TOROIDAL SMART SENSOR INSTRUCTION MANUAL

INTRODUCTION

Thank you for purchasing a Sensorex ITCS Toroidal Conductivity Sensor (FIG. 1). The Sensorex ITCS toroidal (inductive) conductivity sensors feature a wide measurement range and dependable toroidal technology over the range 0-2000 ms/cm. Resistant to corrosion, coatings and fouling common to contacting conductivity sensors, the ITCS3020 is designed for trouble free service life.

The ITCS offers the long life time feature of a toroidal conductivity sensor along with having a direct Modbus 485 or 4-20mA output. No transmitter required.

All ITCS sensor models are available with 10ft or 20ft long 4-conductor cable. Custom lengths are available.

The ITCS sensor offers easy calibration and configuration via the free software interface.
See link to instruction manual for the inteface software.

FIG. 1

SPECIFICATIONS

Measuring Range:	0-2,000,000 uS/cm
Body Material:	NORYL
Max Temperature:	80°C
Max Pressure:	100psig
Temperature Compensation:	PT1000 RTD
Cable Length:	4 Conductor 24AWG, Red = Power +, black = gnd, white = Modbus A and Green = Mdbus B
Process Connection:	3/4" MNPT
Power Requirement:	7-36VDC for Modbus 485 version 24VDC for 4-20mA version
Current Requirement:	5mA@7VDC, 3mA @13VDC, 1.5mA 224VDC, 1.1mA@36VDC

4-20mA maximum loop resistance: 650Ohms
4-20mA loop current accuracy: 32uA
4-20mA loop current resolution: 2uA
4-20mA defaults range: 4mA =0uS, 20mA = 100,000uS
Update rate: 0.5 Seconds
Conductivity Accuracy: 1% of reading or 5uS
Conductivity Resolution: 0.2uS for 0 to 2000uS , 2 uS for 2000uS to 100,000uS, 20 uS for >100,000uS

Products covered by this manual: iTCS3020 sensors,

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INSTALLATION

Your toroidal sensor can be installed in two ways:

1. Submersion Mount:

   Mount sensor into rigid or flexible conduit, using a 3/4" NPT coupling and attaching to the 3/4" NPT threads near the sensor's cable. Be sure to seal conduit to avoid fluid build-up in conduit.

2. In-Line Mount:

The iTCS sensor requires flow cell FC95C. This has 2" inlet and outlet with socket connection.

a. Plumb Flow Cell FC95 into line.

b. Remove the nut

b. Install your ITCS3020 sensor into the top of the FC95C so that the notch on the ITCS3020 flange aligns with the FC95C tab. See FIG 2

c. Make sure o-ring seal is in place.

c. Reinstall the nut hand tight. SEE FIG 3

WIRING

The probe has 4 wires. See FIG 4.

For Modbus 485 mode: Red = +24VDC, Blk = GND, White = Modbus A (+), Green = Modbus B (-)

For 4-20mA mode: Red = +24VDC, Blk = Signal (this is a 2-wire loop-powered 4-20mA output)

FIG. 2

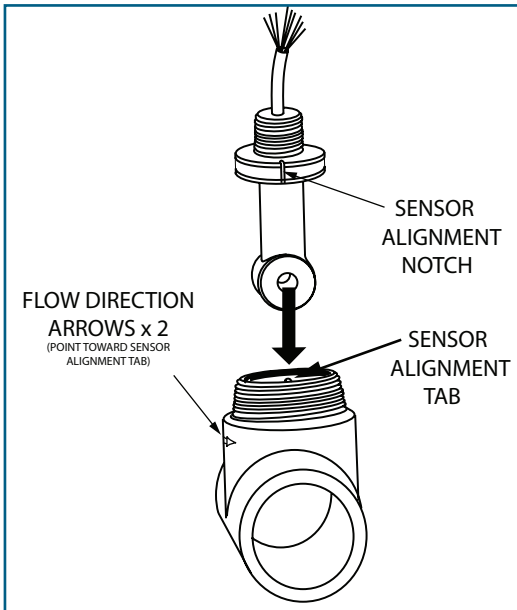


FIG. 3

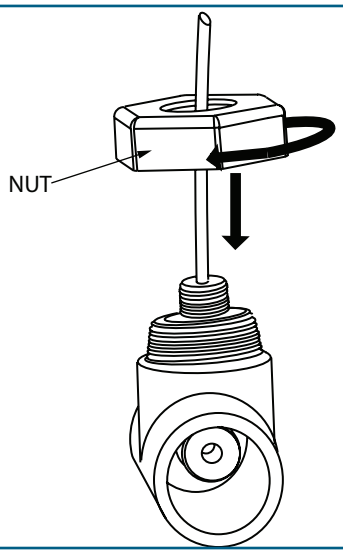
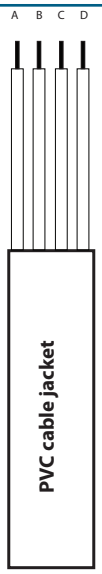


FIG. 4



Wire ID	Color	Function
A	Red	+24V DC
B	Black	GND
C	White	Modbus A (+)
D	Green	Modbus B (-)

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CALIBRATION

Calibration of the sensor must be done after installation and wiring. Use a "low" and a "high" known calibration standard solution. The "low" solution is often DI water or air, and is used to calibrate the zero point of the controller. Plotting these two points will create a straight line, which can be used to find the conductivity value of any solution in the range. See FIG 5.

Make sure probe is immersed in the calibration fluid with the toroids totally submerged.

If the sensor is to be used in a submersion application, calibrate the sensor in a large glass or plastic beaker with all sides of the sensor at least one inch away from the wall. See FIG 6. If the production installation is a pipe (plastic or metal), calibration should be performed in a similar pipe arrangement. All electrodeless (toroidal) sensors have a wall effect that must be taken into account during calibration.

If the non-conductive (plastic) wall is within one (1) inch of the sensor, the sensor's reading will be reduced due to the insulator interaction with the current path. If the sensor is within one (1) inch of a conductive (metal) wall, the sensor's reading will be increased due to the shorting effect of the conducting wall. These wall effects can be calibrated out of the system by simulating the application's mounting configuration. A plot showing the effects of insulating and conducting walls on the output can be seen in FIG 7.

During calibration and production installation (especially in a submersion environment), it is important to dislodge any air bubbles and pay special attention to the center hole of the toroids. Ensure that toroids are totally covered with fluid when calibrating. See FIG 6.

FIG. 5

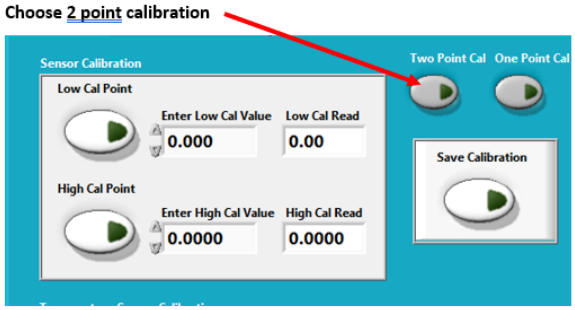


FIG. 6

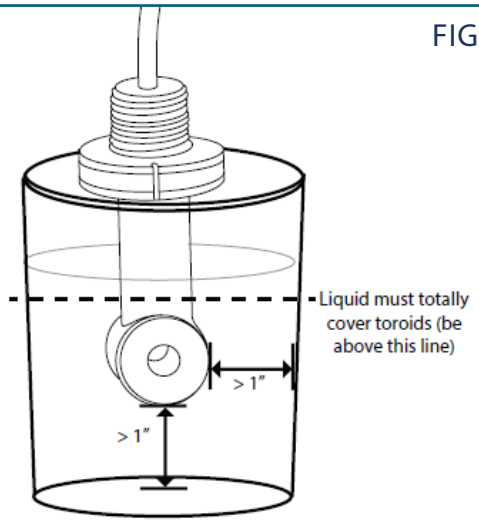
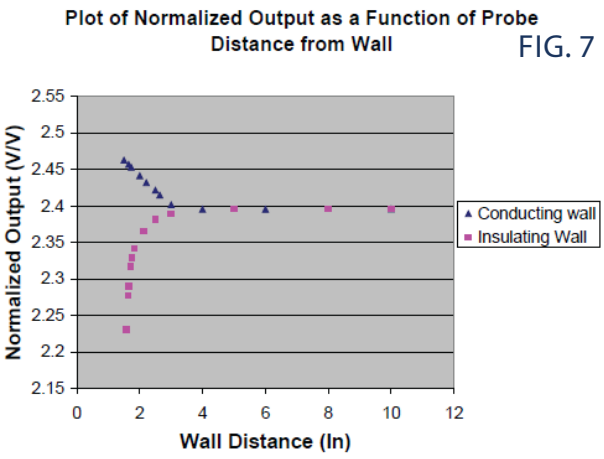


FIG. 7



DESIGNED IN CALIFORNIA, USA
ASSEMBLED IN CALIFORNIA AND CZECH REPUBLIC
11751 MARKON DRIVE • GARDEN GROVE, CA 92841 • 714.895.4344 • WWW.SENSOREX.COM

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MAINTENANCE

The major advantage of the Electrodeless (Toroidal) Sensor is its ability to operate with minimal maintenance. The only maintenance actions required during the normal operational life of the sensor are those aimed at preventing the toroidal opening from being plugged with debris. Use a soft brush or rag to remove any debris in the core opening. If that does not work, try a mild detergent or weak acid (5 - 10% HCl).

TROUBLESHOOTING

Make sure your sensor is communicating. The best way is to used the free Sensorex software interface. Use the setup tab to establish communication. See FIG 8. If the sensor is not communicating see the software manual for troubleshooting suggestions. If communicating, calibrate the sensor at 2-points then make measurements of your fluid. See FIG 9.

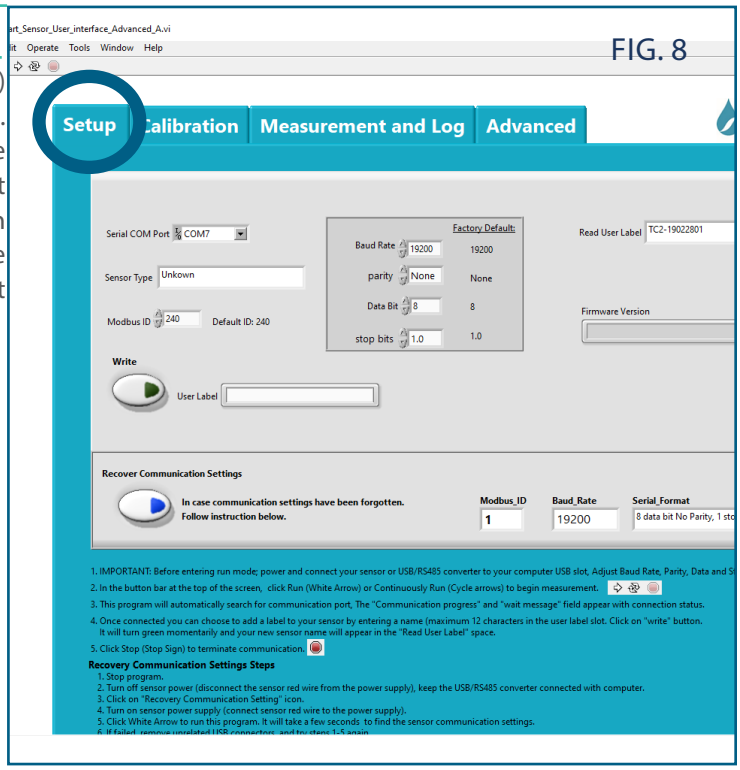

FIG. 8

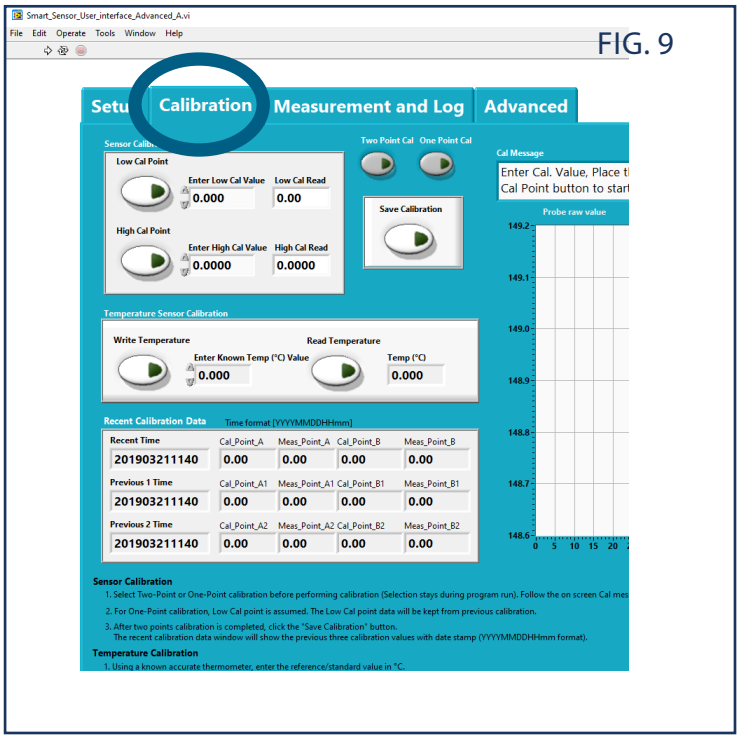

FIG. 9

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