Brief Operating Instructions iTEMP TMT162

Temperature field transmitter HART® communication







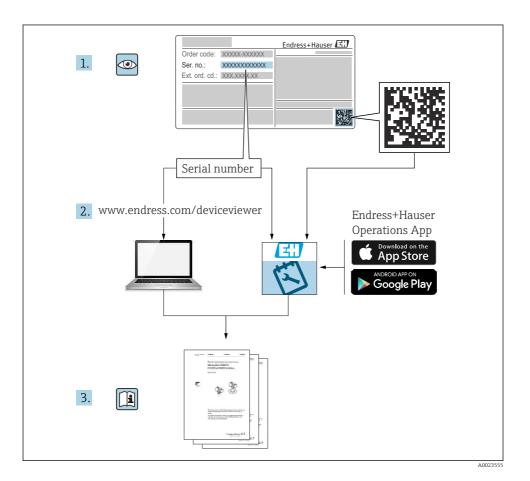
These Brief Operating Instructions are not a substitute for the Operating Instructions pertaining to the device.

Detailed information is provided in the Operating Instructions and other documentation.

Available for all device versions via:

- Internet: www.endress.com/deviceviewer
- Smartphone/tablet: Endress+Hauser Operations app





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1 About this document

1.1 Function of document and how to use

1.1.1 Document function

The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.

About this document iTEMP TMT162

1.1.2 Safety Instructions (XA)

When using in hazardous areas, the relevant national standards must be observed. Separate Ex-specific documentation is provided for measuring systems that are used in hazardous areas. This documentation is an integral part of these Operating Instructions. The installation specifications, connection data and safety instructions contained therein must be strictly observed! Make sure that you use the right Ex-specific documentation for the right device with approval for use in hazardous areas! The number of the specific Ex documentation (XA...) is provided on the nameplate. If the two numbers (on the Ex documentation and the nameplate) are identical, then you may use this Ex-specific documentation.

1.1.3 **Functional** safety



Please refer to Safety Manual SD01632T for the use of approved devices in protective systems according to IEC 61508.

1.2 **Symbols**

1.2.1 Safety symbols

A DANGER

This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.

WARNING

This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.

A CAUTION

This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.

NOTICE

This symbol contains information on procedures and other facts which do not result in personal injury.

1.2.2 **Electrical symbols**

| Symbol | Meaning | Symbol | Meaning |
|--------|--|---------|---|
| | Direct current | ~ | Alternating current |
| ≂ | Direct current and alternating current | <u></u> | Ground connection A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system. |

iTEMP TMT162 Safety instructions

| Symbol | Meaning |
|--------|--|
| | Potential equalization connection (PE: protective earth) Ground terminals that must be connected to ground prior to establishing any other connections. |
| | The ground terminals are located on the interior and exterior of the device: Interior ground terminal: potential equalization is connected to the supply network. Exterior ground terminal: device is connected to the plant grounding system. |

1.2.3 Symbols for certain types of information

| Symbol | Meaning | Symbol | Meaning |
|----------|--|-------------|--|
| ✓ | Permitted Procedures, processes or actions that are permitted. | ✓ ✓ | Preferred Procedures, processes or actions that are preferred. |
| X | Forbidden Procedures, processes or actions that are forbidden. | i | Tip Indicates additional information. |
| [i | Reference to documentation | | Reference to page |
| | Reference to graphic | 1. , 2. , 3 | Series of steps |
| L | Result of a step | | Visual inspection |

2 Safety instructions

2.1 Requirements for the personnel

The operating personnel must fulfill the following requirements:

- ► Trained, qualified specialists: must have a relevant qualification for this specific function and task
- ► Are authorized by the plant owner/operator
- ► Are familiar with federal/national regulations
- ▶ Before beginning work, the specialist staff must have read and understood the instructions in the manuals and supplementary documentation as well as in the certificates (depending on the application)
- ▶ Follow instructions and comply with basic conditions

2.2 Intended use

The device is a universal and configurable temperature field transmitter with either one or two temperature sensor inputs for resistance thermometers (RTD), thermocouples (TC) and resistance and voltage transmitters. The device is designed for mounting in the field.

The manufacturer is not liable for damage caused by improper or non-intended use.

2.3 Workplace safety

When working on and with the device:

▶ Wear the required personal protective equipment as per national regulations.

2.4 Operational safety

- Operate the device only if it is in proper technical condition, free from errors and faults.
- The operator is responsible for the interference-free operation of the device.

Power supply

► The device must only be powered by a 11.5 to 42 V_{DC} voltage supply according to NEC class 02 (low voltage/current) with short circuit power limitation to 8 A/150 VA.

Hazardous area

To eliminate a danger for persons or for the facility when the device is used in the hazardous area (e.g. explosion protection or safety equipment):

- ▶ Based on the technical data on the nameplate, check whether the ordered device is permitted for the intended use in the hazardous area. The nameplate can be found on the side of the transmitter housing.
- ▶ Observe the specifications in the separate supplementary documentation included as an integral part of these instructions.

Electromagnetic compatibility

The measuring system complies with the general safety requirements as per EN 61010-1, the EMC requirements as per the IEC/EN 61326 series and the NAMUR recommendations NE 21 and NE 89.

2.5 Product safety

This measuring device is designed in accordance with good engineering practice to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate.

It meets general safety standards and legal requirements. It also complies with the EU directives listed in the device-specific EU Declaration of Conformity. The manufacturer confirms this by affixing the CE mark to the device.

3 Incoming acceptance and product identification

3.1 Incoming acceptance

Proceed as follows on receipt of the device:

- 1. Check whether the packaging is intact.
- 2. If damage is discovered:

Report all damage immediately to the manufacturer.

- 3. Do not install damaged components, as the manufacturer cannot otherwise guarantee the material resistance or compliance with the original safety requirements, and can also not be held responsible for the consequences that may result.
- 4. Compare the scope of delivery against the contents of your order.
- 5. Remove all the packaging material used for transportation.
- **6.** Do the data on the nameplate match the ordering information on the delivery note?
- 7. Are the technical documentation and all other necessary documents provided, e.g. certificates?
- If one of the conditions is not satisfied, contact your Sales Center.

3.2 Product identification

The device can be identified in the following ways:

- Nameplate specifications
- Enter the serial number from the nameplate in the *Device Viewer* (www.endress.com/deviceviewer): all data relating to the device and an overview of the Technical Documentation supplied with the device are displayed.
- Enter the serial number on the nameplate into the *Endress+Hauser Operations App* or scan the 2-D matrix code (QR code) on the nameplate with the *Endress+Hauser Operations App*: all the information about the device and the technical documentation pertaining to the device is displayed.

3.2.1 Nameplate

The right device?

The nameplate provides you with the following information on the device:

- Manufacturer identification, device designation
- Order code
- Extended order code
- Serial number
- Tag name (TAG)
- Technical values: supply voltage, current consumption, ambient temperature, communication-specific data (optional)
- Degree of protection
- Approvals with symbols
- ► Compare the information on the nameplate with the order.

3.2.2 Name and address of manufacturer

| Name of manufacturer: | Endress+Hauser Wetzer GmbH + Co. KG |
|--------------------------|---|
| Address of manufacturer: | Obere Wank 1, D-87484 Nesselwang or www.endress.com |

Mounting iTEMP TMT162

3.3 Certificates and approvals



For certificates and approvals valid for the device: see the data on the nameplate



Approval-related data and documents: $www.endress.com/deviceviewer \rightarrow$ (enter the serial number)

3.3.1 HART® protocol certification

- The temperature transmitter is registered by the HART® FieldComm Group. The device meets the requirements of the HART Communication Protocol Specifications, Revision 7 (HCF 7.6).
- An overview of other approvals and certifications is provided in the Operating Instructions.

3.4 Storage and transport

| Storage temperature | Without display -40 to +100 °C (-40 to +212 °F) |
|---------------------|---|
| | With display -40 to +80 °C (-40 to +176 °F) |

Maximum relative humidity: < 95 % as per IEC 60068-2-30



Pack the device for storage and transportation in such a way that it is reliably protected against impact and external influences. The original packaging provides the best protection.

Avoid the following environmental influences during storage:

- Direct sunlight
- Proximity to hot objects
- Mechanical vibration
- Aggressive media

4 Mounting

If stable sensors are used, the device can be fitted directly to the sensor. For remote mounting to a wall or stand pipe, two mounting brackets are available. The illuminated display can be mounted in four different positions.

4.1 Mounting requirements

4.1.1 Installation point

For use in hazardous areas, the limit values specified on the certificates and approvals must be observed (see Safety Instructions).

iTEMP TMT162 Mounting

4.1.2 Important ambient conditions

| Ambient temperature range | ■ Without display: -40 to +85 °C (-40 to +185 °F) ■ With display: -40 to +80 °C (-40 to +176 °F) | | | |
|--------------------------------|--|--|--|--|
| | For use in hazardous areas, please see the Ex certificate, which is an integral part of the product documentation. | | | |
| | The display may react slowly at temperatures < -20 °C (-4 °F). The readability of the display cannot be guaranteed at temperatures < -30 °C (-22 °F). | | | |
| Altitude | Up to 2 000 m (6 560 ft) above mean sea level | | | |
| Overvoltage category | П | | | |
| Pollution degree | 2 | | | |
| Insulation class | Class III | | | |
| Condensation | Permitted | | | |
| Climate class | As per IEC 60654-1, Class C | | | |
| Degree of protection | Die-cast aluminum or stainless steel housing: IP67, NEMA 4X | | | |
| Shock and vibration resistance | 2 to 150 Hz at 3g as per IEC 60068-2-6 | | | |
| | The use of L-shaped mounting brackets can cause resonance (see wall/pipe 2" mounting bracket in the 'Accessories' section). Caution: vibrations occurring directly at the transmitter may not exceed specifications. | | | |

4.2 Mounting the transmitter

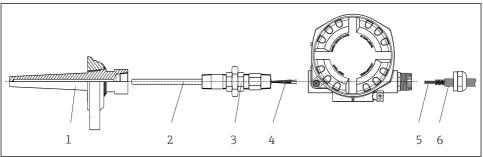
NOTICE

Do not over-tighten the mounting screws, as this could damage the field transmitter.

► Maximum torque = 6 Nm (4.43 lbf ft)

Mounting iTEMP TMT162

4.2.1 Direct sensor mounting



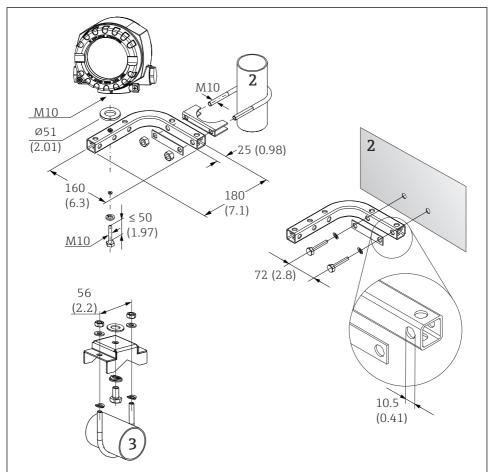
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- 1 Direct field transmitter mounting on sensor
- 1 Thermowell
- 2 Insert
- 3 Neck tube nipple and adapter
- 4 Sensor cables
- 5 Fieldbus cables
- 6 Fieldbus shielded cable
- 1. Mount the thermowell and screw down (1).
- 2. Screw the insert with the neck tube nipple and adapter into the transmitter (2). Seal the nipple and adapter thread with silicone tape.
- 3. Connect the sensor cables (4) to the terminals for the sensors, see the terminal assignment.
- 4. Fit the field transmitter with the insert on the thermowell (1).
- 5. Mount the fieldbus shielded cable or fieldbus connector (6) on the other cable gland.
- 6. Guide the fieldbus cables (5) through the cable gland of the fieldbus transmitter housing into the connection compartment.
- 7. Screw the cable gland tight as described in the Ensuring the degree of protection section →

 18. The cable gland must meet explosion protection requirements.

iTEMP TMT162 Mounting

4.2.2 Remote mounting



- A0027188
- 2 Installation of the field transmitter using the mounting bracket, see 'Accessories' section.

 Dimensions in mm (in)
- 2 Combined wall/pipe mounting bracket 2", L-shaped, material 304
- 3 Pipe mounting bracket 2", U-shaped, material 316L

Electrical connection iTEMP TMT162

4.3 Post-mounting check

After installing the device, always perform the following checks:

| Device condition and specifications | Notes |
|--|-------|
| Is the device undamaged (visual inspection)? | - |
| Do the ambient conditions match the device specification (e.g. ambient temperature, degree of protection, etc.)? | → 🖺 8 |

5 Electrical connection

5.1 Connecting requirements

A CAUTION

The electronics could be destroyed

- ► Switch off power supply before installing or connecting the device. Failure to observe this may result in the destruction of parts of the electronics.
- ► When connecting Ex-certified devices, please take special note of the instructions and connection schematics in the Ex-specific supplement to these Operating Instructions. Contact the supplier if you have any questions.

A Phillips head screwdriver is required to wire the field transmitter at the terminals.

NOTICE

Do not over-tighten the screw terminals, as this could damage the transmitter.

► Maximum torque = 1 Nm (¾ lbf ft).

Proceed as follows to wire the device:

- 1. Remove the cover clamp.
- 2. Unscrew the housing cover on the connection compartment together with the O-ring . The connection compartment is opposite the electronics module.
- 3. Open the cable glands of the device.
- 4. Route the appropriate connecting cables through the openings of the cable glands.
- 5. Wire the cables in accordance with $\rightarrow \blacksquare 3$, $\blacksquare 13$ and as described in the sections: "Connecting the sensor" $\rightarrow \blacksquare 13$ and "Connecting the measuring device" $\rightarrow \blacksquare 15$.
- 6. On completion of the wiring, screw the screw terminals tight. Tighten the cable glands again. Refer to the information provided in the 'Ensuring the degree of protection' section.
- 7. Clean the thread in the housing cover and housing base and lubricate if necessary. (Recommended lubricant: Klüber Syntheso Glep 1)
- 8. Screw the housing cover tight again and fit the cover clamp back on.

iTEMP TMT162 Electrical connection

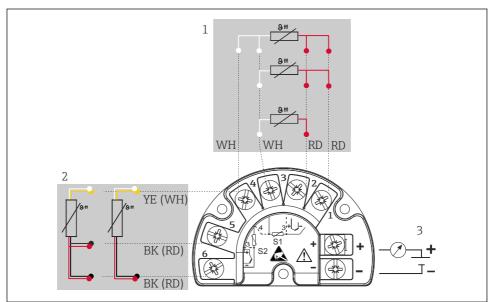
In order to avoid connection errors always follow the instructions in the post-connection check section before commissioning!

5.2 Connecting the sensor

NOTICE

▶ ▲ ESD - Electrostatic discharge. Protect the terminals from electrostatic discharge. Failure to observe this may result in the destruction or malfunction of parts of the electronics.

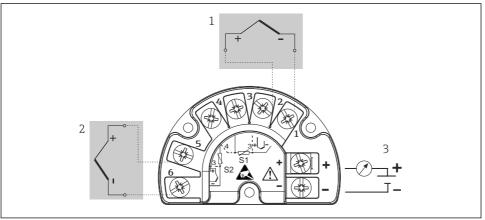
Terminal assignment



A0045944

- 3 Wiring of the field transmitter, RTD, dual sensor input
- 1 Sensor input 1, RTD, : 2-, 3- and 4-wire
- 2 Sensor input 2, RTD: 2-, 3-wire
- *Field transmitter power supply and analog output 4 to 20 mA or fieldbus connection*

Electrical connection iTEMP TMT162



A0045949

- 4 Wiring of the field transmitter, TC, dual sensor input
- 1 Sensor input 1, TC
- 2 Sensor input 2, TC
- 3 Field transmitter power supply and analog output 4 to 20 mA or fieldbus connection

NOTICE

When connecting 2 sensors ensure that there is no galvanic connection between the sensors (e.g. caused by sensor elements that are not isolated from the thermowell). The resulting equalizing currents distort the measurements considerably.

► The sensors must remain galvanically isolated from one another by connecting each sensor separately to a transmitter. The transmitter provides sufficient galvanic isolation (> 2 kV AC) between the input and output.

The following connection combinations are possible when both sensor inputs are assigned:

| Sensor input 1 | | | | | |
|----------------|--|---|---|---|--|
| | | RTD or resistance transmitter, 2- wire | RTD or resistance transmitter, 3- wire | RTD or resistance transmitter, 4- wire | Thermocouple (TC), voltage transmitter |
| | RTD or resistance transmitter, 2-wire | | | - | |
| Sensor input 2 | RTD or resistance transmitter, 3-wire | | | - | |
| | RTD or resistance transmitter, 4-wire | - | - | - | - |
| | Thermocouple (TC), voltage transmitter | | | | |

iTEMP TMT162 Electrical connection

5.3 Connecting the measuring device

5.3.1 Cable gland or cable entry

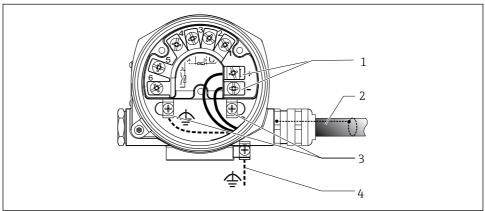
A CAUTION

Risk of damage

Switch off power supply before installing or connecting the device. Failure to observe this may result in the destruction of parts of the electronics.

- ▶ If the device has not been grounded as a result of the housing being installed, we recommended grounding it via one of the ground screws. Observe the grounding concept of the plant! Keep the cable shield between the stripped fieldbus cable and the ground terminal as short as possible! Connection of the functional grounding may be needed for functional purposes. Compliance with the electrical codes of individual countries is mandatory.
- ▶ If the shielding of the fieldbus cable is grounded at more than one point in systems without additional potential matching, mains frequency equalizing currents can occur that damage the cable or the shielding. In such cases, the shielding of the fieldbus cable is to be grounded on one side only, i.e. it must not be connected to the ground terminal of the housing. The shield that is not connected should be insulated!
- i
- The terminals for the fieldbus connection have integrated reverse polarity protection.
- Cable cross-section: max. 2.5 mm²
- A shielded cable must be used for the connection.

Follow the general procedure. $\rightarrow \blacksquare 12$.



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■ 5 Connecting the device to the fieldbus cable

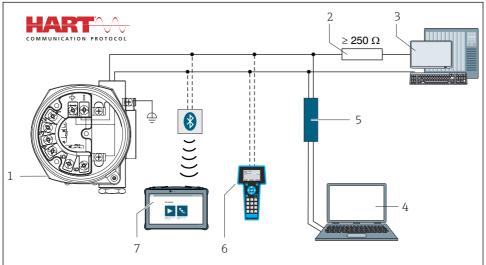
- 1 Fieldbus terminals fieldbus communication and power supply
- 2 Shielded fieldbus cable
- 3 Ground terminals, internal
- 4 Ground terminal (external, relevant for remote version)

Electrical connection iTEMP TMT162

5.3.2 Connecting the HART® communication resistor



If the HART® communication resistor is not integrated into the power supply unit, it is necessary to incorporate a communication resistor of 250 Ω into the 2-wire cable. For the connection, also refer to the documentation published by the HART® FieldComm Group, particularly HCF LIT 20: "HART, a technical summary".



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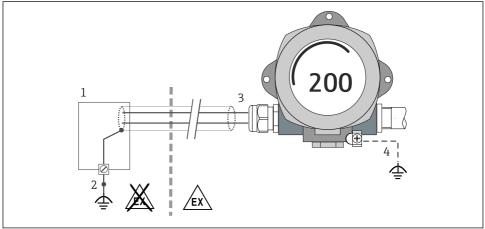
HART® connection with other power supply units that do not have a built-in HART® communication resistor

- 1 Temperature field transmitter
- 2 HART® communication resistor
- 3 PLC/DCS
- 4 Configuration software, e.g. FieldCare, DeviceCare
- 5 HART® modem
- 6 HART® handheld communicator
- 7 Configuration via Field Xpert SMT70

5.3.3 Shielding and grounding

The specifications of the HART FieldComm Group must be observed during installation.

iTEMP TMT162 Electrical connection



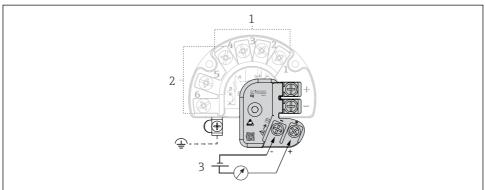
A0010984

■ 7 Shielding and grounding the signal cable at one end with HART® communication

- 1 Supply unit
- 2 Grounding point for HART® communication cable shield
- 3 Grounding of the cable shield at one end
- 4 Optional grounding of the field device, isolated from cable shielding

5.4 Special connection instructions

If the device is fitted with a surge arrester module, the bus is connected and the power is supplied via the screw terminals on the surge arrester module.



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■ 8 Electrical connection of surge arrester

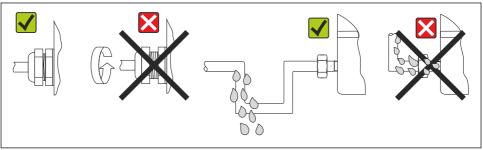
- 1 Sensor 1
- 2 Sensor 2
- 3 Bus connection and power supply

Electrical connection iTEMP TMT162

5.5 Ensuring the degree of protection

The device meets all the requirements of IP66/IP67 protection. Compliance with the following points is mandatory following installation in the field or servicing in order to ensure that IP66/IP67 protection is maintained:

- The housing seals must be clean and undamaged when inserted into their grooves. The seals must be dried, cleaned or replaced if necessary.
- All housing screws and screw caps must be firmly tightened.
- The connecting cables used must have the specified external diameter (e.g. M20x1.5, cable diameter 8 to 12 mm).
- Firmly tighten the cable gland. \rightarrow 9, 18
- The cables must loop down before they enter the cable glands ("water trap"). This means that any moisture that may form cannot enter the gland. Install the device so that the cable glands are not facing upwards. → 9, 18
- Replace unused cable glands with dummy plugs.
- Do not remove the grommet from the cable gland.



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■ 9 Connection tips to retain IP66/IP67 protection

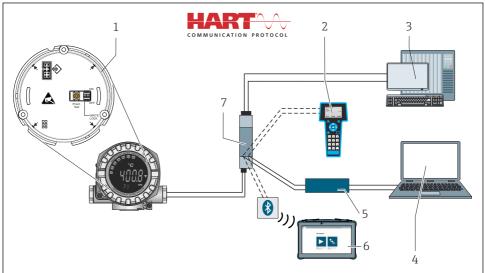
5.6 Post-connection check

| Device condition and specifications | Notes |
|---|---|
| Are the device and cables undamaged (visual check)? | |
| Electrical connection | Notes |
| Does the supply voltage match the information on the nameplate? | Standard mode and SIL mode: $U = 11.5$ to $42 V_{DC}$ |
| Are the mounted cables relieved of tension? | Visual inspection |
| Are the power supply and signal cables connected correctly? | → 1 5 |
| Are all the screw terminals sufficiently tightened? | → 🖺 12 |
| Are all the cable entries installed, tightened and leak-tight? | → 🖺 18 |
| Are all housing covers installed and securely tightened? | → 🖺 19 |

iTEMP TMT162 Operation options

6 Operation options

6.1 Overview of operation options



1002/5/6

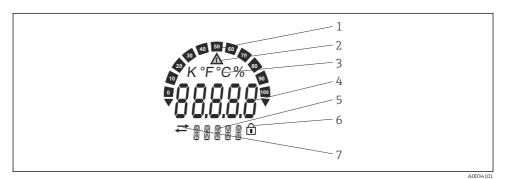
■ 10 Operation options of the device

- 1 Hardware settings via DIP switch and proof-test button
- 2 HART® handheld communicator
- 3 PLC/DCS
- 4 Configuration software, e.g. FieldCare, DeviceCare
- 5 HART® modem
- 6 Configuration via Field Xpert SMT70
- 7 Power supply unit and active barrier, .e.g. RN22 from Endress+Hauser

Operation options iTEMP TMT162

6.1.1 Measured value display and operating elements

Display elements



■ 11 LC display of the field transmitter (illuminated, can be plugged in in 90° steps)

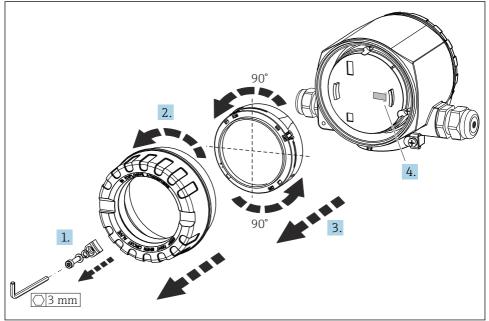
Item no. Function Description In increments of 10% with indicators for underranging and 1 Bar graph display overranging. 2 'Caution' symbol This is displayed when an error or warning occurs. 3 Unit display K, F, C or % Unit display for the internal measured value displayed. Measured value display, digit Displays the current measured value. In the event of an error or warning, the corresponding diagnostics information is displayed. height 20.5 mm Please refer to the relevant Operating Instructions for the device for more information. Indicates which value is currently shown on the display. Text can 5 Status and information display be entered for every value. In the event of an error or a warning, the sensor input that triggered the error/warning is also displayed where applicable, e.g. SENS1 The 'configuration locked' symbol appears when configuration is 6 'Configuration locked' symbol locked via the hardware or software 7 'Communication' symbol The communication symbol appears when HART® communication is active.

Local operation

NOTICE

▶ ▲ ESD - Electrostatic discharge. Protect the terminals from electrostatic discharge. Failure to observe this may result in the destruction or malfunction of parts of the electronics.

iTEMP TMT162 Operation options



A0011211

Procedure for setting the DIP switch or activating the proof test:

- 1. Remove the cover clamp.
- 2. Unscrew the housing cover together with the O-ring.
- 3. If necessary, remove the display with retainer from the electronics module.
- 4. Configure the hardware write protection **WRITE LOCK** accordingly using the DIP switch. In general, the following applies: switch to ON = function enabled, switch to OFF = function disabled. If performing a SIL commissioning test and a proof test, make a device restart using the button.

Once the hardware setting has been made, re-assemble the housing cover in the reverse order.

Commissioning iTEMP TMT162

6.2 Access to the operating menu via the operating tool

The transmitter and measured value display are configured via the $HART^{\otimes}$ protocol or CDI (= Endress+Hauser Common Data Interface). The following operating tools are available for this purpose:

Operating tools

| FieldCare, DeviceCare, Field Xpert (Endress+Hauser) | SIMATIC PDM (Siemens) |
|--|------------------------------|
| AMS Device Manager | Field Communicator 475 |
| (Emerson Process Management) | (Emerson Process Management) |



The configuration of device-specific parameters is described in detail in the Operating Instructions for the device.

7 Commissioning

7.1 Post-installation check

Before commissioning the measuring point, make sure that all final checks have been carried out:

- "Post-mounting check" checklist
- "Post-connection check" checklist

7.2 Switching on the device

Once you have completed the post-connection checks, switch on the supply voltage. The transmitter performs a number of internal test functions after power-up. During this process, a sequence containing device information appears on the display.

| Step | Display | |
|------|---|--|
| 1 | Text "Display" and firmware version of the display | |
| 2 | Firm logo | |
| 3 | Device name (scrolling text) | |
| 4 | 4 Firmware, hardware revision, device revision and device address | |
| 5 | 5 For devices in SIL mode: SIL-CRC is displayed | |
| 6a | Current measured value or | |
| 6b | Current status message | |
| | If the switch-on procedure is not successful, the relevant diagnostic event is displayed, depending on the cause. A detailed list of diagnostic events and the corresponding troubleshooting instructions can be found in the Operating Instructions. | |

iTEMP TMT162 Maintenance

The device works after approx. 30 seconds! Normal measuring mode commences as soon as the switch-on procedure is completed. Measured values and status values appear on the display.

8 Maintenance

No special maintenance work is required for the temperature transmitter.

8.1 Cleaning

A clean, dry cloth can be used to clean the device.



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