MΩ	10 to 0 μ S	100 to 0 μ S	1 000 to 0 μ S	2 000 to 0 μ S
O	O	C	O	0 to 1 μ S	0 to 50 μ S	0 to 5 000 μ S	0 to 5 000 μ S	0 to 10 000 μ S
O	O	C	C	1 to 0 μ S	50 to 0 μ S	500 to 0 μ S	5 000 to 0 μ S	10 000 to 0 μ S
C	C	O	O	0 to 5 μ S	0 to 100 μS	0 to 1 000 μ S	0 to 10 000 μ S	0 to 20 000 μ S
C	C	O	C	5 to 0 μ S	100 to 0 μ S	1 000 to 0 μ S	10 000 to 0 μ S	20 000 to 0 μ S
O	C	O	O	0 to 10 μ S	0 to 200 μ S	0 to 2 000 μ S	0 to 50 000 μ S	0 to 100 000 μ S
O	C	O	C	10 to 0 μ S	200 to 0 μ S	2 000 to 0 μ S	50 000 to 0 μ S	100 000 to 0 μ S
C	O	O	O	0 to 50 μ S	0 to 500 μ S	0 to 5 000 μ S	0 to 100 000 μ S	0 to 200 000 μ S
C	O	O	C	50 to 0 μ S	500 to 0 μ S	5 000 to 0 μ S	100 000 to 0 μ S	200 000 to 0 μ S
O	O	O	O	0 to 100 μ S	0 to 1 000 μ S	0 to 10 000 μ S	0 to 200 000 μ S	0 to 400 000 μ S
O	O	O	C	100 to 0 μ S	1000 to 0 μ S	10 000 to 0 μ S	200 000 to 0 μ S	400 000 to 0 μ S
C = CLOSED O = OPEN				Switch #4 inverts the output: OPEN = 4 to 20 mA, CLOSED = 20 to 4 mA				

11. Calibration

- All CDTX-285X Conductivity/Resistivity Sensor Electronics are factory calibrated for maximum out-of-the-box accuracy.
- The EasyCal feature allows calibration to be performed at the sensor.

The CDE-285X Conductivity sensors come with a certificate of calibration. This certificate provides information regarding the actual cell constant and temperature offset as tested and verified according to NIST standards. This information has been programmed into the CDTX-285X electronics as its default factory value. If required, the sensor can be recertified by contacting Omega.

- SW2: 4 to 20 mA output range selection switch bank
- Power and 4 to 20 mA output terminal block
- SW3 and SW4: Electrode Cell Constant selection switch banks
- D3: LED indicator
- SW1: EasyCal Push-button
- Conductivity Electrode connections



12. EasyCal

EasyCal is a single-point calibration system. During this procedure, if the measured value is within $\pm 10\%$ of any of the test values listed below, the CDE-285X will automatically recognize the test value and calibrate the output to that value.

Note:

The first step (Reset) is recommended each time an electrode is replaced, but is **NOT** necessary upon initial installation or periodic calibration.

- 1. Reset** the CDE-285X to factory calibration: Set all switches on SW3 (and SW4 for dual input) to OPEN. Apply power, wait at least 3 seconds, then press and hold SW1 until the LED (D3) comes on steady then goes off again (approx. 10 seconds). When the LED goes off, release SW1; reset is complete. Reset SW3 and SW4 to the proper settings.
- 2. Place** the electrode/sensor assembly into the conductivity test solution appropriate to your operating range. Shake the electrode to dislodge any air bubbles visible on the surface of the electrode.
 - 146.93 μS , 1408.8 μS , 12856 μS (per ASTM D1125-95)
 - 10 μS , 100 μS , 200 μS , 500 μS , 1000 μS , 5000 μS , 10,000 μS , 50,000 μS , 100,000 μS .
 - Allow at least 2 minutes for the electrode response to stabilize.
- 3. Press** and hold SW1 for approximately 8 to 10 seconds. During this time, the LED will come on steady then go back off. (If the LED blinks several times rapidly, the calibration was not successful. See the troubleshooting section).

Calibration is complete. Return the system to service.

13. Maintenance

- The CDTX-285X requires no periodic maintenance.
- Coatings on the electrode may cause slow response or drift.
- Clean metallic surfaces with a mild detergent and a non-abrasive brush or cotton swab.

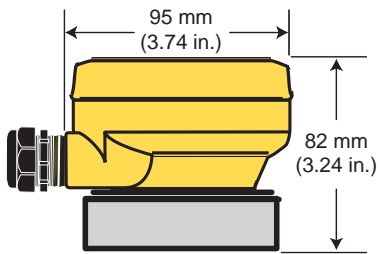
14. Troubleshooting

LED and Output Condition	Possible Causes	Suggested Solutions
Current Out: LED off, current output is 22 mA	<ul style="list-style-type: none"> • SW3 and SW4 set to all OPEN (factory setting) • No electrode installed • SW3 (and SW4) not set correctly • System not ready 	<ul style="list-style-type: none"> • Normal for new system • Install electrode • Set SW3 and SW4 correctly • Retry (recycle power)
During EasyCal, the LED blinks rapidly for 4 seconds	<ul style="list-style-type: none"> • Measured value of the test solution is outside the $\pm 10\%$ tolerance • The electronics or the electrode is defective 	<ul style="list-style-type: none"> • Use fresh test solutions and restart the calibration • Replace the electronics or the electrode
After completing calibration procedure, the output values are inaccurate	<ul style="list-style-type: none"> • Insufficient time allowed for electrode stabilization during calibration procedure • Test solutions are contaminated • EasyCal performed with temp comp OFF, then temp comp turned ON for measurement (or vice versa) 	<ul style="list-style-type: none"> • Recalibrate and wait at least 2 minutes after placing electrode in solution before pressing SW1 • Use fresh test solutions and restart the calibration
The output of the CDTX-285X indicates a value that is off by a factor of 10 (e.g. 10x, 100x the correct value)	<ul style="list-style-type: none"> • The cell constant selection on the CDTX-285X (SW3 or SW4) does not match the actual input 	<ul style="list-style-type: none"> • Match the CDTX-285X switch settings to agree with the sensor being used

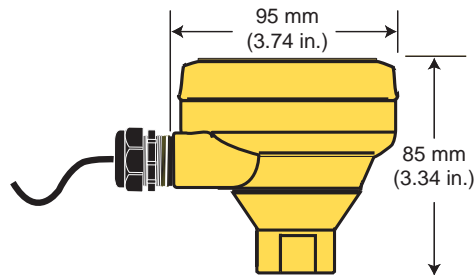
10. Ordering Information

Mfr. Part No.	Description
CDTX-2850-IM	2850 Sensor Electronics with 4 to 20 mA Output and 3/4 inch adapter
CDTX-2850-RM	2850 Sensor Electronics with 4 to 20 mA and Universal adapter
CDTX-2851	Integral system with CDE-2851, 4 to 20 mA, 0.01 cell, NPT threads
CDTX-2852	Integral system with CDE-2852, 4 to 20 mA, 0.1 cell, NPT threads
CDTX-2853	Integral system with CDE-2853, 4 to 20 mA, 1.0 cell, NPT threads
CDTX-2854	Integral system with CDE-2854, 4 to 20 mA, 10.0 cell, NPT threads
CDTX-2851-ISO	Integral system with CDE-2851-ISO, 4 to 20 mA, 0.01 cell, ISO threads
CDTX-2852-ISO	Integral system with CDE-2852-ISO, 4 to 20 mA, 0.1 cell, ISO threads
CDTX-2853-ISO	Integral system with CDE-2853-ISO, 4 to 20 mA, 1.0 cell, ISO threads
CDTX-2854-ISO	Integral system with CDE-2854-ISO, 4 to 20 mA, 10.0 cell, ISO threads

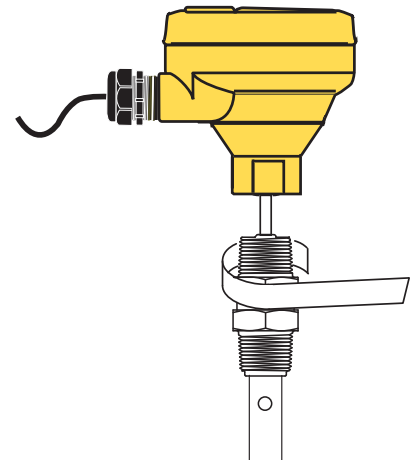
CDTX-285X-RM
Electronics with Universal Adapter



CDTX-285X-IM
Electronics with 3/4-in. Adapter



CDTX-285X
Integral System



WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

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CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

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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.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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- Load Cells & Pressure Gages
- Displacement Transducers
- Instrumentation & Accessories

FLOW/LEVEL

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- Air Velocity Indicators
- Turbine/Paddlewheel Systems
- Totalizers & Batch Controllers

pH/CONDUCTIVITY

- pH Electrodes, Testers & Accessories
- Benchtop/Laboratory Meters
- Controllers, Calibrators, Simulators & Pumps
- Industrial pH & Conductivity Equipment

DATA ACQUISITION

- Communications-Based Acquisition Systems
- Data Logging Systems
- Wireless Sensors, Transmitters, & Receivers
- Signal Conditioners
- Data Acquisition Software

HEATERS

- Heating Cable
- Cartridge & Strip Heaters
- Immersion & Band Heaters
- Flexible Heaters
- Laboratory Heaters

ENVIRONMENTAL MONITORING AND CONTROL

- Metering & Control Instrumentation
- Refractometers
- Pumps & Tubing
- Air, Soil & Water Monitors
- Industrial Water & Wastewater Treatment
- pH, Conductivity & Dissolved Oxygen Instruments