Brief Operating Instructions **iTEMP TMT71, TMT72**

Temperature transmitter TMT71 with 4 to 20 mA analog output TMT72 with HART® communication



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

For detailed information, refer to the Operating Instructions and other documentation.

Available for all device versions via:

- Internet: www.endress.com/deviceviewer
- Smart phone/Tablet: Endress+Hauser Operations App





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1 About this document

1.1 Safety Instructions (XA)

When using in hazardous areas, compliance with national regulations is mandatory. 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 it contains 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.

1.2 Symbols used

1.2.1 Safety symbols

Symbol	Meaning
A DANGER	DANGER! This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
WARNING	WARNING! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
	CAUTION! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
NOTICE	NOTE! 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	\sim	Alternating current
R	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.

Symbol	Meaning
	Protective Earth (PE) A terminal which must be connected to ground prior to establishing any other connections.
	 The ground terminals are situated inside and outside the device: Inner ground terminal: Connects the protectiv earth to the mains supply. Outer ground terminal: Connects the device 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.
	Reference to documentation.		Reference to page.
	Reference to graphic.	1., 2., 3	Series of steps.
4	Result of a step.		Visual inspection.

1.2.4 Symbols in graphics

Symbol	Meaning	Symbol	Meaning
1, 2, 3,	Item numbers	1., 2., 3	Series of steps
A, B, C,	Views	A-A, B-B, C-C,	Sections
EX	Hazardous area	×	Safe area (non-hazardous area)

1.3 Tool symbols

Symbol	Meaning
	Phillips head screwdriver
A0011219	

1.4 Registered trademarks

HART® Registered trademark of the HART® FieldComm Group

2 Basic safety instructions

2.1 Requirements for the personnel

The personnel for installation, commissioning, diagnostics and maintenance 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 Operating Instructions and supplementary documentation as well as in the certificates (depending on the application)
- Following instructions and basic conditions

The operating personnel must fulfill the following requirements:

- Being instructed and authorized according to the requirements of the task by the facility's owner-operator
- ► Following the instructions in these Operating Instructions

2.2 Designated use

The device is a universal and user-configurable temperature transmitter with one sensor input for a resistance thermometer (RTD), thermocouples (TC), resistance and voltage transmitters. The head transmitter version of the device is intended for mounting in a terminal head (flat face) as per DIN EN 50446. It is also possible to mount the device on a DIN rail using the optional DIN rail clip. The device is also optionally available in a version suitable for DIN rail mounting as per IEC 60715 (TH35).

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

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

2.3 Operational safety

- Operate the device in proper technical condition and fail-safe condition only.
- ► The operator is responsible for interference-free operation of the device.

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 that is 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.

NOTICE

► The device must only be powered by a power unit that operates using an energy-limited electric circuit according to UL/EN/IEC 61010-1, chapter 9.4 and requirements of table 18.

3 Incoming acceptance and product identification

3.1 Incoming acceptance

1. Unpack the temperature transmitter carefully. Is the packaging or content damaged?

- └→ Damaged components may not be installed as the manufacturer can otherwise not guarantee compliance with the original safety requirements or the material resistance, and can therefore not be held responsible for any resulting damage.
- 2. Is the delivery complete or is anything missing? Check the scope of delivery against your order.



Does the nameplate match the ordering information on the delivery note?



Are the technical documentation and all other necessary documents provided? If applicable: are the Safety Instructions (e.g. XA) for hazardous areas provided?

If one of these conditions is not satisfied, contact your Endress+Hauser Sales Center.

3.2 Product identification

The following options are available for identification of the device:

- Nameplate specifications
- Extended order code with breakdown of the device features on the delivery note
- Enter the serial number from the nameplate in the *W@M 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?

Compare and check the data on the nameplate of the device against the requirements of the measuring point:



I Nameplate of the head transmitter (example, Ex version)

- *1 Power supply, current consumption and radio approval (Bluetooth)*
- 2 Serial number, device revision, firmware version and hardware version
- 3 Data Matrix 2D code
- 4 2 lines for the TAG name and extended order code
- 5 Approval in hazardous area with number of the relevant Ex documentation (XA...)
- 6 Approvals with symbols
- 7 Order code and manufacturer ID



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- 2 Nameplate of DIN rail transmitter (example, Ex version)
- 1 Product name and manufacturer ID
- 2 Order code, extended order code and serial number, Data Matrix 2D code, FCC-ID (if applicable)
- *3 Power supply and current consumption, output*
- 4 Approval in hazardous area with number of the relevant Ex documentation (XA...)
- 5 Fieldbus communication logo
- 6 Firmware version and device revision
- 7 Approval logos
- 8 2 lines for the TAG name

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 oder www.endress.com
Address of manufacturing plant:	See nameplate

3.3 Scope of delivery

The scope of delivery of the device comprises:

- Temperature transmitter
- Mounting material (head transmitter), optional
- Hard copy of multi-language Brief Operating Instructions
- Additional documentation for devices which are suitable for use in the hazardous area (\$\overline\$), such as Safety Instructions (XA...), Control or Installation Drawings (ZD...).

3.4 Certificates and approvals

The device left the factory in a safe operating condition. The device complies with the requirements of the standards EN 61 010-1 "Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use" and with the EMC requirements as per the IEC/EN 61326 series.

3.4.1 CE/EAC mark, declaration of conformity

The device meets the legal requirements of the EU/EEU guidelines. The manufacturer confirms that the device is compliant with the relevant guidelines by applying the CE/EAC mark.

3.4.2 HART[®] protocol certification

The iTEMP TMT72 temperature transmitter is registered by the HART[®] FieldComm Group. The device meets the requirements of the HART[®] Communication Protocol Specifications.

3.5 Transport and storage

Carefully remove all the packaging material and protective covers that are part of the transported package.

Storage temperature

- Head transmitter: -50 to +100 °C (-58 to +212 °F)
- DIN rail device: -50 to +100 °C (-58 to +212 °F)

4 Installation

4.1 Installation conditions

4.1.1 Dimensions



- Head transmitter version with screw terminals. Dimensions in mm (in)
- A Spring travel $L \ge 5 mm$ (not for US M4 securing screws)
- *B* Mounting elements for attachable measured value display
- C Interface for contacting measured value display



The same dimensions apply to the version with push-in terminals. Exception: housing height H = 30 mm (1.18 in).



H The height of housing H varies depending on the terminal version: screw terminals = 114 mm (4.49 in), push-in terminals = 111.5 mm (4.39 in)

4.1.2 Mounting location

- Head transmitter:
 - In the terminal head, flat face, as per DIN EN 50446, direct mounting on insert with cable entry (middle hole 7 mm)
 - In the field housing, separated from the process
 - With DIN rail clip on DIN rail as per IEC 60715, TH35
- DIN rail transmitter: In DIN rail housing on DIN rail as per IEC 60715, TH35

NOTICE

When using DIN rail transmitters with a thermocouple/mV measurement, increased measurement deviations may occur depending on the installation situation and ambient conditions.

► If the DIN rail transmitter is mounted on the DIN rail without any adjacent devices, this may result in deviations of up to ± 1.34 °C. If the DIN rail transmitter is mounted in series between other DIN rail devices (reference operating conditions: 24 V, 12 mA), deviations of up to + 2.94 °C may occur.

4.1.3 Important ambient conditions

- Ambient temperature: -40 to +85 °C (-40 to 185 °F), .
- Head transmitter in accordance with climate class C1, DIN rail transmitter in accordance with B2 as per EN 60654-1
- Condensation as per IEC 60068-2-33 permitted for head transmitter, not permitted for DIN rail transmitter
- Max. rel. humidity: 95% as per IEC 60068-2-30
- Degree of protection:
 - Head transmitter with screw terminals: IP 00, with push-in terminals: IP 30. In installed state, depends on the terminal head or field housing used.
 - When installing in field housing TA30x: IP 66/68 (NEMA Type 4x encl.)
 - DIN rail device: IP 20

4.2 Installation

A Phillips head screwdriver is required to mount the head transmitter.

- Maximum torque for securing screws = 1 Nm (³/₄ foot-pound), screwdriver: Pozidriv Z2
- Maximum torque for screw terminals = 0.35 Nm (¼ foot-pound), screwdriver: Pozidriv Z1



4.2.1 Mounting the head transmitter

Head transmitter mounting (three versions)

Procedure for mounting in a terminal head, Fig. A:

- 1. Open the terminal head cover (8) on the terminal head.
- **2.** Guide the connection wires (4) of the insert (3) through the center hole in the head transmitter (5).
- **3**. Fit the mounting springs (6) on the mounting screws (7).
- **4.** Guide the mounting screws (7) through the side boreholes of the head transmitter and the insert (3). Then fix both mounting screws with the snap rings (2).
- 5. Then tighten the head transmitter (5) along with the insert (3) in the terminal head.
- 6. After wiring $\rightarrow \implies 18$, close the terminal head cover (8) tightly again.



E 5 Dimensions of angle bracket for wall mount (complete wall mounting set available as accessory)

Procedure for mounting in a field housing, Fig. B:

- 1. Open the cover (1) of the field housing (4).
- 2. Guide the mounting screws (2) through the lateral bores in the head transmitter (3).
- 3. Screw the head transmitter to the field housing.
- 4. After wiring, close the field housing cover $(1) \rightarrow \square$ 18again.

Procedure for mounting on a DIN rail, Fig. C:

- 1. Press the DIN rail clip (4) onto the DIN rail (5) until it engages with a click.
- 2. Fit the mounting springs on the mounting screws (1) and guide the screws through the side boreholes of the head transmitter (2). Then fix both mounting screws with the snap rings (3).
- 3. Screw the head transmitter (2) onto the DIN rail clip (4).

Mounting typical of North America



🖻 6 Head transmitter mounting

Thermometer design with thermocouples or RTD sensors and head transmitter:

- 1. Fit the thermowell (1) on the process pipe or the container wall. Secure the thermowell according to the instructions before the process pressure is applied.
- 2. Fit the necessary neck tube nipples and adapter (3) on the thermowell.
- 3. Make sure sealing rings are installed if such rings are needed for harsh environmental conditions or special regulations.
- 4. Guide the mounting screws (6) through the lateral bores of the head transmitter (5).
- 5. Position the head transmitter (5) in the terminal head (4) in such a way that the bus cable (terminals 1 and 2) point to the cable entry.
- 6. Using a screwdriver, screw down the head transmitter (5) in the terminal head (4).
- 7. Guide the connection wires of the insert (3) through the lower cable entry of the terminal head (4) and through the middle hole in the head transmitter (5). Wire the connection wires up to the transmitter $\rightarrow \cong 19$.
- 8. Screw the terminal head (4), with the integrated and wired head transmitter, onto the ready-mounted nipple and adapter (3).

NOTICE

The terminal head cover must be secured properly to meet the requirements for explosion protection.

• After wiring, securely screw the terminal head cover back on.

4.2.2 Mounting the DIN rail transmitter

NOTICE

Wrong orientation

Measurement deviates from the maximum accuracy rating when a thermocouple is connected and the internal reference junction is used.

► Mount the device vertically and ensure it is oriented correctly!



Image: Mounting the DIN rail transmitter

- 1. Position the top DIN rail groove at the top end of the DIN rail.
- 2. Slide the bottom of the device over the bottom end of the DIN rail until you can hear the lower DIN rail clip click into place on the DIN rail.
- 3. Pull gently on the device to check if it is correctly mounted on the DIN rail.

If it doesn't move, the DIN rail transmitter is correctly mounted.

4.3 Post-installation check

After installing the device, always run the following final checks:

Device condition and specifications	Notes
Is the device undamaged (visual inspection)?	-
Do the ambient conditions match the device specification (e.g. ambient temperature, measuring range, etc.)?	→ 🗎 13

5 Electrical connection

- Switch off the power supply before installing or connecting the device. Failure to observe this may result in the destruction of parts of the electronics.
- ► Do not occupy the display connection. An incorrect connection can destroy the electronics.

5.1 Connection conditions

A Phillips head screwdriver is required to wire the head transmitter with screw terminals. Use a flat blade screwdriver for the DIN rail housing version with screw terminals. The push-in terminal version can be wired without any tools.

Proceed as follows to wire a mounted head transmitter:

- 1. Open the cable gland and the housing cover on the terminal head or the field housing.
- 2. Feed the cables through the opening in the cable gland.
- **3.** Connect the cables as shown in $\rightarrow \bigoplus$ 19. If the head transmitter is fitted with push-in terminals, pay particular attention to the information in the "Connecting to push-in terminals" section". $\rightarrow \bigoplus$ 20
- 4. Tighten the cable gland again and close the housing cover.

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

5.2 Quick wiring guide



8 Terminal assignment of head transmitter



Assignment of terminal connections for DIN rail transmitter

A minimum load of 250 Ω is required in the signal circuit in order to operate the HART[®] transmitter via the HART[®] protocol (terminals 1 and 2).

In the event of a thermocouple (TC) measurement, a 2-wire RTD can be connected to measure the reference junction temperature. This is connected to terminals 4 and 6.

NOTICE

5.3 Connecting the sensor cables

5.3.1 Connecting to push-in terminals



☑ 10 Push-in terminal connection, using the example of a head transmitter

Fig. A, solid wire:

- 1. Strip wire end. Min. stripping length 10 mm (0.39 in).
- 2. Insert the wire end into the terminal.
- 3. Pull the wire gently to ensure it is connected correctly. Repeat from step 1 if necessary.

Fig. B, fine-strand wire without ferrule:

- 1. Strip wire end. Min. stripping length 10 mm (0.39 in).
- 2. Press down on the lever opener.
- 3. Insert the wire end into the terminal.
- 4. Release lever opener.
- 5. Pull the wire gently to ensure it is connected correctly. Repeat from step 1 if necessary.

Fig. C, Releasing the connection:

- 1. Press down on the lever opener.
- 2. Remove the wire from the terminal.
- 3. Release lever opener.

5.4 Connecting the transmitter

Cable specification

- A normal device cable suffices if only the analog signal is used.
- A shielded cable is recommended for HART[®] communication. Observe grounding concept of the plant.
- In the case of the DIN rail version, a shielded cable must be used if the sensor cable length exceeds 30 m (98.4 ft). The use of shielded sensor cables is generally recommended.

Please also observe the general procedure on $\rightarrow \square$ 18.



- 11 Connecting the signal cables and power supply
- 1 Head transmitter installed in field housing
- 2 Head transmitter installed in terminal head
- 3 DIN rail transmitter mounted on DIN rail
- 4 Terminals for HART[®] protocol and power supply
- 5 Internal ground connection
- 6 External ground connection
- 7 Shielded signal cable (recommended for HART[®] protocol)
- The terminals for the power supply signal cable connection (1+ and 2-) are protected against reverse polarity.
 - Conductor cross-section:
 - Max. 2.5 mm² for screw terminals
 - Max. 1.5 mm² for push-in terminals. Min. stripping length of cable 10 mm (0.39 in).



- 12 Fitting the CDI connector of the configuration kit for configuration, visualization and maintenance of the head transmitter via PC and configuration software
- 1 Configuration kit, e.g. TXU10 with USB connection
- 2 CDI connector
- 3 Installed head transmitter with CDI interface

5.5 Special connection instructions

Shielding and grounding

The specifications of the ${\rm HART}^{\rm \tiny {\ensuremath{\mathbb{B}}}}$ FieldComm Group must be observed when installing a ${\rm HART}^{\rm \tiny {\ensuremath{\mathbb{B}}}}$ transmitter.



■ 13 Shielding and grounding the signal cable at one end with HART[®] communication

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

5.6 Post-connection check

Device condition and specifications	Notes
Is the device or cable undamaged (visual check)?	
Electrical connection	Notes
Does the supply voltage match the specifications on the nameplate?	 Head transmitter: U = e.g. 10 to 36 V_{DC} Other values apply in the hazardous area, see the corresponding Ex Safety Instructions (XA). DIN rail transmitter: U = e.g. 11 to 36 V_{DC}
Do the cables have adequate strain relief?	
Are the power supply and signal cables correctly connected?	→ 🖺 19
Are all the screw terminals well tightened and have the connections of the push-in terminals been checked?	
Are all the cable entries installed, tightened and sealed?	
Are all housing covers installed and firmly tightened?	

6 Operation options

6.1 Overview of operation options



■ 14 Operation options for the transmitter via HART[®] communication



In Section 2.15 Operation options for the transmitter via the CDI interface

The transmitter's optional Bluetooth interface is only active if a display unit is not attached or the CDI interface is not used for device configuration.

6.1.1 Measured value display and operating elements

Option: Display TID10 for head transmitter



The display may also be subsequently ordered at any time after purchasing the transmitter, see the 'Accessories' section in the Operating Instructions for the device.



Attach the display to the transmitter

Display elements

Head transmitter



Optional LC display for head transmitter

Item no.	Function	Description
1	Displays the TAG	TAG, 32 characters long.
2	'Communication' symbol	The communication symbol appears when read and write-accessing via the fieldbus protocol.
3	Unit display	Unit display for the measured value displayed.
4	Measured value display	Displays the current measured value.
5	Value/channel display DT, PV, I, %	e.g. PV for a measured value from channel 1 or DT for the device temperature

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Item no.	Function	Description
6	'Configuration locked' symbol	The 'configuration locked' symbol appears when configuration is locked via the hardware.
7	Status signals	

DIN rail transmitter

Two LEDs on the front indicate the device status.

Туре	Function and characteristic
Status LED (red)	When the device is operating without errors, the device status is displayed. This function can no longer be guaranteed in the event of an error.
	 LED off: without diagnostic message LED is lit: diagnostics display, category F LED flashing: diagnostics display of categories C, S or M
Power LED (green) 'ON'	 When the device is operating without errors, the operating status is displayed. This function can no longer be guaranteed in the event of an error. LED off: Power failure or insufficient supply voltage LED is lit: Supply voltage is OK (either via CDI or via supply voltage, terminals 1+, 2-)



The DIN rail transmitter version does not have an interface to the LC display and therefore does not have a local display either.

Local operation

NOTICE

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



Procedure for setting the DIP switch:

- 1. Open the cover of the terminal head or field housing.
- 2. Remove the attached display from the head transmitter.

- 3. Configure the DIP switch on the rear of the display accordingly. In general: switch to ON = function enabled, switch to OFF = function disabled.
- **4.** Fit the display onto the head transmitter in the correct position. The head transmitter accepts the settings within one second.
- 5. Secure the cover back onto the terminal head or field housing.

Switching write protection on/off

Write protection is switched on and off via a DIP switch on the rear of the optional attachable display. When write protection is active, parameters cannot be modified. A lock symbol on the display indicates that write protection is on. Write protection prevents any write access to the parameters. Write protection remains active even when the display is removed. To deactivate write protection, the display must be attached to the transmitter with the DIP switch switched off (WRITE LOCK = OFF). The transmitter adopts the setting during operation and does not need to be restarted.

Turning the display

The display can be rotated 180° using the "DISPL. 180° DIP switch.

6.2 Transmitter configuration

The transmitter and measured value display are configured via the HART[®] protocol or CDI (= Endress+Hauser Common Data Interface). The following operating tools are available for this purpose:

Operating tools

FieldCare, DeviceCare, Field Xpert SMT70 (Endress+Hauser)	SIMATIC PDM (Siemens)
AMS Device Manager	Field Communicator TREX, 475
(Emerson Process Management)	(Emerson Process Management)



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

6.3 Access to the operating menu via the SmartBlue app

The device can be operated and configured via the SmartBlue app. The connection is established via the Bluetooth $^{\odot}$ interface.

The SmartBlue app is available for free download for Android devices (Google Playstore) and iOS devices (iTunes Apple Shop) : *Endress+Hauser SmartBlue*

Directly to the app with the QR code:



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System requirements

- Devices with iOS:
 - iPhone 4S or higher, from iOS9.0
 - iPad2 or higher, from iOS9.0
 - iPod Touch 5th generation or higher, from iOS9.0
- Devices with Android: Android 4.4 KitKat or higher

Download the SmartBlue app:

- 1. Install and start the SmartBlue app.
 - ← A Live List shows all the devices available.
- 2. Select the device from the Live List.
 - └ The Login dialog box opens.

Logging in:

- 3. Enter the user name: admin
- 4. Enter the initial password: serial number of the device.
- 5. Confirm your entry.
 - └ The device information opens.

The transmitter's optional Bluetooth interface is only active if a display unit is not attached or the CDI interface is not used for device configuration.

7 Commissioning

7.1 Post-installation check

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

- "Post-installation check" checklist \rightarrow 🖺 17
- "Post-connection check" checklist \rightarrow 🖺 24

7.2 Switching on the transmitter

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.

The device operates in normal mode after approx. 7 seconds, including the attached display. Normal measuring mode commences as soon as the switch-on procedure is completed. Measured values and status values appear on the display.



If the display is attached when the Bluetooth interface is activated, display initialization is performed twice and Bluetooth communication is disabled simultaneously.

www.addresses.endress.com

