Honeywell

STT85A
SmartLine Temperature Probe Assemblies

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Notices and Trademarks

Revision 2.0, May 2023

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About This Document

This document describes preparation, operation and maintenance of the STT800 Series temperature Probe Assemblies. Mounting, installation and wiring are covered in other documents.

Intended Audience

This manual is intended for the following users:

- Persons responsible for commissioning and installation.
- Service persons responsible for routine maintenance and who diagnose and repair faults.

Revision Information

Revision Number	Date	Description
1.0	September 2020	Initial release
2.0	May 2023	Web links update

References

The following list identifies all documents that may be sources of reference for material discussed in this publication.

Document Title	Document ID
STT85A Specification	34-TT-03-21
STT85A Quick Start Guide	34-TT-25-21

Support and contact info

For Europe, Asia Pacific, North and South America contact details, refer to the back page of this manual or the appropriate Honeywell Solution Support web site:

Honeywell Corporate www.honeywell.com
Honeywell Process Solutions https://www.process.honeywell.com

Telephone and Email Contacts

Area	Organization	Phone Number
United States and Canada	Honeywell Inc.	1-800-343-0228 Customer Service 1-800-423-9883 Global Technical Support
Global Technical Support	Honeywell Process Measurement & Controls	hfs-tac-support@honeywell.com
Global Technical Support Knowledge Articles	Honeywell Process Measurement & Controls	bit.ly/2N5Vldi
Global Sales Email Support	Honeywell Process Solutions	ask-ssc@honeywell.com

Symbol Definitions

The following table lists those symbols used in this document to denote certain conditions.

Symbol	Definition
	**ATTENTION:** Identifies information that requires special consideration.
	**TIP:** Identifies advice or hints for the user, often in terms of performing a task.
CAUTION	Indicates a situation which, if not avoided, may result in equipment or work (data) on the system being damaged or lost, or may result in the inability to properly operate the process.
	**CAUTION**: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices. **CAUTION** symbol on the equipment refers the user to the product manual for additional information. The symbol appears next to required information in the manual.
	**WARNING**: Indicates a potentially hazardous situation, which, if not avoided, could result in serious injury or death. **WARNING** symbol on the equipment refers the user to the product manual for additional information. The symbol appears next to required information in the manual.
	**WARNING, Risk of electrical shock**: Potential shock hazard where HAZARDOUS LIVE voltages greater than 30 Vrms, 42.4 Vpeak, or 60 VDC may be accessible.
	**ESD HAZARD:** Danger of an electro-static discharge to which equipment may be sensitive. Observe precautions for handling electrostatic sensitive devices.
	**Protective Earth (PE) terminal**: Provided for connection of the protective earth (green or green/yellow) supply system conductor.
	**Functional earth terminal**: Used for non-safety purposes such as noise immunity improvement. NOTE: This connection shall be bonded to Protective Earth at the source of supply in accordance with national local electrical code requirements.
	**Earth Ground**: **Functional earth connection.** NOTE: This connection shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.
	**Chassis Ground**: Identifies a connection to the chassis or frame of the equipment shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.

Symbol	Description
	The Factory Mutual® Approval mark means the equipment has been rigorously tested and certified to be reliable.
	The Canadian Standards mark means the equipment has been tested and meets applicable standards for safety and/or performance.
	The Ex mark means the equipment complies with the requirements of the European standards that are harmonised with the 94/9/EC Directive (ATEX Directive, named after the French "ATmosphere EXplosible").

Contents

Tables

Figures

1. Introduction

1.1. Purpose

This manual describes the Honeywell STT SmartLine Probe Assemblies Installation, operation and maintenance.

1.2. Scope

The document is applicable to STT85A SmartLine probe assemblies which consists of STT850 transmitter and various probe types.

1.3. Overview

Honeywell SmartLine temperature probe assemblies are a perfect compliment to SmartLine temperature transmitters to provide factory tested, calibrated and certified assembly for accurate, reliable and safe measurement in process applications. SmartLine STT85A is a fully integrated probe assembly based on SmartLine temperature transmitter STT850, ready for out of box installation that caters to tough industrial applications and includes variety of temperature elements, thermowells and extension types well suited for wide array of industrial temperature measurement needs.

Table 1: STT85A Features and options

Feature/Option	Standard/Available Options
Sensor Element	RTD, PT100- 3-wire (Simplex & Duplex) & 4-wire (Simplex) Thermocouple – Type J & Type K - Simplex & Duplex
Assembly type	Rigid probe assembly Threaded and socket weld thermowell assemblies Drilled Flanged thermowell assemblies
Accuracy class	Class A for RTDs Class 1 for Thermocouples
Calibration	Probe calibration – 2/3/5 points Assembly Calibration (Transmitter with probe) – 2 points
CVD Calibration	Entry of Callender-Van Dusen(CVD) coefficients in transmitter for increased RTD accuracy
Communication Protocols	Analog (4-20 mA), HART version 7, Digitally Enhanced (DE), Fieldbus
Human-Machine Interface (HMI))	Basic display: 2 Line 16 Characters Advanced display: Alphanumeric Graphic display
Approvals	CSA, ATEX, IECEx and FM
Configuration tools	External 3-buttons, Hand Held Communicator, Experion
Integration Tools	Experion or other host system

1.4. Physical Characteristics

As shown in Figure 1, the STT85A is packaged in one major assembly. The elements in the Housing are connected to the process to measure the process variables. It also connects to the host system

and respond to setup commands and execute the software and protocol for the different temperature measurement types.

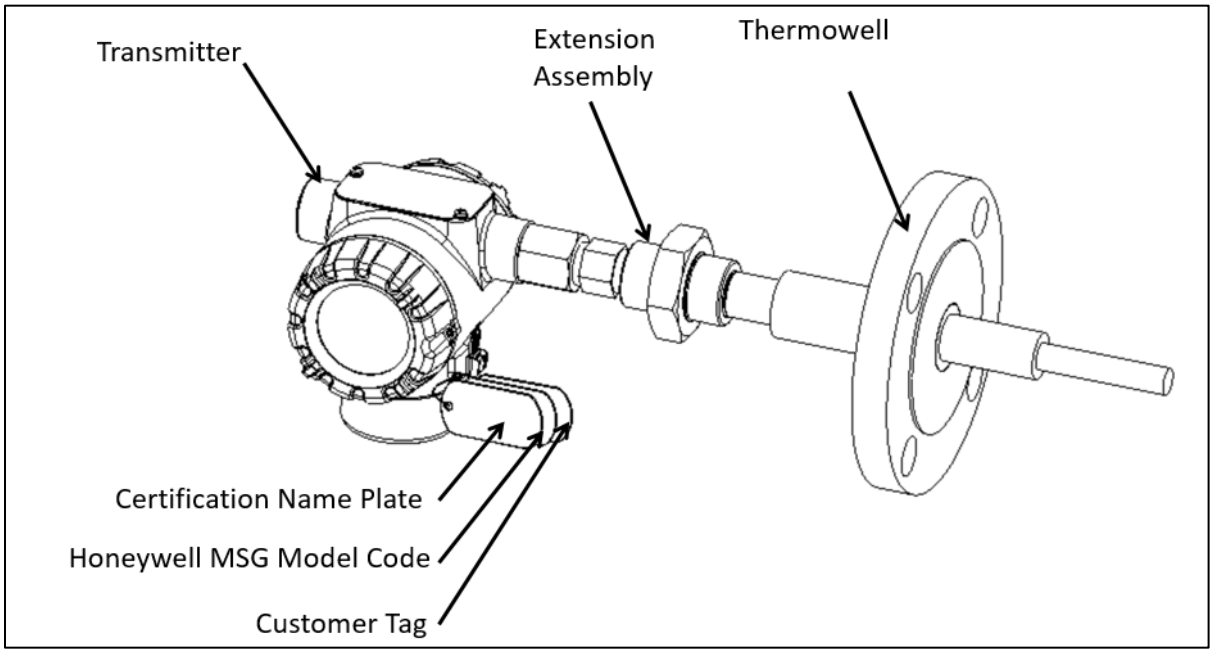


Figure 1 – STT85A SmartLine Temperature Assembly

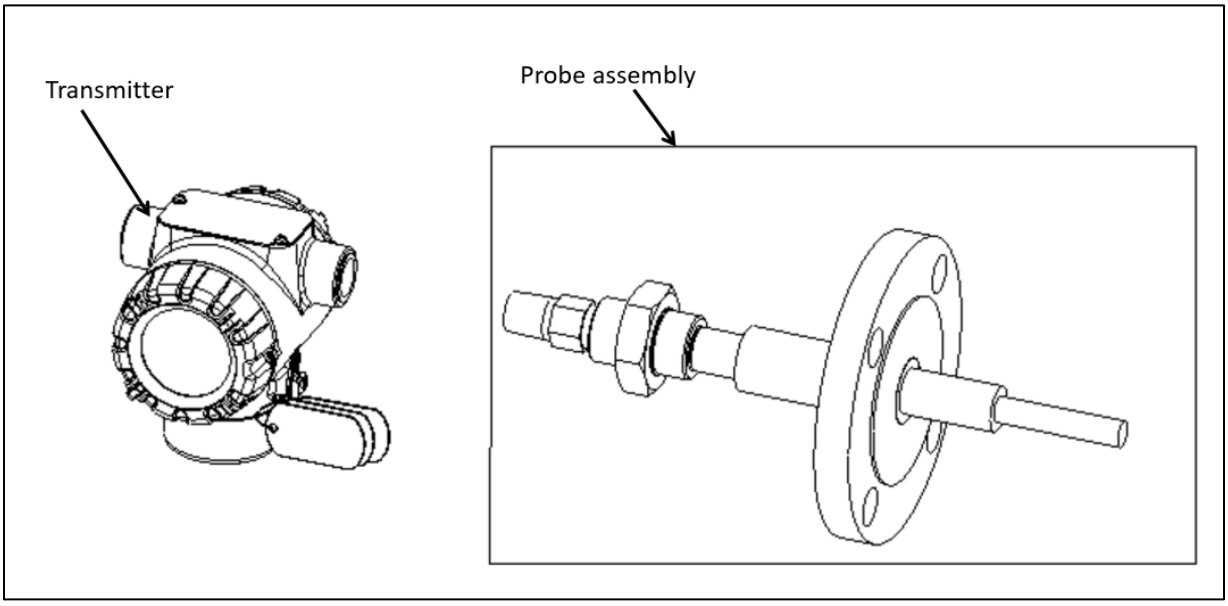


Figure 2: Transmitter and Probe assemblies

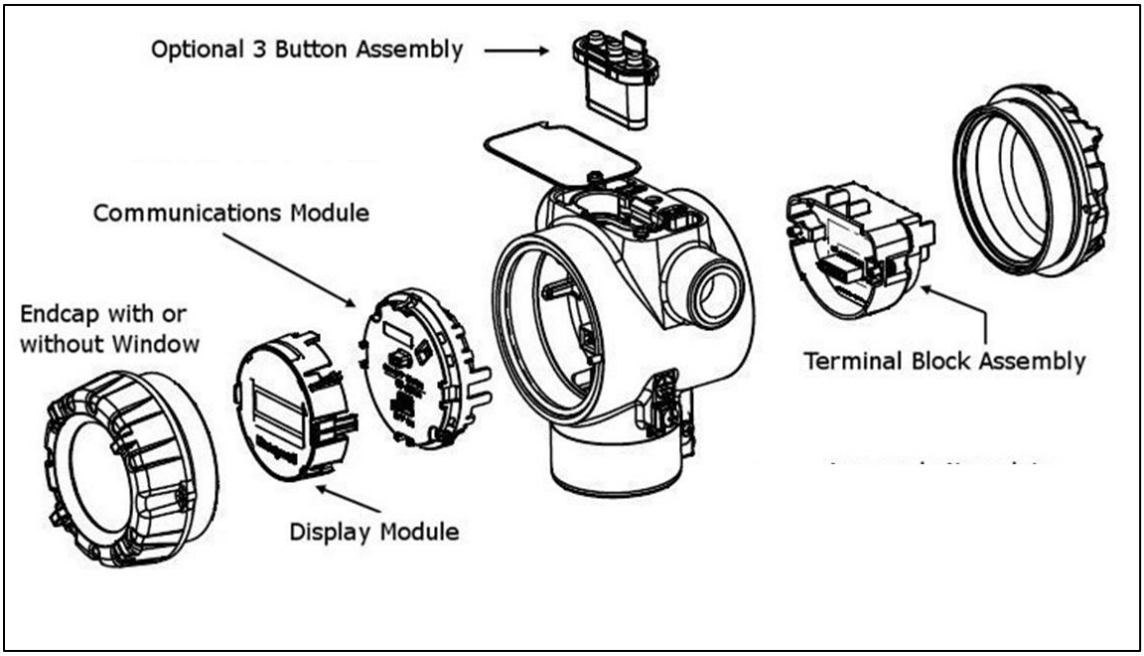


Figure 3: Transmitter Housing components

1.5. Functional Characteristics

The assembly measures process temperature and outputs a signal proportional to the measured process variable (PV). Available output communication protocols include 4 to 20mA, Honeywell Digitally Enhanced (DE), HART, and FOUNDATION Fieldbus.
An optional 3-button assembly is available to set up and adjust the transmitter settings.
In addition, a Honeywell Multi-Communication (MC) Toolkit (not supplied with the transmitter) can facilitate setup and adjustment procedures in the case of HART and DE. Certain adjustments can be made through an Experion Station or a Universal Station if the transmitter is digitally integrated with Honeywell's Experion or TPS/TDC 3000 control system for HART and DE transmitters.
Foundation Fieldbus transmitters have inbuilt short-circuit protection. In-line with FOUNDATION™Fieldbus System Engineering Guidelines (AG-181), the maximum spur current (startup current of transmitter) and connection of at least one test equipment on spur is accepted.

1.6. STT85A SmartLine Assembly NamePlate

The transmitter nameplate mounted on the housing (see Figure 1) that lists its model number, physical configuration, electronics options, accessories, certifications, and manufacturing specialties. **Error! Reference source not found.** is an example of a typical nameplate. The model number format consists of a Key Number with several table selections.

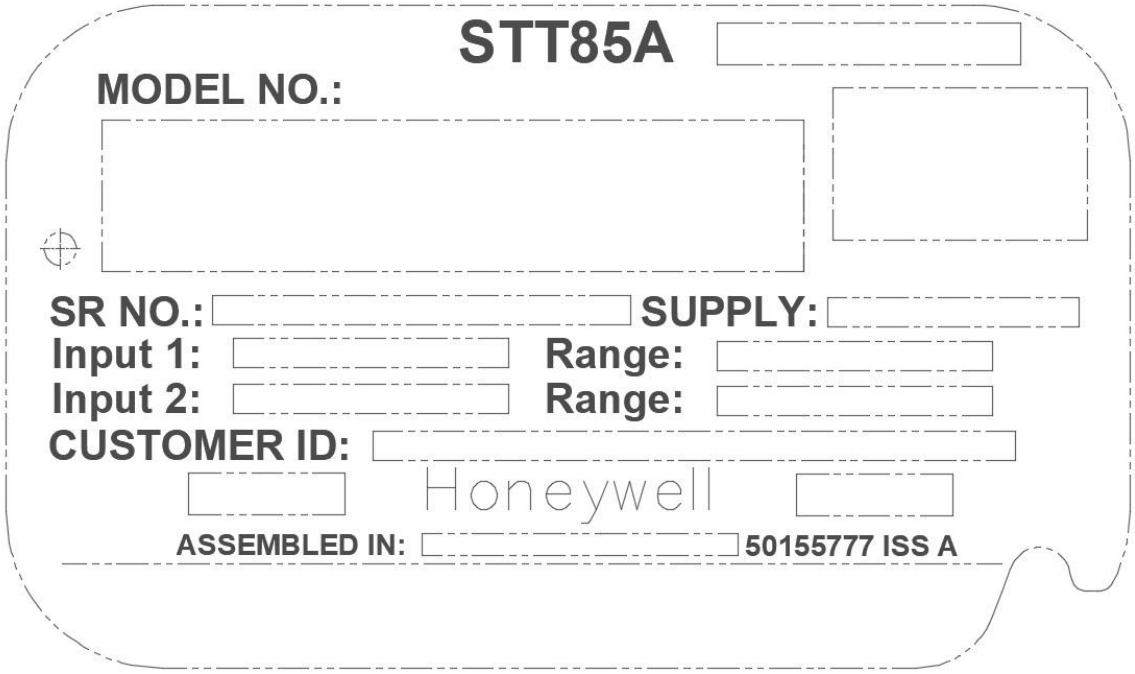


Figure 4: Typical STT85A NamePlate

NOTE: needed pictures of different name plates from TE. examples

1) Model code name plate

You can readily identify the series and basic transmitter type from the key number. For a complete selection breakdown, refer to the appropriate specification and model selection guide provided as a separate document, 34-44-16-40.
MSG also available in the STT85A Specification 34-TT-03-21.

1.7. Probes and Wells:

Table 1 lists the sensor probes supported by STT85A.

Table 2: Sensor Probe Types

Sensor Type	Temperature Range
Thermocouple Type J Class I	0° C to 760° C
Thermocouple Type K Class I	-200° C to 1260° C
RTD Pt 100 3 Wire standard range	-50° C to 260° C
RTD Pt 100 4 Wire standard range	-50° C to 260° C
RTD Pt 100 3 Wire extended range	-180° C to 500° C
RTD Pt 100 4 Wire extended range	-180° C to 500° C

To identify the probe type connected to a device, please check the model key.

- Probe calibration information:
- Assembly Types:

1) Rigid probe assembly without thermowell (Figure 5)
2) Threaded assembly with thermowell and extension (Figure 6)
3) Drilled Flanged assembly with thermowell and extension (Figure 7)

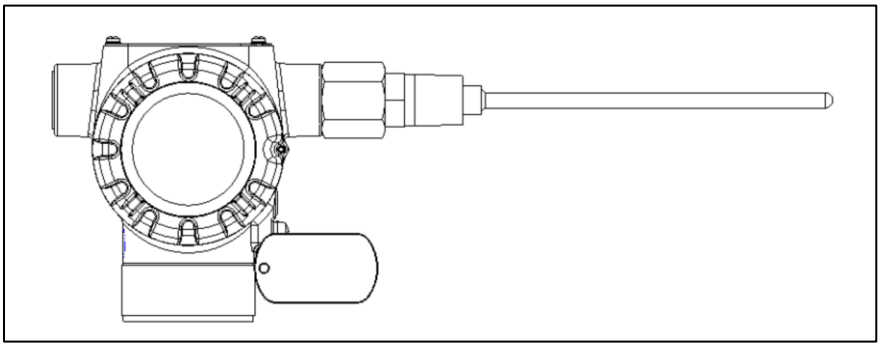


Figure 5: Transmitter with Rigid Probe

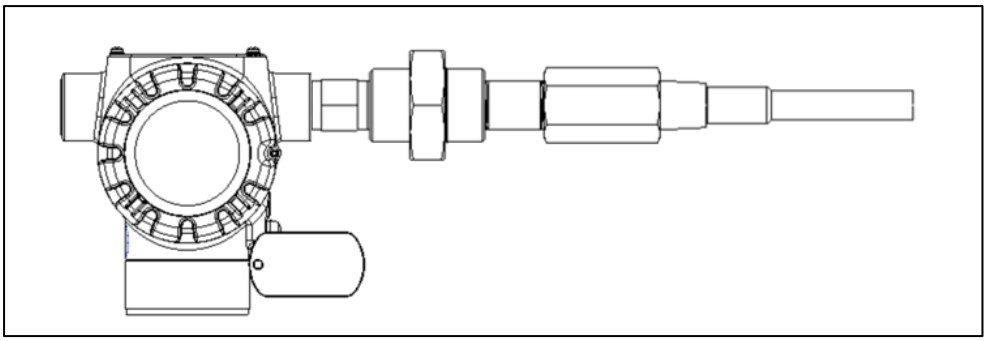


Figure 6: Transmitter with Threaded Thermowell

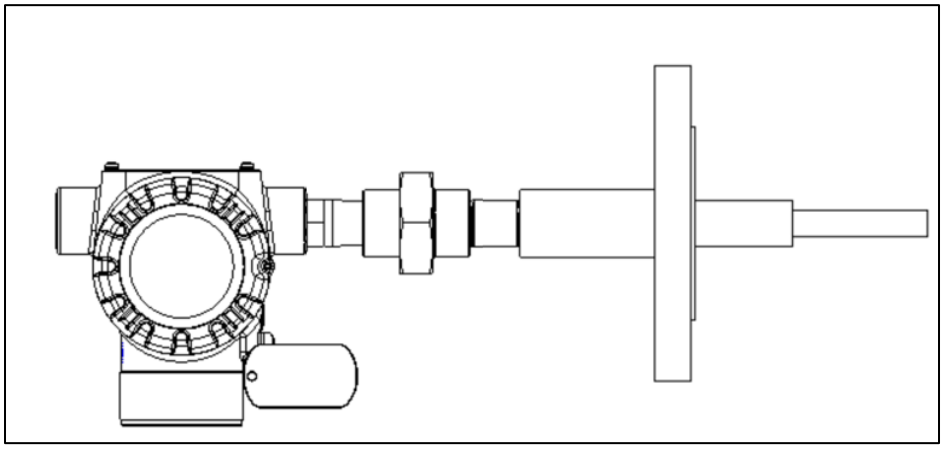


Figure 7: Transmitter with Flanged Thermowell

1.8. Wake frequency calculation for controlled conditions

Thermowells must be carefully selected for processes where significant velocity is present.
By penetrating the process flow, the thermowell is subject to the stress and friction of the flow.
This may set up a natural vibration in the well. If this is not done correctly, the vibration will be such that the well will shear off in the process. This can be especially troublesome in high velocity steam lines. As the engineer needs to have the well deep enough into the process to accurately measure the temperature, the selection of the length and diameter of the well needs to be checked against the process to ensure that they are compatible. This is done through a calculation known as a Murdock.
This calculation will determine whether a thermowell will be acceptable for the proposed process.
The Von Karman Trail refers to the turbulent wake, which is formed as fluid flows past the thermowell.
A vibration frequency is determined by the diameter of the thermowell and the fluid velocity.
Should this frequency equal the natural frequency of the thermowell it will cause the thermowell to vibrate to the point where it will break off? Therefore, it is important that the thermowell is designed to insure the natural frequency of the thermowell always exceeds the potential wake frequency.
Wake frequency calculation option is there in the STT85A Model selection guide. It is a selectable option while placing any new order. Honeywell team will touch with customer for required inputs and help in selecting the suitable thermowell.
For reverification or any special requirement please contact technical assistance team of Honeywell.

1.9. Transmitter Adjustments

For HART and DE variants, Span adjustments are possible in STT85A SmartLine Temperature Transmitters with the optional three-button assembly located at the top of the Electronic Housing (see Figure 3).
For HART and DE you can also use a third-party hand-held configuration tool to make any adjustments to an STT850 SmartLine Temperature Transmitter. Alternately, certain adjustments can be made through the Experion or Universal Station, if the transmitter is digitally integrated with a Honeywell Experion or TPS system. In case of Fieldbus (FF) variants, adjustments can be made using any Fieldbus compliant DCS or Asset management system including Honeywell Experion PKS and Honeywell FDM. Any Fieldbus compliant third-party handheld configuration may also be used.

1.10. Display Options

The STT85A SmartLine Temperature Transmitter has two display options: Basic and Advanced; see Table 3.

Table 3: STT85A Display options

Basic Display	• Suitable for basic process needs • 360 deg rotation in 90 deg increments • 8 configurable screens • 2 lines,16 characters • Standard units of measurement: °F, °C, °R, K, Ω, mV & % (Custom Units available for Fieldbus variant) • Diagnostic messaging

Advnace Display	• Suitable for custom and complex process needs
	• 360° rotation in 90° increments
	• Three (3) configurable screen formats with configurable rotation timing
	  o Large process variable (PV)
	  o PV with bar graph
	  o PV with trend (1-999 hours (allows 31 days), configurable)
	• Eight (8) screens with 3-30 seconds rotation timing
	• Standard engineering units (Custom Units available for Fieldbus variant)
	• Diagnostic alerts and diagnostic messaging • Multiple language support:
	  o EN, FR, DE, ES, RU, IT, TR
	  o EN, CH (Kanji), JP
	• Supports 3-button configuration and calibration
	• Supports transmitter messaging, and maintenance mode indications

1.11. Optional 3-Button Assembly

The optional 3-Button Assembly provides the following features and capabilities:

- Increment, decrement, and enter key functions.
- With the menu-driven display:
- Comprehensive on-screen menu for navigation.
- Transmitter configuration (for HART and DE).
- Transmitter calibration (for HART and DE).
- Display configuration.
- Set span parameters (for HART and DE).
- Viewing transmitter parameters

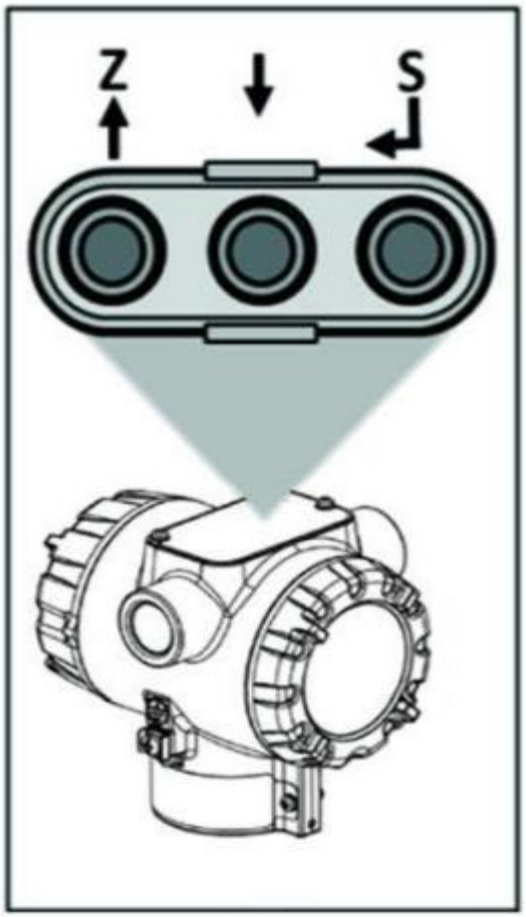


Figure 8: Option 3-button assembly

2. Installation and Startup

2.1. Installation Site Evaluation

Evaluate the site selected for the STT85A installation with respect to the process system design specifications and Honeywell's published performance characteristics for your particular model. Temperature extremes can affect display quality. The display can become unreadable at temperature extremes; however, this is only a temporary condition. The display will again be readable when temperatures return to within operable limits.

Some parameters that you may want to include in your site evaluation are:

- Environmental Conditions:
- Ambient Temperature
- Relative Humidity
- Potential Noise Sources:
- Radio Frequency Interference (RFI)
- Electromagnetic Interference (EMI)
- Vibration Sources
- Pumps
- Motorized System Devices (e.g., pumps)
- Valve Cavitation
- Process Parameters
- Temperature
- Maximum Sensor Input Ratings

2.2. Display Installation Precautions

Temperature extremes can affect display quality. The operable limits for the display are -20C to 70C. The display can become unreadable at electronic temperature extremes, however, this is only a temporary condition. The display will again be readable when temperatures return to within operable limits.
The display update rate may increase at cold temperature extremes, but as with readability, normal updating resumes when temperatures are within limits for full operability.

2.3. CAUTIONS and WARNINGS BEFORE USE:

- Check all items match the order, check its condition and report if there is any damage.
- Store assemblies in clean and dry places.
- Do not use the product for out of temperature limits specified in the product data sheet.
- Do not forget to place O-rings back where applicable.
- Do not expose Terminal block and connection section at very high temperatures above **85°C**.
- The extension length of probe assembly shall be carefully choosen for safe operation of electronics for high process temperature applications.

CAUTION:

CHECK AND OBSERVE ALL APPROPRIATE SAFETY RULES AND REGULATIONS PRIOR TO PERFORMING ANY WORK INVOLVING THE INSTALLATION OF THESE PRODUCTS.

Due to the multitude of ways in which Thermocouple and RTD Assemblies are installed, it is not practical for one set of instructions to cover every installation or every detail that may be required. The instructions and recommendations contained in this manual are provided as an aid to those attempting to work with these units. These instructions are not intended to cover every installation, this is not to be considered an authoritative guide on the installation and maintenance of these assemblies. All specific questions concerning the installation, care and maintenance of these assemblies should be directed to the supplier, manufacturer, or fabricator as they occur.

2.4. Installation Instructions

Wiring Terminal Block:

The transmitter is designed to operate in a two-wire power/current loop with loop resistance and power supply voltage within the HART or DE operating range.

Refer the user manuls STT850: SmartLine Temperature Transmitter User Manual 34-TT-25-03, Figure below show typical connection for 4-20 mA Loop.

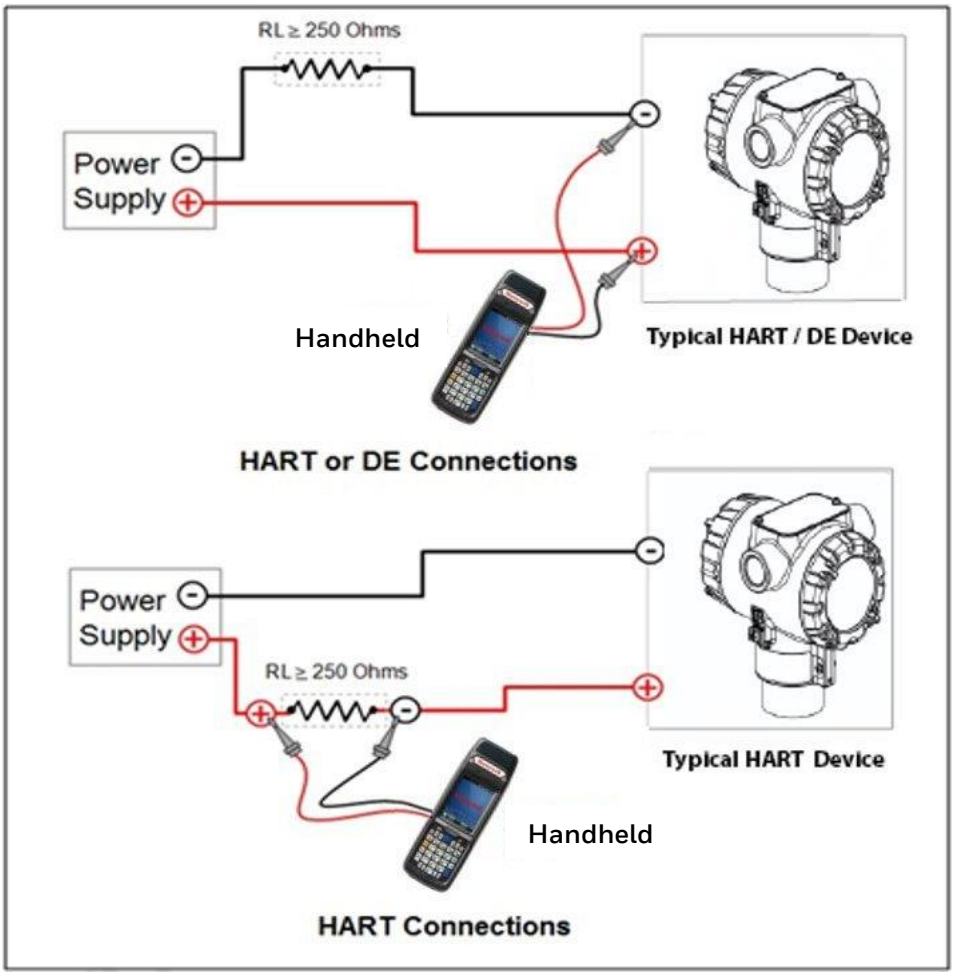
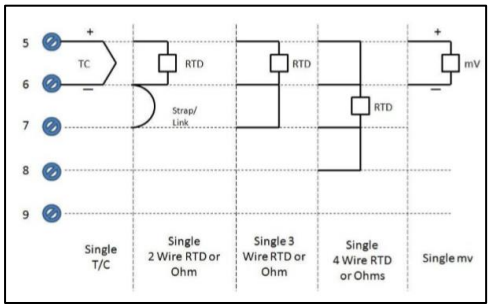
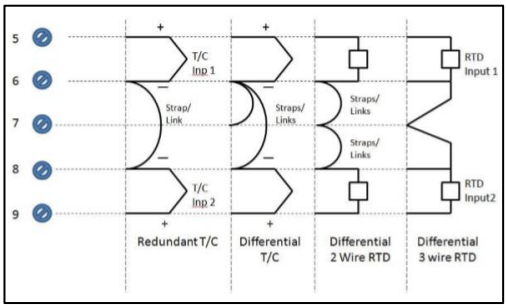


Figure 9: Typical connection for 4-20 mA Loop

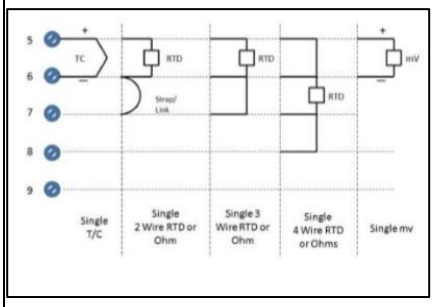
Sensor Wiring



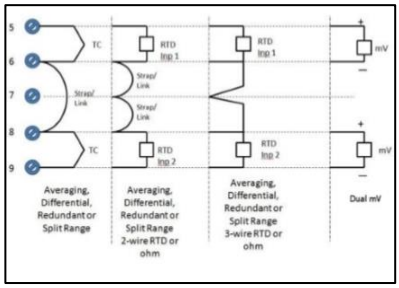
DE- Single Input Wiring Diagram RTD Thermocouple, mV and Ohm Connections



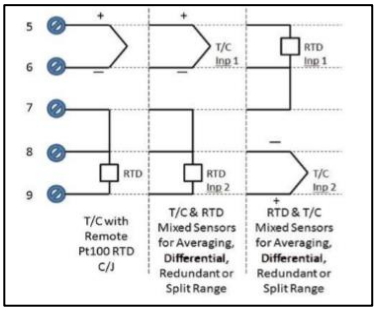
DE- Dual Input Wiring Diagram[1] Thermocouple and RTD Connections[1] Not applicable for single input sensor



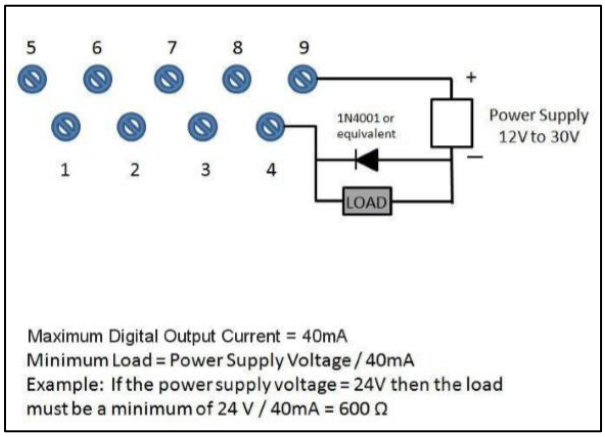
HART/FF – Single Input Wiring Diagram RTD Thermocouple, mV and Ohm Connections



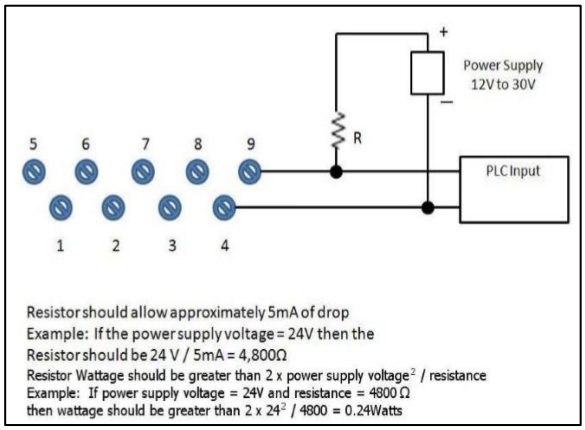
HART/FF – Dual Input Wiring Diagram RTD Thermocouple, mV and Ohm Connections



HART/FF Dual Input Wiring Diagram Remote C/J and Mixed Sensors Connections



Digital Output Connections for mA Load (HART only)



Digital Output Connections for PLC Counting Input (HART only)

Figure 10: Sensor Wiring

3. STT85A Probe Assemblies

3.1. Probe insertion and connection

Instructions for maintaining Insertion length and actual insertion length of Probes:

This is application specific and depends completely on the system in which it is installed.
All thermowells and probes should only be installed and configured exactly per the manufacturer of the systems instruction / Site requirements.

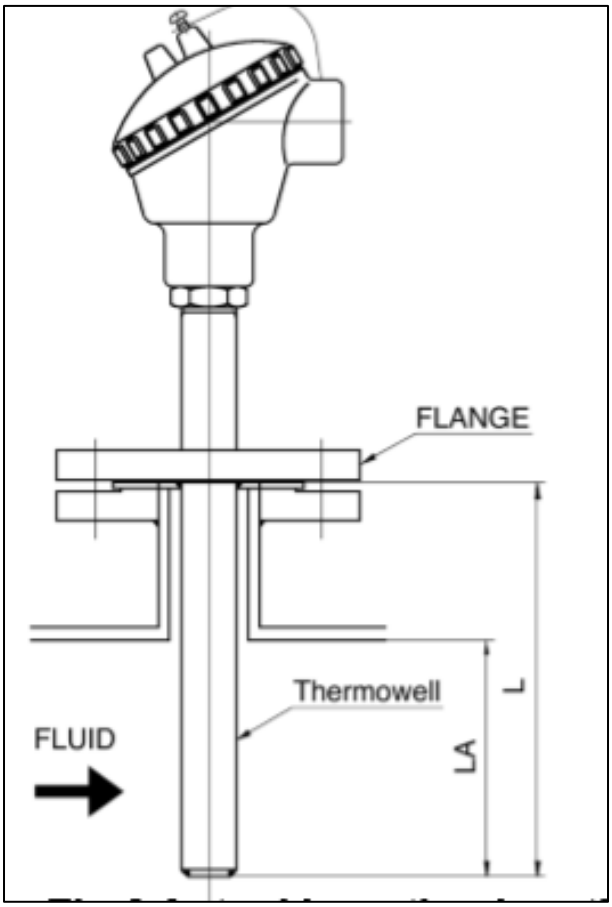


Figure 11: Insertion length and actual insertion length of Probes

STT85A Rigid (no thermowell) or threaded thermowell type mounting to process connection:

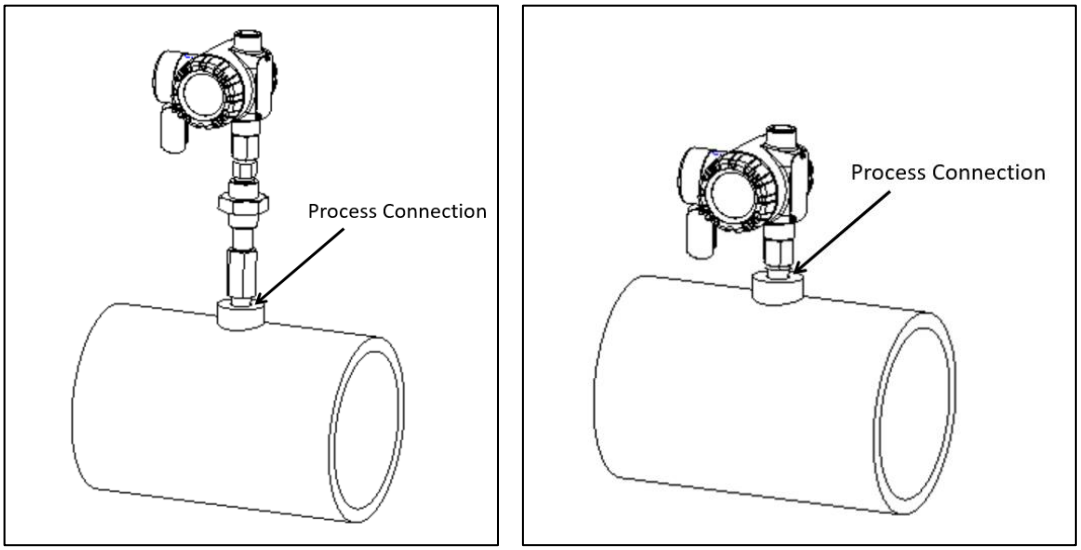


Figure 12: STT85A Rigid (No thermowell) or Threaded thermowell type mounting

1. STT85A Assemblies are pre-tightened. Do not over tighten when installing.
2. Clean threaded opening of any contaminants and excessive burrs. Unless prohibited at site, sealants, PTFE tape, or lubricants may be used to reduce the potential for galling.
3. Insert and align the assembly into process pipe and tighten thermowell at process connection. Never back off (loosen) to achieve alignment which may corrupt the seal contribute to leakage and failure.
4. General torque for ½" NPT process connection is 54 FT/LBS. Tightening torque is not usually recommended due to materials, wall thickness, operating pressures, etc. Please apply according to site conditions.
5. Open housing cover to expose Terminal block.
6. Install suitable conduit into conduit connection.
7. Connect the wires as per the wiring diagrams in the section 2.4.
8. Close the Housing cover.

STT85A flanged type mounting to process connection

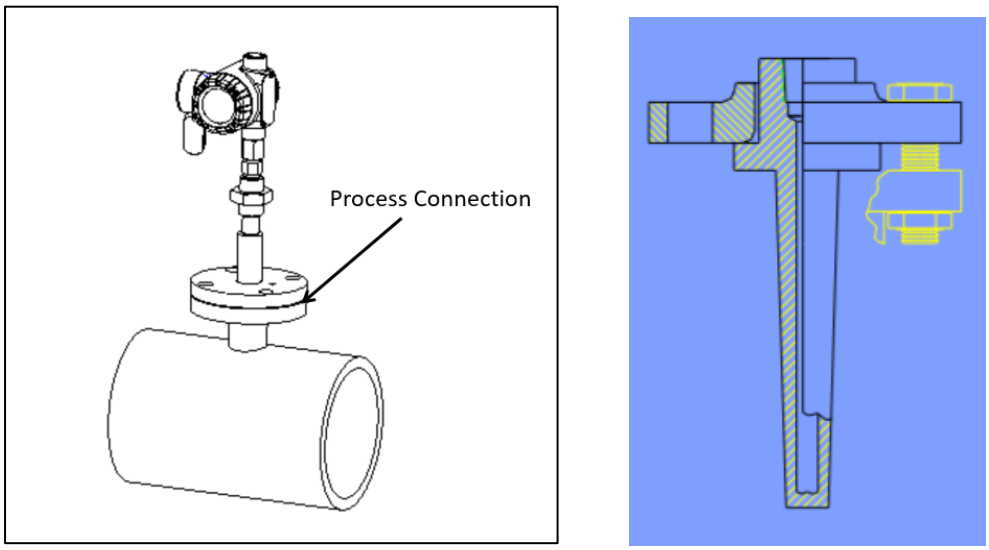


Figure 13: STT85A flanged type mounting to process connection

1. STT85A Assemblies are pre-tightened. Do not over tighten when installing.
2. Consult installation instructions provided by gasket or ring manufacturer.
3. Remove foreign material and debris from all seating surfaces. Examine fasteners for burrs, cracks, and other defects. Examine flange surfaces for warping, radial scores, tool marks, or other faults which may prohibit proper gasket seating.
4. Insert the assembly into process pipe, align thermowell flange surface and bolt holes, ensure gasket or o-ring is the specified size and material. Ensure correct gasket seating.
5. Do not use joint compounds or release agents unless specified by the manufacturer and approved by the site.
6. Bolt torque factor and tightening sequence should comply with the ASME, ISO standards, other pressure vessel agencies, gasket or ring manufacturer, and/or local requirements.
7. Open housing cover to expose Terminal block.
8. Install suitable conduit into conduit connection.
9. Connect the wires as per the wiring diagrams in the section 2.4.
10. Close the Housing cover

STT85A Socket weld mounting to process connection

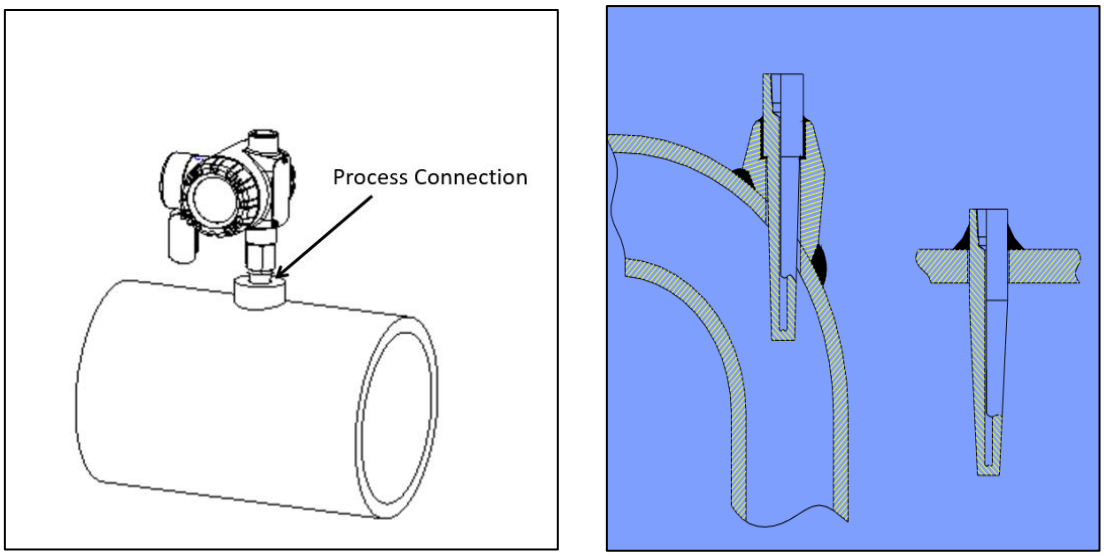


Figure 14: Socket weld mounting to process connection

1. STT85A Assemblies are pre-tightened. Do not over tighten when installing.
2. Remove probe assembly from thermowell before welding of thermowell on to the process pipe.
3. Make sure filler material is appropriate with both thermowell and parent material.
4. Fit Thermowell into socket and align until immersion length is correct.
5. Proceed to weld in accordance with any & all applicable ASME, ASTM, AWS, local standards.
6. Welding should be performed by a trained and experienced or certified professional.
7. After welding process of thermowell, assemble probe into the thermowell once welded joint come normal temperature.
8. Open housing cover to expose Terminal block.
9. Install suitable conduit into conduit connection.
10. Connect the wires as per the wiring diagrams in the section 2.4.
11. Close the Housing cover.

3.2. Conduit entry plugs and adapters:

Procedures:

It is the User/Installer's responsibility to install the transmitters in accordance with national and local code requirements. Conduit entry plugs and adapters shall be suitable for the environment, shall be certified for the hazardous location when required and acceptable to the authority having jurisdiction for the plant.

CONDUIT ENTRY PRECAUTIONARY NOTICE
THE CONDUIT/CABLE GLAND ENTRIES OF THIS PRODUCT ARE SUPPLIED WITH PLASTIC DUST CAPS WHICH ARE NOT TO BE USED IN SERVICE. IT IS THE USER'S RESPONSIBILITY TO REPLACE THE DUST CAPS WITH CABLE GLANDS, ADAPTORS AND/OR BLANKING PLUGS WHICH ARE SUITABLE FOR THE ENVIRONMENT INTO WHICH THIS PRODUCT WILL BE INSTALLED. THIS INCLUDES ENSURING COMPLIANCE WITH HAZARDOUS LOCATION REQUIREMENTS AND REQUIREMENTS OF OTHER GOVERNING AUTHORITIES AS APPLICABLE.

NOTE:

1. No plugs come installed in the housings. All housings come with temporary plastic dust protectors (red) installed and are not certified for use in any installation.

2. cable gland must meet or exceed connection assembly certification. Follow cable gland/Conduit manufacturer's installation instructions.

4. Startup

4.1. Overview

This section identifies typical start up tasks associated with several generic temperature measurement applications. It also includes the procedure for running an optional analog output check.

4.2. Startup Tasks

After completing the installation and configuration tasks for a transmitter, you are ready to start up the process loop. Startup usually includes:

- Applying process inputs to the transmitter.
- Reading inputs and outputs

You can also run an optional output check for individual Process Variable (PV) outputs before startup.
In general, the procedures in this section are based on using a handheld configurator, with a HART, DE or FF variant, to check the transmitter input and output under static process conditions and adjust as required initiating full operation with the running process.

4.3. Output Check Procedures for HART/DE type

The Output Check comprises the following procedures:

- The Loop Test procedure checks for continuity and the condition of components in the output current loop.
- The Trim DAC Current procedure calibrates the output of the Digital-to-Analog converter for minimum (0%) and maximum (100%) values of 4 mA and 20 mA, respectively. This procedure is used for transmitters operating online in analog mode to ensure proper operation with associated circuit components (for example, wiring, power supply, control equipment). Precision test equipment (an ammeter or a voltmeter in parallel with precision resistor) is required for the Trim DAC Current procedure.
- The Apply Values procedure uses actual Process Variable (PV) input levels for calibrating the range of a transmitter. The PV is carefully adjusted to stable minimum and maximum levels, and the Lower Range Limit Value (LRV) and Upper Range Limit Value (URV) are then set by commands from the MC Toolkit. The transmitter does not measure the given PV input or update the PV output while it operates in the Output mode

The transmitter does not measure the given PV input or update the PV output while it operates in the Output mode.
Refer the user manuls STT850 SmartLine Temperature Transmitter User Manual 34-TT-25-03, for detailed procedure to perform Output check

5. Operation

This section provides the information and processes involved for Digitally Enhanced (DE), HART and Foundation Fieldbus (FF) operation.

Refer the respective user manuls for detailes in Operation section of User's manual

- STT850 SmartLine Temperature Transmitter User Manual 34-TT-25-03.

Other manuals:

- STT850 SmartLine Temperature Transmitter HART/DE Option Manual 34-TT-25-06.
- STT850 SmartLine Temperature Transmitter Foundation Fieldbus Manual 34-TT-25-07.
- For the detailed specifications of SmartLine STT850 temperature transmitters, refer STT850 SmartLine temperature Specification, 34-TT-03-14.

Available from:
https://www.process.honeywell.com/en-US/explore/products/instrumentation/temperature-transmitters-and-sensors/smartline-temperature/Pages/smartline-stt850.aspx

6. Maintenance

6.1. Overview

This section provides information about preventive maintenance and replacing damaged parts. The topics covered in this section are:

- Replacement of damaged parts such as the Electronics Modules.

6.2. Preventive Maintenance Practices and Schedules

The STT85A does not require any specific maintenance at regularly scheduled intervals. Maintenance of the STT85A 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 modules themselves should never be opened.
Refer the respective user manuls for more details related to Mantainacne and replacement precaution. STT850 SmartLine Temperature Transmitter User Manual 34-TT-25-03.

6.3. Maintananace and Replacement:

Guidelines before executing any maintenance activity.

- Do not open the cover of the terminal head in operation, located hazardous area
- Do not use insulation resistance tester when plant operated
- Do not disassemble or repair at site temperature sensors to be located hazardious area
- Please check shutdown, ordinary temperature and pressure on maintaiannace, inspection and replacement
- Do not touch sensing probe portion of the temperature sensors
- Do not pull sensor cables forcefully.

Replacement of Sensor with Seal fitting:

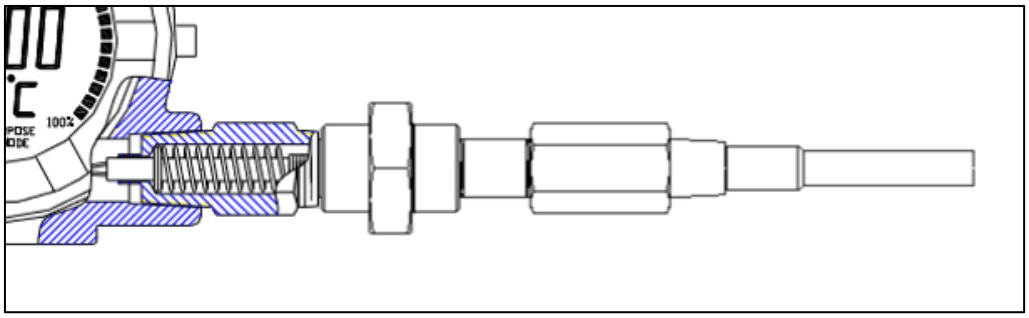


Figure 15: Replacement of Sensor with Seal fitting

1. Open cover on connection head.
2. Remove all wires from terminal block or transmitter.
3. With wrench remove sensor on hex flats of seal fitting.
4. Slide connecting wires thru center of terminal block or transmitter.
5. Tighten fitting.
6. Reconnect all wiring.
7. Close cover.

Removal and Replacement of Sensor with Flame Path Fitting:

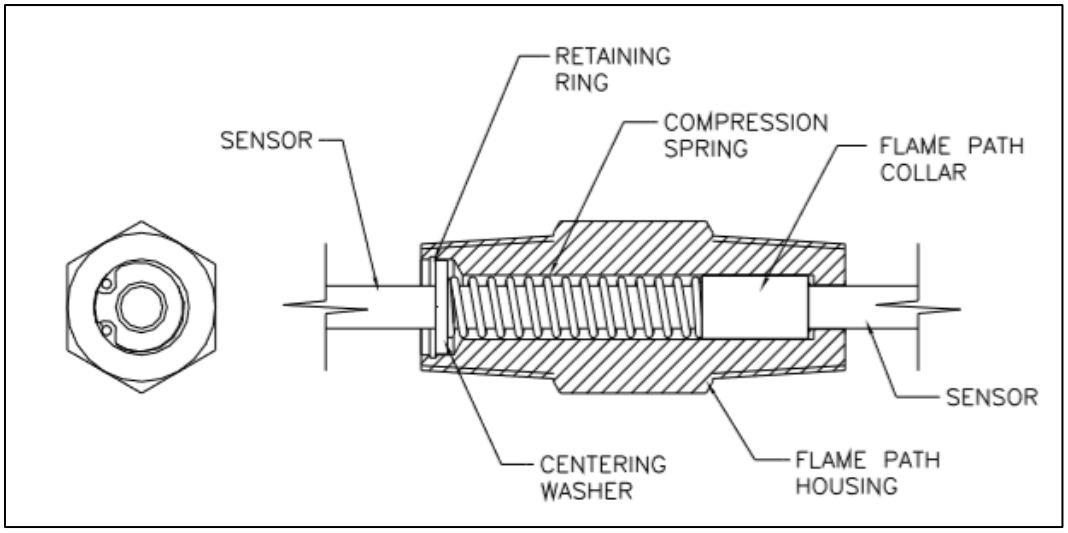


Figure 16: Removal and Replacement of Sensor with Flame Path Fitting

NOTE: A large transmitter with housing requires the flame path fitting be removed from the housing.

1. Loosen locking screw; remove cover.
2. Remove wires from terminal block or transmitter.
3. Remove terminal block or transmitter.
4. With internal/external straight tip retaining ring pliers, release the retaining ring located on top of the fitting. Note: Retaining ring I.D. .239".
5. Slide sensor out of fitting housing.
6. Remove retaining ring, washer, and spring. Install on replacement sensor.
7. Insert replacement into existing housing. Check for spring movement.
8. Reconnect all wiring.
9. Close cover; tighten locking screw

Transmitter maintenance:

Spare parts or Kits:
Replacement of Comm module:
See STT850 SmartLine Temperature Transmitter User Manual 34-TT-25-03.

7. Calibration

7.1. Recommendations for Transmitter Calibration

The STT85A SmartLine Temperature assembly does not require periodic calibration to maintain accuracy. Typically, calibration of a process-connected transmitter will degrade, rather than augment the capability of a smart transmitter. For this reason, it is recommended that assembly be removed from service before calibration. Moreover, calibration must be accomplished in a controlled, laboratory-type environment, using certified precision equipment.

7.2. Calibration Procedures

For a transmitter operating in analog mode, you must calibrate its output signal measurement range using any compatible hand-held communicator or a local display.
For 4-20mA loop Calibration information and procedures for a transmitter operating in the HART/DE mode are provided in the STT850 SmartLine Temperature Transmitter HART/DE Option Manual 34-TT-25-06, section on "Calibration."
For Foundation Fieldbus calibration information refer to STT850 SmartLine Temperature Transmitter Foundation Fieldbus Manual 34-TT-25-07.

7.3. STT850 User Calibration Procedure

Below is the equipment required for the calibration of assembly.

- For HART variant
  - Compatible HART Compliant Host/Handheld
    or
  - DE/HART Modem with Honeywell SCT3000 Host
    or
  - Transmitter Display (Advanced) for HART & DE
    or
  - Pactware with HART DTM for HART Devices only
    and
  - Thermal Bath with good accuracy
    .
- For FF variant
  - Compatible FF Compliant Host/Handheld
    or
  - NI configurator
    and
  - Thermal Bath with good accuracy.

- For DE variant
  - DE/HART Modem with Honeywell SCT3000 Host
    or
  - Transmitter Display (Advanced) for HART & DE
    or
    and
  - Thermal Bath with good accuracy.

7.4. Sensor Input Calibration Procedure:

This section provides details on how to perform user calibration using Pactware for HART Transmitter. The below procedure remains same for all other hosts unless specifically mentioned.

- Ensure Transmitter is not in Write Protection Mode and operational without any critical fault.
- Ensure sensor type configured in transmitter matches with thermal probe connected to transmitter.
- Insert the probe in Thermal bath.
- Configure Lower Calibration Point (Lower Calib Point) & Upper Calibration Point (Upper Calib Point) available from the sensors menu, which are used to perform 2-point calibration. These calibration points shall be within the LRV & URV. They can be same as LRV and URV.
- The calibration points can be accessed by navigating menus as mentioned below on any HART compatible DTM Host using Honeywell STT850 DTM files or hand held device using Honeywell STT850 DD files

Lower Calibration point for Sensor 1:
Device Setup/Sensors/Sensor 1/Sensor 1 Config Parameters/Lower Calib Point

Upper Calibration point for Sensor 1:
Device Setup/Sensors/Sensor 1/Sensor 1 Config Parameters/Upper Calib Point
In case of sensor 2 (Dual) input model,

Lower Calibration point for Sensor 2:
Device Setup/Sensors/Sensor 2/Sensor 2 Config Parameters/Lower Calib Point

Upper Calibration point for Sensor 2:
Device Setup/Sensors/Sensor 2/Sensor 2 Config Parameters/Upper Calib Point

Below snapshot is from PACTware using Honeywell STT850 DTM files on STT850 HART dual input model to access calibration points

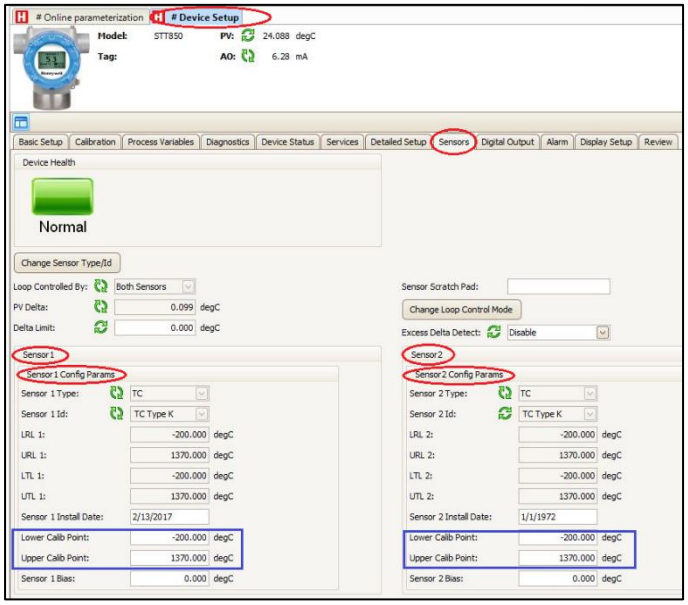


Figure 17: Sensor Input Calibration Procedure

Dual Sensor Input Calibration

- In case of dual sensor input calibration, ensure to configure lower and upper calibration points for both the sensors. (Sensor 1 & Sensor 2) to perform 2-point calibration on both inputs
- To perform Sensor input 1 LRV and URV correct, navigate menus through Device Setup/Calibration/Sensor1 Calibration and for Sensor input 2 LRV and URV correct (in case of dual input model), navigate Device Setup/Calibration/Sensor2 Calibration.

NOTE: The Lower and upper calibration points shown in above picture are not applicable for DE transmitter. DE transmitter is always calibrated at LRV and URV.

Below snapshot is from PACTware using Honeywell STT850 DTM files on STT850 HART dual input model to execute input calibration (corrects)

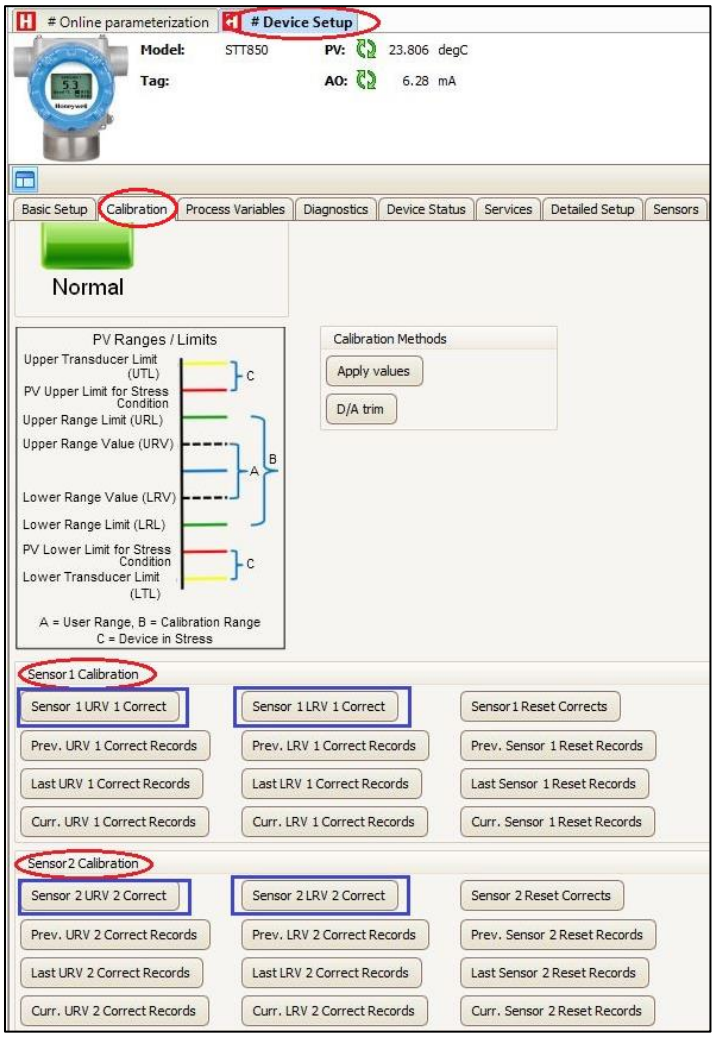


Figure 18: Dual Sensor Input Calibration

7.5. Sensor 1 Input Calibration

Calibrate (Correct) Sensor 1 Input at Lower Calibration Point (LRV Corrects)

1. Adjust the Temperature in Thermal Bath to apply the value corresponding to the lower calibration point entered for Sensor 1.
2. Select the “Sensor 1 LRV 1 Correct” from Device Setup/Calibration/Sensor 1 Calibration menu
3. User will be prompted to ensure device is not in write protected mode and to remove loop from automatic control. After removing the loop from automatic control, press OK
4. On the next prompt – “Please enter Calibration Date in MM/DD/YYYY format. Enter the Calibration date (for example “05/27/2009”) and press OK.
5. On the next prompt - "Please enter the current calibration time in 24 Hr format (Hours Field)", enter the Hours field HH (for example, "12"), and press OK
6. On the next prompt – “Please enter current Calibration Time (Minute field),” enter the Minutes field MM (for example “23”), and press OK
7. On the next prompt-“Apply Sensor 1 LRV temperature”. Ensure temperature applied from source calibrator matches with entered Lower calib point. Press OK
8. On the next prompt- Ensure device reads the applied input temperature value (settling time duration for input should be 20 Sec) when it is stable, select the OK button
9. When the Transmitter has completed the LRV correction, “Remove Temperature” message appears: Select OK to acknowledge.
10. When prompted to return the loop to automatic control, press OK

NOTE: Ensure to calibrate (corrects) at Upper calibration point (URV correct) after calibrating input at Lower calibration point (LRV correct)

Calibrate (Correct) Sensor 1 Input at Upper Calibration Point (URV Corrects)

1. Adjust the Temperature in Thermal Bath to apply the value corresponding to the upper calibration point entered for Sensor 1.
2. Select the “Sensor 1 URV 1 Correct” from Device Setup/Calibration/Sensor 1 Calibration menu
3. User will be prompted to ensure device is not in write protected mode and to remove loop from automatic control. After removing the loop from automatic control, press OK
4. On the next prompt – “Please enter Calibration Date in MM/DD/YYYY format. Enter the Calibration date (for example “05/27/2009”) and press OK.
5. On the next prompt - "Please enter the current calibration time in 24 Hr format (Hours Field)", enter the Hours field HH (for example, "12"), and press OK
6. On the next prompt – “Please enter current Calibration Time (Minute field),” enter the Minutes field MM (for example “23”), and press OK
7. On the next prompt-“Apply Sensor 1 URV temperature”. Ensure temperature applied from source calibrator matches with entered Upper calib point. Press OK
8. On the next prompt- Ensure device reads the applied input temperature value (settling time duration for input should be 20 Sec) when it is stable, select the OK button
9. When the Transmitter has completed the URV correction, “Remove Temperature” message appears: Select OK to acknowledge.
10. When prompted to return the loop to automatic control, press OK

7.6. Sensor 2 Input Calibration

NOTE: Sensor 2 calibration is not applicable for DE transmitter.

Calibrate (Correct) Sensor 2 Input at Lower Calibration Point (LRV Corrects)

1. Adjust the Temperature in Thermal Bath to apply the value corresponding to the lower calibration point entered for Sensor 2.
2. Select the “Sensor 2 LRV 2 Correct” from Device Setup/Calibration/Sensor 2 Calibration menu
3. User will be prompted to ensure device is not in write protected mode and to remove loop from automatic control. After removing the loop from automatic control, press OK
4. On the next prompt – “Please enter Calibration Date in MM/DD/YYYY format. Enter the Calibration date (for example “05/27/2009”) and press OK.
5. On the next prompt - "Please enter the current calibration time in 24 Hr format (Hours Field)", enter the Hours field HH (for example, "12"), and press OK
6. On the next prompt – “Please enter current Calibration Time (Minute field),” enter the Minutes field MM (for example “23”), and press OK
7. On the next prompt-“Apply Sensor 2 LRV temperature”. Ensure temperature applied from source calibrator matches with entered Lower calib point. Press OK
8. On the next prompt- Ensure device reads the applied input temperature value (settling time duration for input should be 20 Sec) when it is stable, select the OK button
9. When the Transmitter has completed the LRV correction, “Remove Temperature” message appears: Select OK to acknowledge.
10. When prompted to return the loop to automatic control, press OK

NOTE: Ensure to calibrate (corrects) at Upper calibration point (URV correct) after calibrating input at Lower calibration point (LRV correct)

Calibrate (Correct) Sensor 2 Input at Upper Calibration Point (URV Corrects)

1. Adjust the Temperature in Thermal Bath to apply the value corresponding to the upper calibration point entered for Sensor 2.
2. Select the “Sensor 2 URV 2 Correct” from Device Setup/Calibration/Sensor 2 Calibration menu
3. User will be prompted to ensure device is not in write protected mode and to remove loop from automatic control. After removing the loop from automatic control, press OK
4. On the next prompt – “Please enter Calibration Date in MM/DD/YYYY format. Enter the Calibration date (for example “05/27/2009”) and press OK.
5. On the next prompt - "Please enter the current calibration time in 24 Hr format (Hours Field)", enter the Hours field HH (for example, "12"), and press OK
6. On the next prompt – “Please enter current Calibration Time (Minute field),” enter the Minutes field MM (for example “23”), and press OK
7. On the next prompt-“Apply Sensor 2 URV temperature”. Ensure temperature applied from source calibrator matches with entered Upper calib point. Press OK
8. On the next prompt- Ensure device reads the applied input temperature value (settling time duration for input should be 20 Sec) when it is stable, select the OK button
9. When the Transmitter has completed the URV correction, “Remove Temperature” message appears: Select OK to acknowledge.
10. When prompted to return the loop to automatic control, press OK

NOTE: If the difference between sensor input value and the device measured value, for uncalibrated unit, is more than 3% of the span (Upper Calibration point – Lower calibration point), calibration will be unsuccessful with an alarm.

8. Troubleshooting

8.1. Overview

Troubleshooting involves responding to error messages. Error messages that may occur on the transmitter's local display are self-explanatory and intuitive. However, this section covers the diagnostic messages that indicate critical conditions. Other than the critical conditions, additional detail is not provided. If you require assistance, contact your distributor or Honeywell Technical Support.

Critical Diagnostics Screens

When a Critical Diagnostic is present in the transmitter, the Advanced Display will show one or more of the screens pictured in Figure 19. These screens will be inserted into the normal screen rotation and displayed between the user-defined operator screens. A description of the diagnostic conditions is given in Table 8-1, along with suggested actions for resolving the problem.

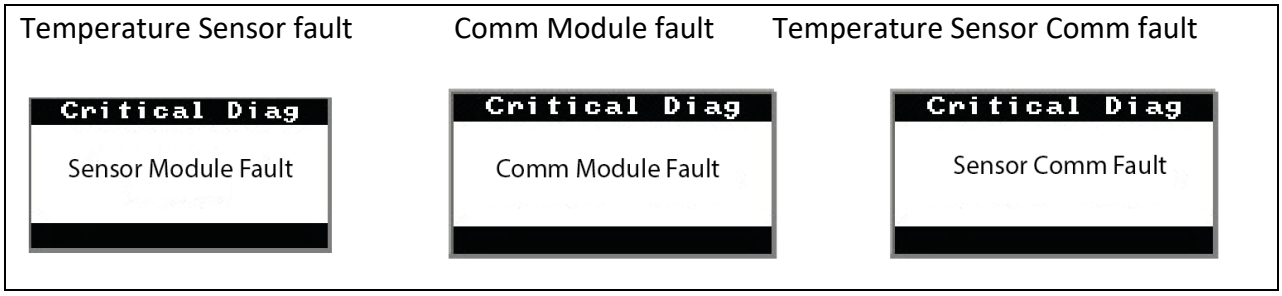


Figure 19: Local Display Fault Diagnostic Conditions

The standard display will display the message CRITICAL FAULT on the top line of the LCD and the appropriate diagnostic text on the lower line.

8.2. Fault Conditions and Recommended Corrective Actions

Table 4: Fault Conditions and Recommended Corrective Actions.

Condtion	Analysis	Recommended Corrective Action
TC reading in the opposite direction relative to the temperature being measured.	Leads are reversed. Red TC wire is negative connection.	Check polarity of connections. See table
Instrumentation reading open circuit or error code.	Measuring junction open.	1. TC: Disconnect TC from instrumentation. Measure across TC leads with an ohmmeter. Resistance should be low. Approximately 7 Ohms. 2. Or, Place a small copper wire across positive and negative terminals. Transmitter should read ambient temperature. 3. RTD: Disconnect RTD from instrumentation. Measure across one red and white lead with an ohmmeter. At room temperature resistance should be approximately 110 to 120 Ohms. 4. Also, it using 3 or 4 wire RTD, Measure between each Red or White wires using an ohmmeter, Value should be 10 ohms or less.
TC Temperature sensor reading close to room temperature.	Short in the wiring at the terminal block or transmitter.	Check wiring connection to terminal block or transmitter. Note: Secondary junction may have formed in the transition area of the TC.

Condtion	Analysis	Recommended Corrective Action
Indication temperature value is abnormal.	Mismatch of thermocouple or compensating lead wire.	Check and match color code.
	Noise (electrical interference from other sources)	1. Replace grounded measuring junction with ungrounded. Note: Response time on ungrounded TC's are higher than grounded. 2. Reduce the field strength interfering with the measurement by: 3. Minimize the size of the measurement loop. Use twisted-pair cabling. 4. Run the measurement wires perpendicular to high-current wires. 5. Filtering can be used to reduce normal mode currents.
Electronics Module Fault. A critical failure has been detected on the HART, DE, or Fieldbus Electronics Module.	Use a HART, DE, or Fieldbus communicator to read the detailed status information from the transmitter. Refer to the appropriate communicator manual for more information about the possible failure causes.	Cycle power to the transmitter. If the problem continues to occur replace the Electronics Module.
Temperature Sensor Module Fault. A critical failure has been detected on the Temperature Sensor Module.	Use a HART, DE, or Fieldbus communicator to read the detailed status information from the transmitter. Refer to the appropriate communicator manual for more information about the possible failure causes.	If the diagnostic status indicates an input problem (burnout, out of range, etc.), correct the root error and then cycle power to the transmitter. If the problem continues to occur replace the Temperature Sensor Module.
Temperature Sensor Comm Fault. Cannot communicate with the Temperature Sensor Module.	Use a HART, DE, or Fieldbus communicator to read the detailed status information from the transmitter. Refer to the appropriate communicator manual for more information about the possible failure causes.	Cycle power to the transmitter. If the problem continues to occur replace the Temperature Sensor Module

9. Security

9.1. Security Guidelines

The STT850 transmitter provides several features designed to prevent accidental changes to the device configuration or calibration data. These features include a Hardware Write Protect Jumper and a Software Write Protect configuration parameter. These features can be used in combination to provide multiple layers of configuration change protection. The default software PIN is “0000” and this needs to be changed by user during installation and commissioning.

A hardware write-protect locks out changes regardless of the entry of a PIN. The hardware jumper requires physical access to the device as well as partial disassembly and should not be modified where the electronics are exposed to harsh conditions or where unsafe conditions exist. For configuration or calibration changes without changing the hardware jumper position the user may choose to rely on the PIN and software lockout features. Ensure that the device has Software write protect enabled and hardware write protect jumper in appropriate position on the device to prevent any unauthorized configuration changes. Change the software PIN periodically and securely maintain the PIN.

A tamper detection feature is available that can indicate that an attempt was made to change either the configuration or calibration of the device (whether a change was made or not). These security features are designed to avoid accidental changes and to provide a means to detect if an attempt was made to change the configuration and calibration.

Physical access to device: HART host (such as DCS) and the devices on the control network shall have physical access control. Otherwise a malicious operation on the transmitters will result in process Shutdown or impact process control. For maximum security, the transmitter device must be protected against unauthorized physical access. Refer to safety manually of STT850 to follow the steps while performing device calibration.

9.2. How to report a security vulnerability

For the purpose of submission, a security vulnerability is defined as a software defect or weakness that can be exploited to reduce the operational or security capabilities of the software or device. Honeywell investigates all reports of security vulnerabilities affecting Honeywell products and services.

To report potential security vulnerability against any Honeywell product, please follow the instructions at: https://honeywell.com/pages/vulnerabilityreporting.aspx

Submit the requested information to Honeywell using one of the following methods:
Send an email to security@honeywell.com or
Contact your local Honeywell Process Solutions Customer Contact Centre (CCC) or Honeywell Technical Assistance Centre (TAC) listed in the “Support and Contact information” section at the front of this document.

10. Appendix A. PRODUCT CERTIFICATIONS

A1. Safety Instrumented Systems (SIS) Installations

For Safety Certified Installations, please refer to STT850/750 Safety Manual #34-TT-25-05 for installation procedure and system requirements.

A2. SIL 2/3 Certification

IEC 61508 SIL 2 for non-redundant use and SIL 3 for redundant use according to EXIDA and TÜV Nord Sys Tec GmbH & Co. KG under the following standards: IEC61508-1: 2010; IEC 61508-2: 2010; IEC61508-3: 2010.

A3.

Refer to Product Specification (34-TT-03-21) or Quick Start Guide (34-TT-25-21) for Approvals / certificates.

Sales and Service
For application assistance, current specifications, ordering, pricing, and name of the nearest Authorized Distributor, contact one of the offices below.

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For more information
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