Model 670K9

SORtrax 4-20mA RF Continuous Level Transmitter

General Instructions

SORtrax is a 4-20 mA continuous level transmitter. It produces a 4-20mA current superimposed on the 24 volt loop supply lines. The 4-20mA current is proportional to the level sensed by the instrument.

SORtrax detects level based on process admittance. Bench or field calibration is easily accomplished. Coarse and fine adjustments are provided to allow the user full control over the zero and span settings, and to insure the most accurate operation possible. Recalibration is needed each time the content of the process changes, due to the different dielectric constant of each material.

NOTE: If you suspect that a product is defective, contact the factory or the SOR® Representative in your area for a return authorization number (RMA). This product should only be installed by trained and competent personnel.

Probe Installation

Probes are mounted vertically from the top of a vessel. The probe must be electrically isolated from the vessel; make no connection between the probe and the vessel other than the process connection and (if applicable) the threaded weight at the probe tip.

Do not weld any part of this instrument.

Make sure that the sensor can be fully inserted and tightened without interference from obstructions inside the tank or vessel. The probe should be mounted away from inlet fill paths. Spray from a fill path may cause false level indications.

Design and specifications are subject to change without notice.

For latest revision, go to ***www.sorfinc.net***

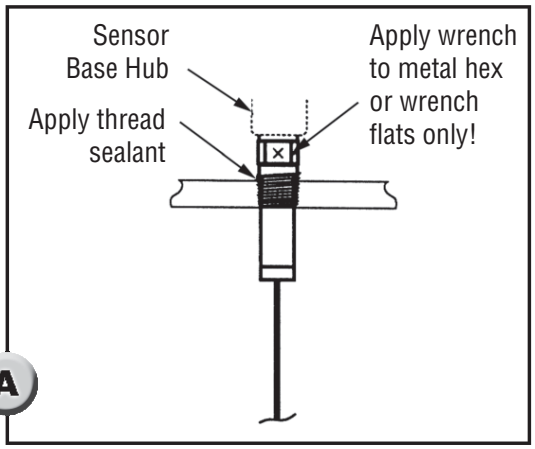
Table of Contents

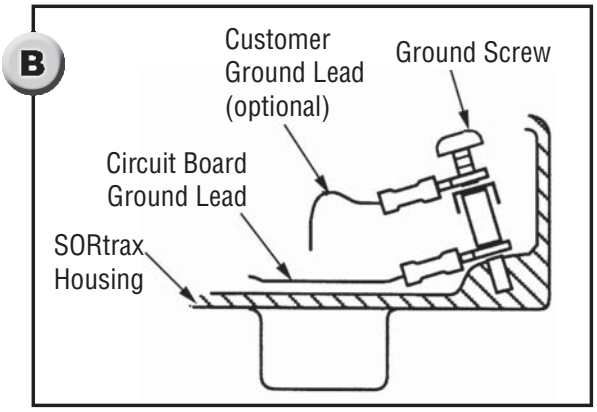
For pressurized vessels, seal the flanged or threaded process connection to prevent leakage.

Do not use the sensor base as a handle to tighten the process connection.

Use suitable mounting bolts to mount a flanged probe on a flanged process connection.

Proper grounding is imperative for correct operation of the unit.



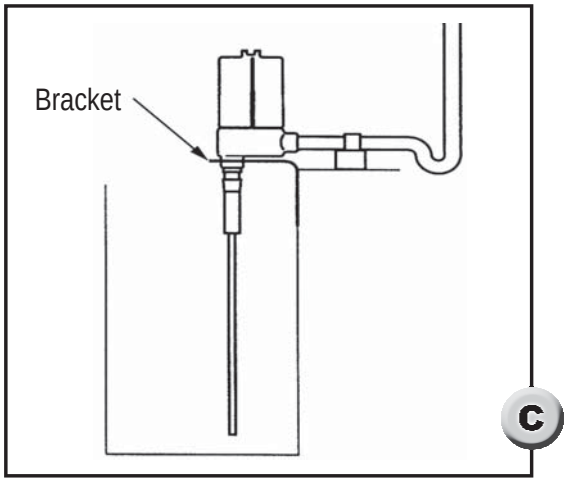


The unit can be grounded two ways. If the tank is metallic, grounding is provided by the tank. If the tank is not metallic, or does not adequately make contact with the sensor, a separate ground wire must be provided by the customer. Run ground wiring through the conduit and into the electronics housing. Attach the ground wire per B.

Open Sump or Basin

Do not suspend the unit by rigid conduit installed in the electrical hub. When installing the unit over an open sump or basin, use a suitable bracket to support the instrument.

Condensation build-up inside the electronics housing may damage the sensitive circuitry. To prevent the ingress of moisture, use drip loops or conduit runs which slope down from the enclosure. (See C)



Electrical Connection

Ensure that wiring conforms to all applicable local and national electrical codes and install unit(s) according to relevant national and local safety codes.

Electrical power must be disconnected from explosion proof models before the cover is removed. Failure to do so could result in severe personal injury or substantial property damage.

This product must be installed with an explosion proof breather vent per agency requirements and the Nationsl Electric Code - Article 501, Section F, paragraph 3.

Use 18 - 22 AWG shielded twisted pair wire to make all signal and power connections. Ensure that wiring conforms to all applicable local and national electrical codes and install unit(s) according to relevant national and local safety codes.

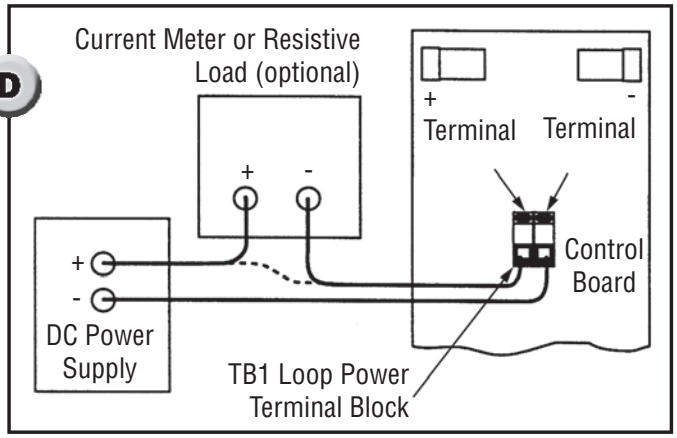
❶ Make sure the power source is turned off.

❷ Remove the housing cover.

❸ Pull power and signal wire through the conduit connection and into the control housing.

❹ Locate TB1 on the control board. (See D) Terminals are labeled "+" and "-". Connect power leads to the proper terminals.

D

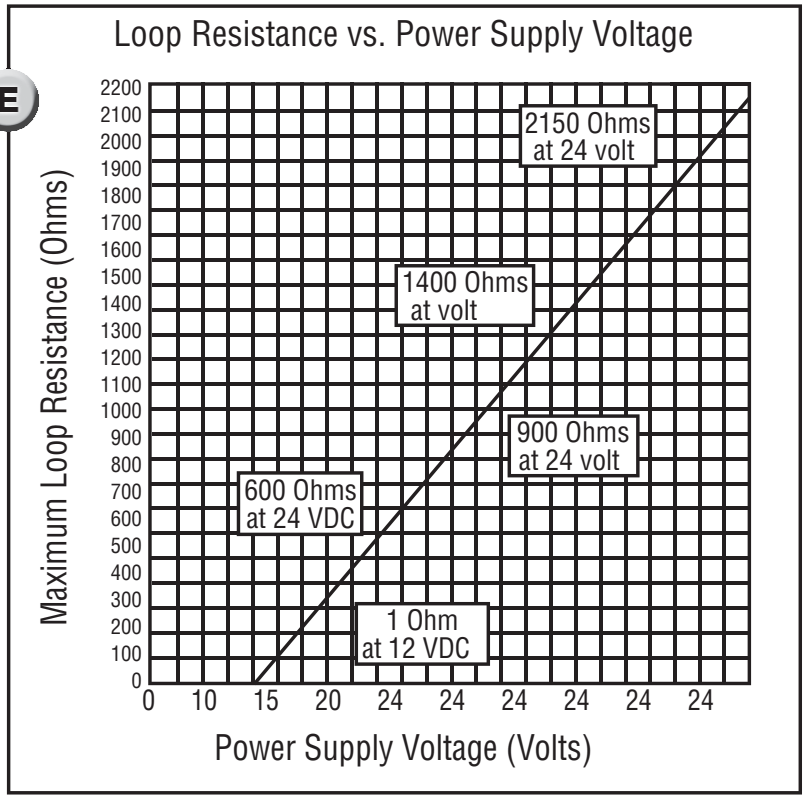


❺ Do not exceed the maximum loop resistance for the circuit. (See E)
Use the following formula to determine the maximum loop resistance of your circuit:

R (ohms) = (input voltage - 12) ÷ 20.0 mA

NOTE: Refer to the individual device specifications of user-supplied equipment to determine the resistive load (in ohms) and the power requirements.

E



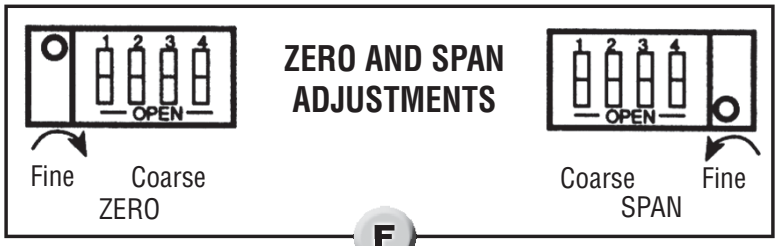
Empty and FIll Calibration

Electrical power must be disconnected from explosion proof models before the cover is removed. Failure to do so could result in severe personal injury or substantial property damage.

Electrical power must be disconnected from explosion proof models before the cover is removed. Failure to do so could result in severe personal injury or substantial property damage.

❶ Install and connect power to the unit per previous pages. Install a current meter to the unit per (D).

❷ Turn both potentiometers (fine adjustments for ZERO and SPAN) fully counterclockwise. (See (F))



F

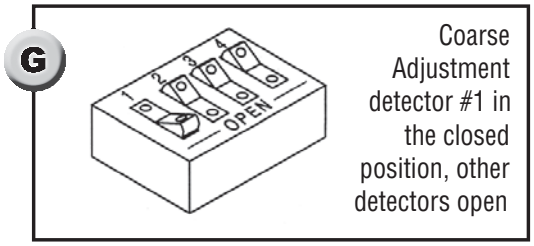
Zero Adjustment (4 mA)

❸ Close detector #1 on coarse adjustment detectors for ZERO and SPAN. (See (G))

❹ Open detectors #2, #3, and #4 on both coarse adjustment detectors per (G).

❺ With the tank at 0%, view the reading on the current meter. If the output is less than 4 mA, turn the fine ZERO adjustment clockwise until 4 mA is reached.

NOTE: Only one ZERO detector may be fin the closed position at any time.



❻ If the output is greater than 4 mA, close the other detectors one at a time (opening the previous detector) until a reading less than 4 mA is attained. Turn the fine ZERO adjustment clockwise until 4 mA is reached.

NOTE: If 4 mA cannot be obtained, see the troubleshooting chart on page 14.

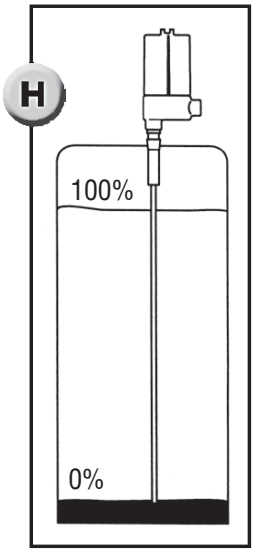
Span Adjustment (20 mA)

❼ Set the process to desired high level. (See (H))

❽ Ensure SPAN coarse adjust detector #1 is in the closed position, with all other detectors open.

❾ Rotate the SPAN fine adjustment pot clockwise until the meter indicates 20 mA If a 20 mA reading cannot be obtained, proceed to step 10.

❿ Open SPAN detector #1 (coarse) and close SPAN detector #2. Repeat step 9. If a 20 mA reading cannot be obtained, repeat the procedure closing detector #3 or #4 until 20 mA is indicated.



Bench Calibration

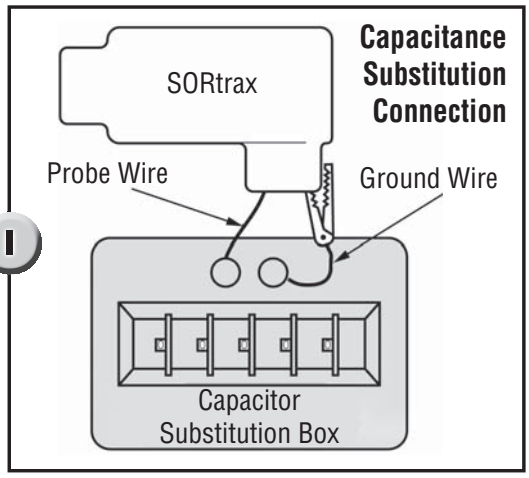
Electrical power must be disconnected from explosion proof models before the cover is removed. Failure to do so could result in severe personal injury or substantial property damage.

❶ Remove the sensor. (Unscrew the sensor from the housing. Disconnect the ring terminal or banana plug from the sensor end.)

❷ Connect power and a current meter to the unit per (D). Connect a capacitor substitution box (available from SOR) to the circuit to simulate the probe. Connect the probe lead to one terminal of the capacitor substitution box, and connect the other terminal of the box to the control housing. (See (I)) Use short connection wires to eliminate any stray capacitance which may affect the calibration.

❸ Set the capacitance box to desired zero level capacitance.

❹ Rotate ZERO and SPAN fine adjustment potentiometers (pots) at least 22 turns counter-clockwise.



(I)

Zero Adjustment (4 mA)

❺ Close ZERO detector #1 and SPAN detector #1. (See (F)) Open all other detectors per (G).

❻ View the reading on the current meter. If the output is less than 4 mA, turn the fine ZERO adjustment clockwise until 4 mA is reached.

NOTE: Only one ZERO detector may be fin the closed posfitfion at any tfime.

❼ If the output is greater than 4 mA, (opening the previous detector) close each coarse adjustment detector, one at a time, until a reading less than 4 mA is reached. Turn the fine ZERO adjustment clockwise until 4 mA is reached.

NOTE: If 4 mA cannot be obtained, please see the trouble shooting chart on page 14.

Span Adjustment (20 mA)

❽ Set the capacitance box to the desired maximum capacitance value.

❾ Ensure SPAN coarse adjust detector #1 is in the closed position, with all other detectors open.

❿ Rotate the SPAN fine adjustment pot clockwise until the meter indicates 20 mA. If a 20 mA reading cannot be obtained, proceed to step 11.

⓫ Open SPAN detector #1 (coarse) and close SPAN detector #2. Repeat step 10. If a 20 mA reading cannot be obtained, repeat the procedure closing detector #3 or #4 until 20 mA is indicated.

NOTE: Only one SPAN detector may be fin the closed posfitfion at any tfime.
NOTE: If 20 mA cannot be obtained, please see the troubleshooting chart on page 14.

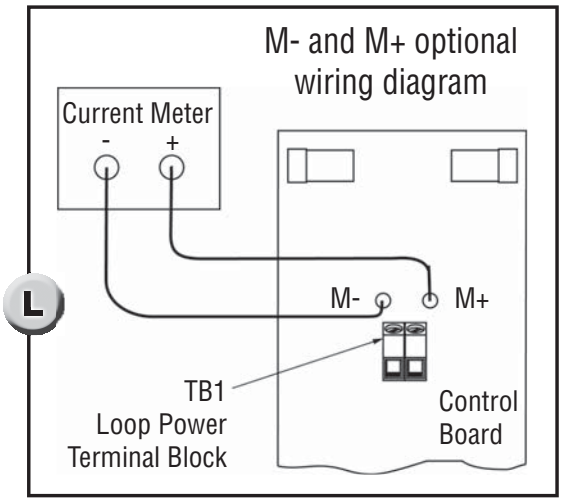
If the zero setting is changed, the span will change, and the unit must be recalibrated.

Blind Calibration

Electrical power must be disconnected from explosion proof models before the cover is removed. Failure to do so could result in severe personal injury or substantial property damage.

Use this calibration method when it is not possible to raise or lower the level of the process in the vessel or tank. Do not permanently install the unit until after setting the ZERO (4 mA) point.

Use the wiring configuration in (L) when the loop cannot be conveniently opened for current monitoring. Attach a current meter as shown.



❶ Turn both potentiometers (fine adjustments for ZERO and SPAN) fully counterclockwise. (See (F))

Zero Adjustment (4 mA)

❷ Close detector #1 on coarse adjustment detectors for ZERO and SPAN. (See (G))

❸ Open detectors #2, #3, and #4 on both coarse adjustment detectors per (G).

❹ With the end of the probe just touching the process, view the output. If the output is less than 4 mA, turn the fine ZERO adjustment clockwise until 4 mA is reached.

NOTE: Only one ZERO detector may be fin the closed posfitfion at any tfime.

❺ If the output is more than 4 mA, (opening the previous detector) close each coarse adjustment detector individually until a reading less than 4 mA is attained. Turn the fine ZERO adjustment clock-wise until 4 mA is reached.

NOTE: If 4 mA cannot be obtained, see the troubleshooting chart on page 14.

Span Adjustment (20 mA)

❻ Calibrate for span by determining the present level in the tank, and setting the span proportionally. For best results, the level should be at 50% or greater.

❼ Determine the level present in the tank. Complete the unit installation, except for the housing cover.

❽ Calculate the expected current output using the following formula: 20mA x (% of tank fill) 20mA = output.

❾ For example: Tank level is at 50%, set SPAN coarse and fine for 20mA reading (16mA x 50% + 4mA, If the material level is at 90%, set the span adjustment for 18.4 mA (16mA x 90% + 4mA, The 100% fill level should be verified at the earliest opportunity.

If the zero setting is changed, the span will change, and the unit must be recalibrated.

Probe and Transmitter Performance Verification

Probe Check Remove the transmitter from the probe. With no process on the probe, check the resistance from the probe to ground. Resistance less than 1MΩ indicates leakage in the probe. With process touching the probe, check the resistance from the probe to ground. Resistance of 100KΩ or less in the case of a bare probe with conductive material indicates that an insulated probe is required. In any other case, a defect in the probe is indicated.

Transmitter Drift Check If the output of the transmitter is drifting, it is important to verify if the drift is due to the probe or the transmitter. If the probe is connected and installed properly, it will not drift.

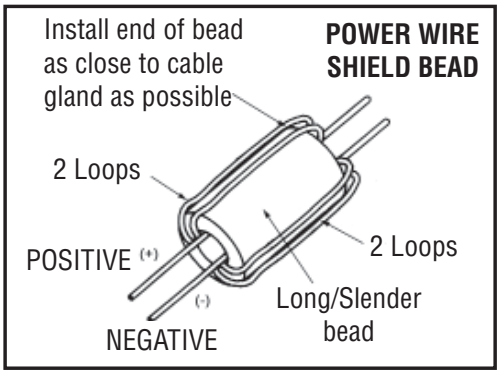
Remove the probe from the transmitter. Without touching the calibration settings, connect a capacitance across the probe to ground input. See Figure 9 on page 5. Change the capacitance until the transmitter output is 4.00 mA. Observe the zero point reading for twenty four hours. If the reading is stable, then the probe or the application is the source of the drift.

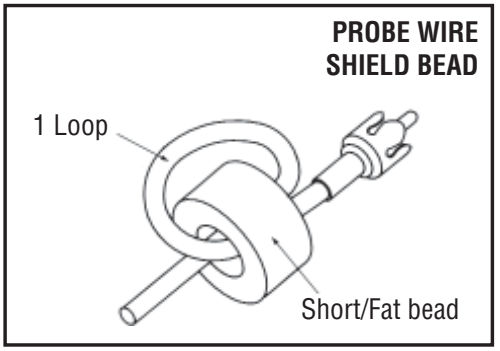
CE Mark Installation

When subjected to an RF interference, the 670K9 will maintain the +/-1% accuracy in all frequency ranges with the following exception:

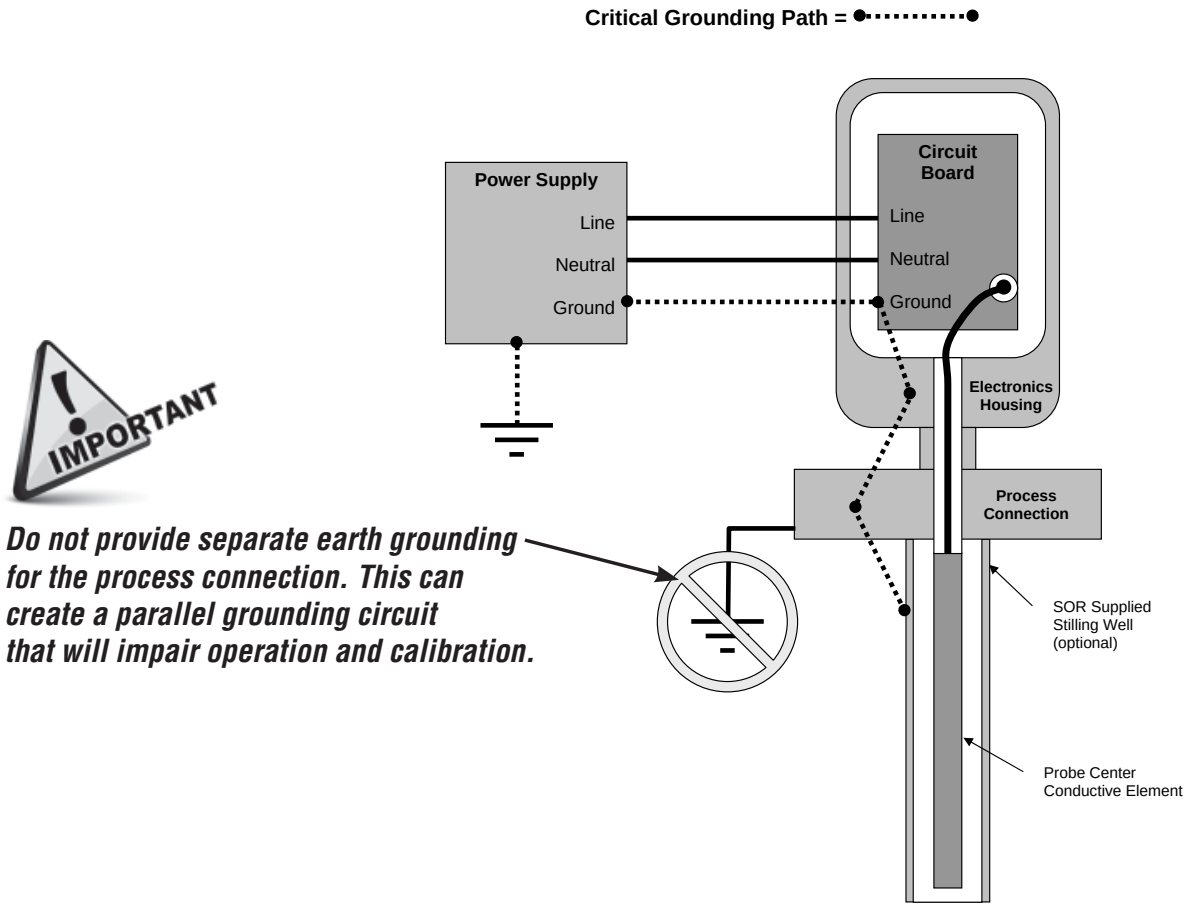
The unit is susceptible to a conducted RF interference in the range of 31-40MHz, reducing the accuracy to +/-1.3%. The +/-1% accuracy is maintained above and below this range.

In order to achieve the stated accuracy for 670K9, a shielded cable, cable gland, shield beads, and the probe should be mounted in a metallic vessel. SOR recommends using a shielded cable made of PVC insulation around a tinned copper braid shield (Olflex CY cable or equivalent). Refer to illustrations for installation of shield beads.

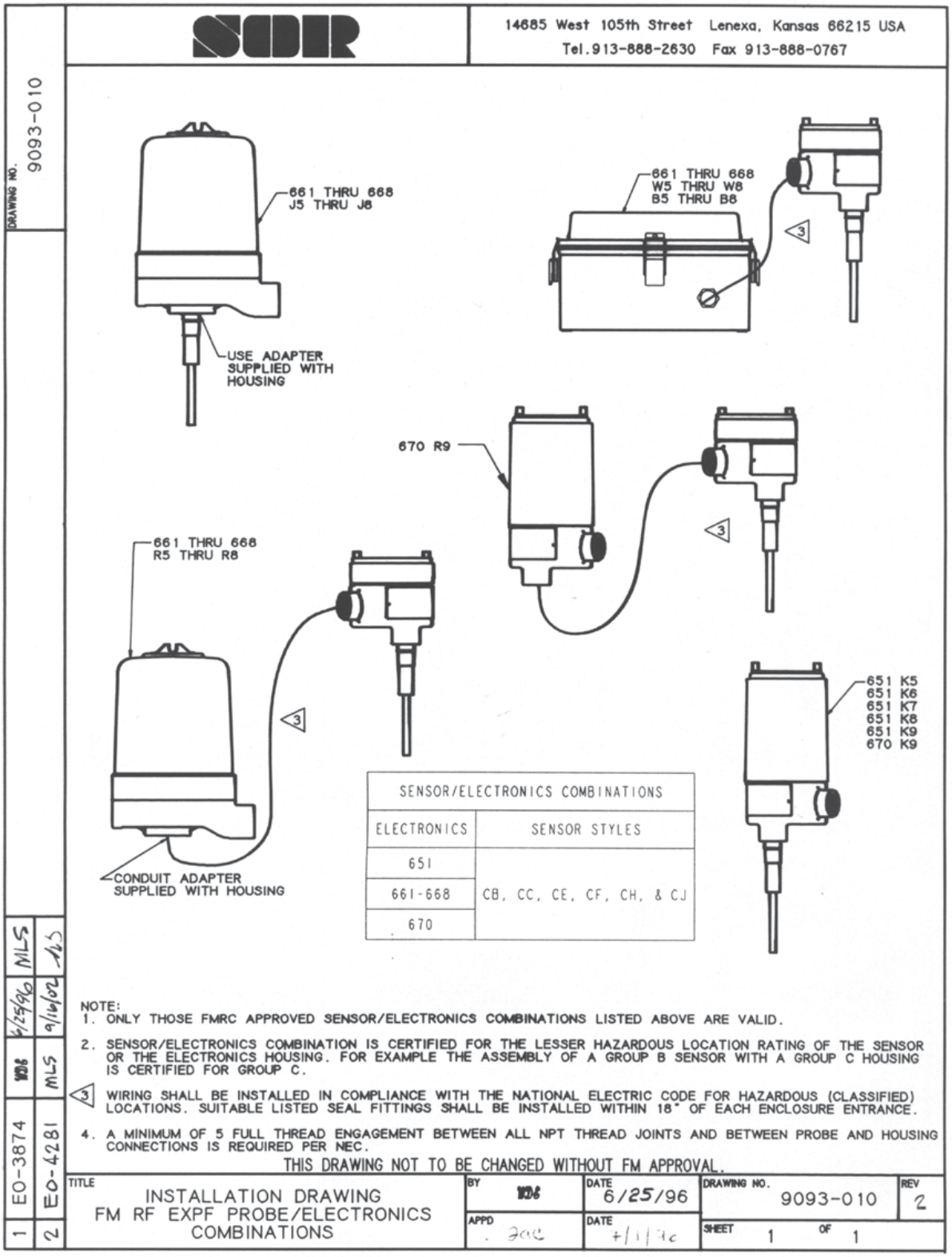




SOR RF Probe Grounding Scheme



Control Drawing

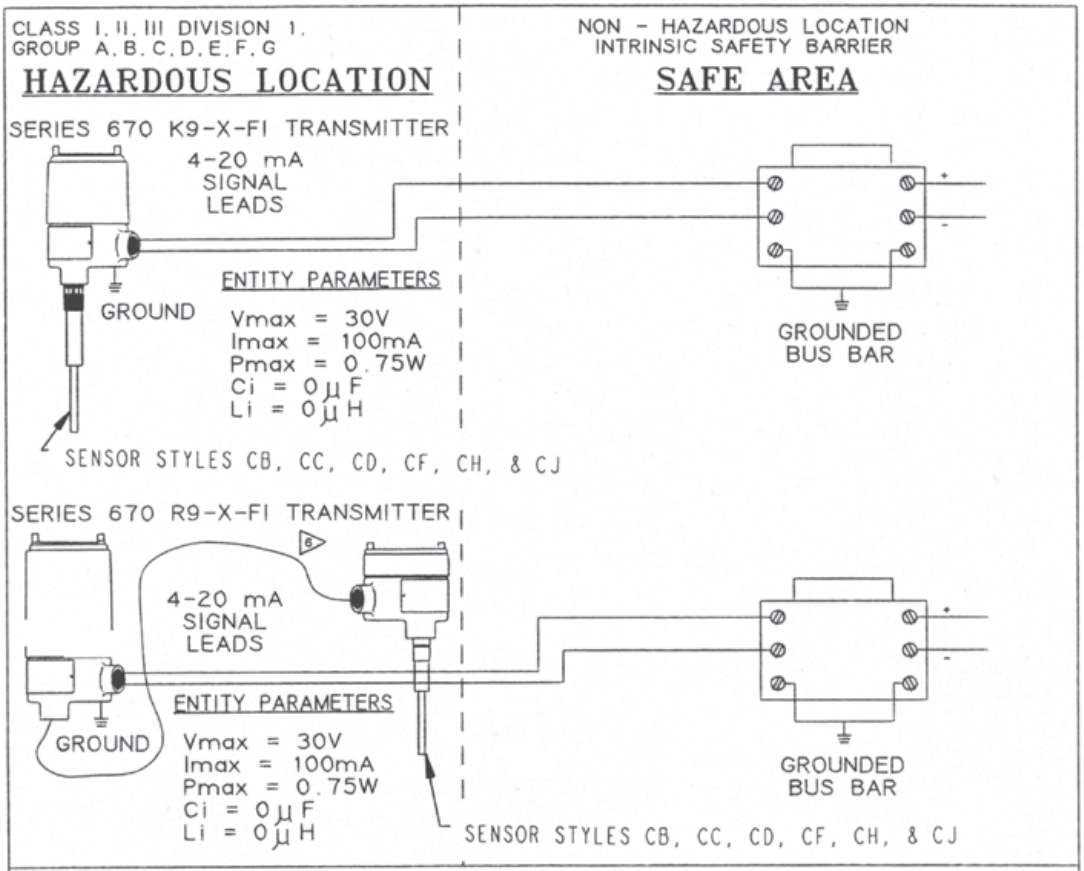


SOR
14685 West 105th Street Lenexa, Kansas 66215 USA
Tel. 913-888-2630 Fax 913-888-0767

DRAWING NO. 9093-013

SERIES 670 TRANSMITTER
FM APPROVED

INTRINSICALLY SAFE (ENTITY)



1. BARRIERS MUST BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS.
2. BARRIER PARAMETERS MUST MEET THE FOLLOWING REQUIREMENTS:
   Voc ≤ Vmax Ca ≥ Ci + CCable
   Isc ≤ Imax La ≥ Li + LCable
3. MAXIMUM NON-HAZARDOUS AREA VOLTAGE MUST NOT EXCEED 250 V.
4. INSTALL IN ACCORDANCE WITH THE NEC (NFPA 70) AND ANSI/ISA RP12.6
5. FOR INTRINSICALLY SAFE CLASS II AND III, DIV 1, GP E, F AND G INSTALLATIONS WHERE CONDUIT IS NOT USED. INSTALL CABLE GLAND FITTING WHICH IS LISTED FOR CLASS II AND III HAZARDOUS (CLASSIFIED) LOCATIONS.

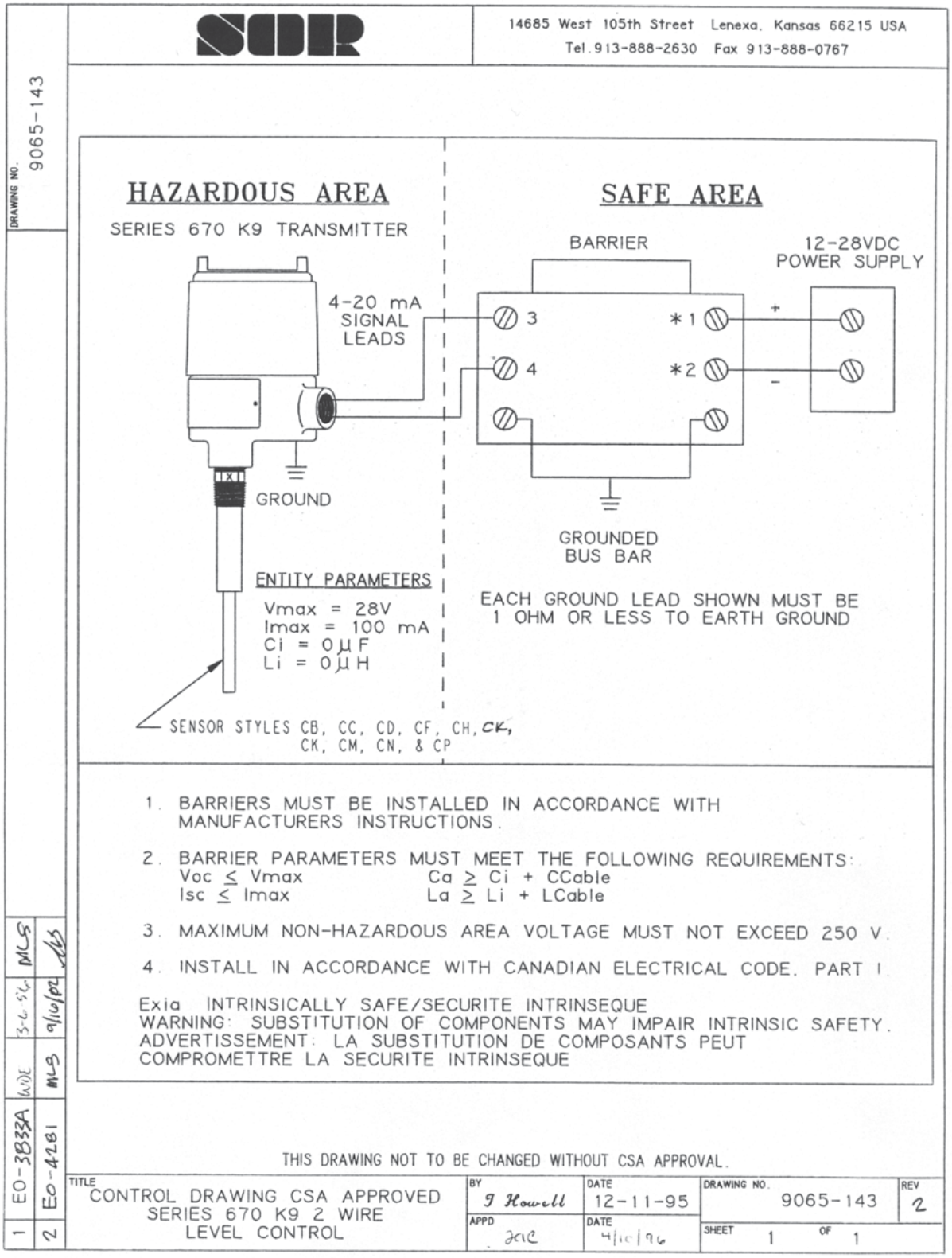
6 MAXIMUM CABLE LENGTH FOR REMOTE PROBE IS 10 FEET.

THIS DRAWING NOT TO BE CHANGED WITHOUT FM APPROVAL.

1	EO-3833A	WDE	3-6-96	MLS	
2	EO-4281	MLS	9/16/96		

TITLE	BY	DATE	DRAWING NO.	REV
CONTROL DRAWING FM APPROVED SERIES 670 K9 2 WIRE RF CONTINUOUS LEVEL CONTROL	WDE	3/6/96	9093-013	2
	APPD jac	DATE 5/1196	SHEET 1 OF 1	

Control Drawing

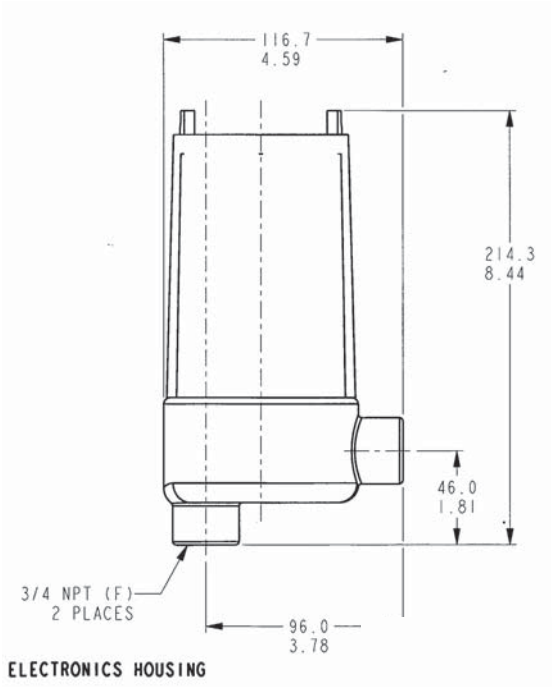


Troubleshooting

Symptom/Problem	Possible Cause	Corrective Action
Not current in the loop	1. Power supply turned off 2. Improper wiring at TB1 3. Excessive loop resistance	1. Check power supply 2. Check electrical connections, figure 4 3. Reduce loop resistance or adjust power supply
Zero point cannot be set to 4.00mA at low level	1. Fine zero incorrect 2. Probe capacitance greater than 500pF when coarse ZERO detector #4 is closed (all other detectors open)	1. Check calibration 2. Use smaller diameter probe or replace bare probe w/insulated probe or locate probe farther from the vessel wall or consult the factory
Span point cannot be increased to 20mA at high level	1. Insufficient probe capacitance 2. Excessive loop resistance 3. Incorrect calibration	1. Increase probe diameter or use probe w/higher dielectric insulation or locate probe closer to vessel wall or install a stilling well or consult the factory 2. Reduce loop resistance or adjust power supply 3. Check calibration
Span point cannot be decreased to 20mA at high level	1. Low probe resistance to ground 2. Probe capacitance greater than 2,000pF	1. Consult the factory 2. Use a smaller diameter probe or replace bare probe w/insulated probe or locate the probe farther from the vessel wall
Transmitter output is 20mA or greater when the vessel is not full	1. Incorrect calibration 2. Probe shorted to ground 3. Material build-up on probe	1. Recalibrate 2. Replace the probe 3. Clean probe and replace or possible misapplication, consult the factory
Erratic transmitter output	1. Turbulent process 2. Radio frequency interference 3. Probe moving within the vessel	1. Install a stilling well 2. Install RFI/EMI filters 3. Improve probe anchoring
Drifting transmitter output	1. Process material properties are changing 2. Probe insulation is eroded 3. Transmitter malfunction	1. Consult the factory 2. Verify probe integrity 3. Consult the factory
Non-linear output	1. Extreme material build-up 2. Non-parallel surfaces near the probe 3. Conducting liquid in an ungrounded vessel, eg: fiberglass tank	1. Consult the factory 2. Mount the probe in a better location or install a stilling well, or install a probe with a ground rod 3. Connect to earth ground to instrument ground

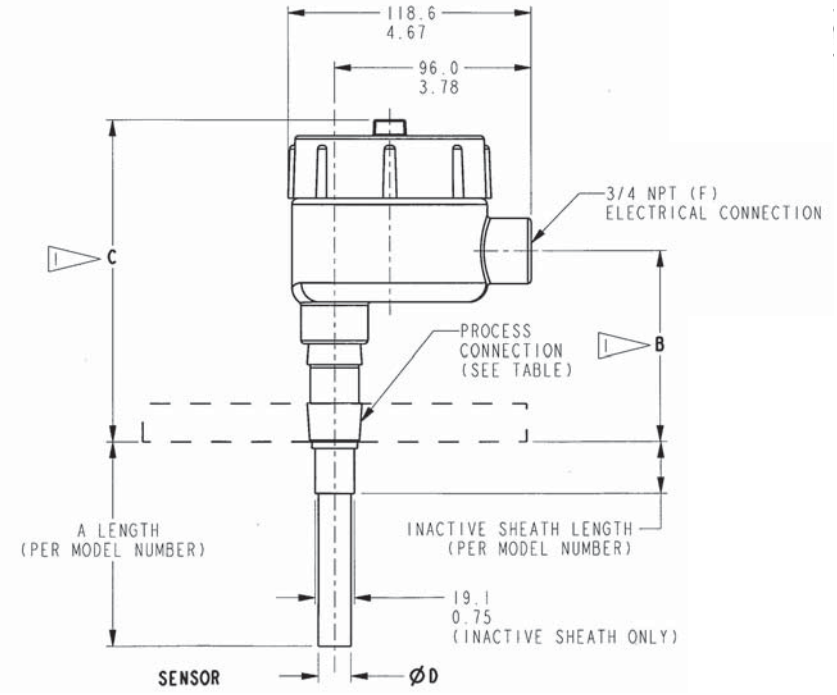
Dimensions

R Housing Configuration (Explosion Proof Remote)



Dimensions are for reference only. Contact the factory for certified drawings for a particular model number.

NOTES:
1. THESE DIMENSIONS ARE BASED UPON A 5 THREAD ENGAGEMENT.



Linear = mm/inches

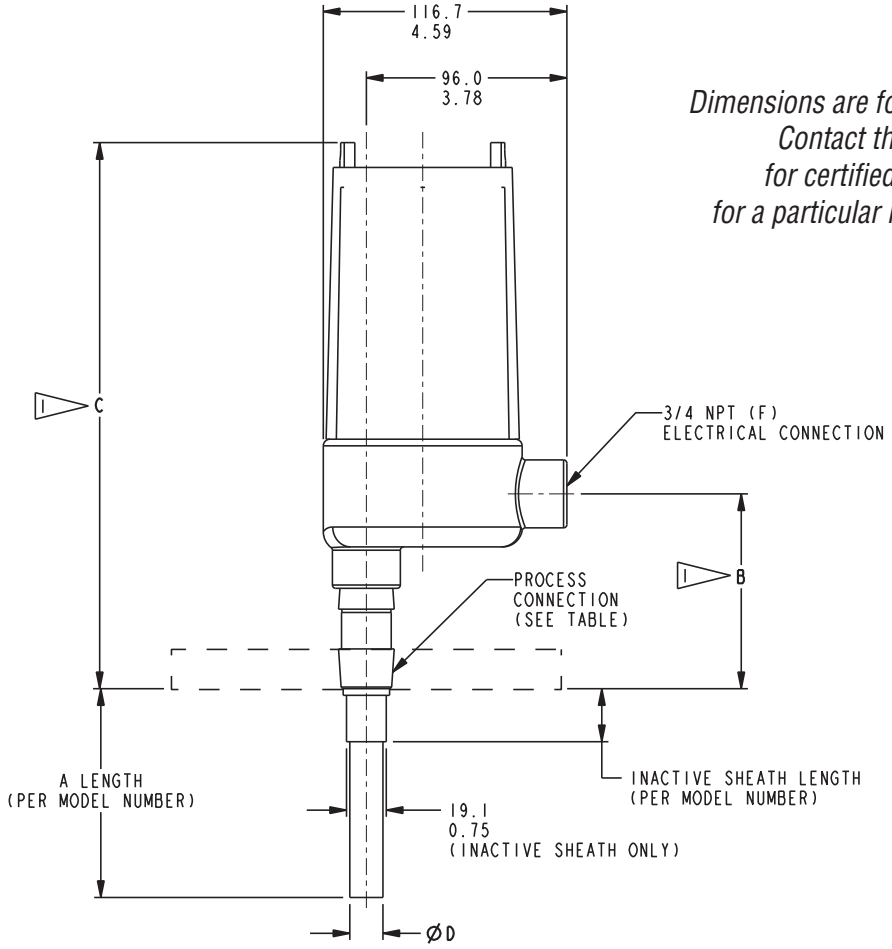
Drawing 0390653

SENSOR STYLE	DIM D
BARE	12.7 0.50
SHEATH	15.9 0.63
BARE WITH STILLING WELL	26.7 1.05
SHEATH WITH STILLING WELL	26.7 1.05
CABLE	7.9 0.31
INACTIVE SHEATH	15.9 0.63
SANITARY	15.9 0.63

PROCESS CONNECTION	DIM B		DIM C	
	CABLE	ALL OTHER	CABLE	ALL OTHER
3/4 NPT (M)	87.8 3.46	94.1 3.71	152.9 6.02	159.2 6.27
1, 1-1/2, & 2 NPT (M)	99.7 3.92	97.3 3.83	164.8 6.49	162.4 6.39
FLANGED	158.5 6.24	158.5 6.24	223.7 8.81	223.7 8.81
STILLING WELL	N/A	120.0 4.72	N/A	185.1 7.29
SANITARY	N/A	94.1 3.71	N/A	159.2 6.27

Dimensions

K Housing Configuration (Explosion Proof Remote)



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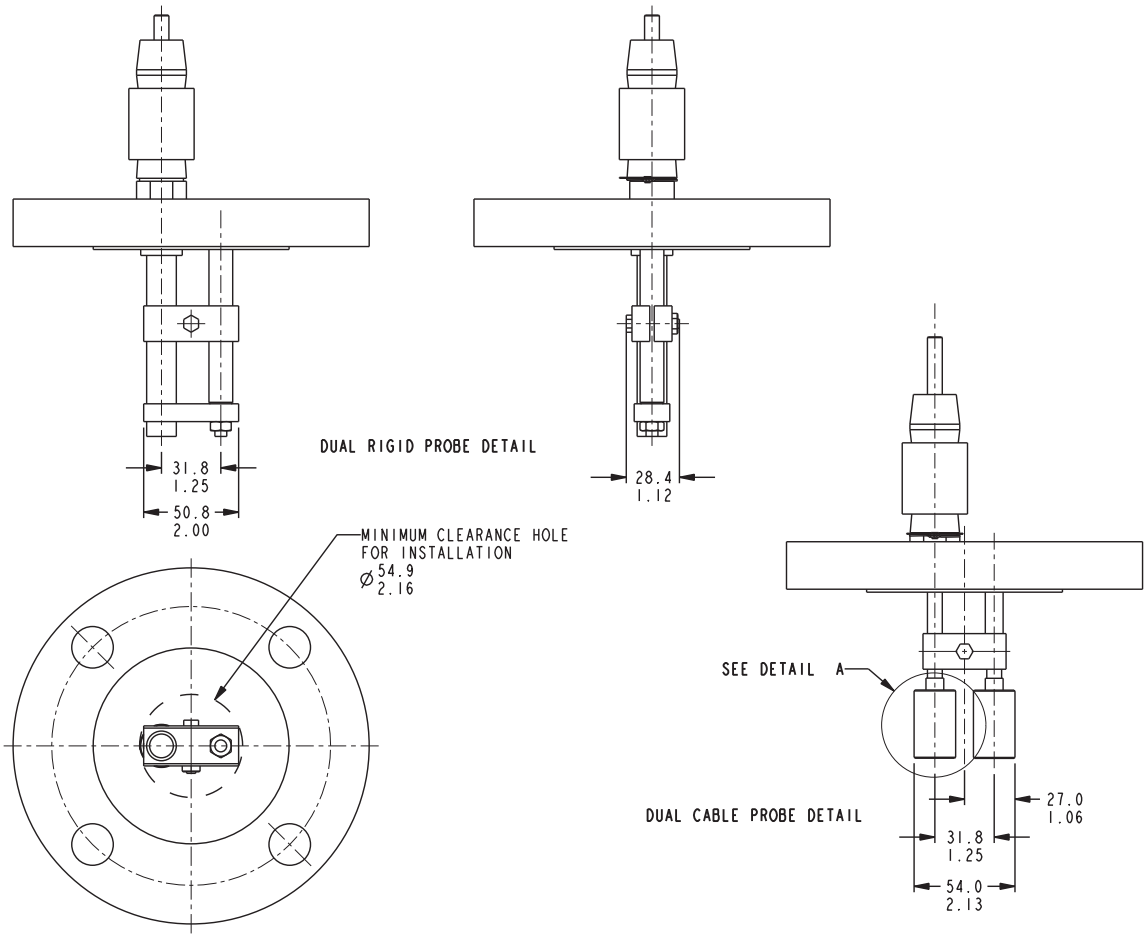
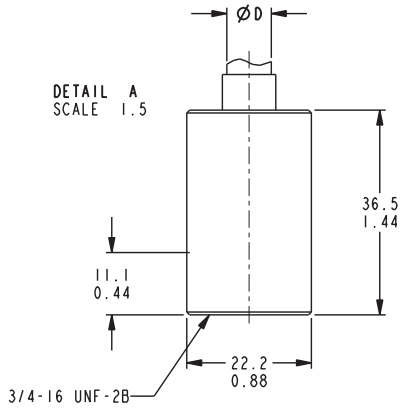
SANITARY	15.9 0.63

PROCESS CONNECTION	DIM B		DIM C	
	CABLE PROBE	ALL OTHER PROBES	CABLE PROBE	ALL OTHER PROBES
3/4 NPT (M)	87.8 3.46	94.1 3.71	256.0 10.08	262.4 10.33
1, 1-1/2, & 2 NPT (M)	99.7 3.92	97.3 3.83	268.0 10.55	265.6 10.46
FLANGED	158.5 6.24	158.5 6.24	326.8 12.87	326.8 12.87
STILLING WELL	N/A	120.0 4.72	N/A	288.3 11.35
SANITARY	N/A	94.1 3.71	N/A	262.4 10.33

Dimensions

Other Sensors





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Drawing 0390654

Printed in USA

www.sorinc.net

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