Honeywell

STT 3000 Smart Temperature Transmitter

Model STT350

Operator Manual

PRODUCT OF FRANCE

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1.1 INTRODUCTION

The STT 3000 Smart Temperature Transmitter is a microprocessor based unit suitable for accepting a wide variety of thermocouple, resistance temperature bulb or millivolt inputs and providing a 2 wire 4-20 mA analog or digital **"DE"** proportional output. The transmitter offers high accuracy and stability together with wide flexibility to suit a wide range of applications. All adjustments and operational settings are implemented through the Smart Field Communicator (SFC) which accesses the transmitter by connecting across the 4-20 mA wiring in parallel with the STT 3000 anywhere along the wiring up to 1,500 meters from the transmitter (Figure 1-1). This manual covers the functionalities of the STT350 model.

Adjustments and facilities available through the SFC include:
- Selection of input sensor type.
- If the sensor type is a thermocouple then internal or external cold junction compensation at an isothermal block can be selected.
- Thermocouple and resistance bulb inputs can be programmed to give an output either linear to temperature or to the millivolt/resistance input.
- Highest and lowest input readings are held in memory and available for checking.
- Range settings are entered in engineering units and extend over the range limits of the sensor type.

Note: The minimum allowed span is 1 engineering unit e.g. 1 degree celsius.
- Configuration as an analog 4-20 mA or digital **"DE"** protocol output.
- All the traditional smart transmitter capabilities for diagnostics, verifying tag number, damping, calibration, reading inputs and outputs etc.
- Changes to the transmitter through the SFC can be prevented by the write protect link.

Additional features of the STT350 which do not necessarily require an SFC are:
- 4, 3 or 2 wire PT100 operation.
- Fault detection on all wires for open circuit inputs can be programmed for upscale or downscale failsafe output drive. (Burnout).
- Write protection prohibits changes to the transmitter configuration.
- Redundant sensor operation for thermocouples. In case the first thermocouple burns out the transmitter switches automatically over to the back-up one.
- True differential temperature measurement. In this mode, both inputs are measured, linearized and then subtracted.

The STT350 is based on a rugged housing with encapsulated electronics for high reliability (Figures 1-2 and 1-3) which is available either for DIN rail mounting or supplied in an explosionproof enclosure. The enclosure is suitable for wall mounting or can be supplied with a 50 mm pipe mount bracket.

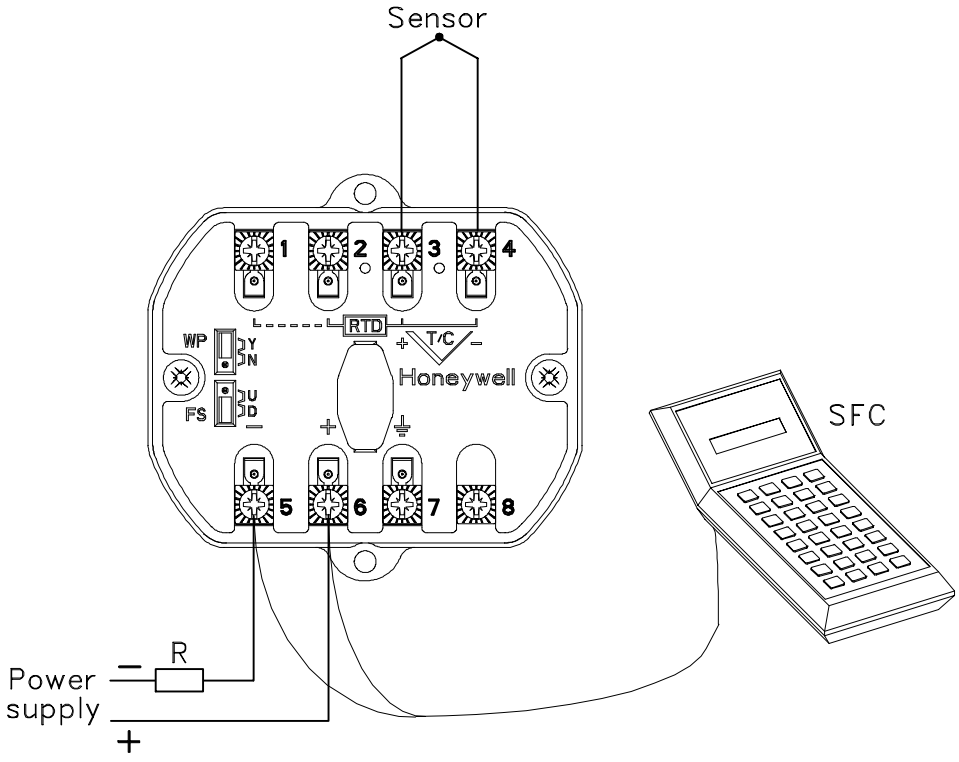


Figure 1-1 Model STT350/SFC/Loop connections

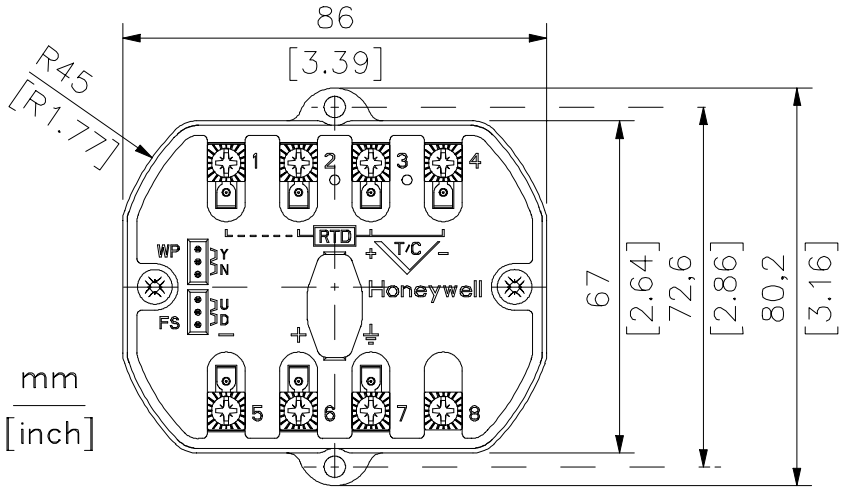


Figure 1-2 Front dimensions

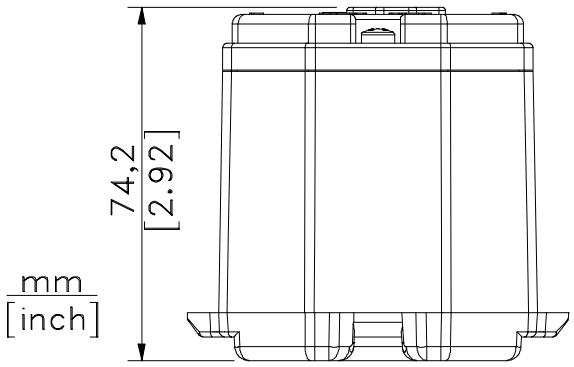


Figure 1-3 Side dimensions

2. TECHNICAL SPECIFICATIONS

2.1 ENVIRONMENTAL CONDITIONS

	Reference	Rated conditions	Operating limits	Storage
Temperature °C (°F)	23 (73)	-40 to 85 (-40 to 185)	-40 to 85 (-40 to 185)	-50 to 100 (-58 to 212)
Humidity (%RH)	10 to 55	5 to 95	5 to 100	5 to 100
Supply Voltage (V)	24	See Figure in section 2.4		

2.2 SENSOR TYPES/STANDARDS/OPERATING LIMITS AND RANGES/DIGITAL ACCURACY

(Accuracies with sensor configuration - without operator calibration)

Sensor type		Min./Max. Range				Rated Span		Standard
	Digital Accuracy % of max. span	°C	°F	Eng. Unit Accuracy °C	Eng. Unit Accuracy °F	°C	°F	
Resistance bulbs :								
PT100	0.01	-200 to 850	-328 to 1562	0.1	0.18	-200 to 450	-328 to 842	IEC 751 : 1986
PT200	0.01	-200 to 850	-328 to 1562	0.1	0.18	-200 to 450	-328 to 842	IEC 751 : 1986
PT500	0.02	-200 to 850	-328 to 1562	0.1	0.18	-200 to 450	-328 to 842	IEC 751 : 1986
PT100J	0.01	-200 to 640	-328 to 1184	0.1	0.18	-200 to 450	-328 to 842	JIS C 1604 - 1981
Nickel-500	0.04	-80 to 150	-112 to 302	0.1	0.18	-50 to 150	-58 to 302	Honeywell type A
Copper-10	0.37	-20 to 250	-4 to 482	1.0	1.8	-20 to 250	-4 to 482	General Electric
Copper-25	0.19	-20 to 250	-4 to 482	0.5	0.9	-20 to 250	-4 to 482	General Electric
Thermocouples :								
B	0.14	200 to 1820	392 to 3308	1.0	1.8	550 to 1820	1022 to 3308	IEC 584-1 (ITS90)
C (W5W26)	0.03	0 to 2300	32 to 4172	0.6	1.08	0 to 1650	32 to 3002	IPTS-68
D (W3W25)	0.03	0 to 2300	32 to 4172	0.6	1.08	330 to 1370	626 to 2498	IPTS-68
E	0.04	-200 to 1000	-328 to 1832	0.2	0.36	0 to 1000	32 to 1832	IEC 584-1 (ITS90)
J	0.04	-200 to 1200	-328 to 2192	0.2	0.36	0 to 800	32 to 1472	IEC 584-1 (ITS90)
K	0.04	-200 to 1370	-328 to 2498	0.3	0.54	-120 to 1370	-184 to 2498	IEC 584-1 (ITS90)
N	0.06	-200 to 1300	-328 to 2372	0.3	0.54	0 to 1300	32 to 2372	IEC 584-1 (ITS90)
R	0.09	-50 to 1760	-58 to 3200	0.5	0.9	500 to 1760	932 to 3200	IEC 584-1 (ITS90)
S	0.08	-50 to 1760	-58 to 3200	0.5	0.9	500 to 1760	932 to 3200	IEC 584-1 (ITS90)
T	0.14	-250 to 400	-418 to 752	0.2	0.36	-100 to 400	-148 to 752	IEC 584-1 (ITS90)
NiNi Moly	0.03	0 to 1300	32 to 2372	0.3	0.54	780 to 1300	1436 to 2372	General Electric (IPTS-68)
Miscellaneous :								
Radiamatic RH	0.6	420 to 1800	788 to 3272	0.3	0.54	780 to 1800	1436 to 3272	Honeywell (RH)
Millivolts	0.01	-20 to 120 mV		8 µV		-10 to 45 mV		
Ohms	0.01	0 to 2000 Ω		0.15 Ω		0 to 2000 Ω		

2.3 PERFORMANCE IN OPERATING RANGE

Output accuracy: +/- 0,025% from 4 mA to 20 mA

Ambient temperature effect for a change of 10 °C (18 °F):
- Digital effect
  RTD or Ohms: +/- (0,029% of reading) [ohms]
  T/C or mV: +/- (0,042% of reading) [mV]
- Output effect
  All inputs: +/- 0,045% of span

Cold junction accuracy: +/- 0.25 °C (0.45 °F)

Cold Junction Rejection Effect at Output: 60: 1 for ambient temperature changes from 23 °C (73 °F) reference

Total Accuracy = Linearization Accuracy + Output Accuracy
Total Temperature Effect = Digital Effect + Output Effect + CJ Effect (T/C's only)

2. TECHNICAL SPECIFICATIONS

NOTE: Output accuracy and output temperature effects should not be included if the STT350 is used in the **"DE"** digital output mode.

Power Supply Effects: +/- 0.005% of span per volt

CE MARK compliance:
In compliance with EMC directive 89/336/EEC

Common Mode Noise Rejection: 120 db (1 million: 1) 50/60 Hz

Series Mode Noise Rejection: 40 db (100: 1) at 50/60 Hz +/- 0.5 Hz

Long term Stability (1 year): 0.05 % of maximum span.

2.4 FUNCTIONAL SPECIFICATIONS

Output: 2 wire 4-20 mA, or digital **"DE"**

Extended working range: 3.8 - 20.8 mA

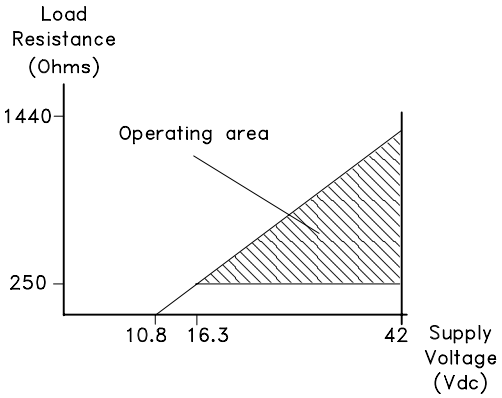
Extreme Output Limits: < 3,8 mA - max. 21.8 mA

Output Update Time: 0.25 seconds

Output Rise Time: 1.5 seconds to 90 % of Final Step Value

Input/Output Galvanic Isolation: depending on local safety standards
Withstands dielectrical strength test of 1500 Vac for 1 minute

Load Resistance Limits: 0 to 1440 ohms as in this figure



2.5 PHYSICAL SPECIFICATIONS

The STT350 is available in 3 physical variations to meet installation and safety requirements. The features common to all variations are included in this section. Features specific to each variation are given in following sections.

2.5.1 STT350 module protection

Enclosure: Electronics encapsulated against moisture penetration

Electrical connections: Screw Terminals accepting 1.5 mm (12AWG) wiring

Safety approval: Intrinsic safety	EEx ia IIC	T6 Tamb. -20 to 40 °C (-4 to 104 °F) T5 Tamb. -20 to 50 °C (-4 to 122 °F) T4 Tamb. -20 to 80 °C (-4 to 170 °F)	30 V, 100 mA, 1.2 W

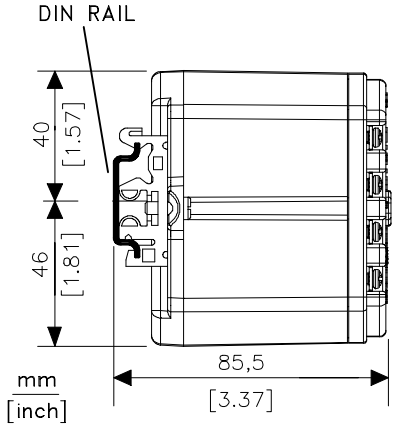
Materials of construction:
- Electronic Module case: Aluminium alloy with baked polyester paint
- Electronic Module terminal block: Black Noryl
- Electronic Module screws: Triple plated brass

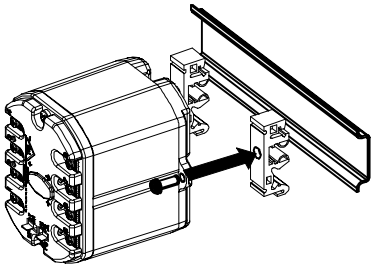
Net weight (module): 0.5 kg

2.5.2 DIN rail mounting

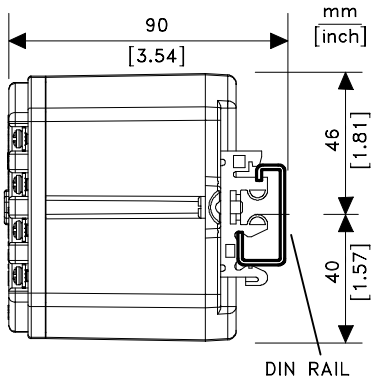
DIN rail mount: Top hat or G type rail.

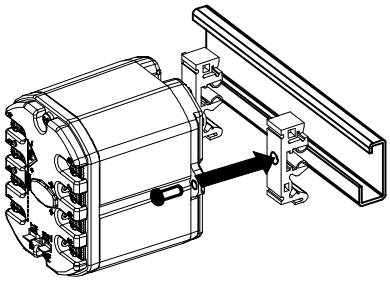
2.5.2.1 Top hat rail mounting dimensions





2.5.2.2 G type rail mounting dimensions

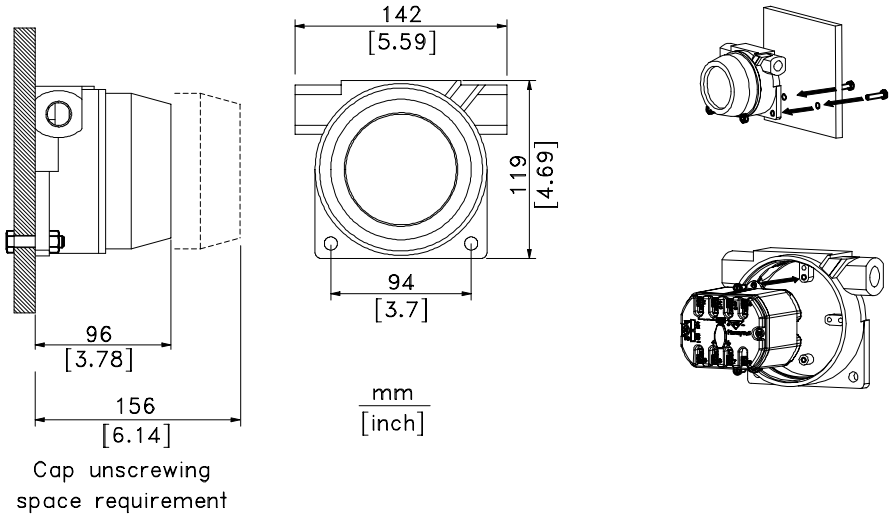




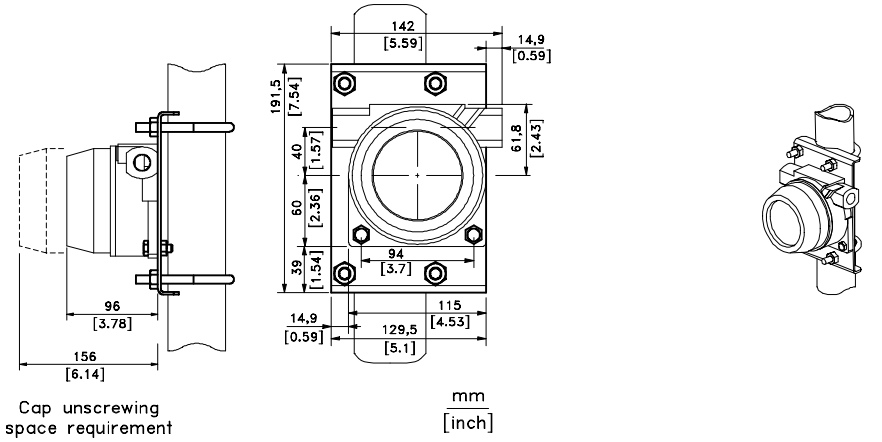
2.5.3 Field mounting in EP housing

Safety approval: EEx d IIC T6 explosionproof
Conduit/Cable Gland/Sensor Sheath Entry: 1/2" NPT (2 entries)
Optional M20 x 1.5 inch NPT adaptors (EEx d), 316SS
Materials of construction: Low copper aluminium with HYBRID epoxy-polyester paint coating or epoxy paint coating.
Net weight: 1.6 kg (3.6 pounds)
Enclosure specification: IP66

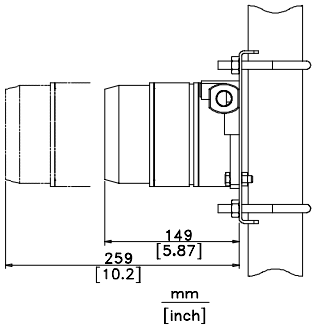
2.5.3.1 Wall mounting dimensions



2.5.3.2 50 mm Pipe mounting dimensions



2.5.3.3 Meter Option



3.1 BASIC OPERATION

As shown in the block diagram, Figure 3-1, the transmitter is powered via the 2 wire 4-20 mA signal connected to terminals 5 and 6 in the output side of the unit.

Inputs are sampled at a rate of 4 times per second, digitised by the A/D converter, compensated for cold junction or resistance lead length and transferred across the galvanic isolation interface. Both power and signal are galvanically isolated between input and output circuits. Before signal transfer across this galvanic isolation it is post read validated for sensor wiring and signal integrity against reference values. On the ouput side of the isolation, the digital data is linearized and ranged to the lower and upper range values held in non volatile memory and converted back to an analog signal. Any changes to customer settings are held in non volatile memory so that they are secured against loss of power. On receipt the data in non volatile memory is the default shipping data programmed into the unit at the manufacturing location if no customer configuration was specified. This shipping data is:

Tag I.D.	: xxxxxxxx		
Sensor type	: mV	LRV: 0 mV	URV: 45 mV
Fault detection	: ON		
Line filter	: 50 Hz		
Output type	: Linear	Output mode	: Analog
CJ Compensation	: Internal	DE conf.	: 6 byte / Single rng.-S V
Damping	: 0 Second		

Connecting an SFC across the 4-20 mA wiring allows changing this data.
The jumper selector Failsafe (FS) determines where the output will drive in case of the STT350 detects an open circuit sensor or internal failure. In the position U it will be driven upscale, when D downscale. The jumper selector Write Protect (WP) allows the protection of the transmitters configuration database. In the position Y(es) the database is write protected and any configuration change will be prohibited. Position N(o) allows configuration changes. The shipping positions of the jumpers are: U for FS and N for WP.

The output of the STT350 can be selected from the SFC to be either 4-20 mA analog or digital DE protocol. The DE output is used primarily with Honeywell's TDC3000 ^{X} distributed control system where it improves performance by avoiding conversion to/from an analog signal and offers full database integration of field transmitters with the central control system.

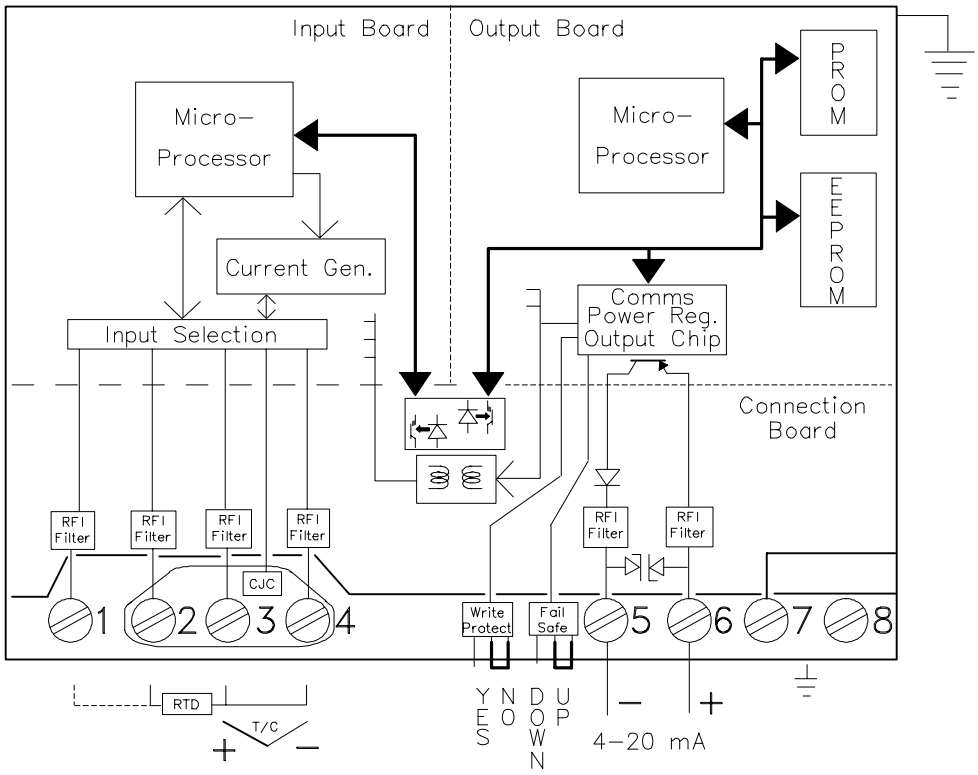


Figure 3-1 Block diagram

3. THEORY OF OPERATION

3.2 SFC COMMUNICATIONS

As previously indicated the SFC communicates by connecting across the 4-20 mA wiring. Communication is by 16 mA pulses which disturb the output signal, so ensure receiving instruments are not on automatic control. The SFC does not feed 16 mA pulses into the loop but instead merely uses the power on the 4-20 mA wires and switches it through a field effect transistor output switch. The SFC always acts as master and the transmitter as slave. When the transmitter is operating in the digital DE mode, there is no wake-up pulse required and the SFC communication does not disturb the PV signal. Consequently, there is no need to put the loop on manual control when operating in the DE mode.

3.3 INTRINSIC SAFETY BARRIERS

Specific safety barriers which have approval to Cenelec Standards, allow bi-directional communications, supports SFC on either side, and have been confirmed by Honeywell to operate satisfactorily with STT350. See table below.

Barrier reference	Safety description	Line Resistance/ Supply Requirements
MTL 706 Current Loop Barrier Current Loop Barrier	28 V/300 ohms/93 mA	130 ohms 22 to 30 Vdc
Elcon CS-I-7021/IS/ST-H Galvanically Isolated Repeater	28 V/300 ohms/93 mA	130 ohms 24 Vdc or 220/110 Vac
MTL 3046 Repeater Power Supply	28 V/300 ohms/93 mA	130 ohms 20 to 35 Vdc
Pepperl + Fuchs KHD3-IST/Ex1	28 V/93 mA	190 ohms 20 to 35 Vdc

3.4 SFC OPERATION

Details on SFC operation are covered in the SFC users manual, however a summary of operations is included in Section 4. It is important that the SFC is the model STS102 or STS103 which is suitable for, not only temperature transmitters, but also for pressure, level, flow (DP) and magnetic flowmeter smart transmitters, both for 4-20 mA analog and DE digital output selections.

NOTE:
We recommend you to use an SFC (STS103) with software version 4.2 or higher to obtain enhanced messages for the STT350. Some enhanced messages for the STT350 will be displayed as **"UNKNOWN STATUS"** if the SFC software version is lower than 4.2. (The SFC software can be upgraded by contacting your nearest Service Center.)

4. BENCH CHECK INSTALLATION/COMMISSIONING

4.1 UNPACKING

Unpack the unit and verify the contents are as ordered i.e. this users manual, either the STT350 Module or the STT350 Module in a field mounting housing and accessories such as Din Rail mounting clips and 50 mm pipe mount bracket are included.

4.2 EQUIPMENT

If a bench check is intended the equipment needed is:
- An input sensor equivalent to the required application or an equivalent calibrator which can simulate millivolts, resistance temperature detector, thermocouple or resistance inputs.
- Nominal 24 Vdc power supply with less than 100 mV peak to peak ripple and able to supply at least 40 mA.
- Smart field communicator.
- Connection wiring and 250 ohms resistor.
- Digital voltmeter with range covering 0-5 Vdc. Note that if a high speed sampling DVM is used, a 1 Hz (160 m sec) averaging filter is recommended.

NOTE: If you are going to check calibration in the thermocouple mode, ensure that the cold junction temperature is stabilised. After connecting and powering up all equipment including the transmitter, protect the transmitter from air draughts and allow at least 1 hour before taking readings.

4.3 INSTALLATION

Connect the equipment as in Figures 4-1 and 4-2. The sensor input connections are indicated on the terminal block for the most common wirings. The following sensor or input types require a special wiring:
- 2-wire resistance: a strap should be wired between terminals 3 and 4, the 2-wire resistance should now be connected between terminals 2 and 3.
- 4-wire resistance: like 3-wire resistance, but the fourth wire to terminal 1.
- Millivolt input: the positive side of the millivolt source should be connected to terminal 3 and the negative to terminal 4.
- Differential RTD (Only PT100D, PT100J, PT200, PT500, Ni500): a strap should be wired between terminals 4 and 1. RTD 1 should be wired between terminals 4 and 3, RTD 2 should be wired between 4 and 2. The output is RTD 1 - RTD 2.

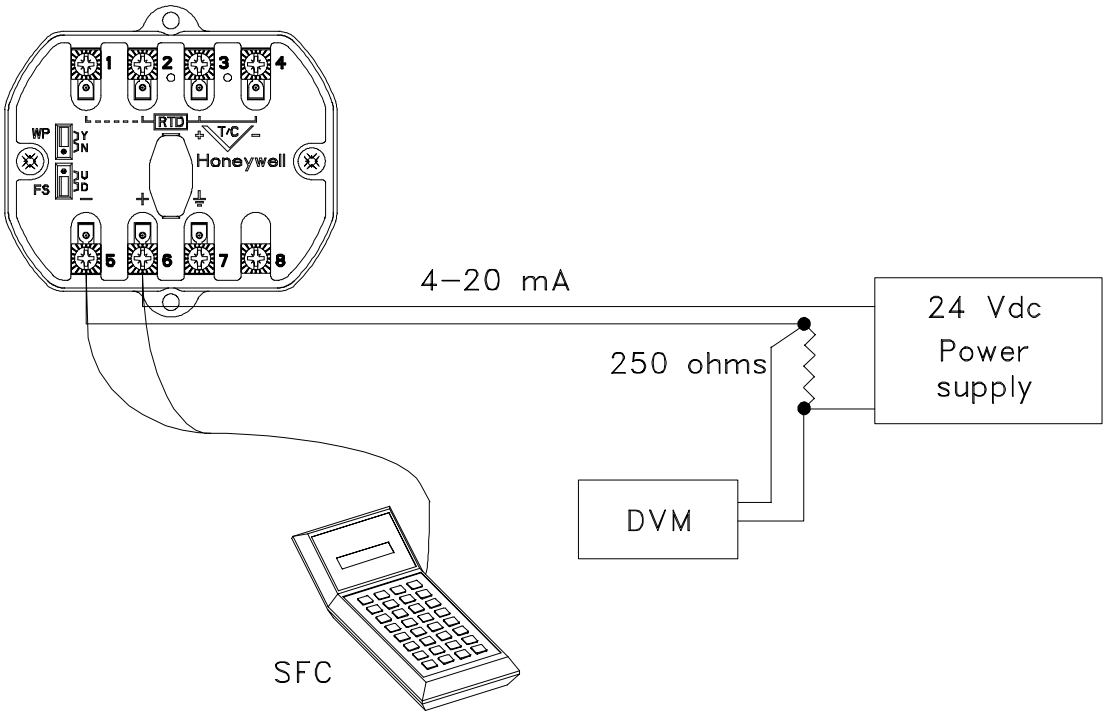


Figure 4-1

4. BENCH CHECK INSTALLATION/COMMISSIONING

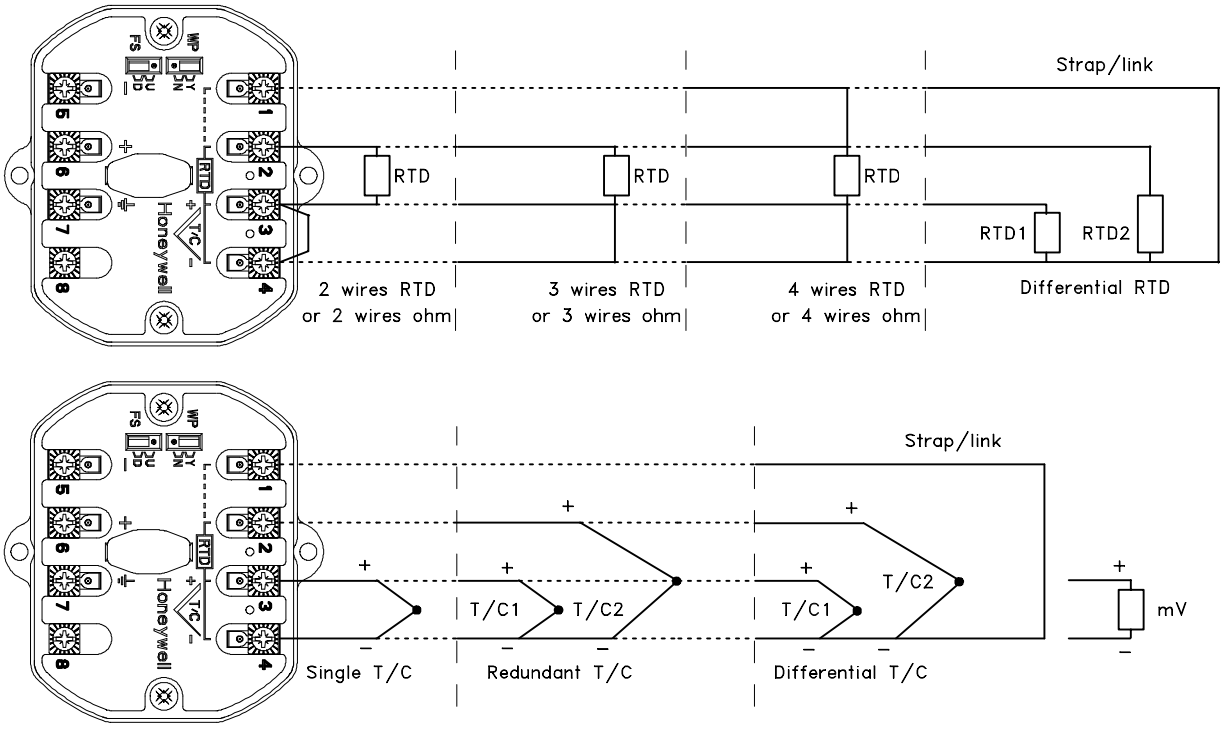


Figure 4-2

- Differential T/C: a strap should be wired between terminal 4 and 1. T/C 1 should be wired between terminals 4 and 3, T/C 2 should be wired between 4 and 2. The output is T/C 1 - T/C 2.
- Redundant T/C: T/C 1 should be wired between terminals 4 and 3, T/C 2 (back-up) should be wired between 4 and 2. When "sensor fault detection" is active (See figure 4-3), the analysis of TC1 and TC2 is done continuously. The measurement is made with the best of TC1 and TC2.

Resistance temperature detector (RTD) measurements use the 3 or 4 wire approach. The transmitter determines by itself if a 3 or 4 wire RTD is connected when powered up. In case a 3 wire RTD is used, the current leading wires are connected between 2 and 4 and the compensating wire to 3. In case a 4 wire RTD is used, the current carrying wires are connected between 1 and 4 and the compensating wires to 2 and 3.

NOTE:
The mode of operation (T/C single, T/C redundant, RTD single, ...) is automatically selected by the transmitter when the sensor type is changed and saved in a non-volatile memory. Therefore it is important to have the carrying wires correctly connected before a sensor type is changed.
At each power up, if the STT350 is in RTD single, a wire analysis is done to select between 3 wires or 4 wires modes.

	MODE OF OPERATION	T/C single	T/C redundant	T/C differential	RTD single (2, 3, 4 wires)	RTD differential
	SFC MESSAGE [1]	**"STATUS CHECK = O.K."**	**"Redundant T/C"**	**"Delta Temp"**	If 4 wire mode, **"4 wire RTD"**, otherwise **"STATUS CHECK = O.K."**	**"Delta Temp"**
SENSOR TYPE	mV	Available	Not available	Not available	Not available	Not available
	0-2000 ohms Cu 10, Cu 25	Not available	Not available	Not available	Available	Not available
	T/C (B, C, ..)	Available	Available	Available	Not available	Not available
	RTD (Pt100, Pt200, ...)	Not available	Not available	Not available	Available	Available

1 For STS103 version 4.2 or higher. Otherwise the SFC message is **"UNKNOWN STATUS"** (See section 5.2, "TROUBLESHOOTING").

TABLE 4-1

EMITTENCE CONFIGURATION FOR RADIAMATIC RH SENSOR:
The emittence for RH sensor must be entered as follows: Configure the cold junction compensation as External (See figure 4-3) and key in the emittence value (min.: 0.1, max.: 10.0) instead of the external cold junction compensation temperature.

4.4 GROUNDING AND SHIELDING TECHNIQUES

The current output signal will operate in either a floating or grounded system. If the signal appears noisy or erratic it is recommended to ground the loop at the negative terminal of the power supply.

In case the transmitter can be disturbed by strong electromagnetic interference it is recommended to connect the transmitter ground terminal to a local ground by a short, large size wire. When a shielded sensor is used, this shield can be connected to the ground terminal. The current loop shielding can be grounded either at the power supply or at the transmitter.

Shielding should only be connected at one point to avoid ground loops.

4.5 STT350 CONFIGURATION

4.5.1 4-20 mA Analog Output Configuration (based on STS102)

Switch on the power supply and the SFC. On power up the SFC will display **"self check"** for a few seconds then having verified proper working gives the reminder **"put loop in manual"**.

Press I.D. button and the transmitter will respond with a display of its name, typically **"STT xxxxxxxx"**. The STT cannot be changed since it identifies the type of transmitter. The current name xxxxxxxx has a cursor under the first letter showing it can be changed to an 8 character Alpha-numeric tag number by using number and letter keys.

NOTE: Even though the transmitter is working properly, the SFC may display at this point **"CRITICAL STATUS"** and an error message if you press **"STATUS"**. These messages are e.g.: **"INPUT OPEN" "UNCERTAIN RDING" "I/P OUT OF SPEC".**

The cause is probably one of the following:
- You have not connected a sensor to the input
- There is an open circuit in the sensor, connecting wiring or terminal connections.
- You have connected a T/C or other millivolt source to the T/C terminals and the transmitter is configured for RTD input (or vice versa).
- You have connected a T/C or millivolt source to the input and the unit is configured properly. However, you subsequently tried to reconfigure for an RTD input with the RTD terminals open (or vice versa).

If your SFC is model STS102/103 you may now connect the appropriate sensor, press **"STATUS"** (in the SFC) **OR** connect the appropriate sensor, and then reconfigure. This will clear the # sign.

However, if your SFC is model STS101 with software revision 5.0, it will not let you proceed. First, connect a T/C to the input terminals (or short the terminals with a wire or paper clip). Second, turn the SFC switch to **"OFF"**. Third, turn the SFC switch to **"ON"**, press **"ID"** and proceed. If the transmitter is still in **"CRITICAL STATUS"**, it is probably configured for an RTD input. Connect an RTD (or 100-350 ohm resistor) to terminals 2, 3 and 4 and repeat the above procedure.

Press status to verify **"status check = OK"** is displayed. Press **"shift"** then **"units"** to access the transmitter database and configure it as required. As mentioned earlier the default shipping mode for units is mV input, 0 - 45 mV range etc. You can now customise the unit to your specific application. The flow chart in Figure 4-3 gives simplified overview of selections and key strokes.

In summary pressing **"Menu Item"** scrolls through the selections of any one category whilst **"next"** (or ▲) steps on to the next category. Equally **"prev"** (or ▼) steps back to the previous category.

When a desired configuration item appears on the SFC display this item may be configured in the SFC **"Hold"** memory by pressing **"Enter"**. When you have completed configuring all items accessible via the **"STT Conf"** Key, or you try to exit via the **"CLR"** Key, the SFC will ask **"Download Change ?"**. Press **"Yes"** (Enter) and the changes will be down loaded from the SFC to the transmitter, or press **"No"** (CLR) and the SFC hold memory will be erased.

Having now configured the input type etc., press **"LRV"** and key in the required temperature for 4 mA output e.g. 100 °C (212 °F).
Press **"Enter"** to load this into the transmitter and repeat with **"URV"** for the 20mA output e.g. 500 °C (932 °F) .

Note that if the input type is changed or the output type is changed from linear to non-linear (or vice versa), the LRV and URV values will default to factory set values and the °C / °F selection will default to °C .

Your STT350 is now configured for your applications.

You can check out the performance by varying the input and observing the output response on the DVM.

Operating card data included with the STS102/103 covers other smart transmitter functions included in the STT350 e.g. damping, calibration, output mode etc. In addition the SFC users manual supplied with the STS102 covers its full operations and capabilities in detail.

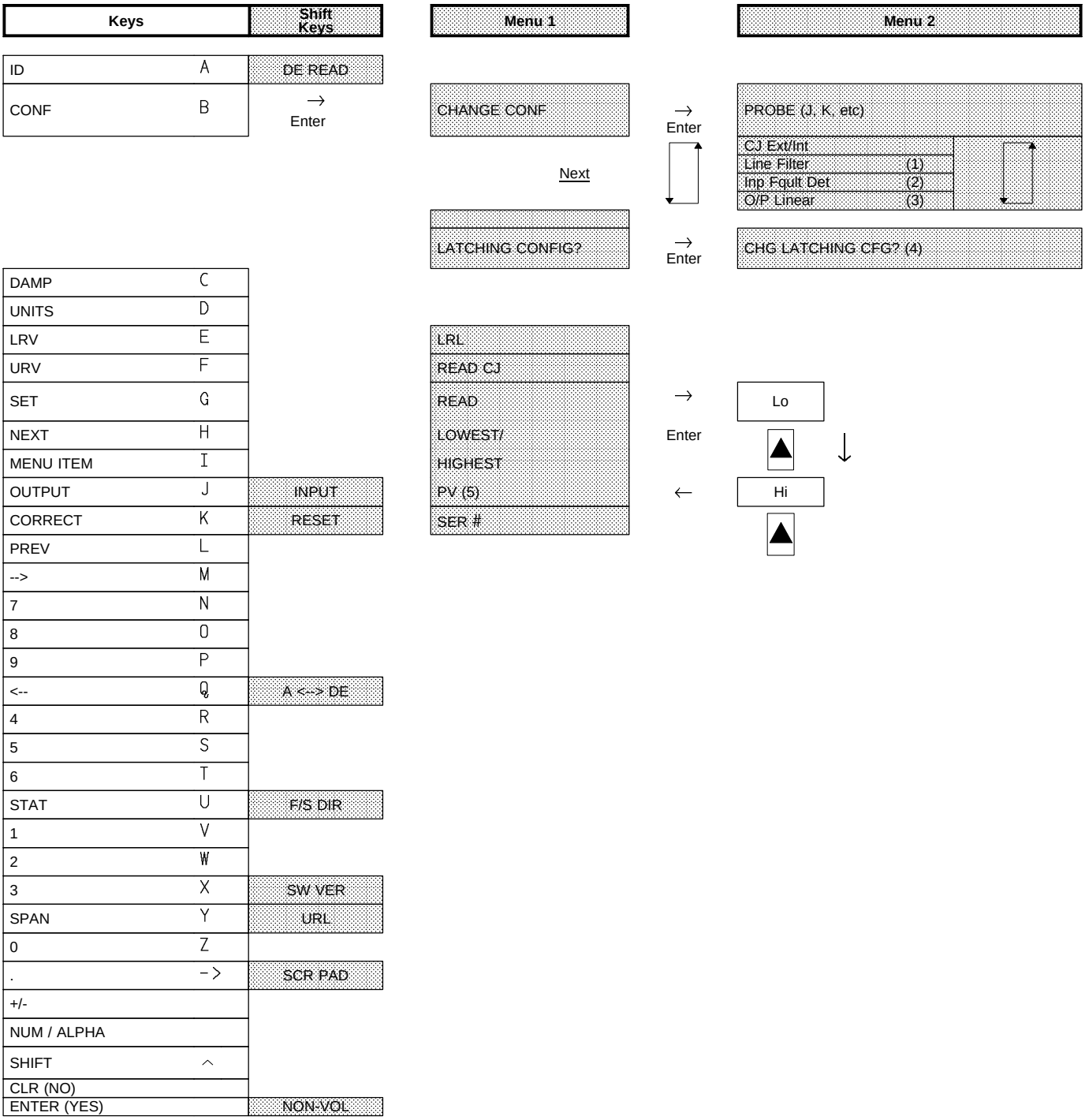


Figure 4-3 Flow chart (Apply to STS101)

Additional Notes

1 This series mode filter should match the local A.C. supply frequency and is set to 50 Hz for Europe, 60 Hz for North America.

2 Sensor fault detection **"on"** will drive the output upscale or downscale as selected by the jumper in the event of an input open condition or in response to most electronic malfunctions. Sensor fault detection **"off"** will give an indeterminate output with an input open condition.

3 "O/P linear" will always read in degrees (C, F, R or K as selected) for T/C and RTD inputs. **"O/P non linear"** will read in millivolts for T/C inputs and in ohms for RTD inputs.

4 Configuration of LATCHED mode (critical alarms)

The LATCHED mode requires an acknowledgment by using the "STAT" key. The NOT-LATCHED mode does not require any acknowledgment.

5 These are the highest and lowest values since the last time they were accessed.

4.5.2 DE Digital Output Configuration

The STT350 transmitter can operate in either an analog or a digital DE communications mode using the same protocol as other Smartline transmitters - ST3000 and MagneW3000. You can use the Smart Field Communicator (SFC) model STS101 or higher to set transmitter operation mode as analog or digital DE communications. Note that STT350 transmitters are factory set for analog communications operation.

This addendum outlines additional steps for the Configuration Flow Chart in Figure 4-3 of this Operator Manual to configure parameters for DE communications mode and change transmitter operation from analog to digital DE communications. The DE configuration parameters are:
- Type of transmitter operation
- Message format
- Failsafe mode for the digital control system

STT350 Configuration Flow Chart: Use the following flow chart to supplement in Figure 4-3 if you want to set your STT350 for DE communications operation.

Be sure that the SFC, power supply, and sensor are connected to the STT350 as shown in Figures 4-1 and 4-2 of the Operator Manual. Note that DVM (shown in Figure 4-1) readings will fluctuate when STT350 is put into the DE communications mode.

ACTION	**DISPLAY RESPONSE**
Continued from Figure 4-3	Ready
Press **"SHIFT" + "MENU ITEM"**	Single Range
Press **"MENU ITEM"**	Dual Range ST/DC
Press **"MENU ITEM"**	Single Range W/SV
Continued pressing of **"MENU ITEM"** cycles through these selections for the type of transmitter operation. Press **"NEXT"** or **"PREV"** to view another configuration parameter without changing present selection ; otherwise, continue by pressing **"ENTER"** to make selection.	
Press **"ENTER"**	ENTERED IN SFC
	W/O DB (4 Byte)
Press **"MENU ITEM"**	W/DB (6 Byte)
Continued pressing of **"MENU ITEM"** cycles through these two selections for the message format with or without database information. Press **"NEXT"** or **"PREV"** to view another configuration parameter without changing present selection ; otherwise, continue by pressing **"ENTER"** to make selection.	
Press **"ENTER"**	ENTERED IN SFC
	F/S = B/O Lo
Press **"MENU ITEM"**	F/S = B/O Hi (Note 1)
Continued pressing of **"MENU ITEM"** cycles through the library of failsafe mode selections ; i.e., F/S = B/O Lo - F/S = LKG - F/S = FSO, B/O Lo - F/S = FSO, B/O Hi - F/S = FSO, LKG... Press **"NEXT"** or **"PREV"** to view another configuration parameter without changing present selection ; otherwise, continue by pressing **"ENTER"** to make selection.	
Press **"ENTER"**	ENTERED IN SFC
	Download Change ?
Press **"ENTER"**	Ready
Press **"SHIFT" + "RESTORE"**	CHNG TO DE ? (Notes 2, 3)
Press **"ENTER"**	DE XMTR
Transmitter operation has been changed from analog to digital DE Communications mode.	
Press **"ID"**	DE XMTR xxxxxxx

TABLE 4-2

ADDITIONAL NOTES

1 Not all failsafe mode selections apply for given type of transmitter operation

2 Total DE mode accuracy = digital accuracy

3 Total temperature effect DE mode output in degrees per 10 °C (18 °F) change = digital effect + CJ effect (for thermocouples only).

4.6 ELECTRICAL AND MECHANICAL CONNECTIONS

If the STT350 is to be installed on DIN Rails then the main considerations are electrical connections and mechanical fixing. Electrical connections are identical to the bench test instructions except that for thermocouples compensation cable is likely to be used. Mechanical fixing of the module is by means of the snap in DIN Rail Clips which have to be screwed to the bottom lugs of the module.

4.7 MOUNTING

The STT350 unit with the explosionproof or general purpose housing can be installed in 3 different approaches:
Wall mounted / 50 mm pipe mounted / Direct mounted on the sensor

If wall or pipe mounting is preferred then ensure the selected situation is suitable. Remember local temperature at the site may be significantly higher than ambient due to heat transfer from the process. Situations with excessive vibration should also be avoided since although the STT350 is highly rated, problems can occur on connecting wiring. Connections are as detailed earlier. Since the low level input to the STT350 is designed to reject common and series mode noise no special screening techniques are required but best results are still provided by adopting the standard practice of screening the sensor signal or using conduit or metal covered mineral insulated cable. At the STT350 the cable entries are 1/2" NPT. The 4-20 mA wiring should conform to normal practice. Screened twisted wire pairs are recommended but are not essential. The 4-20 mA signal has been adopted as an international standard with high noise immunity and the STT350 digital communications uses 16 mA pulses for the same purpose. Wiring from STT350 units can be run in multicore cabling without cross-talk during communications due to slew rate limiting of pulse rise and fall times and the slow secure communication rate of approx. 220 baud.

Galvanic isolation of input/output circuits in the STT350 enables use with grounded or ungrounded probes. The STT350 electronic circuits are completely isolated from ground and so permit the 4-20 mA loop also to be grounded at one point. Normally this is the negative of the power supply connected to instrument earth or safety barrier earth.

4.8 DIRECT MOUNTING INFORMATION

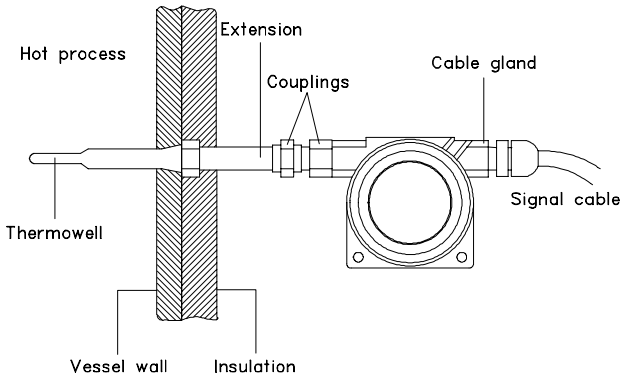


Figure 4-4

In the case where the preferred installation is direct mounted on the sensor as shown in Figure 4-4, the main consideration is heat transfer from the process along the sensor fittings. The STT350 is rated to operate in an environment of 85 °C (185 °F) but heat transfer from an uninsulated process with a short thermowell could easily produce excessive conditions. As a guide Figure 4-5 gives typical temperature gain at the STT350 over ambient conditions for various separations between the process wall and the STT350. These are qualified as typical since thicker thermowells will transfer more heat and sheltered situations could lead to higher local temperatures. Thus this should only be taken as an average guide and a safety factor should be included as considered appropriate. For an ambient temperature of say 35 °C (95 °F) maximum and a process which can operate at say 800 °C (1472 °F), then the absolute minimum length of extension length outside the wall and insulation if used, is 105 mm. Increasing this to 150mm gives a rise of only about 23 °C (41.4 °F) against the allowable 50 °C (90 °F) i.e. a comfortable safety factor.

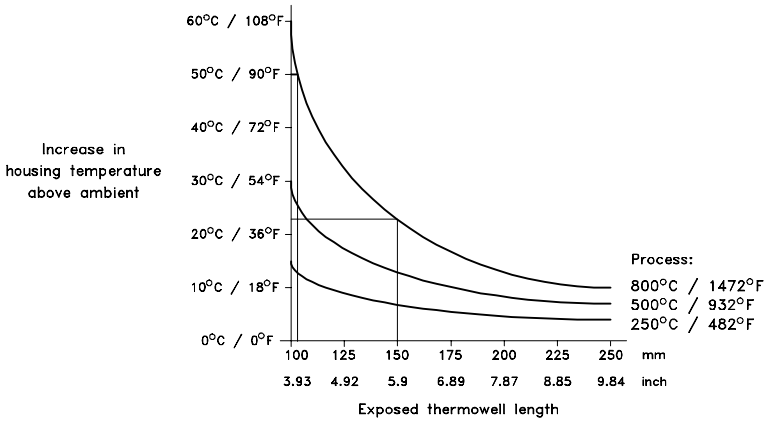


Figure 4-5

EXAMPLE: Process operates at 800 °C (1472 °F) maximum. Ambient can reach 35 °C (95 °F) maximum. STT350 operated at 85 °C (185 °F) maximum.

Permissible housing temperature rise = 85-35 = 50 °C (90 °F) maximum. From graph 50 °C (90 °F) maximum rise requires exposed thermowell length of about 105 mm. Alternatively 150 mm exposed length gives only about 23 °C (41.4 °F) rise.

Another consideration in direct mounting is selection of accessories to provide spring loading of the sensor against the end of the thermowell. This is required for fast response in some applications and must be included in the sensor/thermowell/ extension assembly. With this fitted to the STT350, 15 cm wire length should be left to connect to the input terminals i.e. from the end of the 1/2" NPT male thread. Wiring and connections should conform to local standards and practices.

4.9 COMMISSIONING

Commissioning is carried out after installation and wiring have been completed. Power up the STT350 transmitter and verify via the SFC that it is configured as required. If a bench check and configuration was carried out then the procedure will be clear. If no bench check and configuration was done then refer to section 4.4 and carry it out now. Verify also that the receiving device is actually receiving the output signal and use the SFC in output mode to vary the output signal and verify loop calibration. If small errors exist in the loop then they should be identified and the out of specification device calibrated. For calibration of the STT350 refer to the SFC Operating Guide 34-ST-11-XX. If however no adjustment is possible e.g. with voltage developing resistors or active barriers then the STT350 output can be recalibrated to compensate for loop zero and span errors.

Check also the loop failsafe requirement. STT350 includes a jumper which gives a high (21.8 mA) or low (3.7 mA) output if an internal failure or open circuit sensor is identified. The open circuit sensor detection (selection **"TC FAULT_DET"** on the SFC) can be programmed via the SFC either **"ON"** or **"OFF"**. Open circuit sensor detection operates by inspecting current pulses into the input wiring. If the sensor is also connected to other receiving devices, they could be disturbed by these pulses. Select T/C fault det. **"OFF"** for these applications.

4.10 START UP

Start up the process, check the STT350 environment is still as expected i.e. local temperature and vibration are not excessive, housing cover is tightly sealed and mountings are secure.

If the process operates at a slightly different condition from expected then the range of the STT350 can be easily changed by keying in new URV/LRV setting via the SFC but remember also to rescale the receiving device.

5.1 MAINTENANCE

Maintenance of the STT350 is limited to ensuring that connections, seals and mounting are tight and secure. There are no moving parts or adjustments and hence no reason to open the field housing except to inspect for corrosion or conductive dust entry which could later affect reliable operation. The transmitter module itself should never be opened.

5.2 TROUBLESHOOTING

Troubleshooting on the STT350 loop is greatly simplified by use of the SFC connected in the termination area near the receiving instrument. Use also a DVM at the termination area for the receiving instrument to confirm a similar signal is coming from the field and power is available on the two wires to the STT350. This isolates the problem to either field loop or receiving instrument/power supply/wiring/safety barriers etc. If the original symptom was an unstable input it could be loose connection on the receiving side.
Assuming the above confirms a field loop problem, the likely causes/actions are given below:

For any step the first action is to hook up the SFC to the transmitter and press **"ID"**, then **"STATUS"**.

SYMPTOM	SFC MESSAGE/DISPLAY	POSSIBLE CAUSE	CURE
No input or low input	**"INPUT OPEN"** (with downscale failsafe) **"I/P OUT OF SPEC"** (indicates that the input is below LRL) **"HI RES/LO VOLTS"** which indicates an open circuit loop	Bad sensor wire connection Incorrect operating voltage	Check out field wiring and connections. Ensure that the transmitter is in its voltage operating area. Verify that the 250 ohms resistor is in loop.
High input	**"INPUT OPEN"** (with upscale failsafe) **"I/P OUT OF SPEC"** (indicates that the input is above URL) **"FAILED COMM CHK"** or **"INVALID COMM"** which indicates no or improper communications with STT350.	Bad sensor wire connection Incorrect operating voltage	Check fied wiring and connections for partial short circuit. Check STT350 connections are correct polarity. Check that the transmitter is in its voltage operating area and line resistance is not excessive.
Unstable onscale input	**"STATUS CHECK = O.K."** since any identified problem would give upscale or downscale failsafe.	Bad sensor wire connection Imminent open circuit of sensor Calibrating device disturbed by the periodical sensor current detection Wiring disturbed by strong electromagnetic interference	Check connection and wiring for intermittent connections Check that sensor fault detection is **"ON"**, this allows detection of a bad sensor Turn the fault detection **"OFF"** when performing a bench check for accurate measurement. Protect wiring by using appropriate grounding, shielding, etc.
Failsafe output signal	**"CRITICAL STATUS"**	A failsafe output signal (critical status) is latched for safety and can be caused by several reasons.	Latched means the alarm will only disappear when the cause has disappeared and a power cycle or status request is performed. The SFC will indicate the source of the problem by displaying the appropriate error message.
Extreme negative or differential temperature	**"INPUT OUT OF SPEC"**	During bench checking of RTD's with decade box or resistance simulator, it can happen that the output generates negative temperature. Transmitter is seeing 0 ohm between terminals 1 and 4 as a shorting link.	Check that the resistance between terminal 1 and 4 is always greater than 15 ohms. Remember that differential RTD is restricted to PT100D, PT100J, PT200, PT500, Ni500 and ohms probe type is not supported, the minimum value of the resistance bulbs is never below this.
Incorrect output signal with simulating device	**"STATUS CHECK = O.K."**, but does not correspond to value set by simulating device.	The most common error is changing the sensor wiring after probe type selection or after power-up.	Check the appropriate sensor wiring and power cycle when it is correct.

5. MAINTENANCE/TROUBLESHOOTING

SYMPTOM	SFC MESSAGE/DISPLAY	POSSIBLE CAUSE	CURE
No break detection on RTD lead to terminal 1		The transmitter checks during power-up if the RTD/Ohms lead to terminal 1 is connected to determine operation in 3 or 4 wire mode and ignores the fourth wire in case of 3 wire RTD.	Power cycle will recover from the problem.
"Unknown status" (non-critical message) For SFC version lower than 4.2	**"Unknown status"**	This message can appear in the following cases: → ***In single T/C operation:*** The thermocouple resistance is measured periodically and if it exceeds a value of approx. 500 ohms, this warning signal will be set. The message should be interpreted as **"T/C Res. Drift"**. Note that this is not the sensor break detection alarm which is a critical status message. → ***In differential T/C or RTD operation:*** The message should be interpreted as **"Delta Temp"** mode active. → ***In redundant T/C operation:*** The message should be interpreted as **"Redundant T/C"** mode active. If more than one **"Unknown status"** is displayed, then the message should be interpreted as **"Backup T/C ACT."** or/and **"T/C Res. Drift"** (T/C1, T/C2 or both). → ***In 4 wire RTD or 4 wire OHM operation:*** The message should be interpreted as **"4 wire RTD"** mode active.	Replace T/C at next maintenance operation. No problem No problem Replace T/C at next maintenance operation.
"INVALID REQUEST" when changing LRV or URV	**"INVALID REQUEST"**	If the LRV is changed, the URV tries to change by the same amount to maintain the same SPAN. If this new URV exceeds the URL then this message appears.	Reduce the URV or SPAN before changing the LRV.
Non-critical status message, without # sign	**"USER CORR ACTIVE"**	Transmitter has been trimmed for particular sensor range. This can be done by keying in LRV/URV, CORRECT, ENTER with exact LRV and URV input values to enable improved accuracy over the specifications.	When performing a Reset Correct command or a sensor type change the transmitter will lose this sensor correction and fall back to the original factory calibration.
Remember that successfull communications to the STT350 gives many useful pieces of data even just with the initial I.D. response: **1** Transmitter is powered. **2** Line resistance is correct. **3** The wires run to the correct unit or if not then identify the tag number of the unit connected.			

5.3 RECOMMENDED SPARES

GENERAL DESCRIPTION:	Reference
STT350 Electronics Module	Order from Price Book Section 3 to include options as required.
European Explosionproof Housing	30749634-002
Carbon Steel Mounting Bracket Kit	30755905-501
Stainless Steel Mounting Bracket Kit	30671907-501
STT350 Accessories Kit (8 terminal screws, 2 jumpers, 1 plastic hole cover, 2 module fixing screws, 2 DIN rail adaptors)	46188055-501
Smart Meter	30757178-501
Analog Meter	30756997-501
Meter Mounting Bracket	46188056-501
Meter Cap for Housing	46188066-501
M20 Adaptor (flameproof Ex)	46188203-501
2 DIN clips and 2 screws kit	46188055-502
Diode for Analog Meter	46188067-501
Stick-on engineering unit labels	30756918-001

6.1 INTRODUCTION

These meters are supplied already installed by the factory and provide a display of the transmitter output.

Selection ME gives a 4-20 mA analog output moving coil meter display to ±2% accuracy. A diode is supplied fitted across the meter to enable loop continuity in the event of moving coil failure. To ensure adequate loop power availability in this event add 0.7 V to the transmitter 10.8 V loop requirement i.e. 11.5 V minimum supply Volts.

Selection SM gives the Smart Meter display which can accept either the Digital DE output or the 4-20mA analog signal. With both of these signal types the Smart Meter displays a large bargraph accurate to ±3% and visible from 10 meters away together with a 4 1/2 digit display either in % of span or in engineering units. For the 4-20 mA signal this digital display is ±0.5% of span accurate whilst for the Digital DE signal it has no error, displaying the digital output exactly within it's resolution of ±0.05 for a ±199.9 reading range, ±0.5 for a ±1999 reading range and ±5 for a ±19990 reading range.

The Smart Meter includes various status message and engineering unit information on the LCD screen.

The Smart Meter obtains its power in series with the transmitter and requires 2.25 V which should be added to the transmitter 10.8 V i.e. 13.05 V minimum supply Volts. The minimum loop operating current is <3.8 mA.

6.2 CONNECTION INFORMATION

The addition of either of these meters changes the user wiring connections, because both require a serial connection of the meter in the negative 4-20 mA signal line from the transmitter.

With a meter added, the user connections are now Terminal 6 (+4-20 mA) and Terminal 8 (-4-20 mA) as shown below in Figures 6-1 and 6-2.

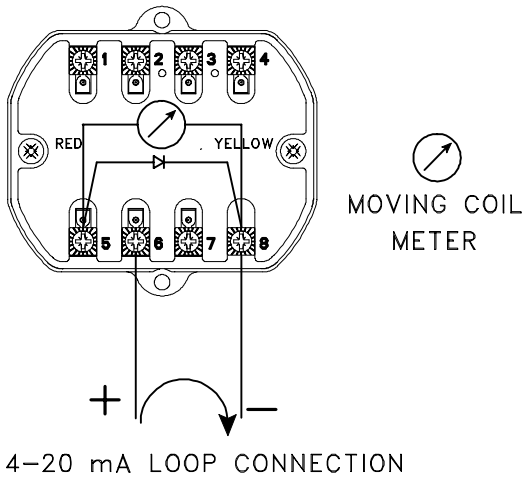


Figure 6-1 SELECTION ME CONNECTIONS

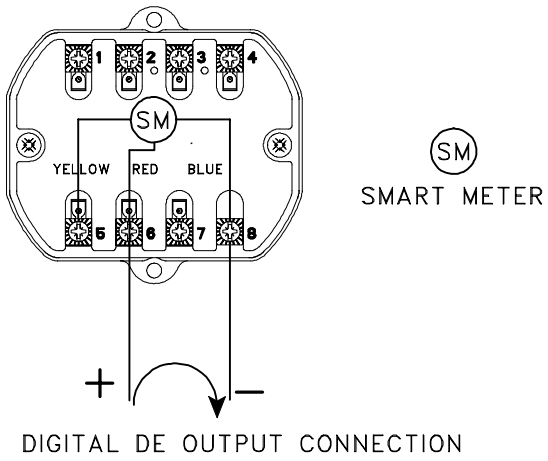


Figure 6-2 SELECTION SM CONNECTIONS

6.3 INSTALLATION / COMMISSIONING

After connecting up as in Figures 6-1 and 6-2 above and powering up the transmitter loop verify the display operates as expected. The Smart Meter may require access to its configuration push button which is accessible via a hole in the bottom/centre of the indicator meter body. This push button enables configuration of the preferred engineering units and meter zero/span calibration for a 4-20 mA signal.

When the loop power is applied the Smart Meter runs a self test diagnostic for about 10 seconds to determine correct loop operation and, if a digital DE signal is present, whether it is a 4 or 6 byte PV signal. Since most transmitters supplied with the Smart Meter operate in 6 byte digital DE output mode, this approach is covered first. If diagnostic displays are present on the meter (e.g. **"OUTPUT MODE"**, **"BAD XMTR STATUS"** or **"FAULT-LAST KNOWN VALUE"**) refer to Diagnostic and Troubleshooting section 6.4.

6.3.1 Transmitter operating in 6 byte output mode

Press button on bottom/centre of the meter body to scroll through the display codes to the preferred engineering unit selection. The display codes are EU1, EU2, ...EUF (and CAL).

For the STT350

EU1 gives °C displayed on the LCD screen
EU2 gives °F displayed on the LCD screen
EU3 converts to °K (add on the stick-on label)
EU4 converts to °R (add on the stick-on label)
EU5 converts to mV (add on the stick-on label)
EU6 converts to Volts (add on the stick-on label)
EU7 converts to Ohms (add on the stick-on label)
EU8 to EUF gives % (of span) displayed on the LCD screen.

Ignore **"CAL"** at this stage: it is described in Section 6.4.3.
Press and hold the button until the desired display code appears. Release button and display reverts to selected unit display.
The Smart Meter is now configured for use, replace the end cap.

6.3.2 Transmitter operating in 4 byte digital output mode or in analog 4-20 mA

In these cases the output signal does not include the transmitter database, only the % of span output signal. Part of this database e.g. LRV/URV, is required to enable an engineering unit display. Accordingly press the **"ID"** key on the SFC. If the transmitter responds **"DE XMTR XXXXXXXX"** then also press the **"SHIFT"**, **"ID"** keys. This enables the Smart Meter to recognise that the temperature units should be used and the necessary part of the database to convert to the preferred engineering units.
Now configure the required engineering units as in section 6.3.1 above.

6.3.3 Transmitter operating in 4-20 mA analog output mode

The Smart Meter is factory calibrated to convert a 4-20 mA signal being received to a 0 to 100% of span display. If it displays a 0.0% output regardless of the transmitter's actual PV output then it requires recalibration. Refer to Section 6.4, Diagnostic and Troubleshooting for the recalibration procedure.

6.4 DIAGNOSTIC AND TROUBLESHOOTING

6.4.1 Moving coil meter

The moving coil meter is a non repairable item. If it reads at bottom of the scale with a known input, check that the connections are good and that the Voltage across the meter/diode terminals is 0.5 to 0.7 V. This reading confirms that the delicate moving coil connections have been damaged and the meter should be replaced.

6.4.2 Smart Meter

Every time power is cycled to the transmitter/meter combination, the Smart Meter runs a self test to check internal operations and switch on all display segments as shown in Figure 6-3 for up to 10 seconds. This enables confirmation of their operation.

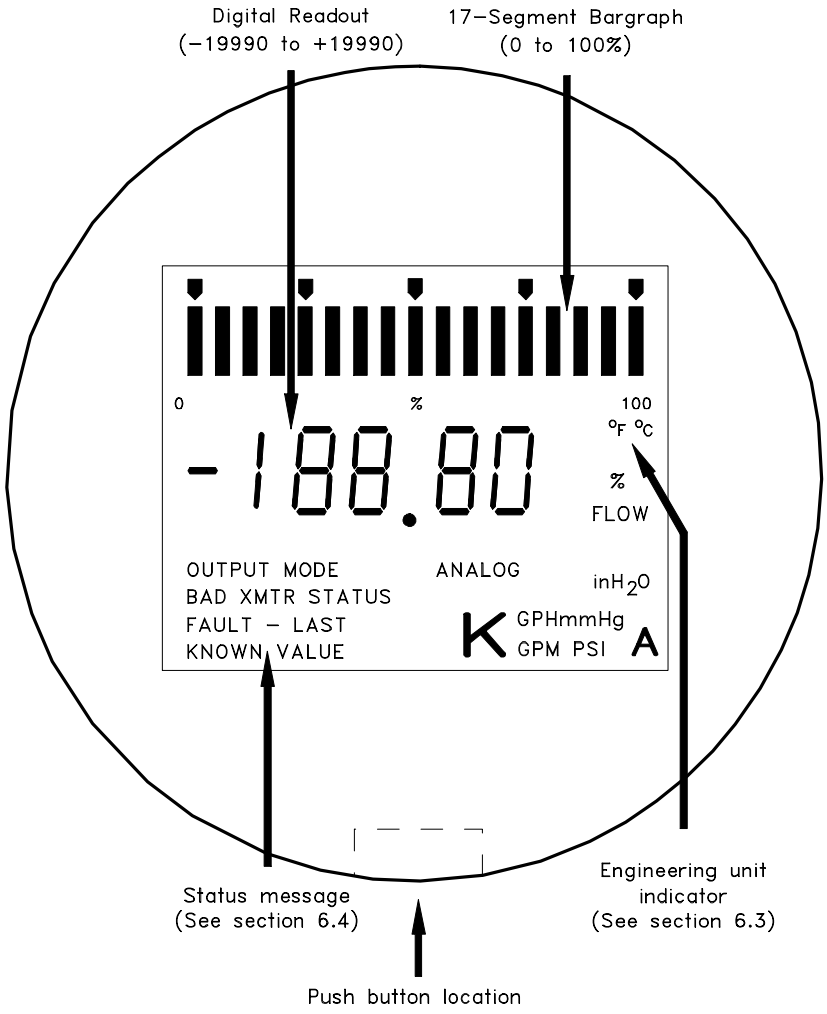


Figure 6-3 Horizontal Style Bargraph

6.4.2.1 Failed self test

If the self test fails, the display will go blank i.e. revert to the unpowered display showing only the basic bargraph outline. Note that some of the temporarily switched on segments should only be seen with an STT350 in this initial self check e.g. **"K"** for a 1,000 engineering unit multiplier (only for readings over 20,000), **"GPH"**, **"GPM"**, **"mmHg"**, **"PSI"**, **"%", "FLOW"** and **"inH$_2$0"** (only used for flow and pressure transmitters).
"ANALOG" is switched on the LCD if the transmitter output signal is 4-20 mA analog.

The "Normal" display should have a partially switched on bargraph corresponding to the transmitter % of span output signal and the corresponding digital display in % or the selected units.

6.4.2.2 Fault conditions

The various possible fault conditions are:

A. At power up the LCD screen stays completely blank. Either the self check failed or the meter is not receiving power. Check the connections.
   Note that the Smart Meter requires 2.25 Volts supply in addition to the minimum 10.8 Volts for the STT350 i.e. minimum of 13.05 V across the meter/transmitter terminals. Verify adequate loop power is available.
B. At power up, after showing all LCD segments the screen shows **"BAD XMTR STATUS"** and **"__ __ __"** instead of the digital engineering unit display. This means that the meter received a critical status diagnostic messsage from the transmitter at power up. Use the SFC to determine the critical status cause and correct.
C. After successful power up, the screen shows **"BAD XMTR STATUS"** and the bargraph/digital displays are flashing. This means that a critical status condition has occurred during operation, the display value may not be correct and again use the SFC to determine the cause and correct.
D. After successful power up, the screen shows **"FAULT-LAST KNOWN VALUE"** and the bargraph/digital displays are flashing. This means that the on-going self diagnostics of the meter has detected an internal fault or that communications from the transmitter has been lost or that 5 or more corrupted messages have been received from the transmitter operating in the digital output mode.
E. After successful power up, the screen shows **"OUTPUT MODE"** and the bargraph flashes whilst the digital display flashes a value 0.0% to 100.0%. This means that the transmitter has been instructed to go to fixed output mode whilst operating as a digital output device. Connect an SFC and press **"OUTPUT"**, **"CLEAR"** to revert to normal operation.
F. The screen shows **"ANALOG"**, **"0.0%"** digital display and no bargraph segments are switched on. This means that the Smart Meter requires calibration to the transmitter operating in 4-20 mA analog output mode. See below.

6.4.3 4-20 mA analog mode calibration

Calibration is only of benefit to ensure display accuracy with a 4-20 mA analog signal. As all Smart Meters are factory calibrated before shipment it should not be required and the facility is included in case recalibration for time drift or transmitter end point offsets are required.
Basically, accurate 4 and 20 mA signals are provided to the meter whilst the configuration button selects the **"CAL"** display. When used with the STT350 these 4 and 20 mA signals can be conveniently provided by using the SFC to switch the transmitter to **"OUTPUT MODE"**.

The full calibration procedure steps are:

- **Step 1 -** Put control loop to Manual and use the SFC to establish communications and put transmitter into 0% output mode (key in **"OUTPUT"**, **"0"**, **"ENTER"** for **"0.0%"**).
- **Step 2 -** Press and hold bottom button on meter body until **"CAL"** appears in the display - release button. The meter will now carry out a zero (LRV) calibration and revert to normal operation (key in **"OUTPUT"**, **"CLEAR"** to revert transmitter to continuous output operation).
- **Step 3 -** Change output mode value to 100% (key in **"OUTPUT"**, **"1"**, **"0"**, **"0"**, **"ENTER"** for 100%).
- **Step 4 -** Press and hold bottom button on meter body until **"CAL"** appears in the display - release button.

The meter will now carry out a span (URV) calibration and revert to normal operation (key in **"OUTPUT"**, **"CLEAR"** to revert transmitter to continuous output operation). Return loop to Automatic operation.
ATTENTION - If **"bAd"** appears in the meter display either after Step 2 or Step 4 then either the 4 mA or the 20 mA signal is not within the meter's acceptable accuracy range and calibration was aborted. Check the mA values and repeat calibration steps as required.

7.1 EXTERNAL LIGHTNING PROTECTION

7.1.1 Wiring reference

Figure 7-1 shows a typical wiring scheme of a transient protector to the STT 3000 Model STT350 transmitter.

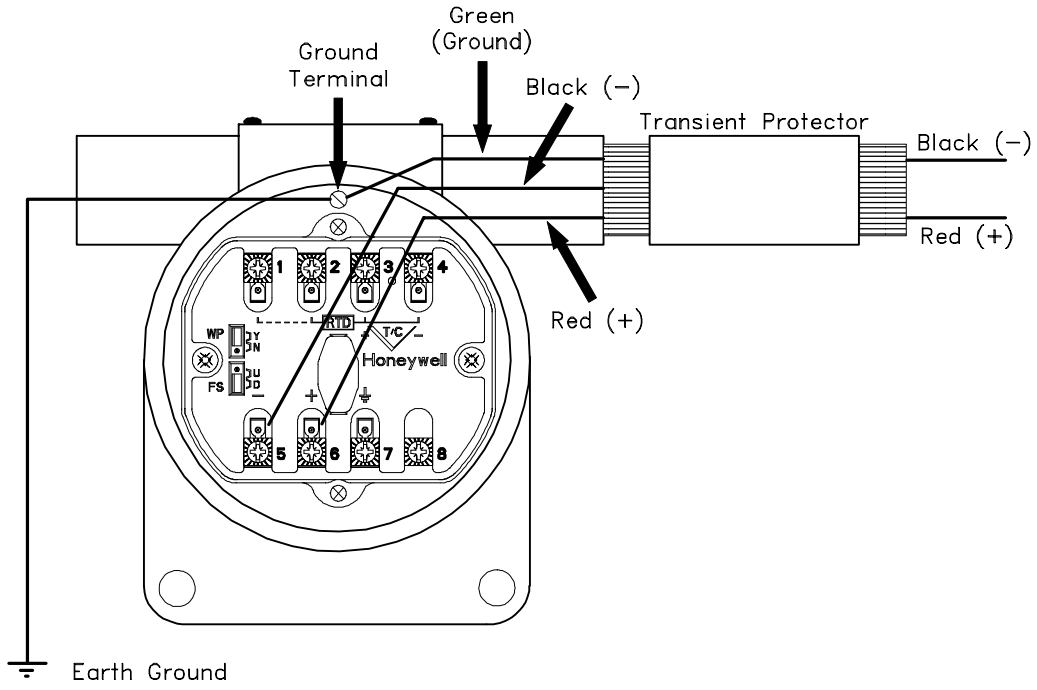


Figure 7-1 Typical transient protector to STT 3000 transmitter wiring

7.1.2 Installation procedure

The procedure in table 7-1 outlines the steps to install a transient protector on an STT 3000 Model STT350 transmitter.

STEP	ACTION
1	Unscrew housing cap.
2	Apply pipe joint tape or compound suitable for operating environment to threads on transient protector - leave first two threads clean.
3	Hold transient protector so end with three wires points toward the right-hand conduit connection in transmitter's housing.
4	Feed three wires through conduit connection and screw protector into connection.
5	Connect red wire to positive (+) terminal 6.
6	Connect black wire to negative (-) terminal 5.
7	Connect green wire to ground terminal inside housing. **ATTENTION:** be sure to keep green wire short and straight.
8	Replace cap.
9	Connect the housing to a suitable earth ground using a #6 or larger Nickel-clad copper wire.
10	Observing polarity, connect field wiring to two wires on other end of transient protector - red wire is positive (+) and black wire is negative (-).

TABLE 7-1 Transient protector installation

7.2 INTERNAL SURGE PROTECTION

7.2.1 Introduction

CAUTION:
In hazardous area/location applications where explosive gases may be present the following instructions MUST be followed:

EEx d / explosion-proof: in explosion-proof / flame-proof applications the loop must be isolated before any EEx d / explosion-proof covers are removed.

EEx i / intrinsic safety: in intrinsically-safe circuits use only IS certified test equipment.

The HW48 can be installed within the housing of a Honeywell STT350 Smart Transmitter to give protection against surges such as those generated by lightning. The unit mounts against the side of the STT350 and fits inside a Honeywell EP housing. Loop wiring is made to the terminal block on the HW48, with connection to the transmitter being made by the HW48 spade terminals. Other connections are made directly to the Honeywell STT350. The HW48 adds 36 ohms to the loop resistance and so it might be necessary to increase the voltage of the loop supply to compensate, to allow the transmitter to function correctly.

The HW48 diverts any surge safely away from the STT350 to the housing, which acts as an equipotential point for the transmitter. The transmitter housing should be bonded to the plant earth by as short a length of wire as possible, using wire of at least 4 mm^2 cross-section.

Used in conjunction with the EP housing, the HW48 does not affect the EEx d / explosion-proof certification of the enclosure. In Zone 2 / Div 2 applications, introducing an HW48, when used in the EP housing, will not adversely affect the safety of the system. In intrinsically safe circuits, the HW48 can be classified as non-energy storing apparatus (<1.2V, <0.1A, <20μJ, <25mW, C_{eq} = 0, L_{eq} = 0).

NOTE:
This surge protection device (SPD) is designed to limit the voltage that can occur both line-line and line-earth and, therefore, this unit will not pass a 500V insulation test. Any system insulation test should be carried out before the HW48 is installed.

7.2.2 Installation

Refer to figure 7-2 for guidance in installing the HW48, using the following instructions. (If a Smart Meter or Analog Meter is being used on the transmitter, cut off the link wire from the side of HW48 before installing it on the transmitter (see figure 7-2). The meter can then be installed onto the transmitter, as shown in figure 7-3.

1. Remove the cover of the transmitter housing (if applicable). The HW48 fits on the side of the STT350 transmitter adjacent to terminals 5, 6, 7 & 8.
2. Remove the retaining screw at the base of the STT350 transmitter on the side of the transmitter by terminals 5, 6, 7 & 8 and loosen the screws on terminals 5, 6 & 8.
3. Replace the fixing screw removed in (2), using it to attach the bonding ring to the housing at the same time, this is the surge bond for the HW48. (This operation can be done with the green/yellow bonding wire uncoiled from the HW48). When the screw is tightened, ensure that the ring terminal does not rotate to such an extent that it will interfere with the replacement of the transmitter housing cover.
4. Mount the HW48 against the side of the STT350. In doing this, the green/yellow wire must be guided into the channel in the side of the HW48. The transmitter retaining screw head will fit into the recess in the base of the HW48 and the terminals of the HW48 will slide into the STT350 terminals 5, 6 & 8. Before tightening the terminal screws, ensure that the HW48 is pressed tightly against the side of the STT350, and hold it in place while tightening the terminals.
5. Attach the wires for the 4-20 mA loop to the terminals marked + and - on the HW48. If there is a screen, it should be connected to the central terminal on the HW48.
6. Replace the transmitter housing cover.

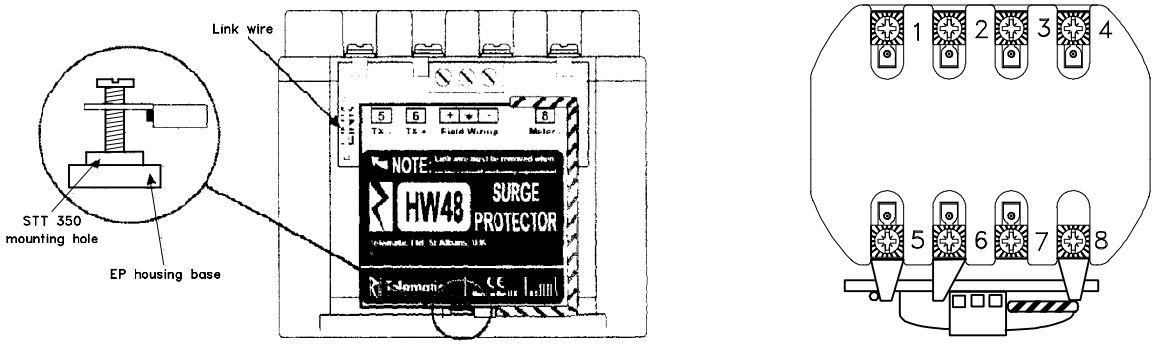
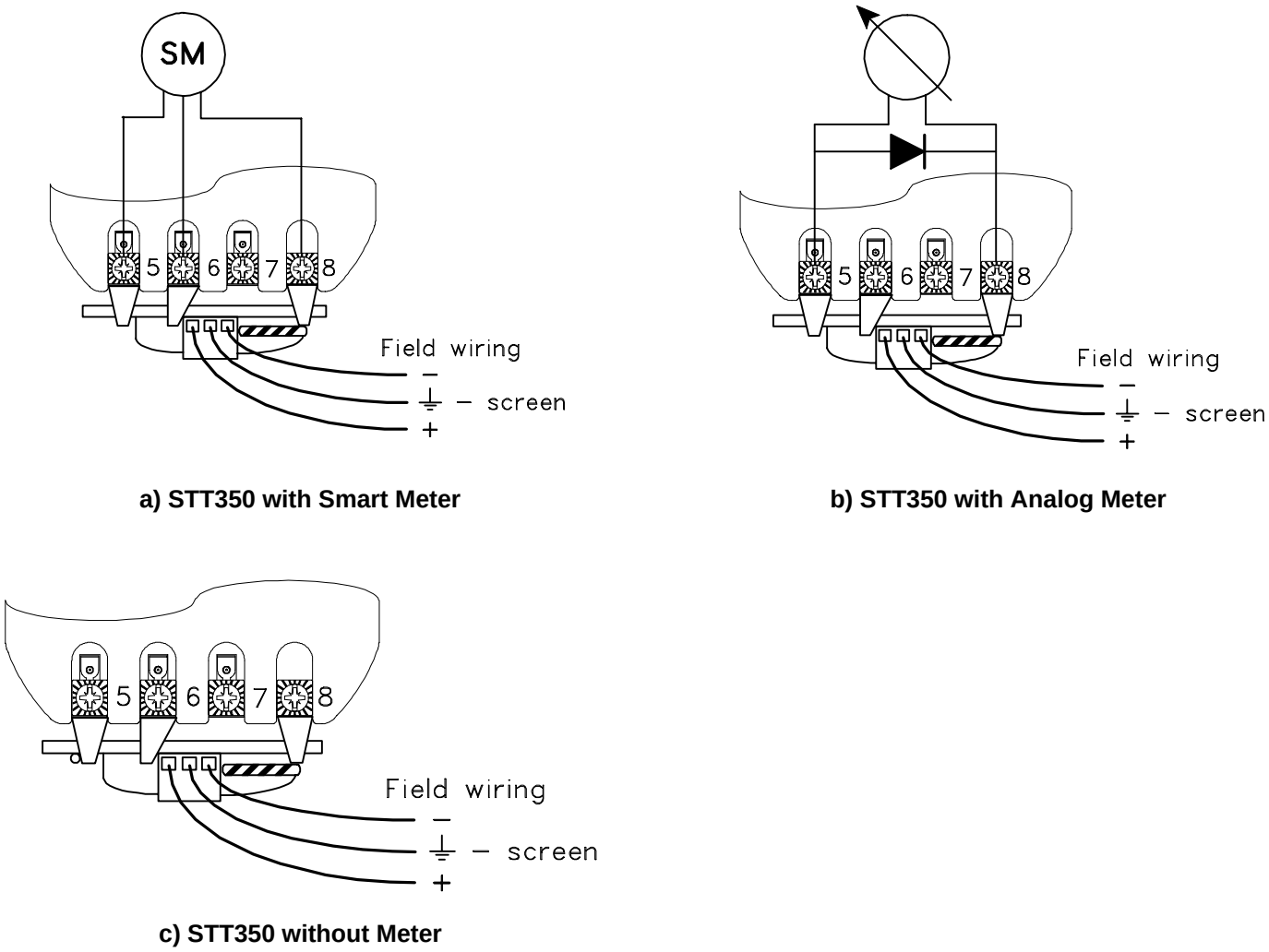


Figure 7-2 Mounting of the HW48 on a transmitter



a) STT350 with Smart Meter

b) STT350 with Analog Meter

c) STT350 without Meter

Figure 7-3 Wiring to the HW48 and transmitter

7.2.3 Maintenance

The unit is designed to give a long "normal" service life. However, if exposed to a large number of high energy transients beyond the capability of the unit, it may fail. The unit has been designed so that, under excessive surge conditions, it should failsafe, protecting the transmitter. If the unit has failed, it can be replaced in the field - the process for removal is the reverse of that for installing the unit. If a replacement HW48 is not immediately available, it is possible to bypass the unit by wiring directly to the transmitter; however, it should be remembered that, in this case, the transmitter will be unprotected from surges.