Honeywell

DirectLine® DL423 Sensor Module *for* Conductivity/Resistivity Measurements User Manual

70-82-25-112
Rev. 2
1/03

Notices and Trademarks

Warranty/Remedy

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose**. Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

CE Conformity

This product is in conformance with the protection requirements of the following European Council Directives: 89/336/EEC, the Electromagnetic Compatibility Directive and 73/23/EEC, the Low Voltage Directive. Conformance of this product with any other "CE Mark" Directive(s) shall not be assumed.

ATTENTION

The emission limits of EN 61326 are designed to provide reasonable protection against harmful interference when this equipment is operated in an industrial environment. Operation of this equipment in a residential area may cause harmful interference. This equipment generates, uses and can radiate radio frequency energy and may cause interference to radio and television reception when the equipment is used closer than 30 m to the antenna(e). In special cases, when highly susceptible apparatus is used in close proximity, the user may have to employ additional mitigating measures to further reduce the electromagnetic emissions of this equipment.

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Insert 70-82-10-03 should accompany this document.

About This Document

Abstract

This manual contains all the information that is needed to install, configure, calibrate, operate, and troubleshoot the DirectLine® Sensor. Insert 70-82-10-03, a quick reference guide for configuring and calibrating the DL423, should accompany this document.

Contacts

World Wide Web

The following lists Honeywell's World Wide Web sites that will be of interest to our customers.

Honeywell Organization	WWW Address (URL)
Corporate	*http://www.honeywell.com*
Industrial Measurement and Control	*http://www.honeywell.com/imc*

Telephone

Contact us by telephone at the numbers listed below.

	Organization	Phone Number	
United States and Canada	Honeywell	1-800-423-9883 1-888-423-9883	*Tech. Support* *Q&A Faxback (TACFACS)*
		1-800-525-7439	*Service*

Symbol Definitions

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

Symbol	Definition
	Earth Ground. Functional earth connection. NOTE: This connection shall be bonded to Protective earth at the source of supply in accordance with national and local electrical code requirements.

Contents

Tables

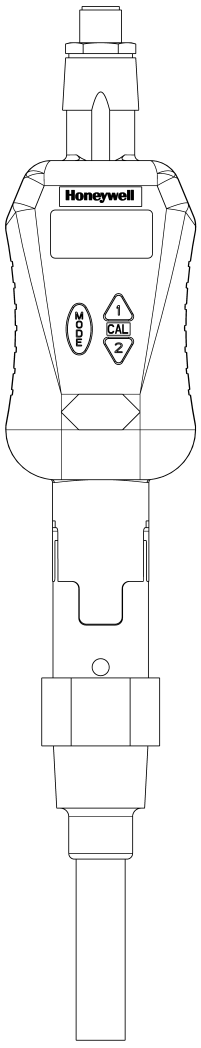
Figures

1. Introduction

1.1 Overview

The DirectLine® Sensor consists of an **electronics module** connected to a **Conductivity Cell.** The electronics module can be separated from the sensor, allowing the sensor to be easily removed or replaced while retaining power to the electronics module.

The electronics module is contained in a NEMA Type 4x sealed weatherproof, corrosion/impact-resistant polysulfone housing that can be mounted at the end of an immersion tube or in a sample line. The sealed plastic housing has plug-in connections for the conductivity cells and 4-20 mA cordset.



Electronics Module

Conductivity Cell

Figure 1-1 DirectLine® Sensor

1.2 Electronics Module

The electronics module is loop-powered by 16-42 Vdc and will modulate its supply current from 4 mA to 20 mA, depending upon the conductivity value that is sensed by the cell. The transmitted loop current is compensated for temperature internally using the standard Honeywell 8550 thermistor.

For submersion or special wiring applications, the remote electronics module is compatible with a remote cable/connector that allows the electronics moduleto be Wall. Pipe, or DIN Rail mounted.

A 4-20 mA output connection is provided via a 6m cordset or a customer supplied cable used in combination with a field wiring connector.

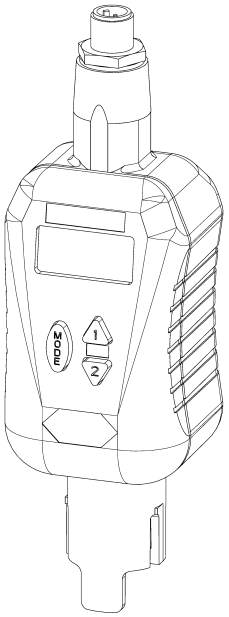


Figure 1-2 Electronics Module

1.3 Operator Interface

The DirectLine® Sensor operator interface consists of three pushbuttons and one 4-digit, 7-segment LCD display with 3 decimal points, plus (+), and minus (–) signs. It is responsible for the display of measured values and configuration of parameter values.

1.4 Specifications

Display Ranges	*Conductivity*: 0 to 2000 µS/cm, 0 to 20.00 mS/cm, 0 to 1000 mS/cm *Resistivity*: 0 to 20.00 MΩ-cm *Total Dissolved Solids (TDS)*: 0 to 2000 ppm, 0 to 2000 ppb, 0 to 200ppt *% Concentration*: 0 to 20.00%
Displayed Temperature Range	–10 °C to +140 °C (14 °F to 284 °F)
Display Accuracy	*Conductivity/Resistivity*: Greater of +/- 2 counts or +/- 0.5% of reading *Concentration*: +/- 0.5% of reading *Temperature*: +/- 0.1°C from –10 to 99.9°C, +/- 1°C from 100 to 140 °C
Display Resolution	4 digits, floating decimal point
Process Temperature	–10 °C to +140 °C (14 °F to 284 °F)
Electronics Module Ambient Temperature	–20 °C to +85 °C (–4 °F to +185 °F)
Output Type	4-20 mA (2-wire loop powered)
Output Calibration	4-20 mA
Cell Constant/Cell Calibration Factor Input	Automatic from EEPROM in Conductivity Cell
Output (Loop)	6m (19.7') cordset or shielded twisted pair with field wiring connector
Output (Loop) User Termination	Tinned leads
Cable Lengths Remote Sensor:	20 feet (cable integral to conductivity cell)
Power	16-42 Vdc, 23mA max *Maximum load resistance:* 250 ohms at 16 Vdc 600 ohms at 24 Vdc 1400 ohms at 42 Vdc
Local Display and Buttons	LCD 4-digit, 7-segment
Engineering Units (Labels)	µS/cm, mS/cm, MΩ-cm, ppm TDS, ppb TDS, ppt TDS, %NaOH, %HCl, %NaCl, %H2SO4
Calibration Options	Cal Trim Factor, 1 Point Cal Solution
Solution Temperature Compensation	Acid (Cation/Ammonia), Salt (Neutral Salts), NaCl, HCl, NaOH, H_2SO_4, and None (for USP24 Conformance)

Diagnostics	Sensor and electronics
Case	Weatherproof, corrosion/impact-resistant housing, IP66
Approvals	***CE Mark*** - for Industrial Applications *UL* – General Purpose for Process Control ***CSA*** - General Purpose FM Class1, Div. 1 (I.S.) FM Class 1, Div. 2 (non-incendive field wiring)
Remote Mounting	Pipe, Wall, or DIN Rail
Dimensions	H 123 mm (4.84”) x W 48 mm (1.89”) x D 46 mm (1.81”)
Weight	Approximately 142 g (5.0 oz.)

1.5 Model Selection Guide

Instructions

- Select the desired key number. The arrow to the right marks the selection available.
- Make the desired selections from Tables I through IV using the column below the proper arrow. A dot (•) denotes availability.

Key Number I II III IV

_ _ _ _ _ - _ - _ - _ - _ _ _ _

Key Number - DirectLine® Sensor Electronics Module

(Specify electrodes/cells/probes separately)

		Selection	Availability				
pH	For use with Durafet II, Meredian II & HPW7000 pH electrodes	DL421	↓				
ORP	For use with ORP electrode.	DL422		↓			
Conductivity	For use with Contacting Conductivity Cells	DL423			↓		
DO - PPM	For use with Dissolved Oxygen ppm Probes	DL424				↓	
DO - PPB	For use with Dissolved Oxygen ppb Probes	DL425					↓

TABLE I - OUTPUT CABLE

Output Cable for Integral or Remote Mounting	None (replacement module or customer supplied output cable)-***Note 1***	D	•	•	•	•	•
	Cordset - 6m (19.7 ft.) - includes connector and cable - ***Note 2***	E	•	•	•	•	•
	Field Wiring Connector ***only*** - customer supplies cable only-***Note 2***	F	•	•	•	•	•

TABLE II - SENSOR CABLE/REMOTE CONNECTOR (between electronic module and electrode, sensor or prc

Integral Mounting	No cable or connector required	0	**d**	**d**	**d**	**d**	**d**
Remote Mounting Cable - Durafet only	6,096m (20 ft.) of sensor cable - Durafet II Remote Mounting	1	**e**				
	15,24m (50 ft.) of sensor cable - Durafet II Remote Mounting	2	**e**				
Remote Mounting Connector (Cable is supplied with sensor or probe)	Remote Mounting Connector - Meredian II pH	3	**e**				
	Remote Mounting Connector - Meredian II ORP	3		**e**			
	Remote Mounting Connector - HPW7000	4	**e**				
	Remote Mounting Connector - Conductivity	5			**e**		
	Remote Mounting Connector - Dissolved Oxygen	6				**e**	**e**

TABLE III - REMOTE MOUNTING OPTIONS

Mounting Kit for Remote Mounting	None Integral unit - mounting not required	A	•	•	•	•	•
	2" (5,08 cm) Pipe mtg. bracket, wall mtg, & DIN Rail clip	B	•	•	•	•	•

TABLE IV - OPTIONS

Tagging	None	00 _ _	•	•	•	•	•
	Linen Customer ID Tag - 3 lines w/22 characters/line	LT _ _	•	•	•	•	•
	SS Customer ID Tag - 3 lines w/22 character/line	SS _ _	•	•	•	•	•
Certificates	None	_ _ 00	•	•	•	•	•
	Calibration & Conformance	_ _ CC	•	•	•	•	•

Notes:

1 Customer supplies cordset ***or*** cable with M12 connecter. Suppliers & P/Ns include:

	Phoenix Contact	Turck
Cord--set	SAC-3P-5.0-PUR/M12FSSH Stainless	RKV4T-6/S618
M12 Field Wiring Connector	SACC-M12FS-4CON-PG7	B8141-0
Cable	2-wire twisted shielded pair	

2 Recommended cable is 2-wire twisted shielded pair

RESTRICTIONS

Restriction Letters	Available Only With		Not Available With	
	Table	Selection	Table	Selection
d	III	A		
e	III	B		

ORDERING INSTRUCTIONS:

1. Part numbers are provided to facilitate Distributor Stock.
2. Orders may be placed either by model selection or by part number.
3. Part numbers are shown within the model selection tables to assist with compatibility information.
4. Orders placed by model selection are systematically protected against incompatibility.
5. Compatibility assessment is the responsibility of the purchaser for orders placed by part number.
6. Items labeled as N/A are not available via the stocking program and must be ordered by model selection.

2. Installation

2.1 Assembly and Wiring

Depending on the customer selected output cable options, the DirectLine can be wired to an appropriate 16-42 Vdc source using 2 different methods:

1) Cordset. See Figure 2-1.
2) Field wiring connector with customer supplied cable. See page 3.

Refer to Section 7 for wiring for CE Mark applications.

2.1.1 Cordset

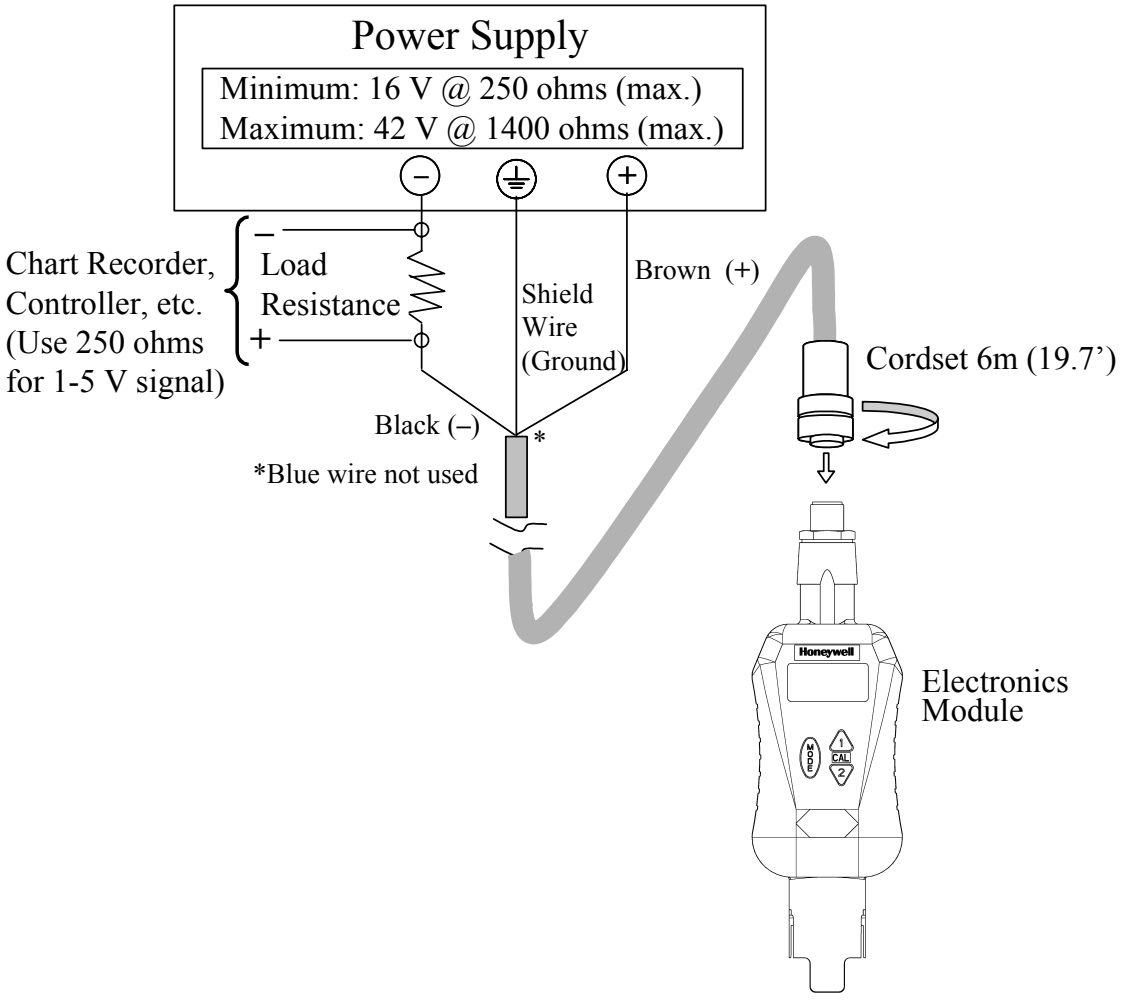


Figure 2-1 Cordset Connection and Wiring

2.1.2 Field Wiring Connector with customer supplied cable

Refer to Figure 2-2. The field wiring connector supports customer supplied cable with an outer diameter of 4-6mm, 2-wire twisted shielded pair.

Table 2-1 Assembly and Wiring Procedure for Field Wiring Connector

Step	Procedure
1	**Disassemble field wiring connector** a) Unscrew parts to separate pressure screw, clamp type cage, gasket, housing and female insert.
2	**Insert customer supplied cable through connector parts** a) Slide pressure screw over skin and tinned customer cable (note orientation). b) Slide clamp type cage over cable (note orientation). c) Slide gasket over cable. d) Slide housing over cable (note orientation).
3	**Connect wires to pins** Look closely at end of female insert to locate pin numbers. Connect positive wire to pin 1 and negative wire to pin 4. Remaining wires and female insert pins 2 and 3 are unused.
4	**Assemble field wiring connector** a) Screw female insert to housing until female insert's o-ring is compressed. b) Slide clamp type cage/gasket into housing. c) Thread pressure screw into housing until ¼ turn past finger tight.
5	**Connect cable to power supply** Wire the other end of the Output cable to a 16-42 Vdc source as indicated in Figure 2-1. Note: your wire colors may be different.

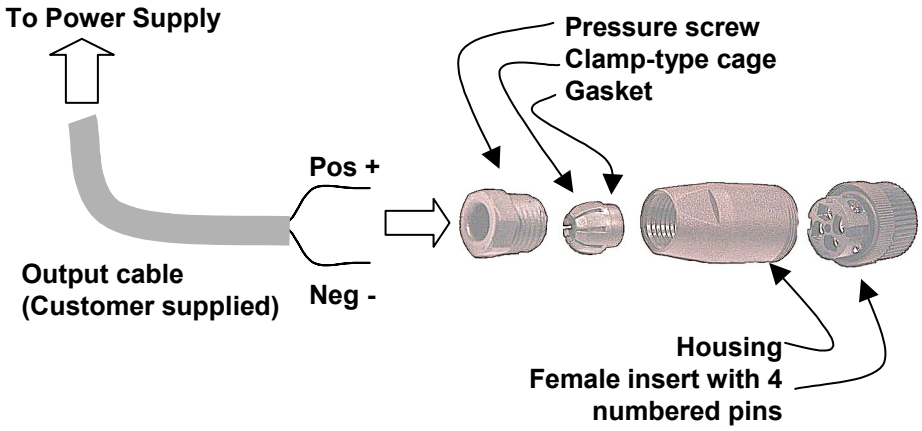


Figure 2-2 Field Wiring Connector

2.2 Mounting

Table 2-2 Integral Mounting Procedure

Step	Procedure
Connect Cell to Pipe and Electronics Assembly (Figure 2-3)	
1	Screw the cell into the pipe tee or flow chamber assembly (3/4 “ NPT thread). Make sure that the final position of the installed electronics module allows the display to be easily viewed by plant personnel.
2	Apply a thin film of silicon grease on the ID of the electronics module’s electrode mounting cavity.
3	Align the slots in the electronics module with those in the cell and press down to connect the electronics to the cell.
4	Tighten the locking screw on the bottom rear of the electronics module.

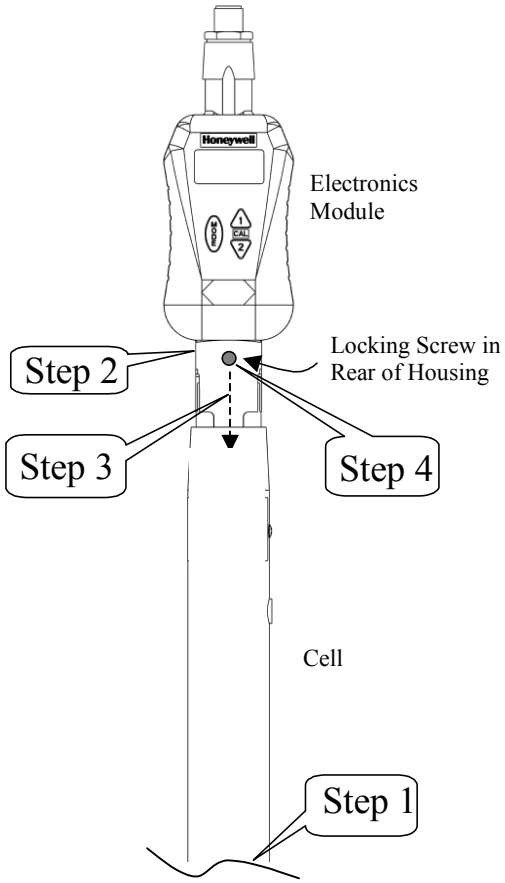


Figure 2-3 Integral Mounting

When the DL423 is specified with Table II = 5, the Remote Connector Assembly (part number 51500768-004) is supplied loose for connection of the conductivity cell cable to the DL423 module.

Table 2-3 gives the mounting procedure.

ATTENTION:

The Blue and Brown leads are shipped with a short piece of shrink tubing around the exposed ends for ESD protection of the EEPROM device. During wiring and installation proper ESD protection is required to ensure that the memory device is not damaged.

Table 2-3 Remote Mounting Procedure for Conductivity Cells

Step	Procedure (Refer to Figure 2-4 and Figure 2-5)
1	Turning counterclockwise, remove strain relief/cover combination from the remote connector assembly.
2	Remove the protective plastic bag from the end of the cell cable.
3	Loosen and remove compression cap from strain relief fitting. Carefully push cable end through cap and strain relief fitting so that these parts are strung back along cable jacket.
4	Connect cable leads as follows: Terminal 1 = Red (Thermistor) Terminal 2 = Black (Cell Low) Terminal 3 = Green (Thermistor) Terminal 4 = White (Cell High) Terminal 5 = Blue (EEPROM Data) Terminal 6 = Brown (EEPROM Ground) Note: for highest accuracy in high purity water applications, the remote cable length must not be modified.
5	Slide cover along cable and tighten by hand onto the remote connector assembly.
6	Slide cap along cable and tighten onto cable jacket with small wrench until cable cannot slide within strain relief rubber bushing.
7	Remove red protective vinyl boot from opposite end of connector assembly.
8	Apply a thin film of silicon grease to the ID of electronics module's remote mounting cavity.
9	Plug remote connector assembly into DL423 module aligning polarity tab of module housing and mating groove on connector.
10	**Secure Electronics Module with Wall, Pipe, or DIN Rail Mounting** Mount bracket with clips facing forward, smaller clip on top and larger clip on bottom. *Wall:* Use one of three through-holes to secure to wall. *Pipe:* Feed hose clamp through two slots and secure to pipe. *DIN rail:* Attach the appropriate DIN rail clip to the mounting bracket: "U" DIN rail—use metal clip and shorter screw (8 mm) "G" DIN rail—use gray clip and longer screw (10 mm) Clip can be rotated for horizontal or vertical DIN rails. Push electronics module onto the remote mounting bracket until it snaps into position.

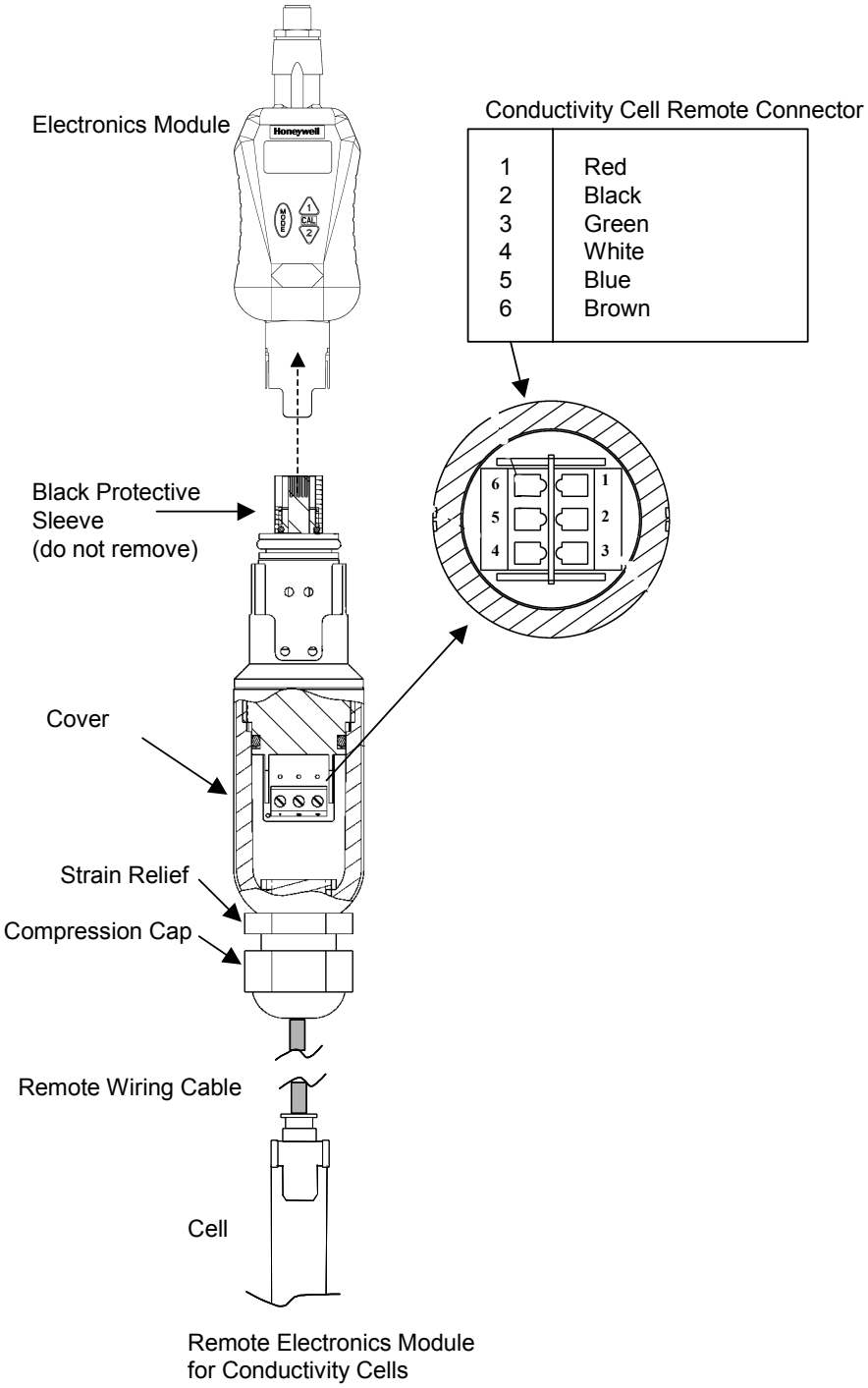
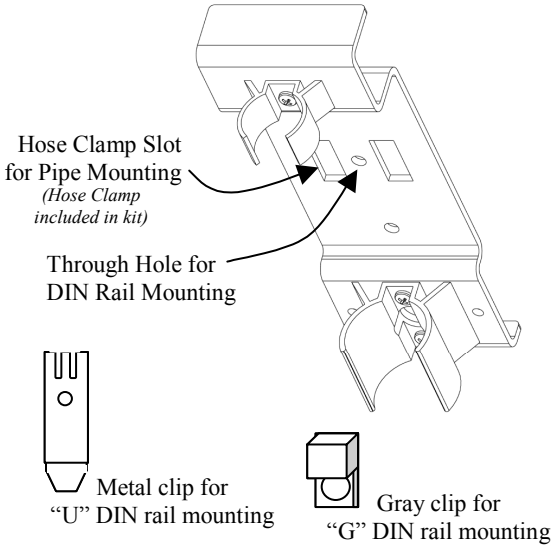


Figure 2-4 Remote Mounting



Mounting Kit

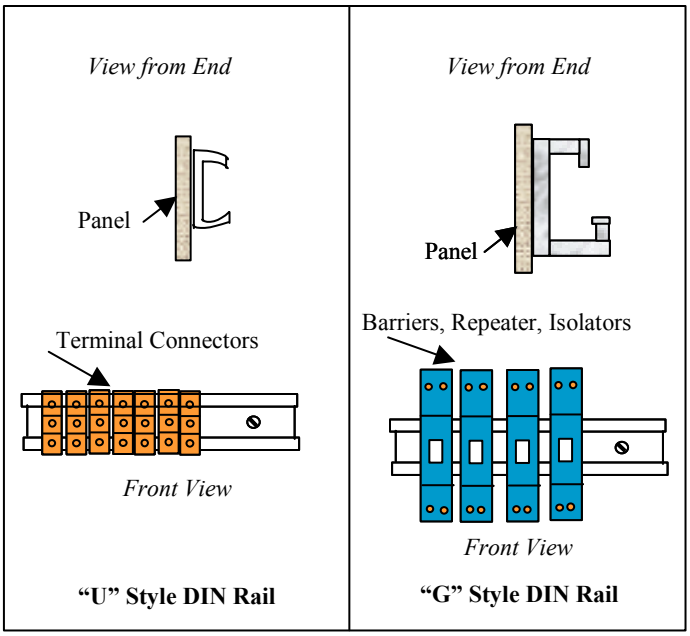


Figure 2-5 Remote Mounting Hardware

2.3 Conduit connections

The DirectLine provides a male ½" NPT thread to accommodate a customer conduit connection. Use ½" conduit coupling (min. 38.1mm (1.5") long) on DL conduit connection to clear cordset connector. Conduit can not be used with field wiring connector due to size restriction.

Do not exceed 200in-lb. torque when attaching fixed piping.

Use wrench flats provided under the ½" NPT threads to support the DirectLine during installation.

3. Configuration

3.1 Overview

Configuration Parameters

Set Up consists of configuring the following functions:

- **Cell Constant Selection** – *Only used with non-DL4000 conductivity cells.* DL4000 cells have an EEPROM that automatically loads the cell constant information into the DL423 module. The available selections are: 0.01, 0.1 (default), 1, 10, 25, 50.
- **PV Type Selection** – The PV type determines the measured, displayed, and transmitted variable. The cell constant determines the available selection of PV types according to the table below:

Cell Constant	Selectable PV Types
0.01, 0.1	Conductivity μS (default), Resistivity, TDS ppb, TDS ppm
1, 10	Conductivity mS (default), TDS ppt
25, 50	Conductivity mS, Concentration (default)

- **Cell Factor Selection -** The Cell Factor is a correction value applied to the Cell Constant to take into account tolerances in manufacturing. *This selection is only used with non-DL4000 conductivity cells.* DL4000 cells have an EEPROM that automatically loads the cell factor information into the DL423 module. Values between 0.850 and 1.150 can be configured (1.000 default).
- **TDS Factor Selection –** The TDS Factor is a conversion value applied to conductivity to calculate the Total Dissolved Solids in units of concentration (ppm, ppb, or ppt) per μS/cm. This configuration menu is only available when the PV Type selection is TDS. Values between 0.010 and 1.999 can be configured (0.500 default).
- **Solution Temperature Coefficient** – Conductivity and resistivity measurements can be compensated to 25° C for a specific solution type. The cell constant determines the available selection of solution types according to the table below:

Cell Constant	Selectable Solution Types
0.01, 0.1	None (Conductivity/Resistivity only), HCl, NaCl (default)
1, 10	None (Conductivity only), HCl, NaCl (default)
25, 50	None (Conductivity only), HCl(default), NaCl, H2SO4, NaOH

- **Noise Suppression Frequency Selection** – Selection of 50 Hz or 60 Hz (default).
  Defaults to 60 Hz at unit reset.

- **Output Configuration** – The following Output Configuration functions can be selected:
  - ***0% Range*** 0 % Range values can be adjusted within a range 0.00 (default) to Max PV in 0.50 increments.
  - ***100% Range*** 100 % Range values can be adjusted within a range 0.00 to Max PV (default) in 0.50 PV increments.
  - ***0% Calibration*** Output current can be typically adjusted to within a range of 3.80 mA to 4.40 mA.
  - ***100% Calibration*** Output current can be typically adjusted to within a range of 19.60 mA to 20.40 mA.

Table 3-1 provides steps and entry information for the complete configuration sequence.

3.2 Configuration Set Up Procedure

ATTENTION:

In Table 3-1, under the **Press** column:

- **Hold** means to hold the button down until the display changes.
- **Momentarily** means to press and release the indicated button.

From the Online display, follow this procedure.

ATTENTION:

If no key is pressed for 60 seconds, the display will abort the entry mode and default to Online Display.

Table 3-1 Configuration Set Up Procedure

Step	Operation	Press	Display
1	Enter **Cell Constant Selection** (if applicable)	**MODE Hold**	***CnSt*** (*for 1 second*) then, (C*urrent Cell Constant Selection*)
	Edit Cell Constant	**MODE Hold**	**Flashing Display – You are now in EDIT mode** (Cell Constant Value)
	Select desired Cell Constant	**▲▼ Momentarily**	To select 0.01, 0.1(default), 1, 10, 25, 50
	Save the Cell Constant	**MODE Momentarily**	Selection for Cell Constant
2	Enter **PV Type Selection**	**MODE Momentarily**	***PtYP*** (*for 1 second*) then, (Current Selection)
	Edit PV type Selection	**MODE Hold**	**Flashing Display – You are now in EDIT mode** (V*alue of current PV Type selection*)
	Select desired PV Type (selection determined by cell constant)	**▲▼ Momentarily**	To select: μS, mS (default), rES, PPb, PPm, PPt, Conc
	Save the PV Type *continued*	**MODE Momentarily**	Selection for PV Type

Step	Operation	Press	Display
3	Enter **Cell Factor Selection** (if applicable**)**	**MODE Momentarily**	***CFAC*** (*for 1 second*) then, (Current Selection)
	Edit Cell Factor Selection	**MODE Hold**	**Flashing Display – You are now in EDIT mode** (V*alue of current Cell Factor selection*)
	Select desired Cell Factor	**▲▼ Momentarily**	To select: 0.850 to 1.150 (1.000 default)
	Save the Cell Factor	**MODE Momentarily**	Selection for Cell Factor
4	Enter **TDS Factor Selection** (if applicable**)**	**MODE Momentarily**	***tdSF*** (*for 1 second*) then, (Current Selection)
	Edit TDS Factor Selection	**MODE Hold**	**Flashing Display – You are now in EDIT mode** (V*alue of current TDS Factor selection*)
	Select desired TDS Factor	**▲▼ Momentarily**	To select: 0.010 to 1.999 (0.500 default)
	Save the TDS Factor	**MODE Momentarily**	Selection for TDS Factor
5	Enter **Solution Type Selection**	**MODE Momentarily**	***SOLU*** (*for 1 second*) then, (Current Selection)
	Edit Solution Type Selection	**MODE Hold**	**Flashing Display – You are now in EDIT mode** (V*alue of current Solution Type selection*)
	Select desired Solution Type	**▲▼ Momentarily**	To select: nonE, HCL, H2SO4, nACL (default), nAOH
	Save the Solution Type *continued*	**MODE Momentarily**	Selection for Solution Type

Step	Operation	Press	Display
6	Enter **Noise Suppression Frequency**	**MODE Momentarily**	**nSUP** (*for 1 second*) then, (*Noise Suppression Frequency Selection*)
	Edit Noise Suppression Frequency	**MODE Hold**	**Flashing Display – You are now in EDIT mode** (V*alue of current Frequency selection*)
	Select desired Frequency	**▲▼ Momentarily**	To select 50 Hz or 60 Hz (default)
	Save the Noise Suppression Frequency	**MODE Momentarily**	Selection for frequency
7	Enter **Output Configuration**	**MODE Momentarily**	**OutC** *Enter Output Calibration* *(Press **MODE** at anytime to return to **OutC**.*
	100% Range Value Selection	**▼ Momentarily**	**rnGH** (*for 1 second*) then, (*value of current 100 % Range Value Selection*)
	Edit 100 % Range Value Selection	**MODE Hold**	**Flashing Display – You are now in EDIT mode** V*alue of current100 % selection*)
	Select desired 100 % PV Value	**▲▼ Momentarily**	Selected 100 % PV Value in 0.50 increments Range: 0.00 to PV Max (*default 0.00*)
	Save the New 100 % Range Value	**MODE Momentarily**	(*New Value*)
8	0 % Range Value Selection	**▼ Momentarily**	**rnGL** (*for 1 second*) then, (*value of current 0% Range Value Selection*)
	Edit 0 % Range Value Selection	**MODE Hold**	**Flashing Display – You are now in EDIT mode** (*value of current 0 % selection*)
	Select 0 % PV Value	**▲▼ Momentarily**	Selected 0 % PV Value in 0.50 increments Range: 0.00 to PV Max (*default PV Max*)
	Save the New 0 % Range Value *continued*	**MODE Momentarily**	(*New Value*)

Step	Operation	Press	Display
9	100 % Calibration	▼ **Momentarily**	**AdJH**
	Adjust 100 % Calibration	**MODE Hold**	**AdJH (flashes) – You are now in EDIT mode** Range: 19.60 to 20.40 mA typically (*default 20.00 mA*)
		▲ ▼ **Momentarily**	**+AdJH** (increments value) –**AdJH** (decrements value)
	Save 100 % Calibration	**MODE Momentarily**	**AdJH**
10	0 % Calibration	▼ **Momentarily**	**AdJL**
	Adjust 0 % Calibration	**MODE Hold**	**AdJL (flashes) – You are now in EDIT mode** Range: 3.80 to 4.40 mA typically (*default 4.00 mA*)
		▲ ▼ **Momentarily**	**+AdJL** (increments value) –**AdJL** (decrements value)
	Save 0 % Calibration	**MODE Momentarily**	**AdJL**
11	Return to Online Display	**MODE Momentarily**	**Returns to Online Display**

4. Calibration

4.1 Calibration

Overview

Calibration consists of the following functions:

- **Cell Calibration Trim Value and Reset** – may be reset to the Factory Default of 1.000. *(go to Step 1)*
- **Cell Calibration** – can only be selected when online PV is displayed. *(go to Step 2)*
- **Temperature Calibration Offset Value and Reset** – may be reset to the Factory Default of 0.0. *(go to Step 3)*
- **Temperature Calibration** – can only be selected when online PV is displayed. *(go to Step 4)*

NOTE: ***Display returns to On-line PV after each step***

ATTENTION:

In Table 4-1, under the **Press** column:

- **Hold** means to hold the button down until the display changes.
- **Momentarily** means to press and release the indicated button.

Table 4-1 Calibration Procedure

Step	Operation	Press	Display
1	**Cell Calibration Trim Reset**	▲ **CCal Momentarily**	**Ctr (1 second)** Then "Cal Trim Value" i.e. 1.250
		▼ **Hold (10 seconds)**	Display will show "1.000". Cell Cal Trim is reset.
	continued	**MODE Momentarily**	Display will change to online PV.

Step	Operation	Press	Display
2	**Cell Calibration**	**▲CCal Hold (3 seconds)**	**CCAL** The display changes to a live solution PV value, so you can continue to monitor the sample.
		▲ or ▼	to edit the Solution PV value (0.000 to MaxPV). The displayed PV value **flashes** at the current value and increments or decrements by 0.001. The output is held at its current percent of range value. Press and hold ▲ or ▼ to increment or decrement by about 0.003/second
		MODE Momentarily	A new Cal Trim value is calculated. If successful, the display will change to online PV and the Output hold will terminate. If an error occurs, "FAIL" will display and return to online PV. The previous Cal Trim value will be retained. Refer to "Diagnostics" for error messages.
3	**Temperature Calibration Offset Reset** *continued*	**▼TCal Momentarily**	**tOFS (1 second)** Then "Temperature Offset Value" i.e. 0.5C or 0.9F
		▼ Hold (10 seconds)	Display will show "0.0". Temperature Offset is reset.
		MODE Momentarily	Display will change to online PV.

Step	Operation	Press	Display
4	**Temperature Calibration**	**▼TCal Hold (3 seconds)**	**tCAL** The display changes to a live temperature reading, so you can continue to monitor the sample.
		▲ or ▼	to edit the Displayed Temperature value. The displayed temperature value **flashes** at the current value and increments or decrements by 0. 1. The output is held at its current percent of range value. Press and hold ▲ or ▼ to increment or decrement by about 0.2/second
		MODE Momentarily	A new Temperature Offset value is calculated. If successful, the display will change to online PV and the Output hold will terminate. If an error occurs, "FAIL" will display and return to online PV. The previous Temperature Calibration Offset value will be retained. Refer to "Diagnostics" for error messages.

5. Operation

5.1 Displays

Overview

The DirectLine® DL423 displays the Online PV Type and Online Temperature. The table below describes these parameters. Table 5-2 is the Display Navigation Procedure.

Table 5-1 Online Parameter Descriptions

Parameter	Description
Online PV	The currently selected PV type determines the current online PV display. Measured PV is displayed with the highest decimal precision possible with four digits. PV measurement and display is updated every 500ms. The Conductivity and Resistivity displays are optionally solution temperature compensated to 25°C according to the currently selected solution type. The Concentration and TDS displays are always measured with solution compensation as determined by the current solution type. Range: 0.000 to 1999
Online Temperature	Measured temperature expressed with fixed tenths decimal precision. Temperature displayed in °C or °F (default = °C) The last selected units become the current units whenever this display is accessed. Range: −10.0 to 110.0 °C −14.0 to 230.0 °F

The default display and home position is the **Online PV** display. It appears when:

- The unit is powered up
- No button presses for 60 seconds
- The Mode button has been pressed during Cell or Temperature calibration
- The Mode button has been pressed during a configuration edit

The PV measurement and display is updated at a rate of 500 ms.

ATTENTION:

In Table 5-2, under the **Press** column:

- **Momentarily** means to press and release the indicated button.

Table 5-2 Display Navigation Procedure

Step	Operation	Press	Display
1	View **Online PV** value	**MODE Momentarily**	*(measured PV)*
2	View **Online Temperature**	**MODE Momentarily**	*(measured temperature in °C or °F)* Proceed to ***step 2A*** or ***step 3***.
2A	Toggle **Online Temperature** display units	**▲ or ▼ Momentarily**	*(measured temperature in °C or °F)* Proceed to ***step 3***.
3	Return to home position	**MODE Momentarily**	*(measured PV)*

5.2 Diagnostic Error Messages

When a diagnostic error or status condition occurs, the Online Display alternates between measured PV and a text message.

Table 5-3 Online Diagnostic Errors

What you see	What it is	What to do
CNFG	Configuration or Calibration data is defective.	Reset unit or cycle power. Second occurrence will show **FALt.**
FALt	Unit electronics are defective.	Replace electronics module.
These errors may occur when online PV or temperature is displayed.		
CELL	Cell is defective, wrong type, or not connected. The error forces the output to exceed burnout level, 21.8mA, but does not latch.	Check cell, cell type, and connection. When the source of the error is removed, the error will clear and the output will return to normal operation.
P HI	Measured PV is > PV Maximum	Bring process within limits
P LO	Measured PV is < PV Minimum	Bring process within limits
t HI	Measured temperature is > 110 °C	Bring process within limits
t LO	Measured temperature is < −10 °C	Bring process within limits

5.3 Unit Reset

Overview

Unit Reset initializes all of the DirectLine® Sensor's calibration and configuration data to factory default values with the exception of the Factory Temperature Calibration correction values, according to Table 5-4 Factory Default Values.

Procedure

- From the Online PV display, press and hold the ▲ **and** ▼ buttons simultaneously until "**rSEt**" appears on the display (**minimum of 10 seconds**).
- "**rSEt**" will remain on the display for about 8 seconds followed by the firmware version, the PV type, μS and the online conductivity value. The unit then returns to the Online PV display.

Table 5-4 Factory Default Values

Data	Default Values
Cell Trim	**0.000**
Temperature Trim	**0.0**
Cell Constant	**0.1**
Primary Variable Type	**MS/cm**
Cell Factor	**1.000**
TDS Factor	**1.000**
Solution Type	**HCl**
Noise Suppression Frequency Selection	**60 Hz**
Output Configuration – 0 % Range Value	**4.00mA**
Output Configuration – 100 % Range Value	**20.00mA**
Output Configuration – 0 % Calibration	**0.000**
Output Configuration – 100 % Calibration	**1999 mS/cm**

6. Spare Parts

Part Number	Description
51452682-003	DirectLine® DL423 Sensor Module (Replacement Module)
51452683-001	6m cordset
51452684-001	Field Wiring Connector supports customer supplied cable (4-6 mm OD)
51500768-004	Conductivity Connector for Remote Mounting
31086221	O-ring for Integral Conductivity Cell
51452706-001	Locking Screw for Conductivity Cell or Remote Conductivity Connector
51452655-001	Remote Mounting Kit for Wall, Pipe, or DIN Mounting

Cordset

The cordset connection is an M12 female type that can be purchased directly from Honeywell or from multiple vendors including:

Turck Industries

Part Number RKV4T-6/S618 for a 6 m cordset with a stainless coupling nut

Part Number RK4T-6/S618 for a 6 m cordset with a nickel plated coupling nut

Phoenix Contact

Part Number SAC-3P-5.0-PUR/M12FSSH Stainless for a 5m cordset with a stainless coupling nut

Part Number SAC-3P-5.0-PUR/M12FSSH for a 5m cordset with a nickel plated coupling nut

Field Wiring connector

The Field Wiring Connector is an all-plastic screw terminal M12 female type that can be purchased directly from Honeywell or from multiple vendors including:

Turck Industries

Part Number B8141-0 for a M12 field wiring connector that accommodates customer supplied cable.

Phoenix Contact

Part Number SACC-M12FS-4CON-PG7 for a M12 field wiring connector that accommodates customer supplied cable.

7. Appendix: CE Mark Applications

In situations where the PV display appears to fluctuate due to field wiring electrical noise, the noise may be reduced by making the additional ground connections as described in Figure 7-1.

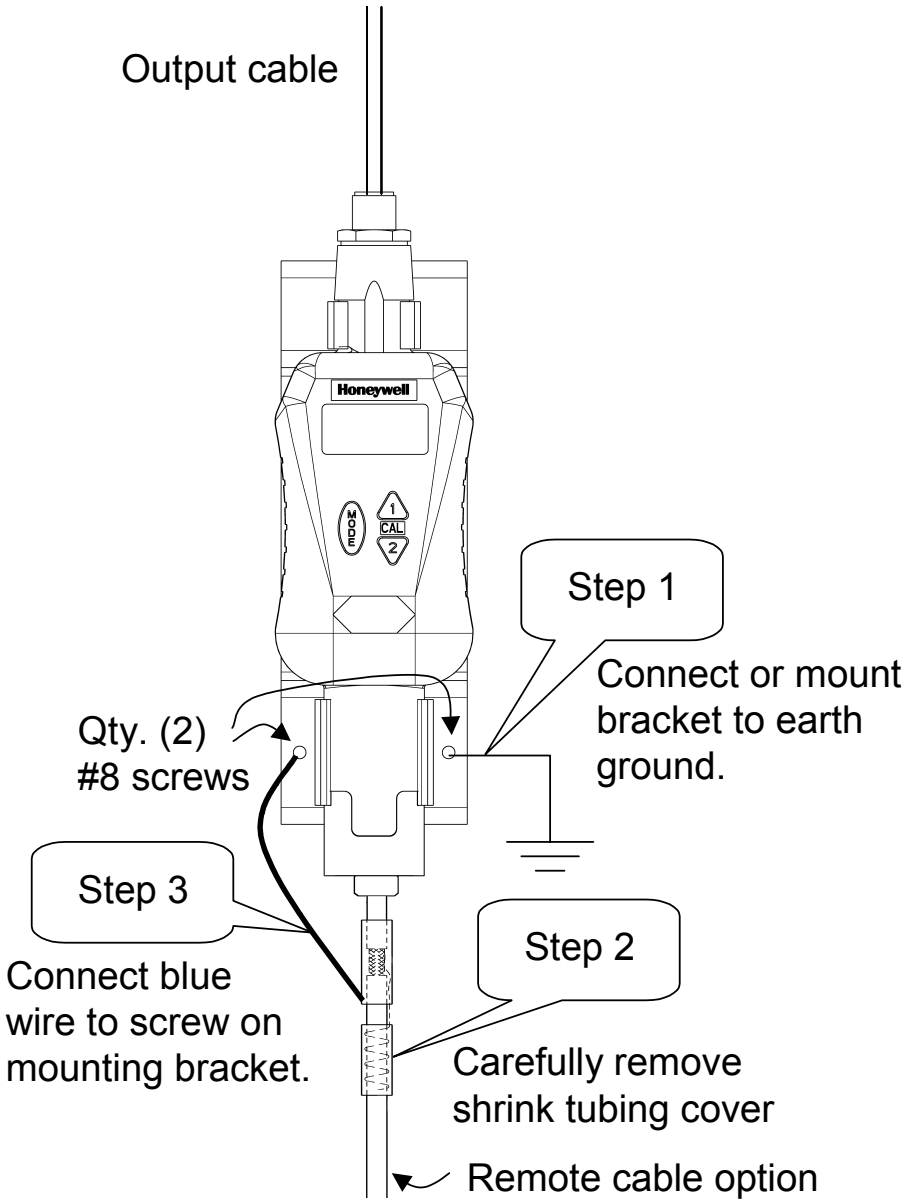


Figure 7-1 Wiring for CE Mark Applications

8. Sales and Service

For application assistance, current specifications, pricing, or name of the nearest Authorized Distributor, contact one of the offices below.

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