Oil / Water Monitors

Model 4528EZ Detector Card Calibration Guidelines

User Manual

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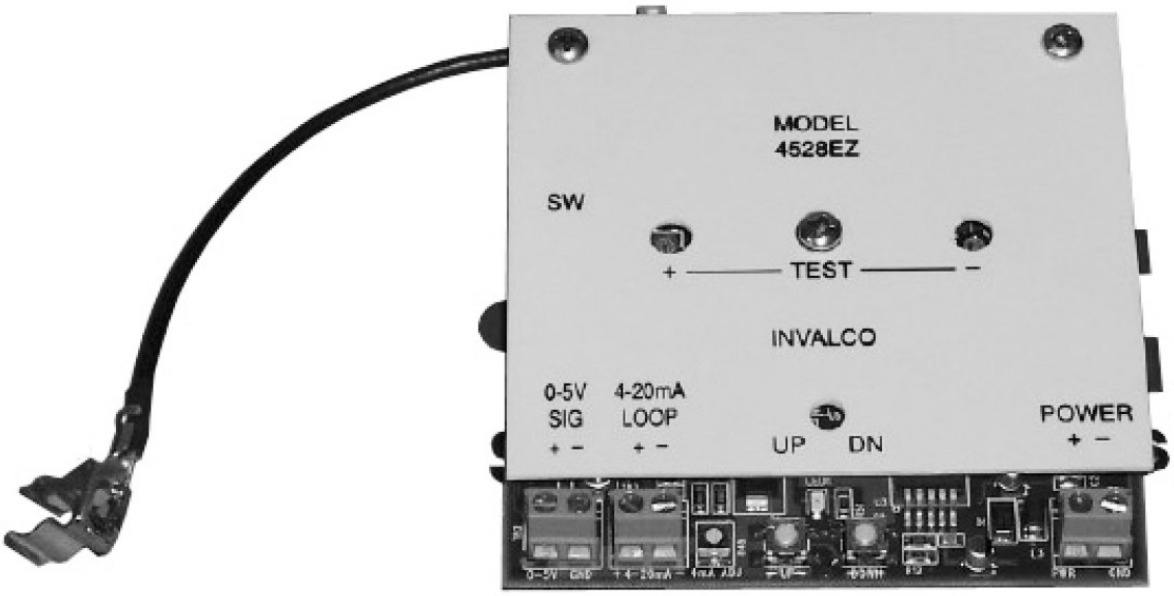

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Literature Library:
http://fmctechnologies.com/en/MeasurementSolutions/OnlineServices.aspx

Introduction

The INVALCO Model 4528 EZ Detector Card is a microprocessor based instrument. When used with an INVALCO Model CX-645 Capacitance Probe it is a continuous on line monitor and alarm of the percent BS&W in a flowing crude oil emulsion stream. When used in conjunction with an INVALCO Model 4728 BS&W Monitor, the user can obtain a real time visual indication of percent BS&W in a flowing crude oil stream.

Programming and Calibration

Note: *The 4528 will not allow entry into program mode if "Check Probe Wire", "Under Range", or "Over Range" conditions are being detected. This is to prevent the user from attempting to calibrate when the unit has detected that it cannot make proper measurements. If Low Dk or High Dk indications are present, that is fine. These only mean that the Dk is no within the present calibration, hence, the reason you may be changing the calibration.*

Starting Calibration

1. Make sure that the probe is full of oil, and that the 4528 is not indicating "Check Probe Wire", "Under Range" or "Over Range".

2. Hold down both the UP and DN buttons, and keep the buttons held down continuously approximately 5 seconds) until the LED turns on full, with no flashing.

3. Let go of the buttons, and the LED will stay on for another 3 to 5 seconds, and then go off. The LED will then change to a single quick flash every two seconds. This just tells you that it is in calibration mode, and not normal operating mode.

4. **Note:** Once in Calibration Mode, fail-safe is disabled.

5. Connect a voltmeter to the test jacks. The voltmeter will be reading somewhere between 0 and 5.1 volts.

6. Using the UP and DN keys set the CUT % that the wish to calibrate to. For example, if the cut is 2.0%, then set for a voltage reading of 2.0 V.

   Note: A special feature of the 4528 EZ is that it will "help" you move quickly to a new point, if it is completely outside the present range. For example, if the unit is displaying 0.0V, then pressing the DN key once will set the present Dk reading at "zero" and then you may use the UP key to set the actual value. The UP key works the same way at 5V. This saves you from pressing the key several times, if the calibration point is well above or well below the last range that the unit was set up to.

7. When the unit is set up with the CUT value that matches the calibration desired, then you are ready to leave the calibration mode.

8. To leave the calibration mode, perform the same operation that brought the unit into calibration: Hold both buttons for 3 to 5 seconds until the LED comes on full, then release the buttons. The LED will be on for an other 3 to 5 seconds, and then the unit will resume operation.

9. At this point, the 4528 has saved the calibration information into nonvolatile memory (memory which does not require power), and is available to automatically restore the calibration settings even if power is lost.

10. **Note:** If the user has begun a calibration, but realizes that they wish to keep the old settings, there are two options:

    a.) If the user has not changed anything with the UP or DN button, then, the calibration information will not have been changed. In this case, just leave the calibration mode as described in 8.

    b.) If the user has made changes, and wishes to stop the calibration, and revert to the old changes, leave the unit in calibration mode (single flash of the LED every two seconds) and simply momentarily shut off or remove power to the 4528. This will stop the unit from ever reaching the point (Step 9, above) where the memory has been modified. When the power is restored, the unit will read the previous settings from memory, and start up automatically with those settings.

4-20mA Zero and Span

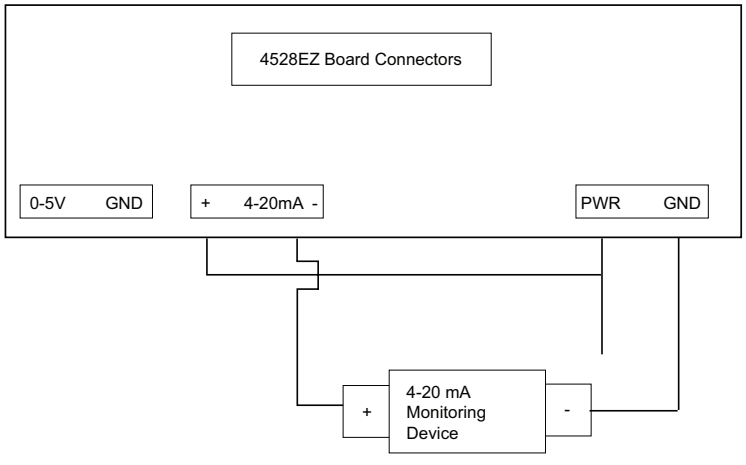
The optional 4-20mA section is made to track the 0-5V output directly, so that 0V = 4mA and 5V = 20mA. Fine adjustment of the 4mA point can be made with the “LOOP ZERO” pot at the lower edge of the board, adjacent to the +LOOP- connector.

The 4-20mA is completely separate from the 4528 detector. It is self powered from the loop. If loop power is not desired, then the user may connect to the 4528 input power connection, and loop through the 4-20mA load. The 4-20mA circuit does not care which side of the load it is connected to. However, the polarity of the + and - connections must be maintained. The loop may be operated at as low as 8 volts, if the load resistance is virtually zero (such as with a digital voltmeter). If a load resistor is used, then the loop voltage will need to be higher, per the table in the specifications. For best results, use a 24V loop supply when driving into a large resistor value.

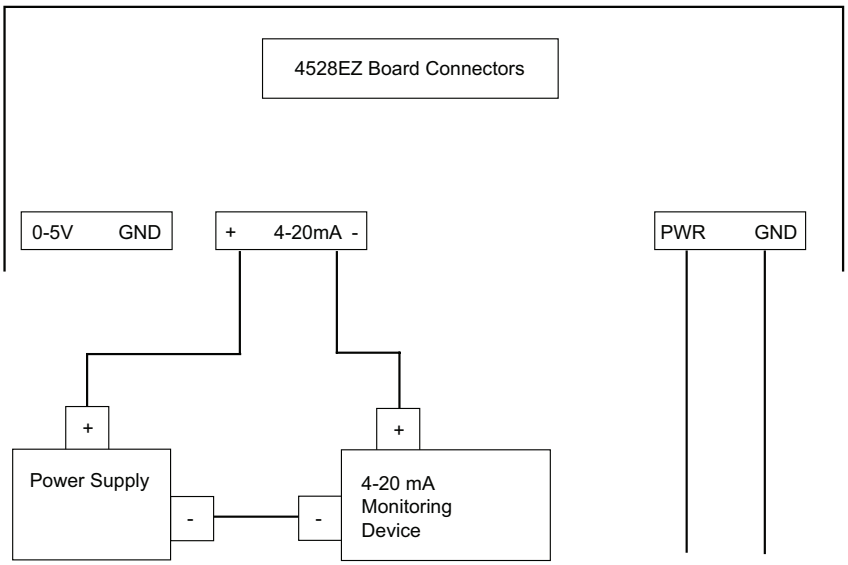
Electrical Connections for the 4-20mA Output

The 4528EZ’s 4-20mA output loop must be powered. This can be accomplished in one of two ways.

First method:
Attach a jumper wire from the 4528EZ terminal labeled “PWR” to the “+” terminal of 4-20mA connector. Next, connect the “-“ terminal of the 4-20mA connector to the positive terminal of the your 4-20mA monitoring device. Connect the minus terminal of your 4-20mA monitoring device to the 4528EZ terminal labeled “GND”. See figure below:



Second method:
Using a second power supply, attach the power supply positive terminal to the "+" terminal of 4528EZ 4-20mA output connector. Then connect the negative power supply terminal to the negative terminal of the 4-20mA monitoring device. Connect the positive terminal of the 4-20mA monitoring device to the "-" terminal of the 4528EZ 4-20mA output connector. See figure below:



Field Selection of Range

The 45228EZ allows you to select the range you need for your application. Follow these steps to select an operating range of 0-5%, 0-10% or 0-20%:

Step 1. Turn off power to the 4528EZ.

Step 2. Connect a DVM (Digital Volt Meter) to the red and black test jacks.

Step 3. Set switch number two to ON position.

Step 4. Reapply power to the 4528EZ.

Step 4A. Hold down both the UP and DN buttons, and keep the buttons held down continuously (approximately 5 sec onds) until the LED turns on full, with no flashing.

Step 4B. Let go of the buttons, and the LED will stay on for another 3 to 5 seconds, and then go off. The LED will then change to a single quick flash every two seconds. This just tells you that it is in calibration mode, and not normal operating mode.

Step 5. The 4528EZ comes from the factory in the 0-5% range. The DVM will come up displaying 0.5. Use the up/down keys to select the appropriate range. Here are the designations:

DVM reads 0.5 for 0-5% range.
DVM reads 1 for 0-10% range.
DVM reads 2 for 0-20% range.

Note: You must make your selection within the 5 seconds of powering up the 4258EZ. If you do not make a selection within 5 seconds the unit will revert to the last range selected.

Step 5A. To leave the Setup mode, perform the same operation that brought the unit into Setup mode: Hold both buttons for 3 to 5 seconds until the LED comes on full, then release the buttons. The LED will be on for an other 3 to 5 seconds, and then the unit will resume operation.

Step 6. Place switch number two back to the off position. The unit is now set for the new range.

Step 7. Go to calibration section and set unit to required water cut.

Troubleshooting the 4528EZ Detector Card

Check Probe Wire: Continuous Flashing of the LED

This means that the unit is detecting an extremely low capacitance value, which corresponds to an open or disconnected wire. The unit must detect this condition for approximately four seconds before the LED begins to indicate the problem, and fail-safe is invoked.

Under Range: LED flashes four times then off for two seconds, and repeats over and over.

This indicates that the unit perceives the probe connection is there, but the probe may be empty, partially empty, or full of fluid that is less than the 1.5 Dk minimum. The detection limit is set up at the capacitance value of a completely empty probe, up to where the probe is full, but Dk is <1.5. The unit must detect this condition for approximately four seconds before the LED begins to indicate the problem, and fail-safe is invoked.

Low Dk or Below Cal Point: LED flashes twice, is off for two seconds, and repeats over and over again.

This indicates that the probe capacitance (Dk) readings are within the range that the 4528 EZ can read, however, the Dk is below the 0% cut point, thus operating outside the range of the present calibration. The unit waits for a maximum of one second to detect this condition, set the LED and to invoke failsafe.

Normal Operation: No LED Operation.

If operating within the calibrated range of the unit, and the voltage output is somewhere between 0 and 5V, then there is no LED indication, and no fail-safe.

High Dk or Above Cal Point: LED flashes three times, is off for two seconds, and repeats over and over again.

This means that the probe capacitance (or Dk) readings are within the range that the 4528 EZ can read, however, the Dk is above the 5% cut point, (trying to output >5V) thus operating outside the range of the present calibration. The unit waits for a maximum of one second to detect this condition, set the LED and to invoke fail-safe.

Over Range: LED flashes six times, then off for one second, and repeats over and over.

This means that the unit perceives that the probe connection is there, but the Dk is too high, the cut is above 5%, the probe could be shorted (with salt water) etc. The unit must detect this condition for approximately four seconds before the LED begins to indicate the problem, and fail-safe is invoked.

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