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SANI-FLOW TEMPERATURE TRANSMMITER Instruction Manual

DESCRIPTION: Analog Programmable

All Chicago Stainless Equipment Temperature Transmitters have been specially designed for critical temperature measurement in sanitary fluid processing. When attached to a supply voltage of 8 to 32 Volts DC, the instrument provides a 4 to 20 mA output which can be connected to a receiver such as a digital indicator, electronic recorder or PLC which can display temperature. We use a Pt-100 (platinum 100 Ohm) 3 wire thin-film RTD which is epoxy encapsulated in an all stainless steel probe to ensure the fastest response characteristics possible. The temperature transmitters are manufactured with a standard 12mm industrial micro DC male receptacle with gold plated contacts to allow for quick and easy installation and removal. It is not necessary to purchase several different items; this is a completely self-contained water tight instrument. No bulky, complicated, leaking wiring heads or tools required. Simply plug in the connector and go. The electrical connection is IP-67 rated which means that the temperature transmitter can be aggressively washed down or temporarily submerged in water while in use. The electronic transmitter can easily be removed, thus allowing the instrument to be autoclaved. And if something should damage the electronics, it can easily be replaced. There is no need to buy an entire new instrument.

SPECIFICATIONS:

Electrical

Input:	8 to 32 Volts DC Loop Power
Output:	4 to 20mA analog
Resolution:	5 µA
Accuracy:	0.2% of full scale
Range:	-30°C to 150°C (-22°F to 302°F) factory or filed rangeable*
Span:	20°C (36°F) minimum to 200°C (360°F) maximum
Linearity:	±0.1% of span
Stability:	3 Wire PT-100 (Platinum – 100 Ohm resistor) 0.03% of span/°C
Coefficient:	Alpha = 0.00385 Ohms/Ohm/Degree C (Per DIN 43760/IEC751)
Burnout:	Upscale
Isolation:	Non-Isolated (Enhanced RMI/EMI rejection circuitry)
Calibration:	With PC Configuration Kit*

Zero Adjustment: Any value within range limits
Span Adjustment: 10°C (18°F)

Physical

Material:	316L stainless steel case hermitically O-ring sealed
Surface Finish:	$R_a$max = 8 micro-inches
Ratings:	IP-67

Ambient Temperature Range: -40°C to +85°C (-40°F to 185°F)
Operating Temperature Range: -40°C to +85°C (-40°F to 185°F)

Connector:	Standard 12mm industrial connector with gold plated copper alloy contacts.
CIP/SIP:	Yes
Autoclave:	Yes, with electronics removed.

* By a knowledgeable technician

CABLE REQUIREMENTS:

The RTD has a standard 12mm micro DC male receptacle which is widely accepted in all industries. The transmitter has 4 gold plated pins. The cable should be of Polyurethane construction, 22 to 24 gauge with at least 2 conductors. The cable must be IP-67 rated, and the contacts should be gold plated. It is recommended that the connectors and cables should be shielded to prevent any RFI or EMI interference.

The cable can be purchased from CSE or from most industrial supply warehouses. We also supply cabling accessories such as extra cable, field wireable connectors, and panel mount connectors; please refer to our Electronic Sensors Cable brochure.

INSTALLATION:

Try to place in a location where the transmitter will be the least subjected to physical abuse. Wet locations are acceptable as long as the cable is attached to the transmitter during exposure to moisture or during wash down. For installation of a new transmitter, follow the wiring instructions below. For replacement of an existing CSE transmitter, simply install on line then attach the existing cable. No rewiring or special tools are required.

Always make sure that the connector is clean and dry before connecting.

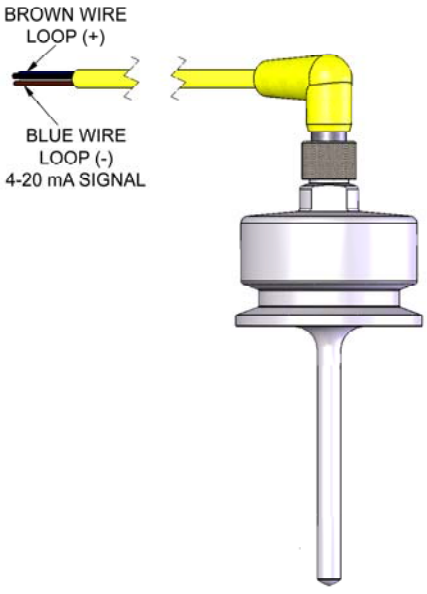
Never use pliers or other tools to tighten the connector; ***firmly finger tighten only***.

WIRING:

Transmitters use two conductors, one for the signal and one for loop power. Below is a drawing of the connector on top of the transmitter. The transmitter uses pin #s 1 and 3. Pin #1 should be connected to the positive lead from the power supply (LOOP+), and pin #3 should be connected to the signal lead from the power supply (LOOP-). When using a CSE cable, the chart below shows the pin outs and wire colors. Simply connect the Brown wire to the positive lead from the loop power supply (8 to 32 volts DC) and connect the Blue wire to the signal lead from the power supply. If supplied with shielding, the bare wire (shield wire) should be connected to a clean ground terminal at the receiver or power supply. The Black wire is not used.

Transmitter Connector

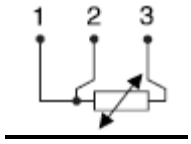
Pin #	Wire Color	Wire Type
1	Brown	Loop+ (8 to 38 Volts DC)
2	No Pin	---
3	Blue	Signal (Loop-, 4 to 20 mA)
4	Black	---



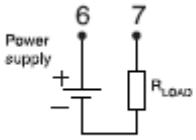
CHANGING THE RANGE:

Setting the transmitter to as tight a range as possible is important to get the most accuracy. The transmitter will cover a range of -30°C to 150°C (180° span) with a calibration accuracy of ±0.1% of full scale or +/- 0.18°C (.001 x 180°). If the range of the transmitter is set to 0°C to 50°C (50° span), the calibration accuracy will improve to +/- 0.05°C (.001 x 50°). Therefore, it is recommended that the transmitter's range be set as tight as possible. The transmitters are set by the factory to -30°C to +150°C; unless a specific range is specified when ordered. If the range needs to be changed in the field, it can only be accomplished by using PC Configuration Kit. This kit consists of software, interface and USB cables. Please contact your local distributor for part numbers and pricing.

INPUT



OUTPUT



CALIBRATION TEST:

Once the transmitter has been ranged it will not necessarily need any calibration. The PC configuration software does have the ability to "tweak" the calibration if necessary. The PC configuration kit is the only way to range or calibrate the transmitter. The following instructions explain how to test the calibration of the transmitter.

- Digital Ohm meter accurate to .01mA
- Power supply (6.5 to 32 volts DC)
- An accurate reference thermometer
- Small flat blade screwdriver
- ½" wrench
- Well agitated controlled temperature bath
- Calculator

A properly calibrated transmitter's output may be calculated using the following formula:

$$\text{mA Output} = \frac{(\text{known temperature} - \text{low end of range})}{\text{Transmitter Span}} \times 16 + 4$$

Example:
If the range of the transmitter is 20°C to 100°C the span is 80°C, and if the temperature being measured is 50°C, use the formula above ([{(50 – 20)/80}x 16] +4 = 10).

In this case, the output for a properly calibrated transmitter would be 10 mA.

Calibration test procedure is as follows:

1. Wire up the transmitter as shown in the wiring diagram above.
2. Place the probe of the transmitter and the reference thermometer into a well agitated bath at a temperature near the low end of the range and allow the readings to stabilize.
3. Read the reference thermometer. Using the formula above, calculate the proper output for the transmitter.
4. Place the probe of the transmitter and the reference thermometer into a well agitated bath at a temperature near the upper end of the range and allow the readings to stabilize.
5. Read the reference thermometer. Using the formula above, calculate the proper output for the transmitter.

This process can be completed much more quickly and simpler by using an RTD simulator and calibration kit. RTD simulators and configuration kits can be purchased from CSE through your local distributor.

CIP/SIP:
In the event that the transmitter needs to be cleaned in place (CIP) or steamed in place (SIP), no extra precautions are necessary except to ensure that the ambient temperature limit of 100°C (212°F) is not exceeded. It is permissible for the process temperature to exceed the transmitter's range; however, accurate outputs are only available within the set range of the transmitter. If the ambient temperature is expected to exceed the limit of 100°C, follow the procedure below for "Autoclaving".

AUTOCLAVING:
The transmitter has an ambient temperature limit of 100°C (212°F) which is generally not sufficient for autoclaving. This limit is imposed because of the circuit board internal to the transmitter. In the event that the transmitter requires autoclaving, the transmitter must be removed. This is a simple procedure which only requires a ½" wrench.

1. Remove the cable and unscrew the transmitter cap by using a ½" wrench.
2. Taking note of wires and their terminal numbers, disconnect the 3 RTD wires from the terminals allowing the cap with the circuit board to be completely removed prior to autoclaving. *DO NOT AUTOCLAVE THE ELECTRONICS.*
3. After autoclaving, reconnect the 3 RTD wires as noted before disconnection.
4. Replace the transmitter cap (make sure the serial number on the cap matches the serial number on the body) and tighten snuggly with a ½" wrench. Be careful not to over twist or pinch the wires.

MAINTENANCE:

CSE Transmitters require little or no maintenance. On a regular basis, simply check that the inside of the connector is clean, dry and finger tightened firmly. *Never use tools to tighten the connector*. Also, check that the probe has not been damaged and that the cable is not cracked or cut.

TROUBLESHOOTING:

1. If you suspect that there is a problem with the transmitter, check that the wires have been connected properly at the receiving end (see wiring diagram above).
2. Check that the connector is finger tightened firmly and that the contacts are clean and dry.
3. Check that the cable is good by testing the continuity of each wire. Replace if necessary.
4. If the receiver indicates a problem, disconnect the transmitter from the receiver and check the output of the transmitter. Wire an Ohm meter in series with the transmitter output and calculate the proper output for the known temperature using the formula above in the "calibration" section. If the output is correct, the receiver needs calibration.
5. Disconnect the cable and remove the transmitter cap with a ½" wrench. Check to make sure that there is no moisture inside the transmitter and that there are no signs of corrosion on the transmitter terminals. If either of these are observed, replace the transmitter by following the procedure below for "Transmitter Replacement" and also replace the cap "O" ring.
6. Check the RTD by using the table of temperature vs. resistance for a 100 Ohm RTD at the end of this manual and measure the resistance of the element using a digital Ohm meter.
    a. Disconnect the cable and remove the transmitter cap with a ½" wrench.
    b. When looking at the transmitter with the 3 wires attached to it, measure the resistance between pin #1 and pin #3. Look up the value in the table and see if the resistance matches the temperature.
    c. If the RTD element checks out to be bad, send the transmitter to the factory for repair.

TRANSMITTER REPLACEMENT:

If it's necessary to replace the transmitter, obtain a new unit through your local distributor and specify the correct part number with the desired temperature range.

1. Remove the cable and unscrew the transmitter cap by using a ½" wrench.
2. Disconnect the 2 wire and 3 wire connectors noting their terminal locations for reassembly.
3. Unscrew the two 6-32 screws and remove the transmitter.
4. Replace with new transmitter.
5. Reconnect the 2 and 3 wire connectors to previously noted terminal locations.
6. Replace the cap "O" ring if necessary.
7. Recalibrate the transmitter by following the directions above under "Calibration".
8. Replace the transmitter cap and tighten snuggly with a ½" wrench. Be careful not to over twist or pinch the wires.

REPLACEMENT/SPARE PARTS:

ITEM	PART NUMBER
Transmitter	Consult Factory
Transmitter Cap	Consult Factory
Transmitter Cap "O" Ring	Consult Factory
RTD Simulator and Calibration Kit	Consult Factory
Transmitter Configuration Kit	Consult Factory

TEMPERATURE vs. RESISTANCE TABLE

DIN 43760**, 100 Ohm Platinum RTD
Alpha = .00385 ohms/ohm/°C

°C	Ohms	°F	Ohms	°F	Ohms
-50	80.31	-50	82.07	210	138.08
-40	84.27	-40	84.27	220	140.18
-30	88.22	-30	86.47	230	142.29
-20	92.16	-20	88.66	240	144.39
-10	96.09	-10	90.85	250	146.49
0	100.00	0	93.03	260	148.58
10	103.90	10	95.21	270	150.67
20	107.79	20	97.39	280	152.75
30	111.67	30	99.57	290	154.83
40	115.54	40	101.74	300	156.91
50	119.40	50	103.90		
60	123.24	60	106.07		
70	127.08	70	108.23		
80	130.90	80	110.38		
90	134.71	90	112.53		
100	138.51	100	114.68		
110	142.29	110	116.83		
120	146.07	120	118.97		
130	149.83	130	121.11		
140	153.58	140	123.24		
150	157.33	150	125.37		
160	161.05	160	127.50		
170	164.77	170	129.62		
180	168.48	180	131.74		
190	172.17	190	133.86		
200	175.86	200	135.97		

*** Interchangeability tolerance also matches British Standard BS 1904 Temperature vs. Resistance curve.*