SIEMENS

SITRANS T

Temperature sensors SITRANS TS100/TS200/TS300/ TS500/TSinsert/TSthermowell

Operating Instructions

04/2024
A5E47810090-AD

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens Aktiengesellschaft. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Siemens Aktiengesellschaft
Digital Industries
Postfach 48 48
90026 NÜRNBERG
GERMANY

Document order number: A5E47810090
Ⓟ 04/2024 Subject to change

Table of contents

Introduction

1

1.1 Purpose of this documentation

These instructions contain all information required to commission and use the device. Read the instructions carefully prior to installation and commissioning. In order to use the device correctly, first review its principle of operation.

The instructions are aimed at persons mechanically installing, connecting and commissioning the device, as well as service and maintenance engineers.

The temperature sensor has a modular structure. See the instructions for the temperature transmitter or the DVM LCD/Display when you integrate a temperature transmitter or a DVM LCD/Display.

1.2 Scope of documentation

"7MC../7MT.." stands for:

Article no.	Product
7MC71..	SITRANS TS100
7MC72..	SITRANS TS200
7MC80..	SITRANS TS300
7MC75..	SITRANS TS500 (Europe portfolio)
7MC65..	SITRANS TS500 (North America portfolio)
7MC55..	SITRANS TS500 (Asia portfolio)
7MC.01..	TSinsert
7MT..	TSthermowell

1.3 Functional Safety Manual

You can find instructions and additional information regarding functional safety of the SITRANS TH/TR/TF 320/420 and SITRANS TS500 transmitters in the English edition of the Functional Safety Manual Functional Safety Manual (https://www.siemens.com/processinstrumentation/documentation). Document number: A5E41864869

1.4 Document history

The overview below summarizes the most important changes in the documentation compared with the previous edition.

Edition	Comment
04/2024	The following sections have been revised: Laws and directives Connecting the plug-in connector Certificates and approvals
06/2023	The following sections have been revised: Nameplate structure (Page 20) Safety notes (Page 13) Technical data (Page 127)
07/2021	The following sections have been revised: Nameplate structure (Page 20) Connecting the plug-in connector (Page 43) Certificates and approvals (Page 142) Dimension drawings (Page 153)
08/2020	First edition

1.5 Product compatibility TH320/420

The following table describes the compatibility between the edition of this manual, the device version, the engineering system and the associated EDD.

Manual edition	Comments	Device version	Compatible version of device integration package	
07/2021 & 01/2021 & 06/2023	New device features	HART 7 TH320/420: 01.02.xx or higher	SIMATIC PDM V9.1	EDD: 01.00.00 or higher
			AMS Device Manager V13.3	EDD: 01.00.01 or higher
			DTM	EDD: 01.00.01 or higher
			Field Communicator FC 375/475	EDD: 01.00.01 or higher

1.6 Checking the consignment

1. Check the packaging and the delivered items for visible damages.
2. Report any claims for damages immediately to the shipping company.

3. Retain damaged parts for clarification.
4. Check the scope of delivery by comparing your order to the shipping documents for correctness and completeness.

⚠ **WARNING**
Using a damaged or incomplete device Risk of explosion in hazardous areas. • Do not use damaged or incomplete devices.

Note

Bending of the sensor during transport

Sensors that are delivered without conduit can be bent during transport. This bending does not affect the quality of the sensor. The mineral insulated cables used for SITRANS TS are bendable.

- Bend the sensor into the required position before you install it. When bending the sensor, note the bending radius of ≥ 24 mm and the length NBL of 60 mm at the tip that is not bendable.

1.7 Cybersecurity information

Siemens provides products and solutions with industrial cybersecurity functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial cybersecurity concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial cybersecurity measures that may be implemented, please visit
https://www.siemens.com/cybersecurity-industry.

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Cybersecurity RSS Feed under
https://new.siemens.com/cert.

1.8 Transportation and storage

To guarantee sufficient protection during transport and storage, observe the following:

- Keep the original packaging for subsequent transportation.
- Devices/replacement parts should be returned in their original packaging.
- If the original packaging is no longer available, ensure that all shipments are properly packaged to provide sufficient protection during transport. Siemens cannot assume liability for any costs associated with transportation damages.

NOTICE
Insufficient protection during storage The packaging only provides limited protection against moisture and infiltration. • Provide additional packaging as necessary.

Special conditions for storage and transportation of the device are listed in Technical data (Page 127).

1.9 Notes on warranty

The contents of this manual shall not become part of or modify any prior or existing agreement, commitment or legal relationship. The sales contract contains all obligations on the part of Siemens as well as the complete and solely applicable warranty conditions. Any statements regarding device versions described in the manual do not create new warranties or modify the existing warranty.

The content reflects the technical status at the time of publishing. Siemens reserves the right to make technical changes in the course of further development.

Safety notes

2

2.1 Preconditions for use

This device left the factory in good working condition. In order to maintain this status and to ensure safe operation of the device, observe these instructions and all the specifications relevant to safety.

Observe the information and symbols on the device. Do not remove any information or symbols from the device. Always keep the information and symbols in a completely legible state.

Symbol	Explanation
	Consult operating instructions

2.1.1 Laws and directives

Observe the safety regulations, provisions and laws applicable in your country during connection, assembly and operation. These include, for example:

- National Electrical Code (NEC - NFPA 70) (USA)
- Canadian Electrical Code (CEC Part I) (Canada)

Additional provisions for applications in hazardous areas are, for example:

- IEC 60079-14 (international)
- EN 60079-14 (EU)

SITRANS TSthermowell

The thermowell is affected by the static, dynamic and chemical load from the process parameters including static and dynamic load, flow induced vortexes. This has influence on the shape of the thermometer, stem diameter and insertion length.

Observe the test certification, provisions and laws applicable in your country during connection, assembly and operation. These include:

- ASME PTC 19.3
- DIN 43772 Annex 1-2
- AD-directive
- VDI/VDE 3511-5

In critical applications, a thermowell stress calculation is recommended:

- ASME PTC 19.3-TW2016
- Dittrich/Klotter-method engineering service

2.1.2 Conformity with European directives

The CE marking on the device symbolizes the conformity with the following European directives:

Electromagnetic compatibility EMC 2014/30/EU	Directive of the European Parliament and of the Council on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC.
Atmosphère explosible ATEX 2014/34/EU	Directive of the European Parliament and the Council on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres.

The applicable directives can be found in the EC conformity declaration of the specific device.

See also

Product documentation (Page 195)

2.1.3 Improper device modifications

⚠ WARNING

Improper device modifications

Risk to personnel, system, and environment can result from modifications to the device, particularly in hazardous areas.

- Only carry out modifications that are described in the instructions for the device. Failure to observe this requirement cancels the manufacturer's warranty and the product approvals. Do not operate the device after unauthorized modifications.

2.2 Requirements for special applications

Due to the large number of possible applications, each detail of the described device versions for each possible scenario during commissioning, operation, maintenance or operation in systems cannot be considered in the instructions. If you need additional information not covered by these instructions, contact your local Siemens office or company representative.

Note

Operation under special ambient conditions

We highly recommend that you contact your Siemens representative or our application department before you operate the device under special ambient conditions as can be encountered in nuclear power plants or when the device is used for research and development purposes.

2.3 Use in hazardous areas

Qualified personnel for hazardous area applications

Persons who install, connect, commission, operate, and service the device in a hazardous area must have the following specific qualifications:

- They are authorized, trained or instructed in operating and maintaining devices and systems according to the safety regulations for electrical circuits, high pressures, aggressive, and hazardous media.
- They are authorized, trained, or instructed in carrying out work on electrical circuits for hazardous systems.
- They are trained or instructed in maintenance and use of appropriate safety equipment according to the pertinent safety regulations.

⚠ WARNING

Use in hazardous area

Risk of explosion.

- Only use equipment that is approved for use in the intended hazardous area and labeled accordingly.
- Do not use devices that have been operated outside the conditions specified for hazardous areas. If you have used the device outside the conditions for hazardous areas, make all Ex markings unrecognizable on the nameplate.

⚠ WARNING

Loss of safety of device with type of protection "Intrinsic safety Ex i"

If the device or its components have already been operated in non-intrinsically safe circuits or the electrical specifications have not been observed, the safety of the device is no longer ensured for use in hazardous areas. There is a risk of explosion.

- Connect the device with type of protection "Intrinsic safety" solely to an intrinsically safe circuit.
- Observe the specifications for the electrical data on the certificate and/or in Technical data (Page 127).

2.4 Use in flameproof enclosures "d" and protection in enclosures "tb"

WARNING

Impermissible repair of explosion protected devices

Risk of explosion in hazardous areas

- Repair must be carried out by Siemens authorized personnel only.

WARNING

Electrostatic charge

Risk of explosion in hazardous areas if electrostatic charges develop, for example, when cleaning plastic surfaces with a dry cloth.

- Prevent electrostatic charging in hazardous areas.

2.4.1 For SITRANS TS500

2.4.1.1 Installation in "Flameproof enclosures "d" and enclosures "tb"

- The enclosure types AG0, AH0, AU0, AV0 and SITRANS TF for temperature sensors of the TS500 series must be connected using suitable cable entry fixtures or conduit systems that meet the requirements of IEC/EN 60079-1, sections 13.1 and 13.2 (with separate test certificate).
- Cable entry fixtures (thread conduits) and sealing plugs in the basic design must not be used in the sender and receiver enclosures.
- All openings not in use on the sender and receiver enclosures must be sealed as specified in IEC/EN 60079-1, section 11.9.
- The connecting cable of the enclosure types AG0, AH0, AU0, AV0 and SITRANS TF for the temperature sensor of the TS500 series must be installed so that permanent wiring and adequate protection against damages is ensured.
- If the temperature at the entry fixtures were to exceed 60 °C, the connecting cables must be heat resistant.
- When the connection is made in a potentially hazardous area, the connecting cable (free cable end) of the enclosure types AG0, AH0, AU0, AV0 and TF for the temperature sensors of the TS500 series must be installed in an enclosure that meets the requirements of an approved degree of protection as specified in IEC/EN 60079-0, section 1.
- All types must in installed in sensor pockets with an adequate degree of protection for the respective application.
- When a SITRANS TS500 with XP degree of protection is combined with a sensor pocket, ASME PTC19.3 must be observed and a minimum wall thickness of 1 mm should be considered.

- To separate Zone 1 from Zone 2 in a hazardous area, a wall thickness of ≥ 1 mm with austenitic stainless steel should be considered. Also take into account the existing process conditions.
  When a sensor pocket is installed correctly and is sealed tight in Zone 0, the sensor screwed into this sensor pocket must be approved for at least Zone 1.
- Any adequately dimensioned sensor pockets must be fully seated in the thread after five full rotations and be ready to use.
- Any comments to this effect must be delivered with the device in an appropriate form.
- A technical standard is in effect for mounted or installed components (terminal compartments, sockets, cable entry fixtures, plug-in connectors) that meets at least the specifications in the certificate of conformity; a separate test certificate must also have been issued for these components.
- Use the device to measure temperatures in accordance with the technical specifications for the maximum ambient temperatures in the connection area of the sensor.

See also

Gas hazardous area: Ex d / XP (Page 134)

Dust hazardous area: Ex i / IS / Ex tb / DIP (Page 136)

2.4.2 For SITRANS TSinsert/TS100/TS200/TS500

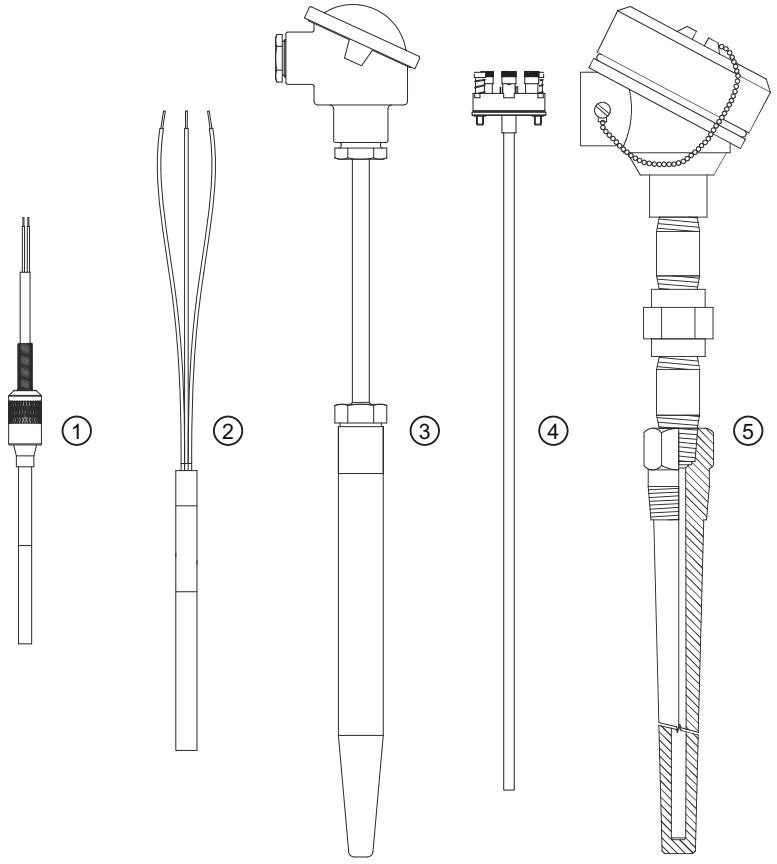
NOTICE
Ambient temperature too high Damage to cable sheath. • At an ambient temperature ≥ 60 °C (140 °F), use heat-resistant cables suitable for an ambient temperature at least 20 °C (36 °F) higher.

Description

3

3.1 Overview

SITRANS TS product family



① SITRANS TS100 7MC71..
general use, compact design with connecting cable

② SITRANS TS200 7MC72..
general use, compact design

③ SITRANS TS500 7MC75../7MC55..
general use, modular design with connection head (European portfolio/ Chinese portfolio)

④ SITRANS TSinsert measuring insert for use in the SITRANS TS500 series

⑤ SITRANS TS500 7MC65../7MC55..
general use, modular design with connection head (North American portfolio/ Chinese portfolio)

Elementary sensors

Resistance thermometers or thermocouples can be used for temperature measurement.

3.2 Application

The temperature sensors of the SITRANS TS product family are used for measuring temperatures in industrial plants.

Depending on the specifications, sensors can be combined with different connection heads, extension tubes, and process connections. This makes the sensors suitable for a variety of process engineering applications, in the following sectors:

- Petrochemical industry
- Pharmaceuticals industry
- Biotechnology
- Food production

3.3 Functional principles

Two different measuring principles are used for measuring temperatures.

- With resistance thermometers, the temperature is measured as a change in resistance. Resistance thermometers, also called Resistance Temperature Devices (RTD), contain sensor elements, like the Pt100 sensor elements in accordance with IEC 60751.
- With thermocouples, the temperature is the change in voltage (Seebeck effect). The thermocouples are in accordance with IEC 584/DIN EN 60584.

3.4 Nameplate structure

Positioning of the nameplate

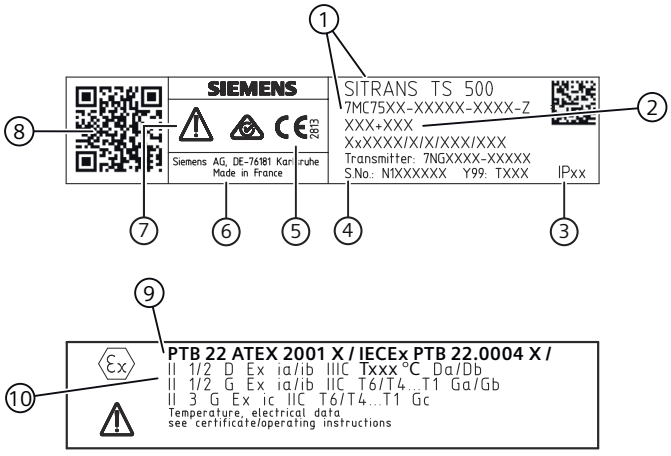
Note

SITRANS TS100/TS200 nameplate

Before commissioning, make sure that the nameplate is attached to the temperature sensor at a clearly visible location.

Device	Positioning of the nameplate
SITRANS TSinsert 7MC701.	On the bottom of the connecting plate or at the outer periphery of the ANSI adapter.
SITRANS TS100 7MC71..	On the sensor cable
SITRANS TS200 7MC72..	On the connector or on the sensor
SITRANS TS500 7MC.5..	On the connection head

Example



①	Product name and article number	⑥	Manufacturer and manufacturing location
②	Additional information on the type	⑦	Note operating instructions, certificates and approvals under Product documentation (Page 195)
③	Degree of protection	⑧	QR code for mobile website with device-specific product information
④	Serial number (S/N)	⑨	Approvals
⑤	Conformity with the country-specific guidelines	⑩	Marking for hazardous area, for example, ATEX/IECEx

3.5 Temperature transmitter for SITRANS TS500

The following head-mounted transmitters and DVM LCD and displays can be combined with the SITRANS TS500 temperature sensors:

Transmitter	Properties
TH100	• Pt100 input • Output 4 ... 20 mA • Can be configured using simple software • P_o: 12.5 mW
TH200	• Universal input (Pt100, thermocouple, etc.) • Output 4 ... 20 mA • Can be configured using simple software • P_o: 37 mW
TH300	• Universal input (Pt100, thermocouple, etc.) • Output 4 ... 20 mA or HART • Diagnostic functions • P_o: 37 mW

Transmitter	Properties
TH400	• Universal input (Pt100, thermocouple, etc.) • Output: PROFIBUS PA or FOUNDATION Fieldbus • Diagnostics • P_o: 12 mW
TH320	• Universal • Output options – 4 ... 20 mA – 4 ... 20 mA or HART • Diagnostic functions • Po: 23.3 mW
TH420	• Universal • Output 4 ... 20 mA or HART • Double sensor input • Diagnostic functions, hot backup function for sensor • Po: 23.3 mW

Additional types of the head-mounted transmitter can be integrated after positive testing of the electrical and mechanical parameters. SITRANS TH200/300 are adequate (P0: 37 mW).

Note

SITRANS TS500 IEC Ex

If the included SITRANS TH transmitter is not IEC Ex compliant, the nameplate of the TS500 only has an ATEX marking.

3.6 Measuring inserts for SITRANS TS500

Measuring inserts for SITRANS TS500 temperature sensors are available in three variants:

- Variant 1:
  DIN mounting disk for accommodating a transmitter or ceramic socket.
- Variant 2:
  Fixed connection of the ends of the mineral insulated cable with a DIN ceramic socket.
- Variant 3:
  Measuring insert in a spring-loaded adapter (ANSI).

3.7 Connection heads for SITRANS TS500

The transmitters can be mounted in connection heads of type B and bigger. The following mounting types are possible:

- Measuring insert mounting
  - Standard type with compact design
  - Measuring insert (sensor) and transmitter form one unit

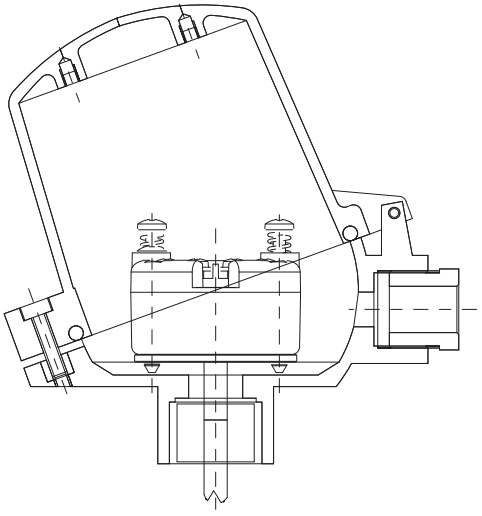


Figure 3-1 Measuring insert mounting of transmitter

- Hinged cover mounting
  - Standard type for connection heads of type BC0: B head with high hinged cover
  - Separate maintenance of the measuring insert and the transmitter is possible.

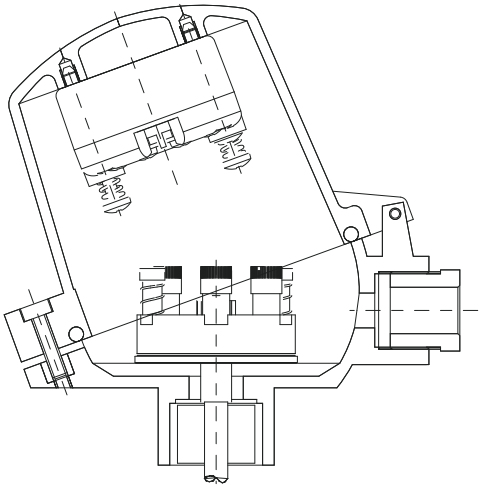


Figure 3-2 Hinged cover mounting of transmitter

3.8 USB modem and SIPROM T

3.8.1 Applications

Use the USB modem only for the purposes specified in these instructions.

The USB modem with SIPROM T parameter assignment software is used for parameter assignment and operation of the following temperature transmitters:

- SITRANS TH100Slim/TH100/TH200/TH320 with 4 to 20 mA
- SITRANS TR200/TR320 with 4 to 20 mA
- SITRANS TF with SITRANS TH200
- SITRANS TF320 with 4 to 20 mA

Connect the temperature transmitter to the PC via the USB modem. The required supply voltage of the temperature transmitter is provided via the USB modem.

NOTICE
Improper use of the USB modem The USB modem and the connected devices can be damaged. • Only use the USB modem for parameter assignment of the named Siemens temperature transmitters. • Always use the SIPROM T parameter assignment software. • Refer to the information in section Technical data (Page 127). • Observe the technical data of the temperature transmitters in the associated operating instructions. You can find the operating instructions on the Internet at Instructions and manuals (http://www.siemens.com/processinstrumentation/documentation).

3.8.2 Product features

- USB port (USB V1.1, compatible with USB 2.0)
- Galvanic isolation between the PC and the temperature transmitter with parameters to be assigned
- Adherence to the Ex requirements for the connected temperature transmitters
- Feeding of the USB modem with supply voltage directly from the USB port of the PC

3.8.3 Meaning of LEDs on the USB modem

LED on the USB modem	Meaning
Power LED lit green.	The USB modem is connected to the USB port of the PC. The operating system of your PC is in normal state.
Power LED flashes green.	The temperature transmitter is assigned parameters.
Power LED is not lit.	This PC is in the standby or idle state.
Comm LED is lit yellow.	The USB modem is restarted.
Comm LED flashes yellow.	Data transfer from the PC to the USB modem.
Error LED is lit red.	Modem-internal errors (RAM errors) or a short-circuit at the modem terminals to the temperature transformer was detected during the parameter assignment operation.
All LEDs are not lit up.	The firmware of the USB modem is being updated.
All LEDs light up for 3 s.	The firmware of the USB modem was successfully updated.

See also

Troubleshooting of USB modem (Page 126)

Installing/mounting

4

4.1 Basic safety notes

WARNING

Exceeded maximum permissible operating pressure

Risk of injury or poisoning.

The maximum permissible operating pressure depends on the device version, pressure limit and temperature rating. The device can be damaged if the operating pressure is exceeded. Hot, toxic and corrosive process media could be released.

Ensure that maximum permissible operating pressure of the device is not exceeded. Refer to the information on the nameplate and/or in Technical data (Page 127).

WARNING

Unsuitable connecting parts

Risk of injury or poisoning.

In case of improper mounting, hot, toxic, and corrosive process media could be released at the connections.

- Ensure that connecting parts (such as flange gaskets and bolts) are suitable for connection and process media.

CAUTION

Seal between extension and conduit

- The seal between the device extension and the conduit must only be used once.

WARNING

Incorrect mounting at Zone 0

Risk of explosion in hazardous areas.

- Ensure sufficient tightness at the process connection.
- Observe the standard IEC/EN 60079-14.

⚠ CAUTION

Hot surfaces resulting from hot process media

Risk of burns resulting from surface temperatures above 65 °C (149 °F).

- Take appropriate protective measures, for example contact protection.
- Make sure that protective measures do not cause the maximum permissible ambient temperature to be exceeded. Refer to the information in Technical data (Page 127).

⚠ CAUTION

External stresses and loads

Damage to device by severe external stresses and loads (e.g. thermal expansion or pipe tension). Process media can be released.

- Prevent severe external stresses and loads from acting on the device.

Note

In order to meet the flame-retardant requirements of the attached cable, only use type-tested sheathed cables with a cable connection length of ≥ 6 m for a cable length.

4.1.1 Installation and location requirements

⚠ CAUTION

High vibration area

Especially with the stainless steel housing version of TS500, use short extensions or external supports when used in a high vibration area.

When TS100/200 sensors are installed in a high vibrating area, use also external supports to fix the probe stem: the unsupported length must not exceed 150 mm and the free end must not exceed 100 mm.

NOTICE

Direct sunlight

Damage to device.

The device can overheat or materials become brittle due to UV exposure.

- Protect the device from direct sunlight.
- Make sure that the maximum permissible ambient temperature is not exceeded. Refer to the information in Technical data (Page 127).

⚠ CAUTION

Process load

The thermowell is affected by the static, dynamic and chemical load from the process parameters, e.g. static and dynamic load, flow induced vortexes. This has influence to the shape of the thermometer, stem diameter and insertion length.

Ensure that the applicable and relevant directives and standards are respected, e.g. ASME PTC 19.3, DIN43772 Annex 1-2, AD-directive, VDI/VDE 3511-5.

In critical applications, a thermowell stress calculation according ASME PTC 19.3-TW2016 or Dittrich/Klotter-method is recommended as an engineering service.

4.1.2 Proper mounting

⚠ DANGER

Protective tube ruptures

Protective tubes that are not suitable for the process or application in question can rupture and result in serious damage to property and personal injuries.

- Make sure that the protective tube is suitable for the respective mounting method and application. If necessary, check the selection and order data of your protective tube.

⚠ WARNING

Electrostatic charge

Danger of explosion in hazardous areas if electrostatic charges develop, for example, in strong airflows in close proximity to belt conveyors.

- Avoid electrostatic charge at the plastic head type BM0 when defining the installation site.

Note

Penetration of water into the plastic head type BM0

Device failure.

- To reach IP54 with a plastic head type BM0, make sure that the mounting angle is in the range of -14 to 194° (208°, see image below).

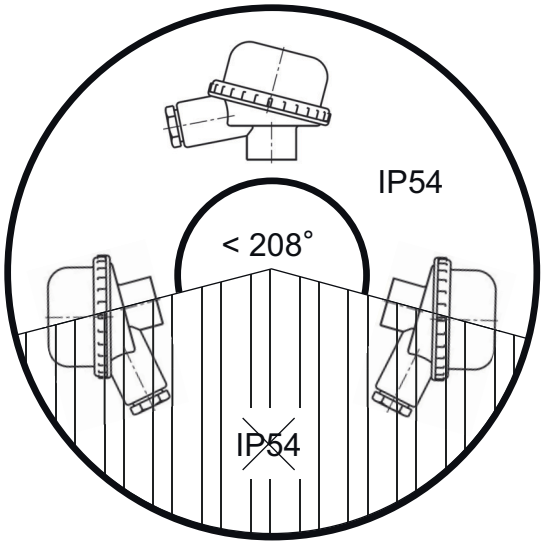


Figure 4-1 Mounting angle of plastic head type BM0

CAUTION

Loss of IP protection

Do not unscrew the device housing from the mounted parts with NPT threaded connection.

NOTICE

Incorrect mounting

The device can be damaged, destroyed, or its functionality impaired through improper mounting.

- Before installing, ensure there is no visible damage to the device.
- Make sure that process connectors are clean, and suitable gaskets and glands are used.
- Mount the device using suitable tools. Refer to the information in Technical data (Page 127) for installation torque requirements.
- Avoid temperature or mechanical shocks during mounting.
- Avoid excessive force or damaging of the on-site mechanical connections.
- Do not deform or adapt the thermowells.
- The use of additive seal or sealant (not in scope of delivery) is recommended between sensor and thermowell.
- Thermowells from carbon steel are protected against corrosion. Clean the thermowell before mounting to avoid poisoning of the sensor and mounting problems.

Note

Loss of degree of protection

Damage to device if the enclosure is open or not properly closed. The degree of protection specified on the nameplate is no longer guaranteed.

4.2 Mounting the SITRANS TS500

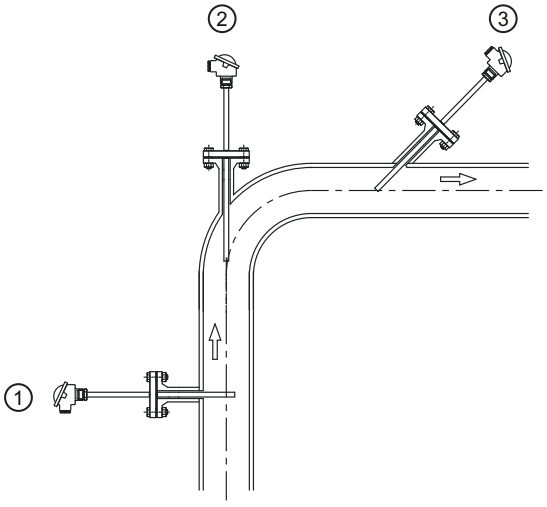
Requirement

The device is suitable for the process with regard to the process connection, media compatibility, temperature resistance and measuring range. See section Technical data (Page 127).

Procedure

1. You prevent faults caused by the heat dissipation in non-representative arrangements by observing the following basic rules:
2. Select an optimal immersion depth. Estimate the immersion depth using the formulas listed in Estimation of immersion depth (Page 139).
   If permitted by the flow velocity, a sensor arrangement between one-third and one-half of the conduit diameter is recommended.
3. If the process load at the sensor pocket permits the exposition, select a measurement location with higher flow velocity.
4. Ensure that there is sufficient thermal insulation of the external components of the thermometer.
5. Ensure that external parts have small surfaces.
6. Select the optimum mounting position for the process in question.

7. With small conduit diameters, mount the sensors against the flow direction. Angled ② or in a pipe elbow ③.

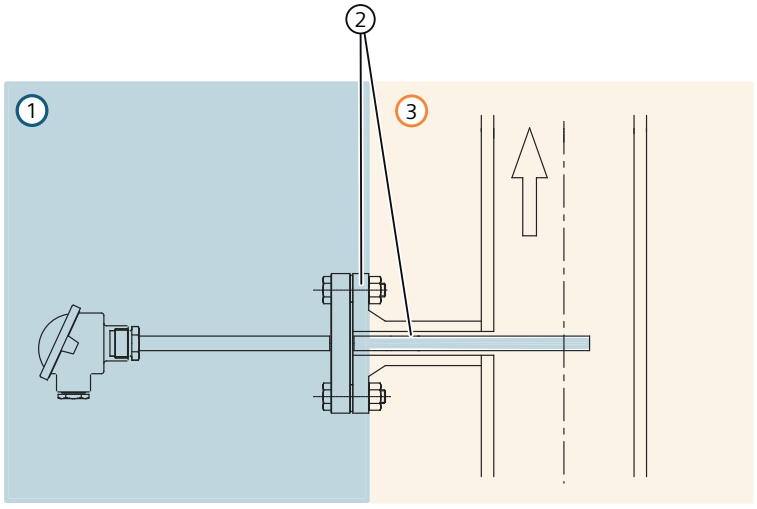


① At a right angle to the flow
② In the pipe elbow against the flow direction
③ Angled against the flow direction

Figure 4-2 Possible mounting positions of the sensor

8. Follow the torques required between device extension and conduit Torques between device extension and conduit (Page 139).
   - If customized adaptations are necessary (only M24 connectors), note the required torques between the device head and extension as specified in Torques between device head and extension (Page 139).
   - When mounting a SITRANS TS500 in full material design type 4 without flange (only Europe portfolio 7MC752..) of the device extension at the conduit, follow the required torques between device extension and conduit (Page 139).

Mounting SITRANS TS500 in the potentially explosive atmosphere



Zone 1/21 or 2/22 protrudes into zone 0/20 from left to right within the protective tube. The wall of the protective tube is part of the separation element.

① Zone 1 or 2
Zone 21 or 22
EPL Db
EPL Gb

② Separation element: Flange and wall of the protective tube

③ Process
Zones 0 and 20
EPL Da
EPL Ga

EPL (Equipment Protection Level) or device protection level

Figure 4-3 Separation element between different zones and different device protection levels

4.3 Mounting SITRANS TS300 in clamp-on design

Note

Measuring position

Only install on round pipes. Avoid an installation close to pipe elbows, sliders, valves, etc.

1. Determine the measuring position on the pipe.
2. Apply the thermal paste on the metal part of the temperature sensor.
3. For the standard design: Install the two sleeving parts to the pipe using two fixing screws.
   For the clamp design: Mount the SITRANS TS300 using a fixing screw.
   – If the process medium does not flow through the full cross-section of the pipe, mount the temperature sensor on the bottom of the pipe.

4. Tighten the fixing screws (tightening torque 4 Nm).
5. Mount the vibration protection and tighten it manually.
   - You can pull out the measuring insert by loosening the RTD recessed grip gland(s).
   - Do not twist the enclosure.
   - Only conduct the mounting work on the RTD recessed grip gland.
   - Do not apply any force to the transmitter (e.g. when opening and closing the cover).
   - Due to the seals being on the inside, the plug-in connectors are only suitable for an ambient temperature of up to 100 °C (212 °F).

4.4 Rotating the display

To read the display in any mounting position, you can rotate it by 360° in 90° steps.

Procedure

1. Use a 3 mm Allen key to loosen the safety catch.
2. Unscrew the cover.
3. Remove the display from the holder.

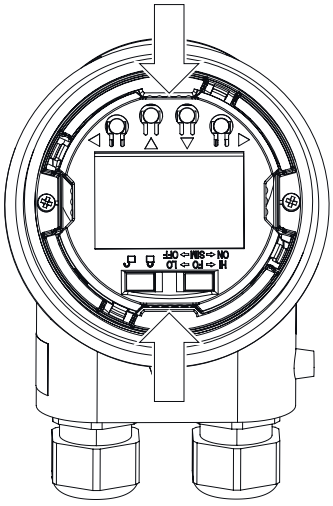


Figure 4-4 Remove the display

4. Rotate the display in 90° increments to the desired position.
5. Mount the display once again at the desired position.
6. Screw the cover back on as far as it will go.
7. Use a 3 mm Allen key to secure the safety catch.

4.5 Disassembly

⚠ WARNING

Incorrect disassembly

The following risks may result from incorrect disassembly:

- Injury through electric shock
- Risk through emerging media when connected to the process
- Risk of explosion in hazardous area

In order to disassemble correctly, observe the following:

- Before starting work, make sure that you have switched off all physical variables such as pressure, temperature, electricity etc. or that they have a harmless value.
- If the device contains hazardous media, it must be emptied prior to disassembly. Make sure that no environmentally hazardous media are released.
- Secure the remaining connections so that no damage can result if the process is started unintentionally.

Connecting 5

5.1 Basic safety notes

⚠ WARNING

Unsuitable cables, cable glands and/or plugs

Risk of explosion in hazardous areas.

- Use only cable glands/plugs that comply with the requirements for the relevant type of protection.
- Tighten the cable glands in accordance with the torques specified in Technical data (Page 127).
- Close unused cable inlets for the electrical connections.
- When replacing cable glands, only use cable glands of the same type.
- After installation, check that the cables are seated firmly.

⚠ WARNING

Incorrect selection of type of protection

Risk of explosion in areas subject to explosion hazard.

This device is approved for several types of protection.

1. Decide in favor of one type of protection.
2. Connect the device in accordance with the selected type of protection.
3. In order to avoid incorrect use at a later point, make the types of protection that are not used permanently unrecognizable on the nameplate.

⚠ WARNING

Improper power supply

Risk of explosion in hazardous areas as result of incorrect power supply.

- Connect the device in accordance with the specified power supply and signal circuits. The relevant specifications can be found in the certificates, in Technical data (Page 127) or on the nameplate.

⚠ WARNING

Lack of equipotential bonding

Risk of explosion through compensating currents or ignition currents through lack of equipotential bonding.

- Ensure that the device is potentially equalized.

Exception: It may be permissible to omit connection of the equipotential bonding for devices with type of protection "Intrinsic safety Ex i".

⚠ WARNING

Unprotected cable ends

Risk of explosion through unprotected cable ends in hazardous areas.

- Protect unused cable ends in accordance with IEC/EN 60079-14.

⚠ WARNING

Loss of degree of protection

When connecting the SITRANS TS100 or TS200 with type protection "Intrinsically safe", ensure the following:

- Adhere to the requirements for electrical connection seperation.
- Use IP54 rated enclosure.

⚠ WARNING

Lemo plug in hazardous areas

For Lemo plug version (7MC7xxx-xxxx2-xxx) make sure the cable ends are in an environment free from dust, water, or shock.

⚠ WARNING

Improper laying of shielded cables

Risk of explosion through compensating currents between hazardous area and the non-hazardous area.

- Shielded cables that cross into hazardous areas should be grounded only at one end.
- If grounding is required at both ends, use an equipotential bonding conductor.

⚠ WARNING

Connecting or disconnecting device in energized state

Risk of explosion in hazardous areas.

- Connect or disconnect devices in hazardous areas only in a de-energized state.
- Install a suitable switch-off device.

Exceptions:

- Devices having the type of protection "Intrinsic safety Ex i" may also be connected in energized state in hazardous areas.

Note

Electromagnetic compatibility (EMC)

You can use this device in industrial environments, households and small businesses.

Metal enclosures ensure improved electromagnetic protection from high frequency radiation. This protection can be increased by grounding the enclosure.

See also

Connecting (Page 37)

Note

Improvement of interference immunity

- Lay signal cables separate from cables with voltages > 60 V.
- Use cables with twisted wires.
- Keep device and cables at a distance from strong electromagnetic fields.
- Take account of the conditions for communication specified in the Technical data (Page 127).
- Use shielded cables to guarantee the full specification according to HART/PA/FF/Modbus/ EIA-485/Profibus DP.

5.1.1 For SITRANS TSinsert

⚠ WARNING

Flying leads

Risk of explosion in hazardous areas due to loss of Intrinsic Safety protection.

- Shorten the ends of flying leads to the appropriate length.
- Keep a minimal clearance of 2 mm between the wires of different circuits, or any circuit and the grounded enclosure.
  - or -
  Use heat shrinking tubes TFE-R 1/8": wall thickness ≥ 0.2 mm, di-electrical strength greater than 500 V.

5.1.2 For SITRANS TSinsert/TS100/TS200/TS500

NOTICE

Ambient temperature too high

Damage to cable sheath.

- At an ambient temperature ≥ 60 °C (140 °F), use heat-resistant cables suitable for an ambient temperature at least 20 °C (36 °F) higher.

5.1.3 For SITRANS TS100/TS200

⚠ WARNING

Use of plug connectors in explosive dust atmosphere

Danger of explosion.

Temperature sensors of the SITRANS TS100 and SITRANS TS200 series must not be used together with plug connectors in atmospheres with combustible dust.

- Do not use plug connectors in areas with combustible dust.

5.1.4 For SITRANS TS500

NOTICE
Condensation in the device Damage to device through formation of condensation if the temperature difference between transportation or storage and the mounting location exceeds 20 °C (36 °F). • Before taking the device into operation, let the device adapt for several hours in the new environment.

5.2 Connecting the device

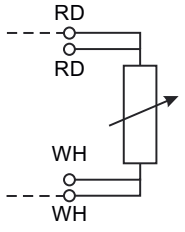
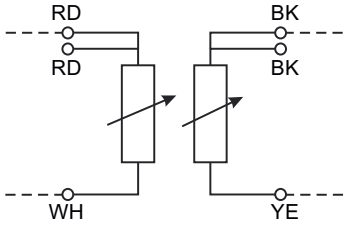
Procedure

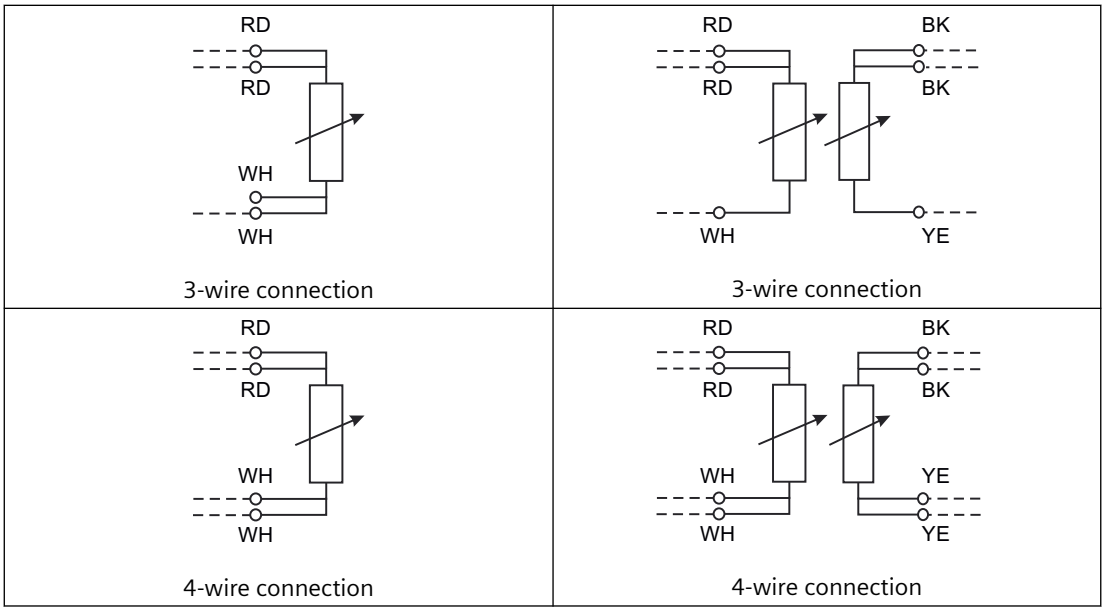
1. Loosen the fixing screws on the enclosure cover and remove the enclosure cover.
2. Insert the connecting cable through the cable gland.
3. Connect the wires to the relevant connecting terminals. Observe the terminal assignment:
   - Connecting the resistance thermometer (Page 41)
   - Connecting the thermocouple (Page 42)
   - Connecting the plug-in connector (Page 43)

See also

Electrical data (Page 140)

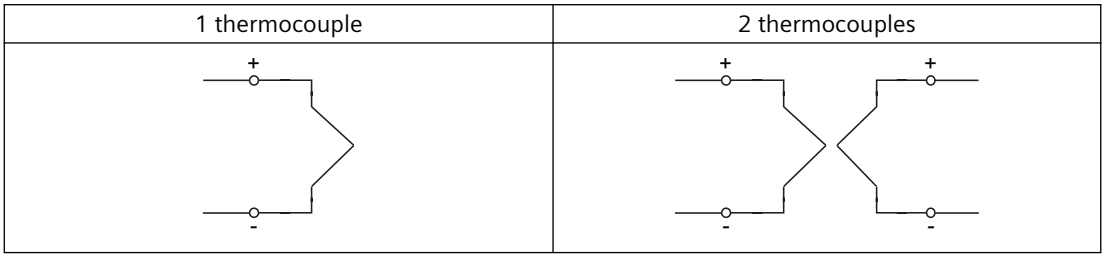
5.3 Connecting the resistance thermometer

1 x RTD	2 x RTD
 2-wire connection	 2-wire connection



Abbreviation of color: RD = red; WH = white; YE = yellow; BK = black

5.4 Connecting the thermocouple



Thermocouples	Cable colors	
Type	**+**	**-**
J	Black	White
K	Green	White
N	Pink	White
E	Violet	White
T	Brown	White

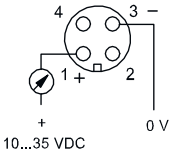
Note

2 thermocouples

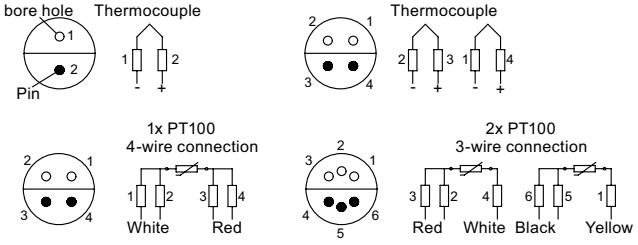
On the terminal block is an additional mark to differentiate between sensor 1 and sensor 2.

5.5 Connecting the plug-in connector

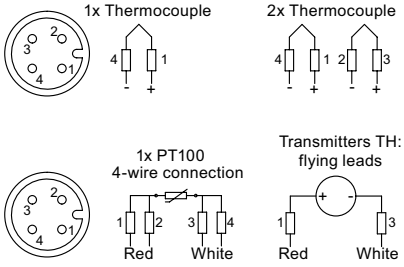
M12 x 1 connection with SITRANS TH100 transmitter



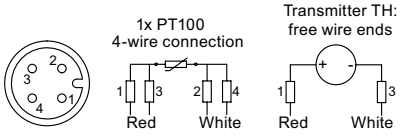
Lemo 1S connection for SITRANS TS100/TS200



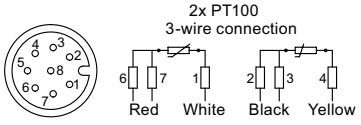
M12 connector for single sensor SITRANS TS100/TS200/TS500



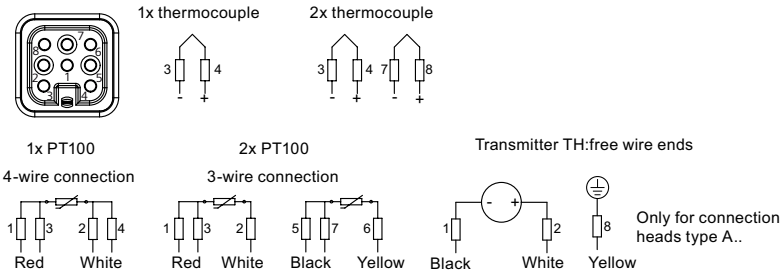
M12 connector for single sensor SITRANS TS300



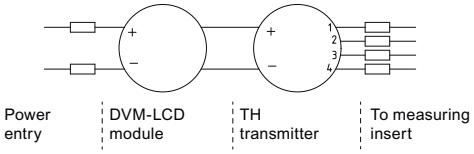
M12 connector for double sensor SITRANS TS100



HAN7 D connector for SITRANS TS500



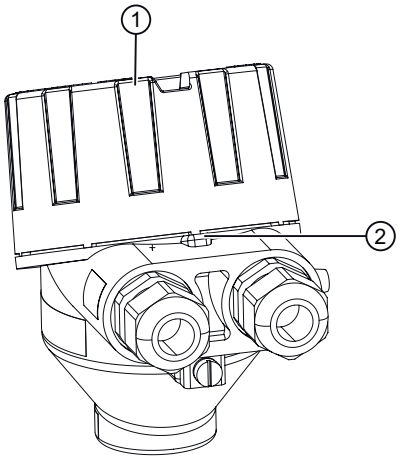
Connection of DVM-LCD and transmitter



5.6 Connecting the SITRANS TS500

5.6.1 Opening the device

Procedure



① Cover of the electrical cable compartment

② Safety catch

Figure 5-1 Opening device with single chamber housing

1. Use a 3 mm Allen key to loosen the safety catch ②.
2. Unscrew the cover of the electrical cable compartment ①.

5.6.2 Connecting the SITRANS TS500 and TH320

Condition

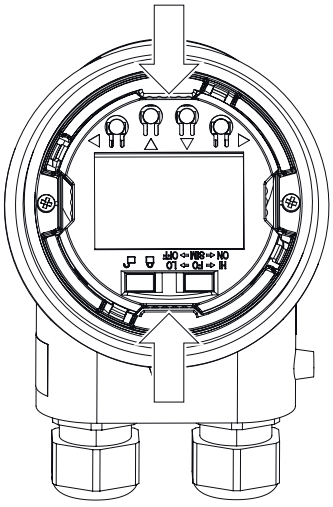
The device is opened. (Page 44)

If you use stranded wire used, you need a ferrule.

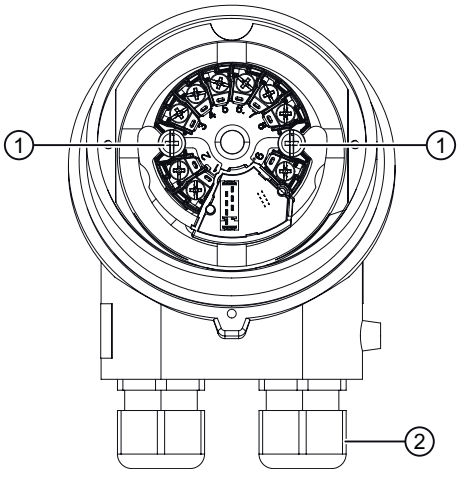
Note the maximum permissible core cross-section (Page 139).

Procedure

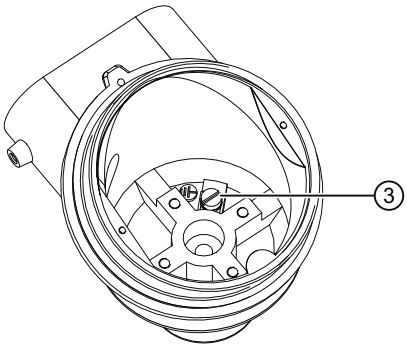
1. Remove the local display from the holder.



2. Loosen the fastening screws of the temperature transmitter ① and remove it.



3. Increase the protection from high-frequency radiation through shielded connecting cables.
   – Lead the shielded connecting cables through the EMC cable glands ②.
   - or -
   – Connect the cable shield to the screw of the ground terminal ③.



   The screw of the ground terminal is electrically connected to the external protective conductor connection.

4. Connect the input terminals ④ and output terminals ⑤.
   Connecting TH320 (Page 51)

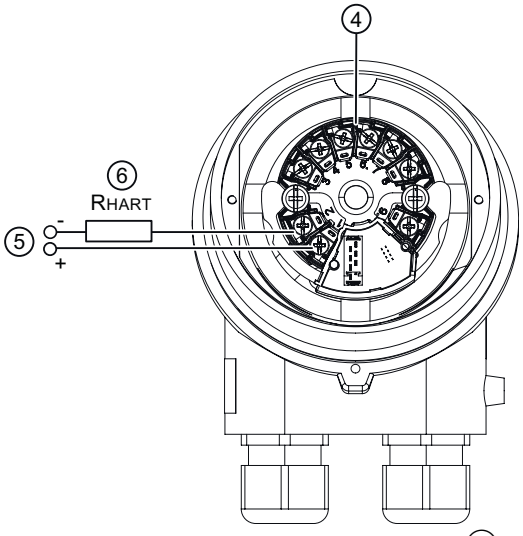
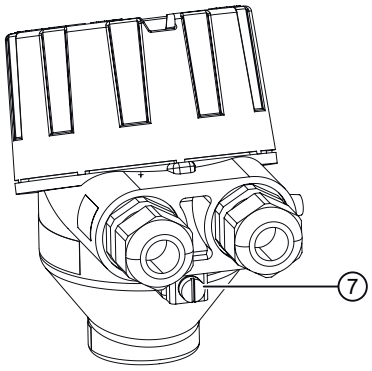


Figure 5-2 HART communication resistor ⑥ (optional)

5. Insert the temperature transmitter and screw it into place.
6. Insert the local display.

7. Close the device.
   Closing the device (Page 50)
8. Connect the device to the plant with the protective conductor connection ⑦.



5.6.3 Connecting the SITRANS TS500 and TH420

Condition

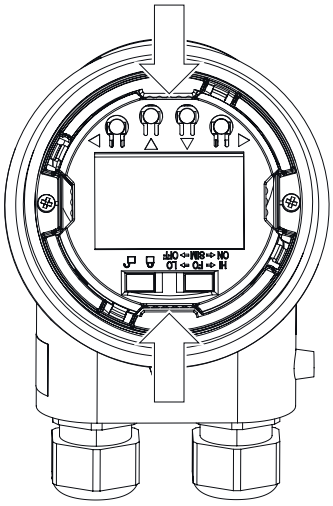
The device is opened. (Page 44)

If you use stranded wire used, you need a ferrule.

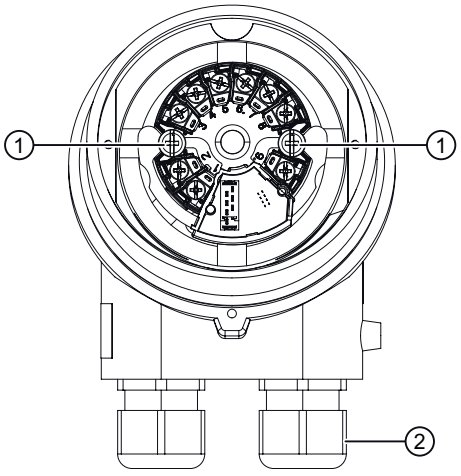
Note the maximum permissible core cross-section (Page 139).

Procedure

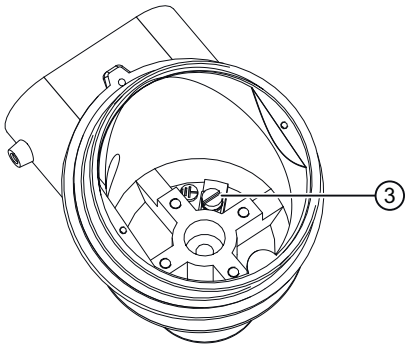
1. Remove the local display from the holder.



2. Loosen the fastening screws of the temperature transmitter ① and remove it.



3. Increase the protection from high-frequency radiation through shielded connecting cables.
   – Lead the shielded connecting cables through the cable glands ②.
   - or -
   – Connect the cable shield to the screw of the ground terminal ③.



   The screw of the ground terminal is electrically connected to the external protective conductor connection.

4. Connect the input terminals ④ and output terminals ⑤.
   Connecting TH420 (Page 52)

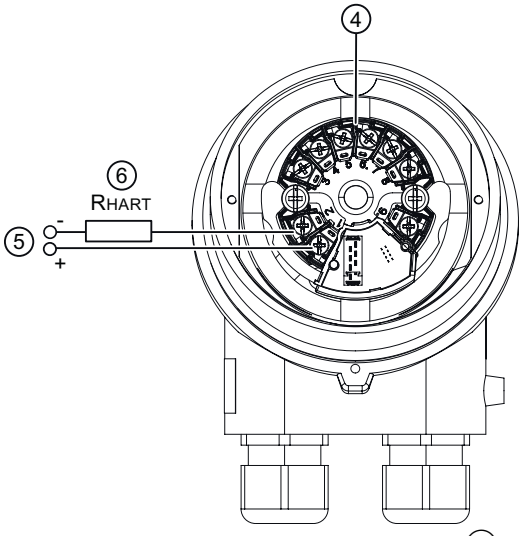
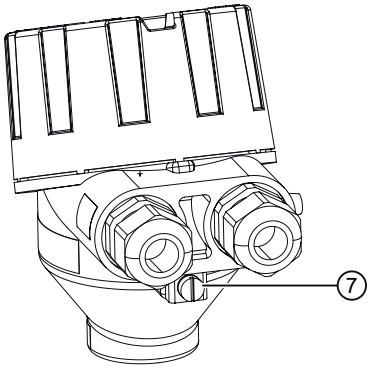


Figure 5-3 HART communication resistor ⑥ (optional)

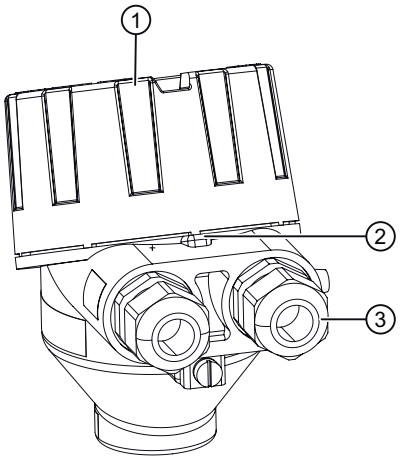
5. Insert the temperature transmitter and screw it into place.
6. Insert the local display.

7. Close the device.
   Closing the device (Page 50)
8. Connect the device to the plant with the protective conductor connection ⑦.



5.6.4 Closing the device

Procedure



① Cover
② Safety catch
③ Cable gland

Figure 5-4 Closing device with single chamber housing

1. Screw the cover ① back on as far as it will go.
2. Use a 3 mm Allen key to secure the cover with the safety catch ②.
3. Check the tightness of the cable glands ③ in accordance with the degree of protection.

5.7 Connecting TH320

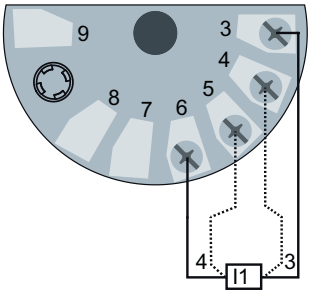
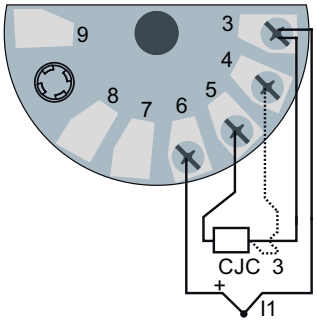
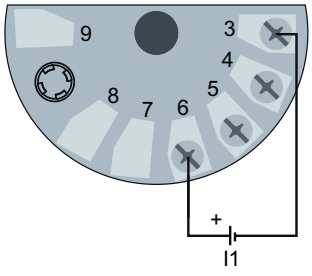
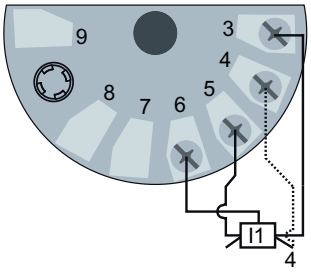
Requirement

If you use stranded wire used, you need a ferrule.

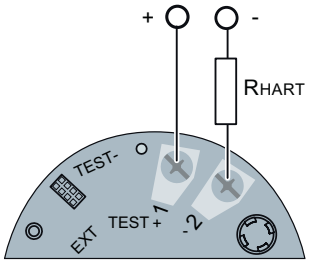
Note the maximum permissible core cross-section (Page 139).

Procedure

1. Connect the input or inputs to terminals 3 to 6.

		
2-wire, 3-wire or 4-wire RTD or linear resistance I1: Input 1	TC (internal CJC or external 2-wire or 3-wire CJC)	
		
Voltage input (unipolar and bipolar)	3-wire or 4-wire potentiometer	

2. Connect the supply voltage to the terminals 1 (+) and 2 (-).
   Take the polarity into account. The device has reverse polarity protection.



For devices with HART communication, connect a ≥ 250 Ω resistor.

5.8 Connecting TH420

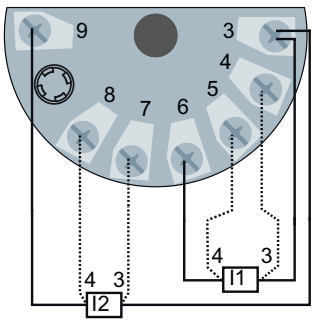
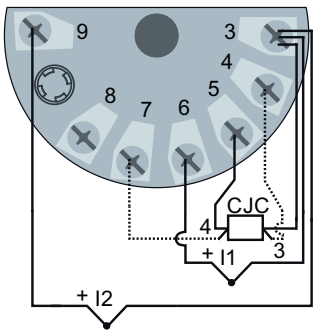
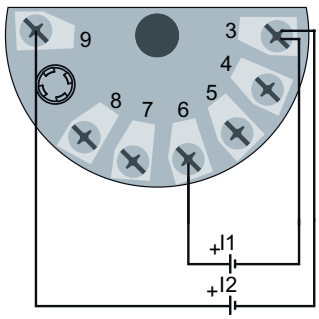
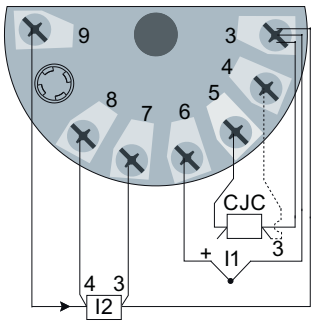
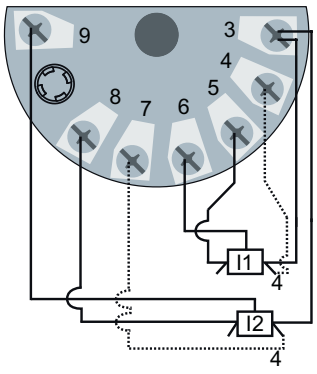
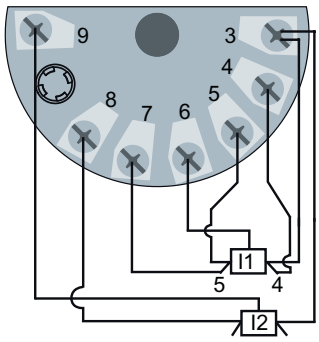
Requirement

If you use stranded wire used, you need a ferrule.

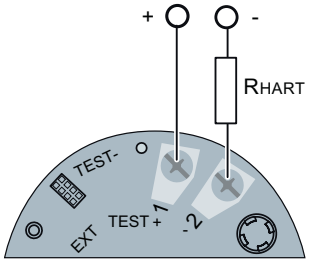
Note the maximum permissible core cross-section (Page 139).

Procedure

1. Connect the input or inputs to terminals 3 to 9.

		
Input 1 (I1) and/or input 2 (I2): 2-wire, 3-wire or 4-wire RTD or linear resistance	Input 1 (I1) and/or input 2 (I2): TC (int. CJC or ext. 2-wire, 3-wire or 4-wire CJC)	Input 1 (I1) and/or input 2 (I2): voltage input (unipolar and bipolar)
		
Input 1: TC (int. CJC or ext. 2-wire or 3-wire CJC) Input 2: 2-wire, 3-wire or 4-wire RTD	Input 1 (I1) and/or input 2 (I2): 3-wire or 4-wire potentiometer	Input 1 (I1): 5-wire potentiometer Input 2 (I2): 3-wire potentiometer

2. Connect the supply voltage to the terminals 1 (+) and 2 (-).
   Take the polarity into account. The device has reverse polarity protection.



   For devices with HART communication, connect a ≥ 250 Ω resistor.

Commissioning

6

6.1 Basic safety notes

WARNING

Improper commissioning in hazardous areas

Device failure or risk of explosion in hazardous areas.

- Do not commission the device until it has been mounted completely and connected in accordance with the information in Installing/mounting (Page 27).
- Before commissioning take the effect on other devices in the system into account.

WARNING

Hot surfaces

Risk of burns resulting from hot surfaces.

- Take corresponding protective measures, for example by wearing protective gloves.

WARNING

Opening device in energized state

Risk of explosion in hazardous areas

- Only open the device in a de-energized state.
- Check prior to commissioning that the cover, cover locks, and cable inlets are assembled in accordance with the directives.

Exception: Devices having the type of protection "Intrinsic safety Ex i" may also be opened in energized state in hazardous areas.

WARNING

Loss of explosion protection

Danger of explosion in hazardous areas if the device is open or not properly closed.

Note

Loss of degree of protection

Damage to device if the enclosure is open or not properly closed. The degree of protection specified on the nameplate is no longer guaranteed.

6.2 Commissioning

Requirements

Ensure that the following commissioning conditions are being met:

- You have connected the sensors correctly. For additional information, refer to:
  - Connecting the resistance thermometer (Page 41)
  - Connecting the thermocouple (Page 42)
- Ensure that the electrical connections are tightened with the correct torque.
- The following applies in particular for device versions with explosion protection:
  - Ensure that the cable glands are suitable for the process and have been tightened correctly.
  - The electrical data must match the specified ex-relevant values.
- All seals must be present, placed correctly and undamaged.

Procedure

1. Close the connection head. Fully screw on the cover for device versions with flameproof enclosures.
2. Connect the sensor integrated into the process to the power supply.

6.3 Commissioning the USB modem and SIPROM T

6.3.1 Fundamental safety instructions

NOTICE
Improper operating conditions Device damage. • Only operate the USB modem under laboratory conditions. • Observe the environmental requirements in section Technical data (Page 127). • Only operate the USB modem in a controlled electromagnetic environment. Do not use radio transmitters, such as mobile phones, in the direct vicinity. • Do not expose the modem to moisture or direct sunlight.

6.3.2 Installing the SIPROM T parameterization software

Requirement

- PC with USB port and Windows 10 operating system
- Windows Microsoft .NET Framework 4.5 or higher for Windows 10
- USB modem present

Procedure

1. Download the SIPROM T parameter assignment software from the Internet free of charge. (http://www.siemens.com/processinstrumentation/downloads)
2. Uninstall the SIPROM T installations from your PC.
3. Before you start the installation, read the information for preparation in the Readme file.
4. Double-click the "setup.exe" file in the SIPROM T software directory.
5. Follow the installation instructions.
6. Download the following USB driver from the Internet: (http://www.ftdichip.com/Drivers/CDM/CDM20830_Setup.exe)
7. Open the USB driver file.
8. Install the downloaded USB driver.

Procedure

1. Open the SIPROM T Software directory > USB Driver.
2. Double-click the "CDM20830_Setup.exe" file.
3. Follow the installation instructions.

4. Open the "Device Manager" in Windows.

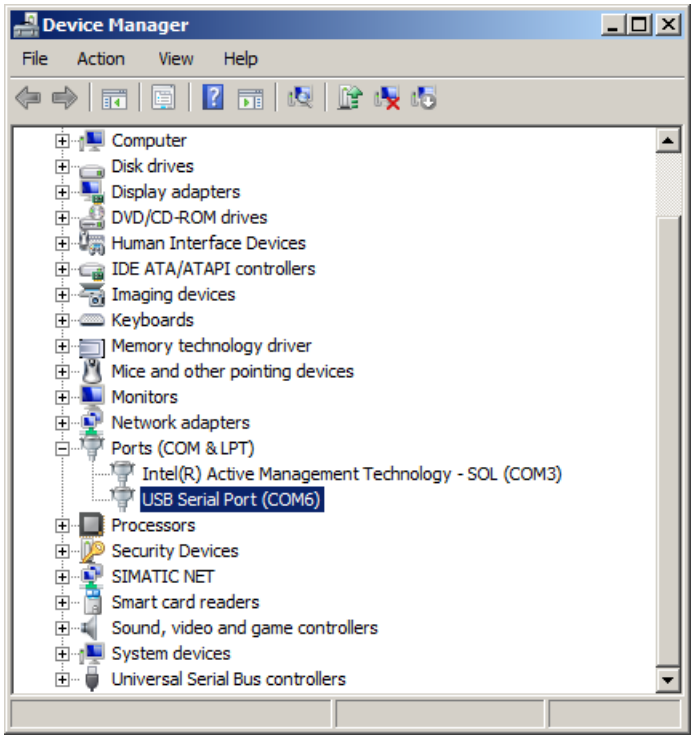


Figure 6-1 Windows Device Manager

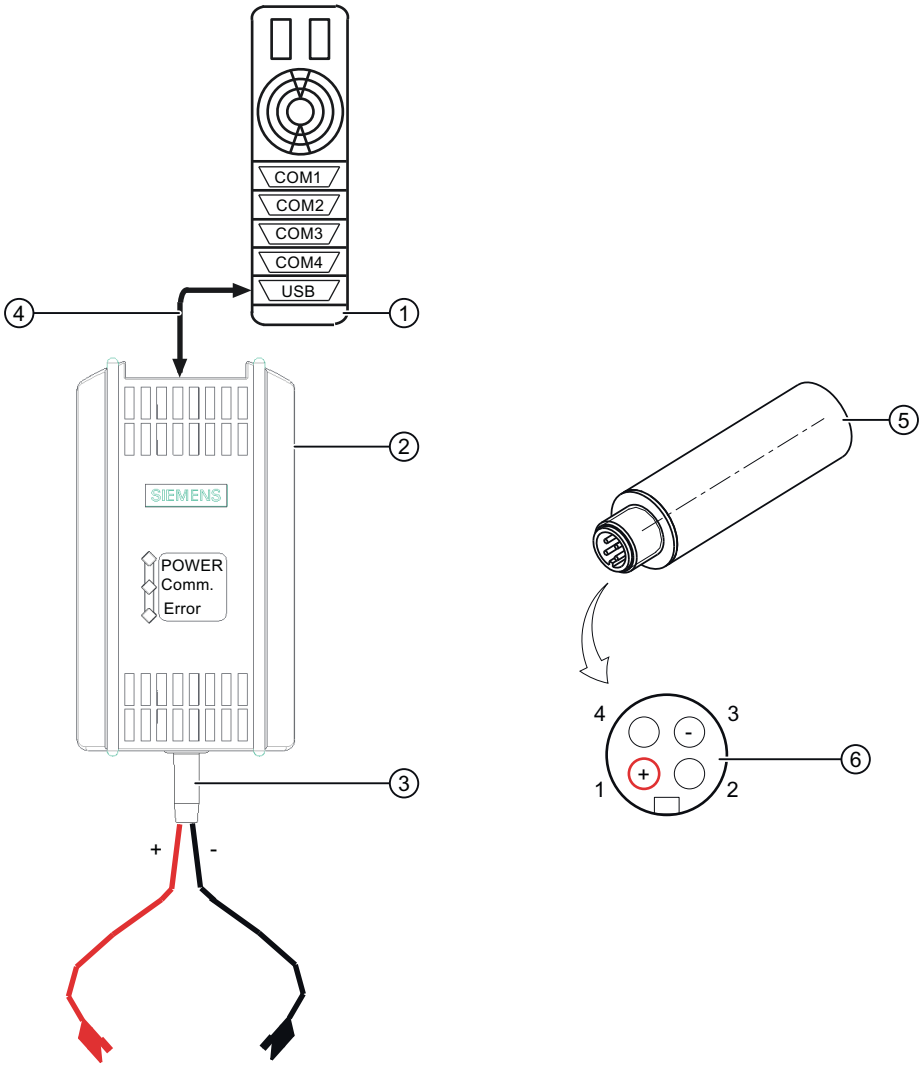
5. Double-click "Ports (COM & LPT)".
   The newly installed USB port is named "USB Serial Port (COMx)", where x stands for the COM port number.
6. Note down the COM port number.
7. Open SIPROM T.
8. In the menu, select "Device" > "Settings".
9. Select the noted COM port number from the Windows "Device Manager".
10. Click "OK".

See also

Uninstalling USB drivers (Page 112)

6.3.3 Connecting USB modem

Procedure



① PC
② USB modem
③ Connecting cable to the temperature transmitter
Red cable plus
Black cable minus
④ USB cable
⑤ SITRANS TH100 Slim
⑥ M12
Contact 1 plus
Contact 3 minus

Figure 6-2 Connecting USB modem

1. Connect the USB modem ② to your PC ① using the USB cable ④.
2. Connect the USB modem to the temperature transmitter using the connecting cable ③.

Operating

7

7.1 Local operation

7.1.1 Buttons

The four buttons are located below the local display.

To access the buttons, remove the cover.

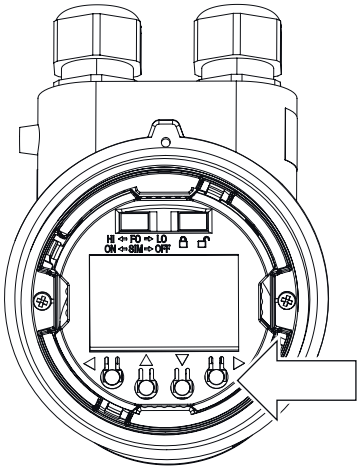


Figure 7-1 Single chamber housing with open cover

7.1.2 Operating the device with display

7.1.2.1 Navigating in the views

You navigate in the views with the buttons:

Buttons (Page 61)

Example

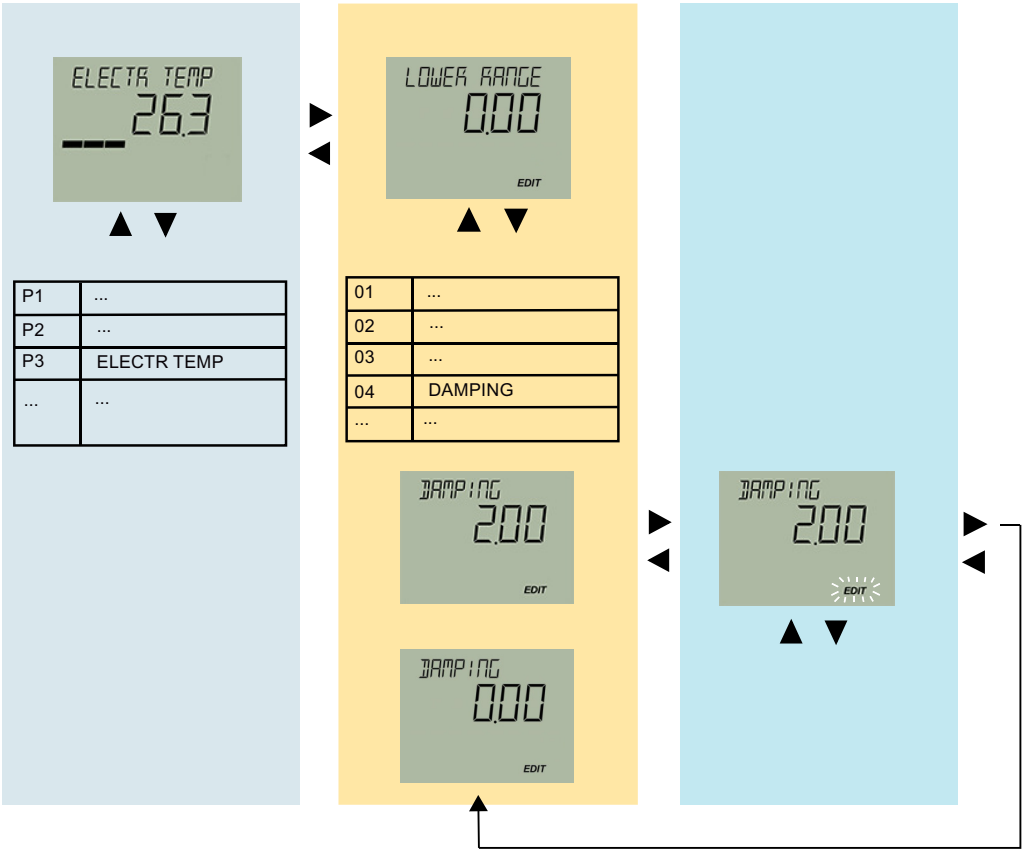


Figure 7-2 The colors represent three different views: Measured value view, parameter view and edit view

7.1.2.2 Measurement view

Measurement view

The measurement view shows the current measured values as well as status and diagnostic messages:

① Name and unit of the measured value (alternating)
② Measured value
③ Measured value ID
④ Bar display

Figure 7-3 Example of measurement view

① shows the name of the measured value and the set unit as alternating values.

Measured value IDs ③ start with "P".

The bar display shows the following information:

- Measured value ID P1: The position of a measured value within the set measuring span.
- Measured value ID P2 and P3: The position of the measured value within the sensor limits.

Display of measured values

The following measured values are displayed:

Measured value ID	Visualization on the display	Meaning
P1	PV	Measured value of the primary variable
P2	INPUT 1	Measured value at input 1
P3	INPUT 2	Measured value at input 2 for devices with two inputs
P4	CURRENT OUT	Analog current of the primary variable
P5	ELECTR TEMP	Electronics temperature

Navigating in the measurement view

Requirement

You have disabled the button lock.

Disabling button lock (Page 96)

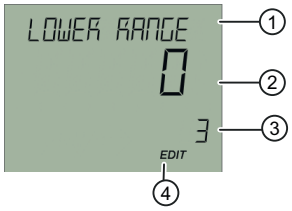
Procedure

1. Use the ▲ and ▼ buttons to navigate in the measurement view.
2. To switch to the parameter view, press the ▶ button.

7.1.2.3 Parameter view

Parameter view

The parameter view shows the parameters, parameter values and the wizards of the device.



① Name and unit of the parameter (alternating)
② Parameter value
③ Parameter ID
④ "EDIT" symbol (permanently enabled)

Figure 7-4 Example of parameter view

For parameters with an associated unit, the parameter name and unit are displayed as alternating values in ①. Example: Lower range value in °C.

List of parameters on the display

The parameters are displayed with parameter ID and parameter name.

Depending on the parameter settings or the device version of your device, some parameters are not visible.

Parameter ID	Parameter name on the display	Meaning
01	TYPE INPUT 1	Input type 1
02	WIRING 1	Connection type for input 1
03	WIRE RES 1	Wire resistance for connecting cable at Input 1
04	TYPE INPUT 2	Input type 2
05	WIRING 2	Connection type for input 2
06	WIRE RES 2	Wire resistance for connecting cable at Input 2
07	PV MAPPING	Assignment of the primary variable
08	UNITS	Set unit of the primary variable
09	LOWER RANGE	Set the lower range value of the primary variable
10	UPPER RANGE	Set upper range value of the primary variable
11	DAMPING	Damping value
12	FUNCT SAFETY	Enable and disable Functional Safety
13	LOOP TEST	Loop test
14	TRIM INPUT 1	One-point calibration input 1
15	TRIM INPUT 2	One-point calibration input 2
16	CHANGE PIN	Change User PIN
17	PIN RECOVERY	PIN recovery

Parameter ID	Parameter name on the display	Meaning
18	USER PIN	Enable and disable User PIN
19	MIN INPUT 1	Minimum measured peak value at Input 1
20	MAX INPUT 1	Maximum measured peak value at input 1
21	MIN INPUT 2	Minimum measured peak value at input 2
22	MAX INPUT 2	Maximum measured peak value at Input 2
23	MIN ETEMP	Minimum transmitter electronics temperature
24	MAX ETEMP	Maximum transmitter electronics temperature
25	BUTTON LOCK	Enable and disable button lock

The parameter ID is written after the parameter name in parentheses from here on out.
Example: Parameter "Damping value" [11].

Navigating in the parameter view

Requirement

The button lock is disabled.

Disabling button lock (Page 96)

Procedure

1. Use the ▲ or ▼ buttons to navigate within the parameters.
   To navigate faster, keep the ▲ or ▼ button pressed.
   After the last parameter, you jump to the first parameter, and vice versa.
2. To switch to edit view, press the ▶ button.
3. To return to the measurement view, press the ◀ button.

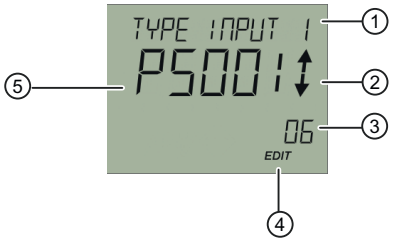
7.1.2.4 Edit view

You change the parameter values in the edit view. Wizards are available for specific parameters.

Parameter values

There are various parameter values:

- Enumerations (e.g. unit type)
- Numerical values (e.g. damping)



①	Name of parameter and, if available, unit (alternating)	④	"EDIT" symbol (flashing)
②	Enumeration arrows (for enumerations only)	⑤	Parameter value
③	Parameter ID		

Figure 7-5 Example of edit view

For parameters with an associated unit, the parameter name and unit are displayed as alternating values in ①. Example: Lower range value in °C.

See also

Disabling button lock (Page 96)

Changing parameter values

Requirement

The device is not write-protected.

For information on write protection, refer to section Locking the device (Page 67).

Procedure

1. Navigate to the parameter view (Page 61).
2. Select the desired parameter with the ▲ or ▼ button.
   Use the ▶ button to confirm.
   You are in the edit view.
3. Change the parameter value with the ▲ or ▼ button.
   To navigate faster, keep the ▲ or ▼ button pressed.
4. Save the change with the ▶ button.
   Or, cancel the change with the ◀ button.

7.2 Remote operation

You can operate the device using HART communication. The following is required for this purpose:

- A handheld (e.g. FC475) or PC software such as SIMATIC PDM.
- A HART modem to connect a PC with the device or a lead to connect the handheld with the device.

See also

SIMATIC PDM (Page 197)

7.3 Locking the device

7.3.1 Introduction

The following options are available to lock the device:

- Enable write protection using switch.
- Enable write protection using the User PIN.
- Enable write protection using the button lock.

Write protection	Symbol	ID	Read measured values on the display	Read parameters on the display	Change parameters via the device with display
Switch enabled		**L**	Yes	Yes	No
User PIN[1)] enabled		**LP**	Yes	Yes	Yes, after input of the user PIN
Button lock enabled		**LL**	Yes	No	No

[1)]The user PIN is factory set to 2457 in the device. When delivered, write protection is disabled using the user PIN.

Devices with functional safety

To enable functional safety, first enable the User PIN.

7.3.2 Enable write protection with write protection switch

Introduction

The write protection switch is used for enabling write protection.

Procedure

1. Unscrew the cover.
2. Slide the write protection switch to the closed lock position.

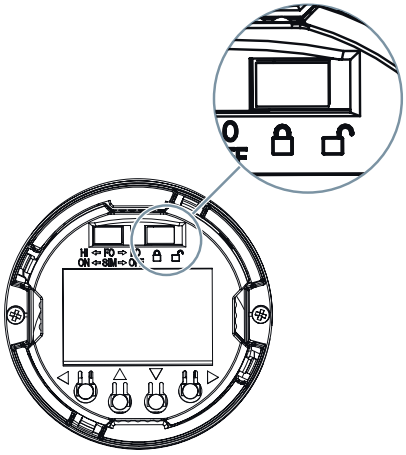


Figure 7-6 Enable write protection using the write protection switch

Result

When the write protection switch is set to the closed lock position, measured values and parameters can be read.

7.3.3 Enable the User PIN on the display

Requirement

The User PIN is disabled.

Procedure

1. Navigate to the parameter view.
   Navigating in the views (Page 61)
2. Select the parameter "User PIN".
3. Use the ▶ button to confirm.
   The message "USER PIN ON" (User PIN enabled) appears for 2 seconds.

Result

7.3.4 Enable the button lock on the display

Procedure

1. Navigate to the parameter view.
   Navigating in the views (Page 61)
2. In the parameter view, select the "Button lock" parameter.
3. Press the ▶ button.
   The "EDIT" symbol flashes.
4. Select ON with the ▲ or ▼ button.

5. Use the ▶ button to confirm.

Result

- The display automatically returns to the measurement view.
- The display automatically changes between the measured values every 12 seconds.
- The symbol for button lock "LL" and the measured value ID are displayed alternately.

Parameter assignment

8

8.1 Overview of parameters and functions

Introduction

You can operate the device via local operation or remote operation (e.g. SIMATIC PDM).

- The parameters that you can reach over the device with a display are marked by the parameter ID. Hereinafter, the parameter ID is always written inside parentheses after the parameter name. Example: Parameter "Damping value" [04].
- You can access the complete number of parameters via remote operation.
  The device-specific parameters are available in each tool for configuration.
  The instructions or online help for these tools will provide you with information on how to use the different tools for parameter assignment.

8.1.1 Parameters and functions

List of parameters and functions

The following parameters are available via the local operation and via remote operation (e.g. SIMATIC PDM).

The parameters are grouped according to their function in the following overview:

Quick start	**SIMATIC PDM**	**Device with display (local operation)**
"Quick Start" wizard	Menu command "Device > Wizard > Wizard - Quick start..."	-

Current output	**SIMATIC PDM**	**Device with display (local operation)**
Set input type	"Settings > Sensor settings" parameter group	Input type 1 [01] (Page 76) / Input type 2 [04] (Page 80)
Set wiring configuration	"Settings > Sensor settings" parameter group	Connection type for input 1 [02] (Page 80) / Connection type for input 2 [05] (Page 83)
Set lower range value Set upper range value	"Settings > Current output" parameter group	Lower range value [09]/Upper range value [10] (Page 86)
Lower range current Upper range current	"Settings > Current output" parameter group	-
Set damping value	"Settings > Sensor settings" parameter group	Damping value [11] (Page 87)

Current output	**SIMATIC PDM**	**Device with display (local operation)**
Set current output	"Settings > Current output" parameter group	-
Set saturation limits	"Settings > Current output" parameter group	-
Loop test	Menu command "Device > Loop test"	Loop test [13] (Page 88)

Application	**SIMATIC PDM**	**Device with display (local operation)**
Select unit	"Settings > Sensor settings" parameter group	Unit [08] (Page 85)
Set the linearization table (60 breakpoints)	"Settings > Sensor settings" parameter group	-
Set the spline curve (40 breakpoints)	"Settings > Sensor settings" parameter group	-
Change Callendar-Van Dusen coefficients	"Settings > Sensor settings" parameter group	-

Calibration	**SIMATIC PDM**	**Device with display (local operation)**
One-point calibration	Menu command "Maintenance > Calibration"	One-point calibration input 1 [14] (Page 90) / One-point calibration input 2 [15] (Page 90)
Two-point calibration	Menu command "Maintenance > Calibration"	-

Identification	**SIMATIC PDM**	**Device with display (local operation)**
Read and configure identification data of your device	"Identification" parameter group	-

Maintenance and diagnostics	**SIMATIC PDM**	**Device with display (local operation)**
Set fault current for input and output	"Maintenance and diagnostics > Measuring range check mode" parameter group	-
Set fault current for sensor error detection	"Maintenance and diagnostics > Error detection" parameter group	-
Set fault current for drift detection	"Maintenance and diagnostics > Drift detection" parameter group	-
Display of the diagnostics	Menu command "Diagnostics > Diagnostics"	-
Limit monitoring and event counter	Menu command "Diagnostics > Device status"	-

Maintenance and diagnostics	**SIMATIC PDM**	**Device with display (local operation)**
Calibration	Menu command "Maintenance > Calibration"	One-point calibration input 1 [14] (Page 90) / One-point calibration input 2 [15] (Page 90)
Display operating time	Menu command "Diagnostics > Operating time"	-
Display peak values Reset peak values	"Diagnostics > Peak values" parameter group	Minimum measured peak value at Input 1 [19] (Page 94) / Maximum measured peak value at Input 1 [20] (Page 94) / Minimum measured peak value at Input 2 [21] (Page 95) / Maximum measured peak value at Input 2 [22] (Page 95)

HART communication	**SIMATIC PDM**	**Device with display (local operation)**
Configure HART address	Menu command "Device > Assign address and tag"	-
Select PV selector Select SV selector Select TV selector Select QV selector	"Settings > Assignment of dynamic variables" parameter group	-

Write protection	**SIMATIC PDM**	**Device with display (local operation)**
Enable and disable user PIN	Menu command "Device > Security"	Enable user PIN (Page 93) / Disable user PIN (Page 93)
Change user PIN	Menu command "Device > Security > Change user PIN"	Change user PIN (Page 90)
PIN recovery	-	PIN recovery [17] (Page 91)
Enable and disable button lock	-	Enabling button lock (Page 96) / Disabling button lock (Page 96)

Reset	**SIMATIC PDM**	**Device with display (local operation)**
Device restart	Menu command "Device > Device restart"	-
Factory reset	Menu command "Device > Reset > Factory reset"	-
Reset to sensor calibration	Menu command "Device > Reset > Reset to sensor calibration"	-

Functional Safety

The following additional functionality is available for devices with Functional Safety:

Functional Safety	SIMATIC PDM	Device with display (local operation)
Enable and disable Functional Safety	Menu command "Device > Functional Safety"	Functional Safety Manual (Page 9)

8.1.2 Advanced functions

Description

Function	Description
Difference	The analog output signal is proportional to the difference between the measured values of sensors 1 and 2.
Average value measurement	The analog output signal is proportional to the average value of the measured values of sensors 1 and 2.
Max.	The analog output signal is proportional to the sensor with the highest value.
Min.	The analog output signal is proportional to the sensor with the lowest value.
Sensor drift	When the difference of the measured values between sensor 1 and sensor 2 exceeds a defined limit, a sensor drift warning or sensor drift error is displayed.
Redundancy (hot backup)	The analog output signal is proportional to the primary sensor (sensor 1 or sensor 2) as long as no error is detected and the input is within the user-defined limit. If an error is detected at the primary sensor or the sensor 1 value is outside the user-specific limit, the analog output signal becomes proportional to the redundant sensor (sensor 1 or sensor 2) and a warning is generated.
User-specific linearization - Callendar-Van Dusen coefficients	Supports the change of the Callendar-Van Dusen coefficients.
Custom type - Linearization table	Supports the input of up to 60 breakpoints.
Custom type - Spline curve	Supports the input of up to 40 breakpoints.
Operating hours counter - Transmitter electronics	Recording of the internal transmitter temperatures during operation, recording time in each of 9 fixed sub-temperature ranges.
Operating hours counter - Sensors	Recording of the sensor measuring temperatures during operation, recording time in each of 9 fixed sub-temperature ranges. The subranges are specified separately for each sensor type.
Peak values - Transmitter electronics	Recording of the minimum and maximum internal transmitter temperature across the entire device lifetime.
Peak values - Sensors	The recording of the min./max. measured values of the sensor(s) is saved. When the measurement configuration is changed, the values are reset.

8.2 Parameter assignment with USB modem and SIPROM T

Requirements

- SITRANS TH100Slim/TH100/TH200/TH320 with 4 to 20 mA
- SITRANS TR200/TR320 with 4 to 20 mA
- SITRANS TF with SITRANS TH200
- SITRANS TF320 with 4 to 20 mA

Procedure

NOTICE
Disconnect USB modem Device damage. 1. Leave the temperature transmitter connected to the USB modem and PC during the parameter assignment operation. 2. After completion of the parameter assignment, wait another 2 seconds before you disconnect the temperature transmitter.

1. Disconnect the temperature transmitter from the 4 to 20 mA current loop.
2. Install the SIPROM T parameter assignment software.
   Installing the SIPROM T parameterization software (Page 57)
3. Install the USB driver.
   Installing the SIPROM T parameterization software (Page 57)
4. Connect the USB modem and the temperature transmitter to your PC.
   Connecting USB modem (Page 59)
   – The Power LED is lit green.
     Meaning of LEDs on the USB modem (Page 25)
5. Open SIPROM T.
6. Select the menu command "Device > Read from device".
7. Assign the temperature transmitter parameters.
8. Select the menu command "Device" > "Write to device".
9. Wait at least 2 seconds before you disconnect the temperature transmitter.

See also

Identification (Page 98)

User-specific type (Page 98)

Set the linearization table (60 breakpoints) (Page 100)

Set the spline curve (40 breakpoints) (Page 100)

Sensor calibration (Page 100)
Transmitter sensor matching (Page 103)
Operating hours counter (Page 104)
Current output (Page 105)

8.3 Parameter assignment over device with display

Introduction

This section describes all parameters that you can reach over the device with a display.

You will find information on operating the device with display in the section Operating the device with display (Page 61).

You can find the list of available parameters with ID and parameter name in the section List of parameters on the display (Page 64).

8.3.1 Input type 1 [01]

Selects the input type 1.

	Indication on the display	Meaning
Setting range:	P100I	Pt100 - IEC 751
	P500I	Pt500 - IEC 751
	P1k I	Pt 1000 - IEC 751
	TC B	TC Type B - IEC 584
	TC E	TC Type E - IEC 584
	TC J	TC Type J - IEC 584
	TC K	TC Type K - IEC 584
	TC N	TC Type N - IEC 584
	TC R	TC Type R - IEC 584
	TC S	TC Type S - IEC 584
	TC T	TC Type T - IEC 584
	TC L	TC Type L - IEC 584
	TC U	TC Type U - DIN 43710
Factory setting:	P100I	Pt100 - IEC 751

You can select all input types via remote operation.

	Remote operation	**Indication on the display**	**Meaning**
Setting range:	Ohm	OHM	Ohm
	kOhm	KOHM	kiloOhms
	Calibrated RTD - Callendar-Van Dusen	CVD	Calibrated RTD - Callendar-Van Dusen coeffi-cients
	Potentiometers	POT	Potentiometers
	RTD Ptx - IEC 751, 10 ≤ x ≤ 10,000	PTX I	RTD Ptx[1)] - IEC751, 10 ≤ x ≤ 10,000[1)]
	RTD Pt50 - IEC 751	P50 I	RTD Pt50 - IEC 751
	RTD Pt100 - IEC 751	P100I	RTD Pt100 - IEC 751
	RTD Pt200 - IEC 751	P200I	RTD Pt200 - IEC751
	RTD Pt500 - IEC 751	P500I	RTD Pt500 - IEC 751
	RTD Pt1000 - IEC 751	P1k I	RTD Pt1000 - IEC 751
	RTD Ptx - JIS C1604-81, 10 ≤ x ≤ 10,000	PTX J	RTD Ptx[1)] - JIS C1604-81, 10 ≤ x ≤ 10,000[1)]
	RTD Pt50 – JIS C1604-81 (R100/R0 = 1.3916)	P50 J	RTD Pt50 – JIS C1604-81 (R100/R0 = 1.3916)
	RTD Pt100 - JIS C1604-81 (R100/R0 = 1.3916)	P100J	RTD Pt100 - JIS C1604-81 (R100/R0 = 1.3916)
	RTD Pt200 - JIS C1604-81 (R100/R0 = 1.3916)	P200J	RTD Pt200 - JIS C1604-81 (R100/R0 = 1.3916)
	RTD Nix - DIN 43760, 10 ≤ x ≤ 10,000	NIX D	RTD Nix[1)] - DIN 43760, 10 ≤ x ≤ 10,000[1)]
	RTD Ni50 - DIN 43760	N50 D	RTD Ni50 - DIN 43760
	RTD Ni100 - DIN 43760	N100D	RTD Ni100 - DIN 43760
	RTD Ni120 - DIN 43760	N120D	RTD Ni120 - DIN 43760
	RTD Ni1000 - DIN 43760	N1k D	RTD Ni1000 - DIN 43760
	RTD Cux - ECW No. 15, 5 ≤ x ≤ 1,000	CUX E	RTD Cux[1)] - ECW No. 15, 5 ≤ x ≤ 1,000
	RTD Cu10 - ECW No. 15 (α = 0.00427)	C10 E	RTD Cu10 - ECW No. 15 (α = 0.00427)
	RTD Cu100 - ECW No. 15 (α = 0.00427)	C100E	RTD Cu100 - ECW No. 15 (α = 0.00427)
	RTD Cu50 - GOST 6651-1994 (α = 0.00426)	C50G1	RTD Cu50 - GOST 6651-1994 (α = 0.00426)
	RTD Cu50 - GOST 6651-2009 (α = 0.00428)	C50G2	RTD Cu50 - GOST 6651-2009 (α = 0.00428)
	RTD Cu100 - GOST 6651-2009 (α = 0.00428)	C1hG2	RTD Cu100 - GOST 6651-2009 (α = 0.00428)
	RTD Pt50 – GOST 6651-2009 (α = 0.00391)	P50 G	RTD Pt50 – GOST 6651-2009 (α = 0.00391)
	RTD Pt100 – GOST 6651-2009 (α = 0.00391)	P100G	RTD Pt100 – GOST 6651-2009 (α = 0.00391)
	RTD Cu100 – GOST 6651-1994 (α = 0.00426)	C1hG1	RTD Cu100 – GOST 6651-1994 (α = 0.00426)
	RTD Cux – GOST 6651-1994 (α = 0.00426)	CUX G	RTD Cux[1)] – GOST 6651-1994 (α = 0.00426)

	Remote operation	**Indication on the display**	**Meaning**
	RTD Nix – GOST 6651-2009 (α = 0.00617)	NIX G	RTD Nix[1)] – GOST 6651-2009 (α = 0.00617)
	RTD Ni50 – GOST 6651-2009 (α = 0.00617)	N50 G	RTD Ni50 – GOST 6651-2009 (α = 0.00617)
	RTD Ni100 – GOST 6651-2009 (α = 0.00617)	N100G	RTD Ni100 – GOST 6651-2009 (α = 0.00617)
	RTD Cux – GOST 6651-2009 (α = 0.00428)	CUX G	RTD Cux[1)] – GOST 6651-2009 (α = 0.00428)
	RTD Ptx – GOST 6691-2009 (α = 0.00391)	PTX G	RTD Ptx[1)] – GOST 6691-2009 (α = 0.00391)
	Micro-Volts unipolar (CUSTOM SPECIFIC)	µV	Micro-Volts unipolar (CUSTOM SPECIFIC)
	Milli-Volts unipolar (CUSTOM SPECIFIC)	mV	Milli-Volts unipolar (CUSTOM SPECIFIC)
	Volts unipolar (CUSTOM SPECIFIC)	V	Volts unipolar (CUSTOM SPECIFIC)
	µV bipolar	µV±	Micro-Volts bipolar
	µV unipolar	µV±	Micro-Volts unipolar
	mV bipolar	mV±	Milli-Volts bipolar
	mV unipolar	mV±	Milli-Volts unipolar
	V bipolar	V±	Volts bipolar
	V unipolar	V±	Volts unipolar
	TC Type B - IEC 584	TC B	Thermocouple Type B - IEC 584
	TC Type E - IEC 584	TC E	Thermocouple Type E - IEC 584
	TC Type J - IEC 584	TC J	Thermocouple Type J - IEC 584
	TC Type K - IEC 584	TC K	Thermocouple Type K - IEC 584
	TC Type L - DIN 43710	TC L	Thermocouple Type L - DIN 43710
	TC Type Lr - GOST 3044-84	TC LR	Thermocouple Type Lr - GOST 3044-84
	TC Type N - IEC 584	TC N	Thermocouple Type N - IEC 584
	TC Type R - IEC 584	TC R	Thermocouple Type R - IEC 584
	TC Type S - IEC 584	TC S	Thermocouple Type S - IEC 584
	TC Type T - IEC 584	TC T	Thermocouple Type T - IEC 584
	TC Type U - DIN 43710	TC U	Thermocouple Type U - DIN 43710
	TC Type W3 - ASTM E 988	TC W3	Thermocouple Type W3 - ASTM E 988
	TC Type W5 - ASTM E 988	TC W5	Thermocouple Type W5 - ASTM E 988
	Custom type	CUSTM	Custom type
Factory setting:	RTD Pt100 - IEC 751	P100I	Pt100 - IEC 751

[1)] Value x matches customer RTD value

8.3.2 Connection type for input 1 [02]

Selects the connection type for input 1 depending on the selected sensor.

Indication on the display	WIRING 1
Setting range:	2, 3, 4-wire
Factory setting:	3-wire

8.3.3 Wire resistance for connecting cable at Input 1 [03]

Requirement: Connection type 2-wire

Selects the wire resistance for Input 1.

Indication on the display	WIRE RES 1
Setting range:	0 to 100 Ω
Factory setting:	0 Ω

8.3.4 Input type 2 [04]

Selects the input type 2.

Setting range:	Display	Meaning
	NONE	No input type selected
	P100I	Pt100 IEC751
	P500I	Pt500 IEC751
	P1k I	Pt1000 IEC751
	TC B[1)]	Thermocouple Type B IEC 584
	TC E[1)]	Thermocouple Type E IEC 584
	TC J[1)]	Thermocouple Type J IEC 584
	TC K[1)]	Thermocouple Type K IEC 584
	TC N[1)]	Thermocouple Type N IEC 584
	TC R[1)]	Thermocouple Type R IEC 584
	TC S[1)]	Thermocouple Type S IEC 584
	TC T[1)]	Thermocouple Type T IEC 584
	TC L[1)]	Thermocouple Type L IEC 584
Factory setting:	NONE	No input type selected

[1)] Can only be selected when the input type TC was also selected for input 1.

You can select all input types via remote operation.

Setting range:	Remote operation	Indication on the display	Meaning
	Ohms	OHM	Ohm
	kiloOhms	KOHM	kiloOhms
	Calibrated RTD - Cal Van Dusen	CVD	Calibrated RTD - Cal Van Dusen
	Potentiometers	POT	Potentiometers
	RTD Ptx - IEC 751, 10 ≤ x ≤ 10.000	PTX I	RTD Ptx - IEC751, 10 ≤ x ≤ 10,000[1)]
	RTD Pt50 - IEC 751	P50 I	RTD Pt50 - IEC 751
	RTD Pt100 - IEC 751	P100I	RTD Pt100 - IEC 751
	RTD Pt200 - IEC 751	P200I	RTD Pt200 - IEC751
	RTD Pt500 - IEC 751	P500I	RTD Pt500 - IEC 751
	RTD Pt1000 - IEC 751	P1k I	RTD Pt1000 - IEC 751
	RTD Ptx - JIS C1604-81, 10 ≤ x ≤ 10,000	PTX J	RTD Ptx - JIS C1604-81, 10 ≤ x ≤ 10,000[1)]
	RTD Pt50 – JIS C1604-81 (R100/R0 = 1.3916)	P50 J	RTD Pt50 – JIS C1604-81 (R100/R0 = 1.3916)
	RTD Pt100 - JIS C1604-81 (R100/R0 = 1.3916)	P100J	RTD Pt100 - JIS C1604-81 (R100/R0 = 1.3916)
	RTD Pt200 - JIS C1604-81 (R100/R0 = 1.3916)	P200J	RTD Pt200 - JIS C1604-81 (R100/R0 = 1.3916)
	RTD Nix - DIN 43760, 10 ≤ x ≤ 10,000	NIX D	RTD Nix - DIN 43760, 10 ≤ x ≤ 10,000[1)]
	RTD Ni50 - DIN 43760	N50 D	RTD Ni50 - DIN 43760
	RTD Ni100 - DIN 43760	N100D	RTD Ni100 - DIN 43760
	RTD Ni120 - DIN 43760	N120D	RTD Ni120 - DIN 43760
	RTD Ni1000 - DIN 43760	N1k D	RTD Ni1000 - DIN 43760
	RTD Cux - ECW No. 15, 5 ≤ x ≤ 1,000	CUX E	RTD Cux - ECW No. 15, 5 ≤ x ≤ 1,000[1)]
	RTD Cu10 - ECW No. 15 (α = 0.00427)	C10 E	RTD Cu10 - ECW No. 15 (α = 0.00427)
	RTD Cu100 - ECW No. 15 (α = 0.00427)	C100E	RTD Cu100 - ECW No. 15 (α = 0.00427)
	RTD Cu50 - GOST 6651-1994 (α = 0.00426)	C50G1	RTD Cu50 - GOST 6651-1994 (α = 0.00426)
	RTD Cu50 - GOST 6651-2009 (α = 0.00428)	C50G2	RTD Cu50 - GOST 6651-2009 (α = 0.00428)
	RTD Cu100 - GOST 6651-2009 (α = 0.00428)	C1hG2	RTD Cu100 - GOST 6651-2009 (α = 0.00428)
	RTD Pt50 – GOST 6651-2009 (α = 0.00391)	P50 G	RTD Pt50 – GOST 6651-2009 (α = 0.00391)
	RTD Pt100 – GOST 6651-2009 (α = 0.00391)	P100G	RTD Pt100 – GOST 6651-2009 (α = 0.00391)
	RTD Cu100 – GOST 6651-1994 (α = 0.00426)	C1hG1	RTD Cu100 – GOST 6651-1994 (α = 0.00426)
	RTD Cux – GOST 6651-1994 (α = 0.00426)	CUX G	RTD Cux – GOST 6651-1994 (α = 0.00426)[1)]
	RTD Nix – GOST 6651-2009 (α = 0.00617)	NIX G	RTD Nix – GOST 6651-2009 (α = 0.00617)[1)]

	RTD Ni50 – GOST 6651-2009 (α = 0.00617)	N50 G	RTD Ni50 – GOST 6651-2009 (α = 0.00617)
	RTD Ni100 – GOST 6651-2009 (α = 0.00617)	N100G	RTD Ni100 – GOST 6651-2009 (α = 0.00617)
	Micro-Volts bipolar	µV±	Micro-Volts bipolar
	Milli-Volts bipolar	mV±	Milli-Volts bipolar
	Volts bipolar	V±	Volts bipolar
	TC Type B - IEC 584	TC B	Thermocouple Type B - IEC 584
	TC Type W5 - ASTM E 988	TC W5	Thermocouple Type W5 - ASTM E 988
	TC Type W3 - ASTM E 988	TC W3	Thermocouple Type W3 - ASTM E 988
	TC Type E - IEC 584	TC E	Thermocouple Type E - IEC 584
	TC Type J - IEC 584	TC J	Thermocouple Type J - IEC 584
	TC Type K - IEC 584	TC K	Thermocouple Type K - IEC 584
	TC Type N - IEC 584	TC N	Thermocouple Type N - IEC 584
	TC Type R - IEC 584	TC R	Thermocouple Type R - IEC 584
	TC Type S - IEC 584	TC S	Thermocouple Type S - IEC 584
	TC Type T - IEC 584	TC T	Thermocouple Type T - IEC 584
	TC Type L - DIN 43710	TC L	Thermocouple Type L - DIN 43710
	TC Type U - DIN 43710	TC U	Thermocouple Type U - DIN 43710
	TC Type Lr - GOST 3044-84	TC LR	Thermocouple Type Lr - GOST 3044-84
	RTD Cux – GOST 6651-2009 (α = 0.00428)	CUX G	RTD Cux – GOST 6651-2009 (α = 0.00428)[1)]
	RTD Ptx – GOST 6691-2009 (α = 0.00391)	PTX G	RTD Ptx – GOST 6691-2009 (α = 0.00391)[1)]
	Custom Linearization (CUSTOM SPECIFIC)	CUSTM	Custom Linearization (CUSTOM SPECIFIC)
	Micro-Volts unipolar (CUSTOM SPECIFIC)	µV	Micro-Volts unipolar (CUSTOM SPECIFIC)
	Milli-Volts unipolar (CUSTOM SPECIFIC)	mV	Milli-Volts unipolar (CUSTOM SPECIFIC)
	Volts unipolar (CUSTOM SPECIFIC)	V	Volts unipolar (CUSTOM SPECIFIC)
	None	NONE	No input type selected
Factory setting:	None	NONE	No input type selected

[1)] Value x matches customer RTD value

8.3.5 Connection type for input 2 [05]

Selects the connection type for input 2 depending on the selected sensor.

Indication on the display	WIRING 2
Setting range:	2, 3, 4-wire
Factory setting:	-

8.3.6 Wire resistance for connecting cable at Input 2 [06]

Requirement: Connection type 2-wire

Selects the wire resistance for Input 2.

Indication on the display	WIRE RES 2
Setting range:	0 to 100 Ω
Factory setting:	-

8.3.7 Assignment of the primary variable [07]

8.3.7.1 Introduction

Introduction

You select which device variable is displayed in the Measurement view (Page 62) with the "Assignment of the primary variable" parameter.

The primary variables are available for your selection:

Indication on the display	**Device variable**
I 1	Input 1
I 2	Input 2
CJC 1	Input 1 CJC
CJC 2	Input 2 CJC
AVG	Average input 1 and input 2
I 1-I 2	Difference input 1 - input 2
I 2-I 1	Difference input 2 - input 1
ABS	Absolute difference input 1 - input 2
MIN	Minimum input 1 or input 2
MAX	Maximum input 1 or input 2
I 1 B	Input 1 and input 2 as backup
I 2 B	Input 2 and input 1 as backup
AVG B	Average input 1 and input 2 with both as backup
MIN B	Minimum input 1 or input 2 with both as backup
MAX B	Maximum input 1 or input 2 with both as backup
ETEMP	Electronics temperature

8.3.7.2 Setting the assignment of the primary variable

Requirement

You know the parameter values for the "Assignment of the primary variable" parameter. (Page 84)

Procedure

1. Navigate to the parameter view.
   Navigating in the views (Page 61)
2. Select the parameter "Assignment of the primary variable".
3. Press the ▶ button.
4. Select the desired input value with the ▲ or ▼ button.
5. Use the ▶ button to confirm.

Result

- The selected device variable is displayed in the measurement view (P1).

8.3.8 Unit [08]

Selects the unit for the "Sensor temperature" and "Electronics temperature" measured values that are displayed in the measurement view.

Setting range:	K
	°C
	°F
	°R
Factory setting:	°C

You can select additional units with the remote operation that are to be displayed in the measurement view.

8.3.9 Lower range value [09]/Upper range value [10]

8.3.9.1 Lower range value [09] parameter

Sets the lower range value.

Indication on the display:	LOWER RANGE
Setting range:	Within the measuring limits
Factory setting:	0 °C The lower range value (4 mA) corresponds to 0% of the measuring range.

8.3.9.2 Upper range value [10] parameter

Sets the upper range value.

Indication on the display:	UPPER RANGE
Setting range:	Within the measuring limits
Factory setting:	100 °C

8.3.9.3 Adjusting lower range value/upper range value

Introduction

The lower range value (4 mA) corresponds to 0% of the measuring range. The upper range value (20 mA) corresponds to 100% of the measuring range. Using remote operation you can change the relationship between the values of the lower range value/upper range value and the current output. For example, lower range value corresponds to 20 mA.

You have the following options for assigning the desired temperature measurements to the lower range value and the upper range value:

	Device with display	**Remote operation**
Set lower range value	"Lower range value" parameter	Settings > Current output > Lower range value
Set upper range value	"Upper range value" parameter	Settings > Current output > Upper range value

The minimum permissible measuring span of the input type must not be underpassed. You can find the minimum permissible measuring span of your input type in the section Technical data (Page 127).

Procedure

1. Navigate to the parameter view.
   Navigating in the views (Page 61)
2. In the parameter view, select the "Set lower range value" parameter.

3. Press the ▶ button.
4. Enter a value within the measuring limits of the selected input type with the ▲ or ▼ button.
5. Use the ▶ button to confirm.
   The lower range value is set. Note that the upper range value does not move automatically.
6. Navigate to the "Set upper range value" parameter.
7. Press the ▶ button.
8. Enter a value within the measuring limits of the selected input type with the ▲ or ▼ button.
9. Use the ▶ button to confirm.
   The upper range value is set.

Result

You have defined your measuring range.

- If the minimum permissible measuring span that is dependent on the selected input type is underpassed, the message "FAILD" appears.

See also

Parameters and functions (Page 71)

8.3.10 Damping value [11]

8.3.10.1 Damping value parameter

Sets the damping (filtering) for smoothing of sudden process value variations.

Setting range:	0.01 s ... 60 s, in steps of 0.01 s
Factory setting:	0 s

The damping influences the response time of the device: When you increase the damping value, the response time of the temperature transmitter to changes in the pressure measurement increases.

- Reduce the damping value for faster response times. Specify a value that meets the requirements regarding signal stability and response time.

8.3.10.2 Set damping value

Procedure

1. Navigate to the parameter view.
   Navigating in the views (Page 61)
2. Select the "Damping value" parameter.

3. Press the ▶ button.
4. Set the damping with the ▲ and ▼ buttons.
5. To set the damping in steps of 0.10 s, press and hold down the buttons.
6. Use the ▶ button to confirm.

8.3.11 Functional Safety [12]

Enables Functional Safety.

The parameter is only visible for devices with Functional Safety.

See also

Functional Safety Manual (https://www.siemens.com/processinstrumentation/documentation)

8.3.12 Loop test [13]

Sets a constant loop current for test purposes.

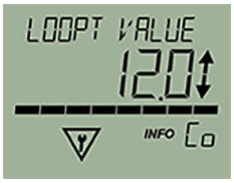
You have the option of selecting preset values or a user-defined value.

Setting range:	3.55 mA	
	4 mA	
	12 mA	
	20 mA	
	22.8 mA	
	USER	User defined
Factory setting:	12 mA	

8.3.12.1 Loop test with preset loop current value

1. Navigate into the parameter view.
   Navigating in the views (Page 61)
2. Select the parameter "Loop test".

3. Use the ▶ button to confirm.



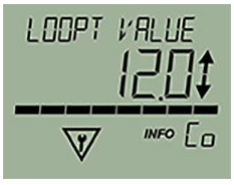
The loop test starts:

- The "EDIT" symbol flashes.
- The "Function check" symbol is displayed.
- The "Co" symbol (constant current mode) is displayed.

4. Change the preset value with the ▲ or ▼ button.
5. Use the ▶ button to confirm.
The loop test starts.
6. End the loop test with the ◀ button.

8.3.12.2 Loop test with user defined loop current value

1. Navigate into the parameter view.
Navigating in the views (Page 61)
2. In the parameter view, select the "Loop test" parameter.
3. Use the ▶ button to confirm.



The loop test starts:

- The "EDIT" symbol flashes.
- The "Function check" symbol is displayed.
- The "Co" symbol (constant current mode) is displayed.

4. Change to "USER" with the ▲ or ▼ button.
5. Use the ▶ button to confirm.
6. Set a value between 3.6 mA and 22.8 mA using the buttons ▲ or ▼.
7. Use the ▶ button to confirm.
The loop test starts.
8. End the loop test with the ◀ button.

8.3.13 One-point calibration input 1 [14]

Calibrates the lower calibration point at input 1. The device moves the characteristic by the difference between the original and the new calibration point. The result of the one-point calibration is saved in the TRIM INPUT 1 parameter.

Indication on the display:	TRIM INPUT 1

The two-point calibration via remote operation calibrates the low and high calibration point.

See also

Setting two-point calibration (Page 102)

Setting one-point calibration (Page 101)

8.3.14 One-point calibration input 2 [15]

Calibrates the lower calibration point at input 2. The device moves the characteristic by the difference between the original and the new calibration point. The result of the one-point calibration is saved in the TRIM INPUT 2 parameter.

Indication on the display:	TRIM INPUT 2

The two-point calibration via remote operation calibrates the low and high calibration point.

See also

Setting two-point calibration (Page 102)

Setting one-point calibration (Page 101)

8.3.15 Change User PIN [16]

8.3.15.1 Change user PIN

Used to change the User PIN.

Setting range:	1 to 65535
Factory setting:	2457

Requirement

The "User PIN (Page 93)" parameter is enabled.

Procedure

1. Navigate to the parameter view.
   Navigating in the views (Page 61)
2. Select the parameter "Change user PIN".

3. Press the ▶ button.
4. Enter the old user PIN.
5. Enter the new user PIN with a value between 1 and 65535.
   Changing parameter values (Page 66)

6. Use the ▶ button to confirm.
7. Repeat the new user PIN and use the ▶ button to confirm.

Result

- If both user PINs match, the "COMPL" message appears.
  The user PIN has been successfully changed.
- If the two user PINs do not match, the "FAILD" message appears.
  Then repeat the described procedure.

8.3.16 PIN recovery [17]

Used to reset the user PIN to the factory setting.

The user PIN is factory set to 2457 in the device.

8.3.16.1 Recovering the user PIN

Requirement

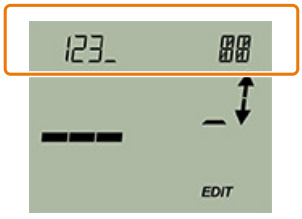
- You have received the PUK from Technical Support (Page 196) using the serial number of your device.
- The "User PIN (Page 93)" parameter is enabled.

Procedure

1. In the parameter view, select the "PIN recovery" parameter.

2. Press the ▶ button.
   The cursor and the "EDIT" symbol flash.
3. Enter the digits of the PUK:
   - Use the ▲ or ▼ button to change.
   - Use the ▶ button to confirm.
   - Use the ◀ button to delete.

   The complete PUK is shown on the top line of the display.



4. When the PUK is complete, use the ▶ button to confirm.

Result

- If you have entered the correct PUK, the message "NEW PIN - 2457" appears.
  The user PIN has been reset to the factory setting 2457.
- If the PUK was not correctly entered, the message "FAILD" appears.
  Then repeat the described procedure.

8.3.17 User PIN [18]

8.3.17.1 User PIN

Used to enable or disable the user PIN.

Setting range:	ON	Enable user PIN
	OFF	Disable user PIN
Factory setting:	User PIN disabled	

When user PIN is enabled, the measured values and parameters are read-only.

- To change the parameters and use the device functions, the user PIN must be input.

The user PIN 2457 is factory preset in the device.

8.3.17.2 Enable user PIN

Requirement

The User PIN is disabled.

Procedure

1. Navigate to the parameter view.
   Navigating in the views (Page 61)
2. Select the parameter "User PIN".
3. Use the ▶ button to confirm.
   The message "USER PIN ON" (User PIN enabled) appears for 2 seconds.

Result

The User PIN is activated after about 10 minutes or after a device restart.

8.3.17.3 Disable user PIN

Requirement

The user PIN is enabled.

Procedure

1. Navigate to the parameter view.
   Navigating in the views (Page 61)
2. Select the parameter "User PIN".
3. Use the ▶ button to confirm.
4. Select YES with the ▲ or ▼ button.

5. Use the ▶ button to confirm.
   The message "USER PIN OFF" appears for 2 seconds.

Result

The User PIN is disabled.

8.3.18 Minimum measured peak value at Input 1 [19]

Shows the minimum measured peak value at input 1.

Indication on the display	MIN INPUT 1

8.3.19 Maximum measured peak value at Input 1 [20]

Shows the maximum measured peak value at input 1.

Indication on the display	MAX INPUT 1

8.3.20 Minimum measured peak value at Input 2 [21]

Shows the minimum measured peak value at input 2.

Indication on the display	MIN INPUT 2

8.3.21 Maximum measured peak value at Input 2 [22]

Shows the maximum measured peak value at input 2.

Indication on the display	MAX INPUT 2

8.3.22 Minimum transmitter electronics temperature [23]

Shows the minimum measured transmitter electronics temperature.

Indication on the display	MIN ETEMP

8.3.23 Maximum transmitter electronics temperature [24]

Shows the maximum measured transmitter electronics temperature.

Indication on the display	MAX ETEMP

8.3.24 Button lock [25]

Enables the button lock. You can continue to operate the device using remote operation.

Setting range:	ON	Button lock enabled
	OFF	Button lock disabled
Factory setting:	OFF	

8.3.24.1 Enabling button lock

Procedure

1. Navigate to the parameter view.
   Navigating in the views (Page 61)
2. In the parameter view, select the "Button lock" parameter.
3. Press the ▶ button.
   The "EDIT" symbol flashes.
4. Select ON with the ▲ or ▼ button.

5. Use the ▶ button to confirm.

Result

- The display automatically returns to the measurement view.
- The display automatically changes between the measured values every 12 seconds.
- The symbol for button lock "LL" and the measured value ID are displayed alternately.

8.3.24.2 Disabling button lock

Procedure

To disable the button lock, press and hold the ▶ button for 5 seconds.

Result

- The symbol for Button lock "LL" is hidden.
- You can operate the device using the buttons.

8.4 Assigning parameters using remote operation

8.4.1 Introduction

Introduction

This section describes the most important parameters and functions that are available additionally over remote operation:

- "Quick Start" wizard
- Identification (TAG)
- Custom type
- Sensor calibration
- Transmitter sensor matching
- Assignment of dynamic variables
- Current output

8.4.2 "Quick Start" wizard

You use the "Quick start" wizard to configure your device in five steps for the required application:

- Step 1: Identification
- Step 2: Sensor settings
- Step 3: Assignment of dynamic variables
- Step 4: Process parameters
- Step 5: Process alarms
- Step 6: Summary
  The summary provides an overview of the "old" and "new" parameters.
  To store the parameters in SIMATIC PDM and transfer them to the device, click the "Apply" button.

8.4.3 Identification

Define the data that you need to identify your device under the "Identification" parameter group. A distinction is made between data you can set yourself and values that are preset in the factory. The default values are write-protected and cannot be changed by the user. The corresponding allocation is set out below:

Designation	Adjustable	Preset	Factory setting
Short tag	X	-	
Long tag (TAG)	X	-	
Description	X	-	
Message	X	-	
Installation date	X	-	dd.mm.yyyy
Device			
Manufacturer_id	-	X	Siemens
Device type	-	X	SITRANS TH320/TH420/TR320/TR420
Product name	-	X	SITRANS TH320[1)]
Serial number	-	X	in accordance with device manufacture
Final assembly number	-	-	
Hardware version	-	X	in accordance with device manufacture
Firmware version	-	X	in accordance with device manufacture
EDD version	-	X	

[1)] in accordance with the order

8.4.4 User-specific type

8.4.4.1 Introduction

For special applications, a user-specific type is available. There is no internal validation check in the Engineering System. Test the expected functionality for your application.

Enter up to 60 breakpoints via SIPROM T or the remote operation.

- Set the linearization table (60 breakpoints) (Page 100)
  Enter the desired number of breakpoints. You can freely position x and y values on the linearization curve.

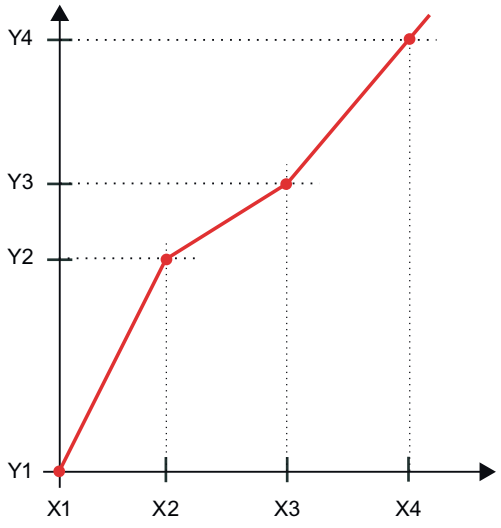


Figure 8-1 Linearization table

- Set the spline curve (40 breakpoints) (Page 100)
  Enter the minimum and maximum X-value. The x values are distributed evenly on the x axis according to the desired number of breakpoints. You can freely assign the y values.

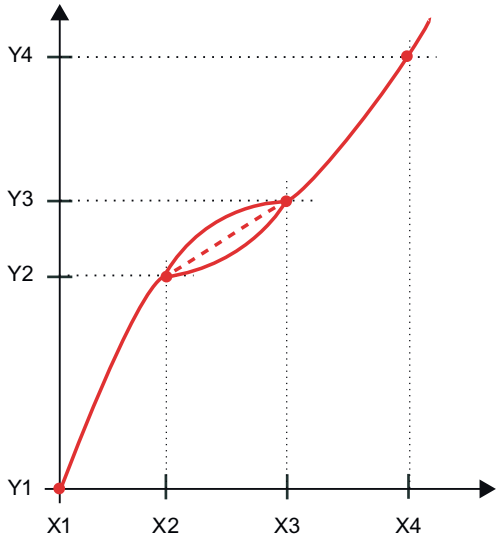


Figure 8-2 Spline curve

8.4.4.2 Set the linearization table (60 breakpoints)

Procedure

1. Select the "Custom type" option for the "Type" parameter.
2. Select a custom type from the list, e.g. resistance.
3. Select the "Linearization table" option for the "Linearization type" parameter.
4. Enter the desired number of breakpoints.
   You can enter a minimum of 3 and up to 60 breakpoints.
5. Enter the x values and associated y values.
6. Transfer the linearization table to the device.
7. Test the expected functionality for your application.
   There is no internal validation check in the Engineering System.

8.4.4.3 Set the spline curve (40 breakpoints)

Procedure

1. Select the "Custom type" option for the "Type" parameter.
2. Select a custom type from the list, e.g. resistance.
3. Select the "Spline curve" option for the "Linearization type" parameter.
4. Enter the minimum and maximum X value.
5. Enter the desired number of breakpoints.
   You can enter a minimum of three and up to 40 breakpoints.
6. Enter the values of the Y points.
7. Transfer the spline curve to the device.
8. Test the expected functionality for your application.
   There is no internal validation check in the Engineering System.

8.4.5 Sensor calibration

8.4.5.1 Introduction

The sensor calibration can be a one-point calibration and a two-point calibration.

You use the one-point calibration to set the device characteristic at the low calibration point.

You use the two-point calibration to set the device characteristic at the low and high calibration point.

The results are correct measured values at the calibration points.

Enter the calibration points within the measuring range using the remote operation.

8.4.5.2 Setting one-point calibration

Requirement

- The measured value for the low calibration point is stable.
- There is no sensor error.
- The measured value is in the measuring range.

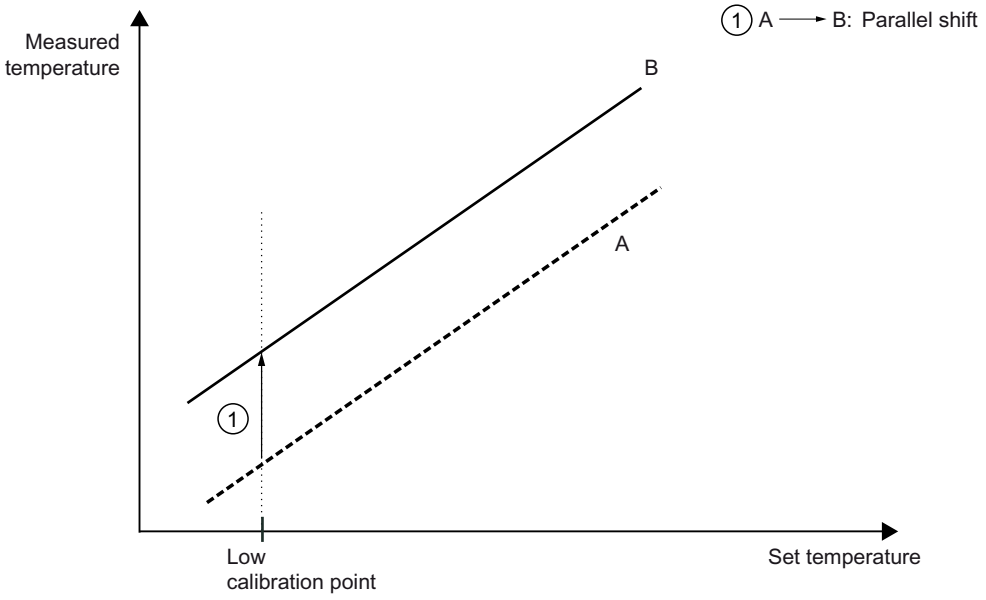
Procedure

1. Select the menu command "Maintenance > Calibration".
2. Select the tab input 1 or input 2.
3. Bring the sensor to a stable temperature environment. For example, 0 °C.
   The fluctuation of the measured value is within the precision requirements.
   We recommend use of a calibrator, e.g. from Beamex.
4. Click the "One-point calibration" button.
5. Confirm the warnings.
6. When your measured value is stable, assign the measured value to the low calibration point of the device.

Result

The device calibrates to the measured value.

The device moves the characteristic by the difference between the original and the new calibration point.



A Original characteristic

B Characteristic after the one-point calibration of the low calibration point

8.4.5.3 Setting two-point calibration

Requirement

- The measured values for the high and low calibration point are stable.
- There is no sensor error.
- The measured values are in the measuring range.

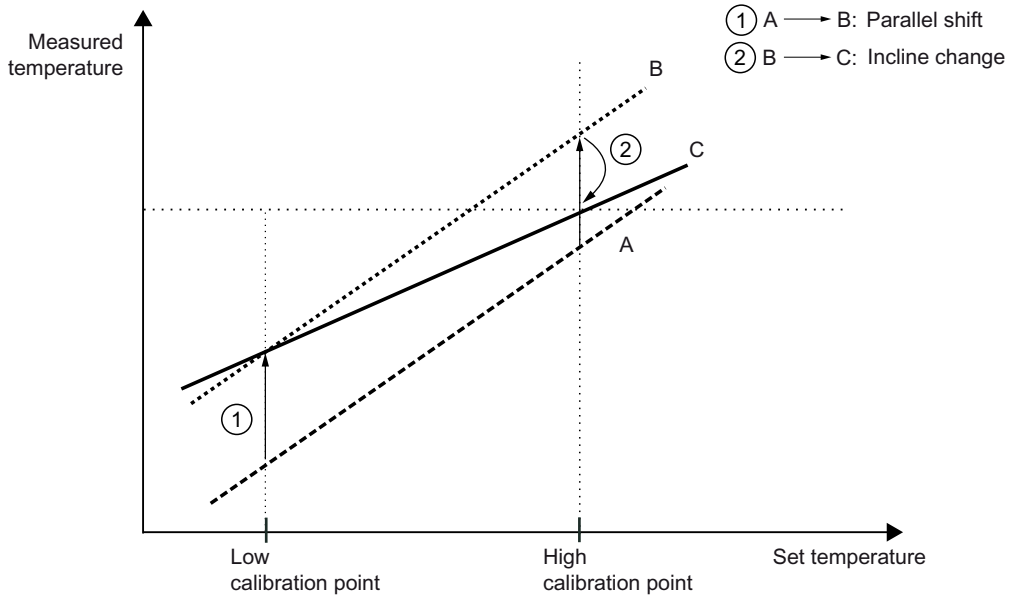
Procedure

1. Select the menu command "Maintenance > Calibration".
2. Select the tab input 1 or input 2.
3. Bring the sensor to a stable temperature environment. For example, 0 °C.
   The fluctuation of the measured value is within the precision requirements.
4. Click the "Two-point calibration" button.
5. Confirm the warnings.
6. When your measured value is stable, assign the measured value to the low calibration point of the device.
7. Repeat the process for the high calibration point.

Result

The device calibrates to your measured values.

The device moves the characteristic by the difference between the original and the new calibration points.



A	Original characteristic
B	Characteristic after the two-point calibration of the low calibration point
C	Characteristic after the two-point calibration of the high calibration point

8.4.6 Transmitter sensor matching

8.4.6.1 Introduction

The Callendar-Van Dusen coefficients are used to match the temperature transmitter with the sensor. If requested, the sensor manufacturer will provide you with the Callendar-Van Dusen coefficients according to IEC 60751 with the sensor. The results are correctly measured measured values over the desired temperature range through very good approximation of the actual temperature response of the platinum resistance thermometer.

You can change the calibration points R0, A, B, C, Alpha, Beta and Delta using the remote operation.

8.4.6.2 Changing the Callendar-Van Dusen coefficients

Procedure

1. Select a sensor with Callendar-Van Dusen coefficients for the "Input type" parameter.
2. Change the values for R0, A, B and C, or R0, Alpha, Beta and Delta.
3. Transfer the values to the device.

8.4.7 Assignment of dynamic variables

With the remote operation you can assign any device variable for the dynamic variables PV selector, SV selector, TV selector and QV selector.

The device variable assigned to the PV selector controls the loop current.

Device variables:	Input 1
	Input 2
	Input 1 CJC
	Input 2 CJC
	Average input 1 and input 2
	Difference input 1 - input 2
	Difference input 2 - input 1
	Absolute difference input 1 - input 2
	Minimum input 1 or input 2
	Maximum input 1 or input 2
	Input 1 and input 2 as backup
	Input 2 and input 1 as backup
	Average input 1 and input 2 with both as backup
	Minimum input 1 or input 2 with both as backup
	Maximum input 1 or input 2 with both as backup
	Electronics temperature

8.4.8 Operating hours counter

Operating hours counter for transmitter electronics

- Monitors the number of operating hours during which the transmitter remained in continuous operation, depending on the ambient temperature.
- The operating hours history of the transmitter is recorded in 9 ambient temperature ranges.
- Starts with the first commissioning at the factory.
- Operating hours counter and temperature ranges cannot be reset or set by the user.
- The operating hours counter is only updated as long as the device is in measuring mode. The operating hours counter is not updated in simulation mode.

Operating hours counter for sensor measuring temperature

- Monitors the sequence of the sensor connected to the transmitter in various process areas.
- The operating hours sequence of the process variable is recorded in 9 ranges. It is subdivided according to the connected sensor and its sensor limits. The user cannot set the ranges.
- The operating hours counter is automatically reset when you change one of the following parameters in the device:
  - Input type
  - Wiring configuration
  - RTD factor

Procedure

1. Using remote operation (for example SIMATIC PDM), select the menu command "Diagnostics > Operating time".
2. Select "Input 1", "Input 2" or "Electronics temperature" in the submenu.

8.4.9 Current output

8.4.9.1 Fault current

Introduction

Fault current of the transmitter

The fault current is set to ≤ 3.6 mA at the factory.

You set the fault current of the internal transmitter from ≤ 3.6 mA to ≥ 21 mA with the switch on the display.

Setting the fault current of the internal transmitter with switch to ≥ 21 mA (Page 108)

A fault current ≥ 21 mA is not permissible for operation of the device with functional safety. Functional safety cannot be activated with a fault current ≥ 21 mA.

Fault current of the sensor

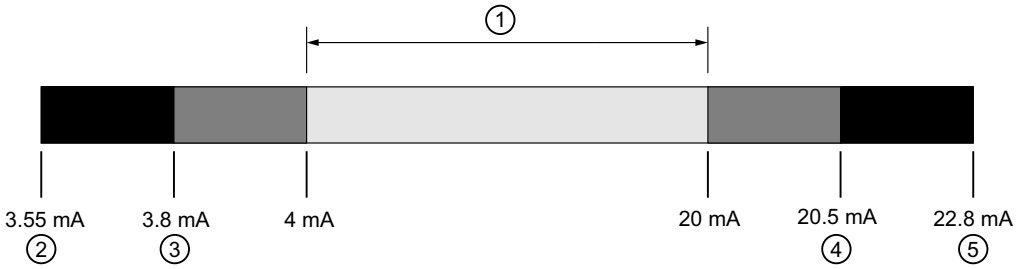
Your device is delivered with the following Factory settings of SITRANS TH320/TH420 (Page 150).

You use parameter assignment software to change the parameters for the fault current.

Lower fault current parameter

Adjusts the magnitude of the lower fault current ②.

Setting range:	Between 3.55 mA and lower saturation limit ③
Factory setting:	3.55 mA, or as specified in order

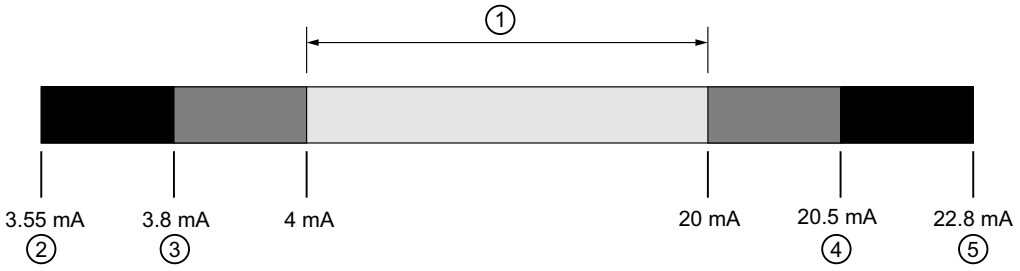


① Normal operation
② Lower fault current (factory setting)
③ Lower saturation limit (factory setting)
④ Upper saturation limit (factory setting)
⑤ Upper fault current (factory setting)

Upper fault current parameter

Adjusts the magnitude of the upper fault current ⑤.

Setting range:	Between upper saturation limit ④ und 22.8 mA
Factory setting:	22.8 mA, or as specified in order



① Normal operation
② Lower fault current (factory setting)
③ Lower saturation limit (factory setting)
④ Upper saturation limit (factory setting)
⑤ Upper fault current (factory setting)

See also

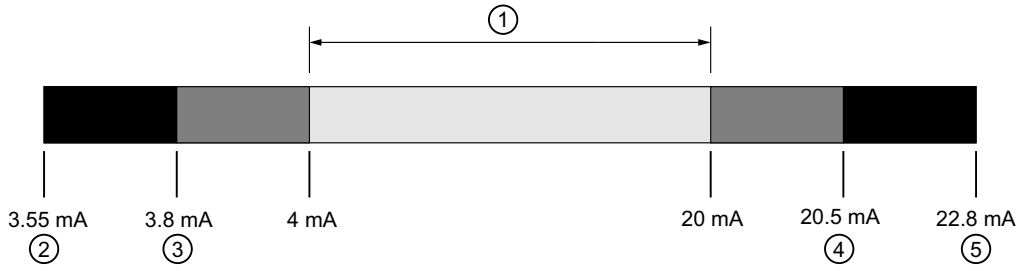
Setting the fault current of the internal transmitter with switch to ≥ 21 mA (Page 108)

8.4.9.2 Lower saturation limit parameter

Sets the lower threshold for the lower saturation limit③.

The loop current cannot drop below the set threshold.

Setting range:	Between lower fault current② and 4 mA
Factory setting:	3.8 mA, or as specified in order

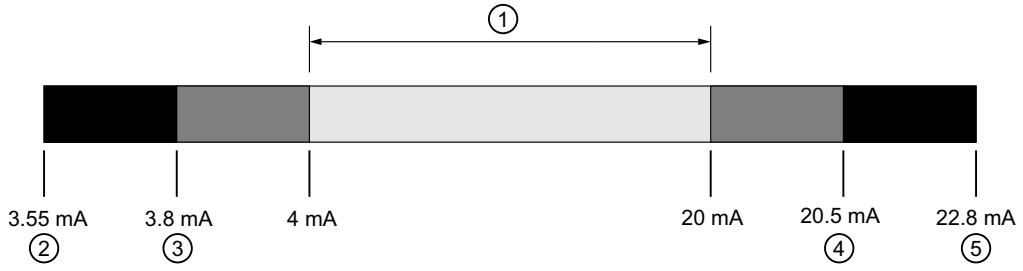


① Normal operation
② Lower fault current (factory setting)
③ Lower saturation limit (factory setting)
④ Upper saturation limit (factory setting)
⑤ Upper fault current (factory setting)

8.4.9.3 Upper saturation limit parameter

Sets the threshold for the upper saturation limit④.

Setting range:	Between 20 mA and the upper fault current
Factory setting:	20.5 mA, or as specified in order



① Normal operation
② Lower fault current (factory setting)
③ Lower saturation limit (factory setting)
④ Upper saturation limit (factory setting)
⑤ Upper fault current (factory setting)

See also

Technical data (Page 127)

8.5 Setting the fault current of the internal transmitter with switch to ≥ 21 mA

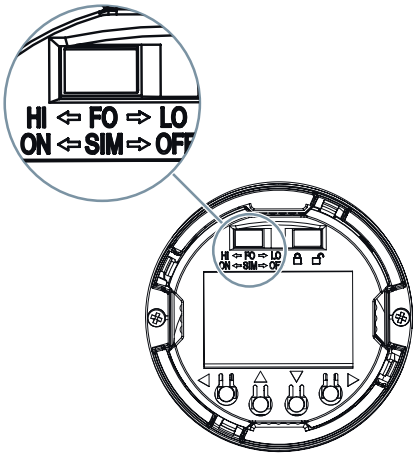
Introduction

You set the fault current of the internal transmitter from ≤ 3.6 mA to ≥ 21 mA with the switch on the display.

A fault current ≥ 21 mA is not permissible for operation of the device with functional safety. Functional safety cannot be activated with a fault current ≥ 21 mA.

Procedure

1. Unscrew the cover.
2. Move the left switch to the HI position.



FO Fault current
LO Lower fault current ≤ 3.6 mA
HI Upper fault current ≥ 21 mA
SIM Reserved for devices with PA (simulation mode)

Figure 8-3 Set the upper fault current using switch

Result

When the switch is in the HI position, the upper fault current is enabled.

See also

Current output (Page 105)

Service and maintenance

9

9.1 Basic safety notes

Note

The device is maintenance-free.

9.1.1 Maintenance

The device is maintenance-free. However, a periodic inspection according to pertinent directives and regulations must be carried out.

An inspection can include:

- Ambient conditions
- Seal integrity of the process connections, cable entries, and cover
- Reliability of power supply, lightning protection, and grounds

9.1.2 SITRANS TS500

⚠ WARNING

Use of a computer in a hazardous area

If the interface to the computer is used in the hazardous area, there is a risk of explosion.

- Ensure that the atmosphere is explosion-free (hot work permit).

⚠ WARNING

Dust layers above 5 mm

Risk of explosion in hazardous areas.

Device may overheat due to dust build up.

- Remove dust layers in excess of 5 mm.

⚠ CAUTION

Releasing button lock

Improper modification of parameters could influence process safety.

- Make sure that only authorized personnel may cancel the button locking of devices for safety-related applications.

NOTICE

Penetration of moisture into the device

Damage to device.

- Make sure when carrying out cleaning and maintenance work that no moisture penetrates the inside of the device.

9.2 Cleaning

Cleaning the enclosure

- Clean the outside of the enclosure with the inscriptions and the display window using a cloth moistened with water or a mild detergent.
- Do not use any aggressive cleansing agents or solvents, e.g. acetone. Plastic parts or the painted surface could be damaged. The inscriptions could become unreadable.

See also

Cleaning (Page 110)

⚠ WARNING

Electrostatic charge

Risk of explosion in hazardous areas if electrostatic charges develop, for example, when cleaning plastic surfaces with a dry cloth.

- Prevent electrostatic charging in hazardous areas.

9.3 Maintenance and repair work

WARNING

Impermissible repair and maintenance of the device

- Repair and maintenance must be carried out by Siemens authorized personnel only.

WARNING

Impermissible repair of explosion protected devices

Risk of explosion in hazardous areas

- Repair must be carried out by Siemens authorized personnel only.

WARNING

Impermissible accessories and spare parts

Risk of explosion in areas subject to explosion hazard.

- Only use original accessories or original spare parts.
- Observe all relevant installation and safety instructions described in the instructions for the device or enclosed with the accessory or spare part.

WARNING

Improper connection after maintenance

Risk of explosion in areas subject to explosion hazard.

- Connect the device correctly after maintenance.
- Close the device after maintenance work.

Refer to Connecting (Page 37).

WARNING

Humid environment

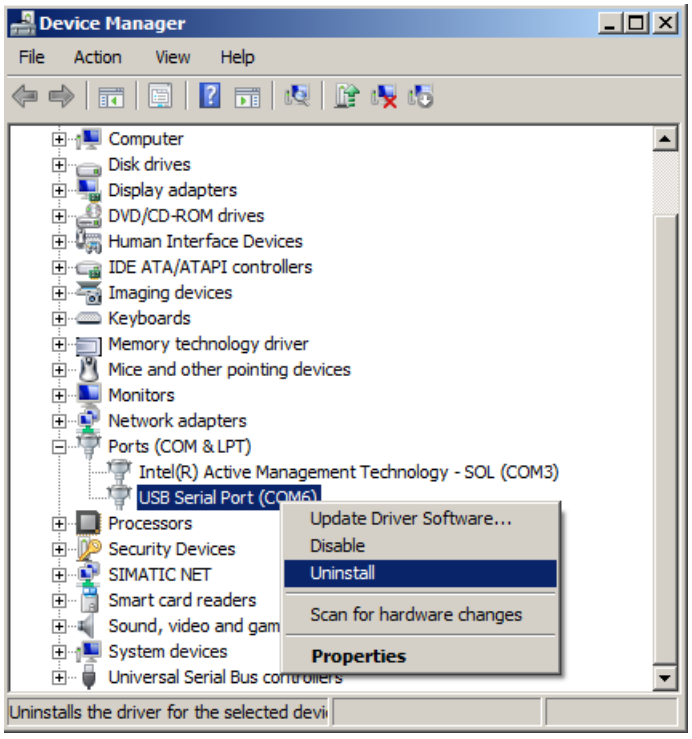
Risk of electric shock.

- Avoid working on the device when it is energized.
- If working on an energized device is necessary, ensure that the environment is dry.
- Make sure when carrying out cleaning and maintenance work that no moisture penetrates the inside of the device.

9.3.1 Uninstalling USB drivers

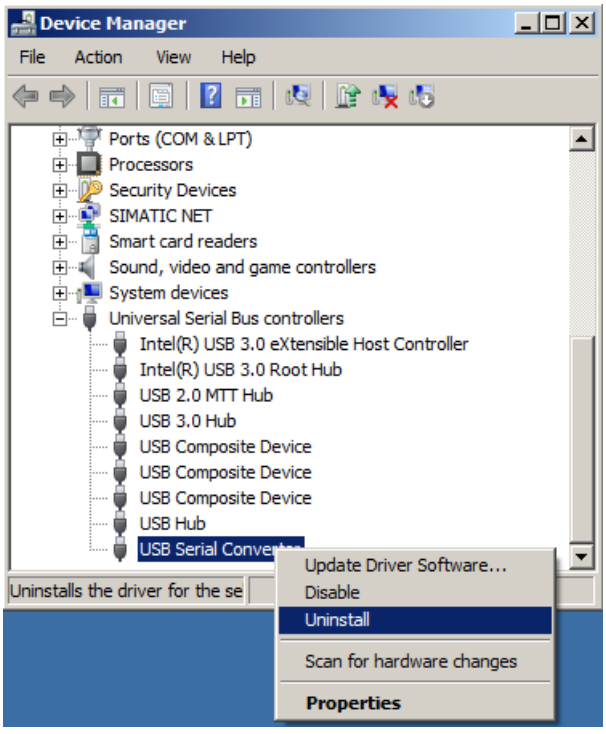
Procedure

1. Select "Ports (COM & LPT)" > "USB Serial Port (COMx)" in the Windows Device Manager.
2. Right-click on "USB Serial Port (COMx)".
3. Select "Uninstall" from the shortcut menu.



4. Select "USB Controller" > "USB Serial Converter" in the Windows Device Manager.

5. Right-click on "USB Serial Converter".
6. Select "Uninstall" from the shortcut menu.



Result

The associated registration entry for the USB modem is deleted.

9.3.2 SITRANS TS500

CAUTION

Hot surfaces

Risk of burns during maintenance work on parts having surface temperatures exceeding 70 °C (158 °F).

- Take corresponding protective measures, for example, by wearing protective gloves.
- After carrying out maintenance, remount touch protection measures.

9.3.2.1 Checking the seals

Inspect the seals at regular intervals

1. Clean the enclosure and seals.
2. Check the enclosure and the seals for cracks and damage.
3. If necessary, lubricate the seals or replace them. Use only original seals (https://www.siemens.com/industrymall).

9.3.2.2 Check cable glands

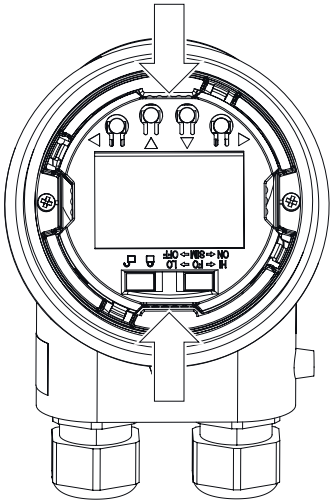
- Check the tightness of the cable glands at regular intervals.
- Tighten the cable glands if necessary.

9.3.3 Replacing the display

9.3.3.1 Removing the display

Procedure

1. De-energize the device.
2. Open the device.
   Opening the device (Page 44)
3. Remove the local display from the holder.



4. Disconnect the cable from the local display.

9.3.3.2 Installing the display

Procedure

1. Connect the cable to the local display as shown in the figure.

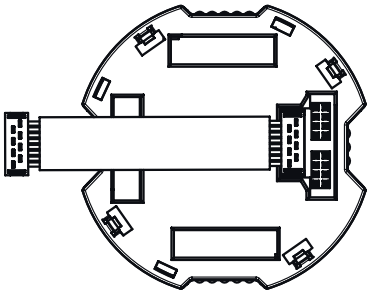


Figure 9-1 Ensure correct polarity!

2. Fasten the local display in the holder.
3. Close the device.
   Closing the device (Page 50)

9.3.4 Service and maintenance

Recalibration

Temperature sensors are essentially maintenance-free. However, we recommend recalibration under the following conditions:

- Processes with strong vibrations or changes in temperature.
- Food, pharma, biotechnology applications (annually), TS300 only.
- Processes that demand high measuring accuracy and safety.

Note

Recalibration intervals

Define the recalibration intervals for the specific process or plant. With constant operating temperatures and a low load, the reference values are as follows:

- < 2 years at temperatures up to 400 °C
- < 5 years at temperatures up to 200 °C

Recalibration of SITRANS TS300

Description	Recalibration procedure	
Clamp-on version	Do not disconnect the pipe sleeve from the pipe - leave the measuring position unchanged for reproducible measurement.	
	It is not necessary to disconnect the power supply to perform calibration.	
	Loosen recessed grip screw(s) to remove the RTD connector or housing and unscrew the measuring insert from the pipe collar.	
Block calibrators	Use calibrator sleeves that have been adapted to the shape of the RTD unit only.	
	Insert must have a borehole of ∅6.00 mm (0.24") H7, depth = 8 mm (0.31").	
	Do not exceed 100 °C (212 °F) at locking plug [80 °C (176 °F) when using a temperature transmitter].	
	Use block calibrator with dual-zone-technology with internal reference sensor only.	
	Observe the adjustment time specified by the manufacturer when heating the calibrator.	
	1	Apply heat sink compound to the RTD unit before inserting it in the calibrator sleeve.
	2	Check the electrical connector (cable end) as indicated by the nameplate.
	3	After inserting the RTD unit, wait about 5 minutes for the temperature to settle.
	4	Compare the temperature of the calibrator with the RTD temperature and adjust if necessary.
Ohmic measurement	1	Take into account any line resistance.
	2	Apply heat sink compound to the RTD plug-in unit.

9.4 Return procedure

To return a product to Siemens, see Return document (http://www.siemens.com/processinstrumentation/returngoodsnote).

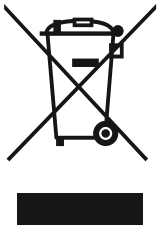
Contact your Siemens representative to clarify if a product is repairable, and how to return it. They can also help with quick repair processing, a repair cost estimate, or a repair report/ cause of failure report.

NOTICE
Decontamination The product may have to be decontaminated before it is returned. Your Siemens contact person will let you know for which products this is required.

See also

Decontamination declaration (http://www.siemens.com/sc/declarationofdecontamination)

9.5 Disposal



Devices described in this manual should be recycled. They may not be disposed of in the municipal waste disposal services according to the Directive 2012/19/EC on waste electronic and electrical equipment (WEEE).

Devices can be returned to the supplier within the EC and UK, or to a locally approved disposal service for eco-friendly recycling. Observe the specific regulations valid in your country.

Further information about devices containing batteries can be found at: Information on battery/product return (WEEE) (https://support.industry.siemens.com/cs/document/109479891/)

Note

Special disposal required

The device includes components that require special disposal.

- Dispose of the device properly and environmentally through a local waste disposal contractor.

Diagnostics and troubleshooting 10

10.1 Device status symbols

Device status is shown using symbols on the local display. Additionally, the symbol and respective text message for each device status can be seen in remote engineering, asset management or process control systems.

Locally, alarms are shown as a symbol in the lower line of the display. If several diagnostic states are active at the same time, the symbol for the most critical state is shown.

Device status characteristics

The following table provides possible cause of device status and actions for the user or service.

The symbols used on the local display are based on NAMUR status signals, whereas symbols used in SIMATIC PDM are based on Siemens standard alarm classes.

Note

Device status priority conflict - Namur vs Siemens standard

When more than one diagnostic event is active simultaneously, a conflict in priorities may arise. In this case, the Namur symbol on the local display will differ from that shown in SIMATIC PDM.

- For example: if both diagnostic states "Maintenance demanded" and "Configuration error" are active,
  - Local display (using Namur symbols) will show "Configuration error" as higher priority.
  - SIMATIC PDM (using Siemens standard symbols) will show "Maintenance demanded" as higher priority.

Be aware of the priority for each device status, depending on the interface used.

Note

Priorities of the NAMUR device status

This device uses the priorities of the NAMUR device status based on the HCF specification.

The order of the symbols in the table corresponds to the priority of the device status, starting with the most critical message.

Device status symbols

Display – NAMUR NE 107		NAMUR – HCF	SIMATIC PDM/PLC		
Symbol	**Device status**	**Priority ***	**Symbol**	**Device status**	**Priority ***
	Failure	1		Maintenance alarm	1
Cause: Output signal invalid due to fault in the field device or in the peripherals. **Measure:** Maintenance is required immediately.					
	Maintenance re-quired	4		Maintenance demanded	2
Cause: Output signal is still valid, but wear reserve is almost exhausted and/or a function will be limited soon. **Measure:**Maintenance is strongly recommended as soon as possible.					
	Maintenance re-quired	4		Maintenance required	3
Cause: The output signal is still valid. No functional restrictions have been determined but the wear reservice will most likely be exhausted in the next few weeks. **Measure:** Maintenance of device should be planned.					
	Function test	2		Manual operation	4
Cause: Output signal temporarily invalid (e.g. frozen) due to work being performed on the device. **Measure:** Manual mode over HMI or disable the engineering system.					
	Function test	2		Simulation mode	5
Cause: The output signal does temporarily not reflect the process because the output is based on a simulation value. **Measure**: Simulation mode over HMI or disable the engineering system or restart device.					
	Failure	1		Out of service	6
Cause: The output signal does not represent the process value. The device mode is set to "Out of service". **Measure:** Disable "Out of service" and enable normal operation.					
	Failure	1	 (red)	Configuration error	7
Cause: Output signal invalid due to parameter setting, connection error or configuration error in the HW. **Measure:** Check hardware configuration of the device over HMI or engineering system.					

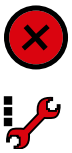
Display – NAMUR NE 107		**NAMUR – HCF**	**SIMATIC PDM/PLC**		
Symbol	**Device status**	**Priority ***	**Symbol**	**Device status**	**Priority ***
	Out of specification	3		Process value alarm	8
Cause: Deviations from permissible ambient or process conditions detected by the device (by means of self-monitoring or based on warnings/errors in the device) indicate that the measured value is unreliable or that deviations from the set value in the actuators are most likely greater than anticipated under normal operating conditions. Process or ambient conditions can damage the device or result in unreliable results. **Measure:** Check ambient temperature or process conditions. If possible, install device at different location.					
	Function test	2	 (yellow)	Configuration warning	9
Cause: Safety validation is not complete. **Measure:** Acknowledge safety event in the Functional Safety menu and repeat safety commissioning.					
	Out of specification	3		Process value warning	10
Cause: Deviations from permissible ambient or process conditions detected by the device (by means of self-monitoring or based on warnings/errors in the device) indicate that the measured value is unreliable or that deviations from the set value in the actuators are most likely greater than anticipated under normal operating conditions. Process or ambient conditions can damage the device or result in unreliable results. **Measure:** Check ambient temperature or process conditions. If possible, install device at different location.					
No symbol is displayed				Process value tolerance	11
Cause: At least one process value violates one of the process tolerance limits set in the device parameters. **Measure:** Check the parameter settings for limits for this application.					
No symbol is displayed			No symbol is displayed	Configuration changed	12
Cause: The device configuration has changed due to a work process. **Measure:** Reset configuration bit memory to delete the diagnostic message.					
No symbol is displayed	Good – OK		No symbol is displayed	No assignment	13
Cause: Device state ok. No errors from active diagnostics. **Measure:** No action required.					

* The smallest number indicates the highest level of error severity.

** In SIMATIC PDM, the Siemens standard symbol as well as the corresponding NA\ symbol is displayed (by the device display).

10.2 Diagnostic messages

The following table shows the IDs of diagnostic messages and possible causes and instructions for corrective actions.

ID	Symbols	Message	Cause/Remedy
8A		Input 1 error	A sensor error (broken/shorted sensor) is detected at Input 1. Unplug and reconnect the sensor cable. If the problem persists, replace the sensor.
8b		Input 2 error	A sensor error (broken/shorted sensor) is detected at Input 2. Unplug and reconnect the sensor cable. If the problem persists, replace the sensor.
8C		Input 1 CJC error	A sensor error (broken/shorted sensor) is detected at the cold junction compensation measurement used for Input 1. Unplug and reconnect the sensor cable. If the problem persists, replace the sensor.
8d		Input 2 CJC error	A sensor error (broken/shorted sensor) is detected at the cold junction compensation measurement used for Input 2. Unplug and reconnect the sensor cable. If the problem persists, replace the sensor.
8E		Drift detected ("Drift detection mode" configured as "Alarm").	The difference of the measured results between Input 1 and Input 2 lies above the configured maximum limit. Unplug and reconnect the sensor cable. If the problem persists, replace the sensor.
		Drift detected ("Drift detection mode" configured as "Error").	
8F		Backup enabled	A sensor error is detected, the backup sensor is in use. Unplug and reconnect the sensor cable. Check if the sensor is operated out of specified limits. If the problem persists, replace the sensor. Exception: 8F has higher priority than 8A, 8b, 8C and 8d.
8G		Backup error	A sensor error is detected at the backup sensor, no backup is available. Unplug and reconnect the sensor cable. Check if the sensor is operated out of specified limits. If the problem persists, replace the sensor. Exception: 8G has higher priority than 8A, 8b, 8C and 8d.

ID	Symbols	Message	Cause/Remedy
8H		Drift detected, reference voltage FVR	A critical measurement error was detected at the internal voltage reference. Reset the device or switch it off and back on. If the problem persists, contact Technical Support.
8J		Drift detected, reference voltage VREF	A critical measurement error was detected at the internal voltage reference. Reset the device or switch it off and back on. If the problem persists, contact Technical Support.
8L		Drift detected at Input 1	A critical measurement error was detected at Input 1. Reset the device or switch it off and back on. If the problem persists, contact Technical Support.
8n		Drift detected at Input 2	A critical measurement error is detected at Input 2. Reset the device or switch it off and back on. If the problem persists, contact Technical Support.
8o		Drift detected, ground voltage offset to terminal 3	A critical measurement error is detected on ground voltage offset to terminal 3. Reset the device or switch it off and back on. If the problem persists, contact Technical Support.
bF		Configuration not supported by device	**Device LED flashing red**: The configuration is temporarily invalid for less than 3 seconds, for example during parameter download. No further action is required by the user. **Device LED lights permanently red**: The configuration is temporarily invalid for more than 3 seconds, for example if the download is paused. Correct and/or resend the configuration.
bL		Device restart due to unexpected program error	Watchdog function has detected an internal device error. Restart the device. If the problem persists, contact Technical Support.
bo		Primary variable out of limits	Process value has reached the sensor limit. Review process conditions versus product specifications.
bP		Non-primary variable out of limits	A process value that is not mapped to the primary variable has reached the sensor limit. Review process conditions versus product specifications.

ID	Symbols	Message	Cause/Remedy
CA		Simulation mode	The device is in simulation mode and one or more of its device variables are not representative of the process. Disable the simulation to return to normal operation.
Co		Loop current fixed	The loop current is being held at a fixed value and is not responding to process variations. Disable the simulation to return to normal operation.
CP		Loop current in saturation ("Measuring range check mode" configured as "Output" or "Input and output").	The loop current has reached its upper (or lower) saturation limit and cannot increase (or decrease) any further. Adjust the loop current scaling.
		Loop current in saturation ("Measuring range check mode" deactivated or configured as "Input").	
E4		Internal RTD sensor error	Sensor error is detected at the internal temperature sensor. Reset the device or switch it off and back on. If the problem persists, contact Technical Support.
EL		Electronics temperature alarm	**Device LED flashing red**: The device is operated outside its specified temperature range. Check the operating temperature.
Fb		Minimum supply voltage not reached	**Device LED is off**: A supply voltage is probably applied but still too low. Check the power supply (at the output terminals). If the problem persists, contact Technical Support.
		Supply voltage below limit	**Device LED lights permanently red:** The device is operated below its specified supply voltage range. Check the power supply (at the output terminals). Reset the device or turn it off and on again. If the problem persists, contact Technical Support.
FL		Electronics defect	Defect of device electronics. A replacement of the device is recommended. Contact Technical Support.
Fn		Error in communication with input CPU	An unrecoverable error occurred in the internal communication to the input CPU. Reset the device or switch it off and back on. If the problem persists, contact Technical Support.

ID	Symbols	Message	Cause/Remedy
FE		Loop current read back error	The loop current does not correspond to the expected value. Check DAC trim settings. Restore to factory DAC calibration. If the problem persists, contact Technical Support.
FC		Maximum supply voltage exceeded	The device is operated above its specified supply voltage range. Check the power supply (at the output terminals). Reset the device or switch it off and back on. If the problem persists, contact Technical Support.
FU		Input CPU reconfiguration failed	An unrecoverable error occurred in the input CPU. Reset the device or switch it off and back on. If the problem persists, contact Technical Support.
L		-	The device is write-protected by a write-protection switch.
LL		-	Button lock is enabled.
LP		-	Parameters and device functions are write-protected with a user PIN.
SA		Error in EEPROM communication	An unrecoverable error occurred in the internal communication to the EEPROM. Reset the device or switch it off and back on. If the problem persists, contact Technical Support.
Sb		Volatile memory check failure Maintenance alarm	Device electronics error. Restart the device. If error continues, device electronics may have a defect. Repair is required. Contact Technical Support.
SC		CRC16 error in input CPU configuration	An unrecoverable error occurred in the internal input CPU. Reset the device or switch it off and back on. If the problem persists, contact Technical Support.
Sn		Exception error during code execution	An exception error occurred in the program execution of the main CPU. Reset the device or switch it off and back on. If the problem persists, contact Technical Support.
So		Stack integrity error	An exception error occurred in the program execution of the main CPU. Reset the device or switch it off and back on. If the problem persists, contact Technical Support.

ID	Symbols	Message	Cause/Remedy
SU		Electronics temperature alarm (functional safety)	**Device LED lights permanently red:** The device is operated outside its specified temperature range in functional safety mode. Check the operating temperature.
ST		Enable of functional safety failed	The device is transitioning to functional safety mode, or has failed to do so. Validate the functional safety configuration or reselect normal operation. If the problem persists, contact Technical Support.

10.3 Troubleshooting of USB modem

Below you can find information on how to troubleshoot simple errors yourself.

LED on the USB modem	Cause of error	Remedy
Power LED is not lit.	The USB cable is not connected.	• Connect the USB cable. Connecting USB modem (Page 59)
	Hardware fault occurred.	• Replace the device.
Power LED flashes yellow during parameter assignment of the temperature transmitter.	No temperature transmitter connected.	1. Check the polarity on the temperature transmitter. Connecting USB modem (Page 59) 2. Check whether the loop current is at least 3.5 mA.
Comm LED is not lit.	USB modem is not detected by the PC.	1. Check the port settings in SIPROM T. 2. Check the driver installation and reinstall SIPROM T if necessary.
Error LED illuminates red during the temperature transmitter parameter assignment.	Short-circuit at the modem terminals for the temperature transmitter.	• Check the wiring of the modem terminals. Connecting USB modem (Page 59)
Error LED is lit red.	Hardware fault occurred.	• If the Error LED remains continuously lit even after repeatedly switching the power supply of the modem off and on, the USB modem is defective. Replace the USB module.

See also

Meaning of LEDs on the USB modem (Page 25)

Technical data

11

11.1 Rated conditions

Storage	
Storage temperature	-40 ... +80 °C (-40 ... +176 °F)
Degree of protection in accordance with EN 60529	See nameplate. The degree of protection is achieved when the device is mounted correctly. See section Installing/mounting (Page 27).

11.1.1 Minimum permitted ambient temperatures in the connection area of the sensor

Sensor	Minimum permissible ambient temperature in the connection area of the sensor
SITRANS TSinsert/TS100/TS200	-40 °C
SITRANS TS300	-20 °C
SITRANS TS500	
• **All devices with functional safety** • SITRANS TS500 • SITRANS TS500 with SITRANS TH320/TH420 **and** display • SITRANS TH100/TH200/TH300/ TH400 with HAN 7D plug-in connector and M12 (option codes G12 and G13)	-40 °C
SITRANS TS500 type 7MC75.. with head type AG0 and AU0 (option G and U) in non-SIL applications, without display, optional with installed SITRANS TH320/ TH420	-50 °C
• Electronics and cable glands of the SITRANS TS500	• Electronics and cable glands are designed for the minimum permissible ambient temperature of the SITRANS TS500. • When the electronics or the cable gland are not designed for the minimum permissible ambient temperature, the minimum permissible ambient temperature of the entire SITRANS TS500 is reduced accordingly. • See the datasheets of the electronics and the cable glands.

See also

Nameplate structure (Page 20)

11.1.2 Maximum permissible ambient temperatures in the connection area of the sensor

11.1.2.1 General limitations for compression fittings

Due to the PTFE sealing, standard compression fittings are limited to a maximum temperature of 200 °C.

11.1.2.2 SITRANS TS100

Note

Application SITRANS TS100

SITRANS TS100 temperature sensors are only approved for the temperature classes T4 and T6. Pay attention to the temperature resistance of the connection cables. See Ambient temperature too high (Page 40).

11.1.2.3 SITRANS TS500

For all devices with functional safety, the maximum permissible ambient temperature is +75 °C.

	Gas		Dust
SITRANS TS500	**in "intrinsic safety Ex i"** **- or -** **in "non-sparking ec"**	**in "flameproof enclosure (Ex d)"**	**is part of "intrinsic safety Ex i"** **- or -** **in "non-intrinsically safe circuits (Ex tb)"**
Without electronics (only enclosure without terminal socket)	See head TS500 and relevant temperature class	See head TS500 without electronics	See head TS500 without electronics
With temperature transmitters SITRANS TH or transmitters from third parties	$T_{a\_max} = (T_1 - \Delta T2G) \leq T_2$ T_1 = see relevant certificate of the temperature transmitters. ΔT2G and T_2	See head TS500 with electronics When installing transmitters from third parties, observe the maximum permissible power consumption of 3 W.	See head TS500 with electronics When installing transmitters from third parties, observe the maximum permissible power consumption of 1 W. The maximum surface temperature of the TS500 enclosure is assumed to be 85 °C. **Notice!** If the maximum permissible ambient temperature of the transmitters from third parties is less than 85 °C, run the following calculation: $T_{a\_max} = T_1 - \Delta T1D - \Delta T2D$ T_1 = see relevant certificate of the temperature transmitters. ΔT1D = 22K (max. permissible power consumption of 1 W) ΔT2D
With temperature transmitters SITRANS TH100/200/300 with DVM LCD (7MF4997-1BS)	$T_{a\_max} = T_3 \leq T_2$ T_3 T_2	See head TS500 with electronics	$T_{a\_max} = T_3$ T_3
With temperature transmitters SITRANS TH320/420 with display (7MF7902-1AD)	$T_{a\_max} = T_3 \leq T_2$ T_3 T_2	See head TS500 with electronics	$T_{a\_max} = T_3$ T_3

T_1 = Max. permissible ambient temperature of the temperature transmitter according to certificate

T_2 = Max. permissible ambient temperature of the respective connection head without transmitter

T_3 = Max. permissible ambient temperature SITRANS TH100/200/300 with DVM LCD (7MF4997-1BS) or SITRANS TH320/420 with display (7MF7902-1AD)

See also

SITRANS TH100/200/300 with DVM LCD or SITRANS TH320/420 with display (Page 130)

Gas hazardous area: Ex i / IS / Ex ec / NI (Page 132)

Gas hazardous area: Ex d / XP (Page 134)

Product documentation (Page 195)

SITRANS TH100/200/300 with DVM LCD or SITRANS TH320/420 with display

You can find the values of ΔT2G in the tables
Table 11-3 Gas Ex i/ec (Page 132),
Table 11-4 Gas Ex i/ec (Page 133),
Table 11-5 Type 2N (Page 133) and
Table 11-6 Type 2N (Page 134) and
ΔT2D in the table Table 11-9 Dust Ex i/tb (Page 136) and
Table 11-10 Type 2N (Page 137).

Table 11-1 **Gas hazardous area Zone 1**

Permissible power supply parameters	**T_3 = Permissible ambient temperature**	
	Gas hazardous area Zone 1 / Div. 1: SITRANS TH100/200/300 with DVM LCD	**Gas hazardous area Zone 1: SITRANS TH320/420 with display**
U_i = 30 V DC I_i = 120 mA L_i = 0 µH C_i = 2.2 nF P_i = 900 mW	-	T4: -40 ... +85 °C - ΔT2G T5: -40 ... +65 °C - ΔT2G T6: -40 ... +50 °C - ΔT2G
U_i = 30 V I_i = 100 mA P_i = 750 mW	T4: -40 °C ≤ T_3 ≤ +75 °C - ΔT2G T6: -40 °C ≤ T_3 ≤ +45 °C - ΔT2G	T4: -40 ... +85 °C - ΔT2G T5: -40 ... +70 °C - ΔT2G T6: -40 ... +55 °C - ΔT2G
U_i = 27 V I_i = 90 mA P_i = 610 mW	T4: -40 °C ≤ T_3 ≤ +85 °C - ΔT2G T6: -40 °C ≤ T_3 ≤ +50 °C - ΔT2G	T4: -40 ... +85 °C - ΔT2G T5: -40 ... +75 °C - ΔT2G T6: -40 ... +60 °C - ΔT2G
U_i = 25.2 V I_i = 84 mA P_i = 530 mW	T4: -40 °C ≤ T_3 ≤ +85 °C - ΔT2G T6: -40 °C ≤ T_3 ≤ +52 °C - ΔT2G	-

Table 11-2 **Dust hazardous area Zone 21**

Permissible power supply parameters	**T_3 = Permissible ambient temperature**	
	Gas hazardous area Zone 1 / Div. 1: **SITRANS TH100/200/300 with DVM LCD**	**Gas hazardous area Zone 1:** **SITRANS TH320/420 with display**
U_i = 30 V DC I_i = 120 mA L_i = 0 µH C_i = 2.2 nF P_i = 900 mW	-	T4: -40 ... +85 °C - ΔT2G T5: -40 ... +65 °C - ΔT2G T6: -40 ... +50 °C - ΔT2G
U_i = 30 V I_i = 100 mA P_i = 750 mW	T85 °C: -40 °C ≤ T_3 ≤ +53 °C - ΔT2D	T4: -40 ... +85 °C - ΔT2G T5: -40 ... +70 °C - ΔT2G T6: -40 ... +55 °C - ΔT2G
U_i = 27 V I_i = 90 mA P_i = 610 mW	T85 °C: -40 °C ≤ T_3 ≤ +63 °C - ΔT2D	T4: -40 ... +85 °C - ΔT2G T5: -40 ... +75 °C - ΔT2G T6: -40 ... +60 °C - ΔT2G
U_i = 25.2 V I_i = 84 mA P_i = 530 mW	T85 °C: -40 °C ≤ T_3 ≤ +63 °C - ΔT2D	-

See also

Gas hazardous area: Ex i / IS / Ex ec / NI (Page 132)

Dust hazardous area: Ex i / IS / Ex tb / DIP (Page 136)

Gas hazardous area: Ex i / IS / Ex ec / NI

The maximum ambient temperatures T_2 of the respective connection head **without transmitter** can be found in the cells of the following tables. The temperature rise caused by the medium is already taken into account in the tables.

Table 11-3 Gas Ex i/ec

Head type				AU0		AV0, SITRANS TF		BA0: BB0; BC0; BD0; AA0, AB0, AC0, KJ0, BS0, AG0	
T_{max} Head				120 °C		85 °C		100 °C	
Temperature class				T4	T6	T4	T6	T4	T6
Temperature of medium (°C)	Temperature rise caused by medium ΔT2G (K)	Extension length "X" (mm)		T_2 in °C	T_2 in °C	T_2 in °C	T_2 in °C	T_2 in °C	T_2 in °C
440 °C	23	40		97	57	62	57	77	57
	12	80		108	68	73	68	88	68
	6	150		114	74	79	74	94	74
	3	300		117	77	82	77	97	77
290 °C	22	40		98	58	63	58	78	58
	11	80		109	69	74	69	89	69
	5	150		115	75	80	75	95	75
	2	300		118	78	83	78	98	78
200 °C	16	40		104	64	69	64	84	64
	8	80		112	72	77	72	92	72
	4	150		116	76	81	76	96	76
	2	300		118	78	83	78	98	78
130 °C	9	40		111	71	76	71	91	71
	5	80		115	75	80	75	95	75
	3	150		117	77	82	77	97	77
	1	300		119	79	84	79	99	79
80 °C	5	40		120	80	85	80	100	80
	3	80		120	80	85	80	100	80
	1	150		120	80	85	80	100	80
	0	300		120	80	85	80	100	80

Table 11-4 Gas Ex i/ec

				Head type	**BT0, AH0**	**BMO**	**BP0**	
				T_{max} Head	**80 °C**	**80 °C**	**100 °C**	
				Temperature class	**T6**	**T6**	**T4**	**T6**
Temperature of medium (°C)	**Temperature rise caused by medium ΔT2G (K)**		**Extension length "X" (mm)**		**T_2 in °C**	**T_2 in °C**	**T_2 in °C**	**T_2 in °C**
440 °C	23	43*	40		57	37	57	37
	12	23*	80		68	57	77	57
	6	11*	150		74	69	89	69
	3		300		77	77	97	77
290 °C	22		40		58	58	78	58
	11		80		69	69	89	69
	5		150		75	75	95	75
	2		300		78	78	98	78
200 °C	16		40		64	64	84	64
	8		80		72	72	92	72
	4		150		76	76	96	76
	2		300		78	78	98	78
130 °C	9		40		71	71	91	71
	5		80		75	75	95	75
	3		150		77	77	97	77
	1		300		79	79	99	79
80 °C	5		40		80	80	100	80
	3		80		80	80	100	80
	1		150		80	80	100	80
	0		300		80	80	100	80

* Value for header type BP0 and BMO

Table 11-5 Type 2N

			Head type	**AU0**		**AV0, SITRANS TF**	
			T_{max} Head	**120 °C**		**85 °C**	
			Temperature class	**T4**	**T6**	**T4**	**T6**
Temperature of medium (°C)	**Temperature rise caused by medium ΔT2G (K)**			**T_2 in °C**	**T_2 in °C**	**T_2 in °C**	**T_2 in °C**
100 °C	7			120	73	78	73
80 °C	5			120	80	85	80

Table 11-6 Type 2N

Head type			BA0: BB0; BC0; BD0; AA0, AB0, AC0, KJ0, BS0, AG0		BMO, BT0, AH0	BP0	
T_{max} Head			100 °C		80 °C	100 °C	
Temperature class			T4	T6	T6	T4	T6
Temperature of medium (°C)	Temperature rise caused by medium ΔT2G (K)		T_2 in °C	T_2 in °C	T_2 in °C	T_2 in °C	T_2 in °C
100 °C	7		100	73	73	100	73
80 °C	5		100	80	80	100	80

Gas hazardous area: Ex d / XP

The maximum ambient temperatures T_a for the respective connection head **with or without transmitter** can be obtained from the cells in the following tables. The temperature increase given by the medium is already considered there.

Table 11-7 Gas Ex d

Head type			AH0, AV0, SITRANS TF	AG0, UG0		AU0, UU0	
T_{max} head			85 °C	100 °C		120 °C	
Temperature class			T6	T4		T3	T4
Max. permitted power consumption of electronic (W)			0 ... 3[1] With or without electronic	0 Without electronic	1 ... 3[1] With electronic	0 Without electronic	1 ... 3[1] With electronic
Medium temperature (°C)	Extension length "X" (mm)		T_{a_max} in °C	T_{a_max} in °C	T_{a_max} in °C	T_{a_max} in °C	T_{a_max} in °C
440 °C	40		43	76	53	96	48
	80		55	88	65	108	60
	150 ... 300		61	94	71	114	66
290 °C	40		54	87	64	107	59
	80 ... 300		61	94	71	114	66
200 °C	40		58	91	68	111	63
	80 ... 300		63	96	73	116	68
130 °C	40 ... 300		61	94	71	114	66
80 °C	40 ... 300		67	100	77	120	72

[1] For the determination of ambient temperatures, maximum enclosure temperature of 85 °C was taken as a basis when electronic are incorporated.

Table 11-8 Type 2N

Head type		**AH0, AV0, SITRANS TF**	**AG0, UG0**		**AU0, UU0**	
T_{max} head		**85 °C**	**100 °C**		**120 °C**	
Temperature class		**T6**	**T4**		**T3**	**T4**
Max. permitted power consumption of electronic (W)		**0 ... 3[1)] With or without electronic**	**0 Without electronic**	**1 ... 3[1)] With electronic**	**0 Without electronic**	**1 ... 3[1)] With electronic**
Medium temperature (°C)		**T_{a_max} in °C**	**T_{a_max} in °C**	**T_{a_max} in °C**	**T_{a_max} in °C**	**T_{a_max} in °C**
100 °C		60	100	70	120	65
80 °C		67	100	77	120	72

[1)] For the determination of ambient temperatures, maximum enclosure temperature of 85 °C was taken as a basis when electronic are incorporated.

Dust hazardous area: Ex i / IS / Ex tb / DIP

The maximum ambient temperatures T_a for the respective connection head **with or without transmitter** can be obtained from the cells in the following tables. The temperature increase given by the medium is already considered there.

Table 11-9 Dust Ex i/tb

Head type				AH0, AV0, SITRANS TF		AG0, UG0		AU0, UU0	
T_{max} head				85 °C		100 °C		120 °C	
Max. permitted power consumption of electronic (W)				0 Without electronic	1[1] With electronic	0 Without electronic	1[1] With electronic	0 Without electronic	1[1] With electronic
Medium temperature (°C)	Temperature increase by Medium ΔT2D (K)	Extension length "X" (mm)		T_{a_max} in °C	T_{a_max} in °C	T_{a_max} in °C	T_{a_max} in °C	T_{a_max} in °C	T_{a_max} in °C
440 °C	36	40		49	--	64	--	84	--
	18	80		67	45	82	45	102	45
	8	150		77	55	92	55	112	55
	4	300		81	59	96	59	116	59
250 °C	22	40		63	--	78	--	98	--
	11	80		74	52	89	52	109	52
	5	150		80	58	95	58	115	58
	1	300		84	62	99	62	119	62
120 °C	10	40		75	53	90	53	120	53
	5	80		80	58	95	58	120	58
	3	150		82	60	97	60	120	60
	0	300		85	63	100	63	120	63

[1] Assembled temperature transmitter e.g. SITRANS TH without Display

Table 11-10 Type 2N

Head type			AH0, AV0, SITRANS TF		AG0, UG0		AU0, UU0	
T_{max} head			T85 °C		100 °C		120 °C	
Max. permitted power consumption of electronic (W)			0 Without electronic	1[1] With electronic	0 Without electronic	1[1] With electronic	0 Without electronic	1[1] With electronic
Medium temperature (°C)	Temperature increase by Medium ΔT2D (K)		T_{a_max} in °C	T_{a_max} in °C	T_{a_max} in °C	T_{a_max} in °C	T_{a_max} in °C	T_{a_max} in °C
100 °C	10		75	53	100	53	120	53
80 °C	8		85	63	100	63	120	63

[1] Assembled temperature transmitter for example SITRANS TH

11.1.3 Maximum permitted sample temperatures within the process

Note

Permissible ambient temperature at sensor

The maximum permissible ambient temperature at the sensor simultaneously corresponds to the highest permissible sample temperature.

The minimum permissible sample temperatures are up to -200 °C depending on the version of the temperature sensor.

See also

Maximum permitted sample temperatures within the process (Page 137)

Resistance thermometers

Table 11-11 RTD temperature sensor (R_{th} max=120 K/W)

1 x RTD TF/3 mm/6 mm 2 x RTD TF/3 mm/6 mm 1 x RTD WW/3 mm/6 mm 2 x RTD WW/3 mm/6 mm	Max. permissible sample temperature (°C)			
	Certified transmitter in Zone 0 with type of protection "Intrinsically safe"		Certified transmitter in Zone 1, 2 with type of protection "Intrinsically safe"	
	P0: 0 ... ≤37 mW [1]	P0: ≥37 ... ≤100 mW	P0: 0 ... ≤37 mW [1]	P0: ≥37 ... ≤100 mW
T1 = 450 °C -10K	348	340	436	428
T2 = 300 °C -10K	228	220	286	278
T3 = 200 °C - 5K	152	144	191	183

1 x RTD TF/3 mm/6 mm **2 x RTD TF/3 mm/6 mm** **1 x RTD WW/3 mm/6 mm** **2 x RTD WW/3 mm/6 mm**	**Max. permissible sample temperature (°C)**			
	Certified transmitter in Zone 0 with type of protection "Intrinsically safe"		**Certified transmitter in Zone 1, 2 with type of protection "Intrinsically safe"**	
	P0: 0 ... ≤37 mW [1]	**P0: ≥37 ... ≤100 mW**	**P0: 0 ... ≤37 mW [1]**	**P0: ≥37 ... ≤100 mW**
T4 = 135 °C - 5K	100	92	126	118
T6 = 85 °C - 5K	60	52	76	68

[1] For example SITRANS TH

Thermocouples

Table 11-12 Thermocouple temperature sensor (R_{th} max=15 K/W)

1 x TC type J, K, N /3 mm **2 x TC type J, K, N /3 mm** **1 x TC type J, K, N /6 mm** **2 x TC type J, K, N /6 mm**	**Max. permissible sample temperature (°C)**	
	Certified transmitter in Zone 0 with type of protection "Intrinsically safe"	**Certified transmitter in Zone 1, 2 with type of protection "Intrinsically safe"**
	P0: 0 ... 100 mW	
T1 = 450 °C -10K	351	439
T2 = 300 °C -10K	231	289
T3 = 200 °C -5K	155	194
T4 = 135 °C -5K	103	129
T6 = 85 °C -5K	63	79

11.1.4 Measuring range

The measuring range refers to the temperature limits in which the thermometer can be used practically for measuring purposes. Depending on the loads at the place of use and the required accuracies, the actual measuring range may decrease.

Note

Measuring ranges

The application or possible operating temperatures depend on the configuration of the temperature sensor.

11.2 Construction

Table 11-13 Torque values for M20 accessories

Torques for M20 accessories	Plastic head	Metal head	Cable cross-section
Cable gland made of plastic	5.0 Nm	5.0 Nm	6 ... 12 mm
Cable gland made of metal	-/-	5.0 Nm	5 ... 14 mm
Adapter M20 to NPT½	5.0 Nm	5.0 Nm	-/-

SITRANS TS500 with head type A requires a minimum thickness of the open-ended wrench of 5 mm. The maximum wrench size is SW24.

Table 11-14 Torques between device extension and conduit

Connection type	Tightening torque
Thread M14	25 Nm
Thread M18	40 Nm
Thread G½; thread M20	50 Nm
½ Inch NPT	Hand-tight and one to two complete rotations with a wrench
Spring-loaded compression fitting	5 Nm

Table 11-15 Torques between device head and extension

Head type	Tightening torque
Metal head	20 Nm
Plastic head	5 Nm

Table 11-16 Estimation of immersion depth

Process medium	Immersion depth (calculation) [1]
Water	Immersion depth ≥ TSL[1] + (5 x $\varnothing_{conduit}$)
Air	Immersion depth ≥ TSL[1] + (10 to 15 x $\varnothing_{conduit}$)

[1] TSL = Temperature-sensitive length

Table 11-17 Maximum core cross-section

SITRANS TH	SITRANS TR	SITRANS TF
1 x 1.5 mm² (AWG 13)	2.5 mm² (AWG 13)	Single chamber housing: 1.5 mm² (AWG 13) Dual chamber housing: 2.5 mm² (AWG 13)

11.3 Electrical data

Devices for general use

Measured current	
$I_{Measuring}$ (Pt 100)	0.3 ... 1.0 mA
$I_{Measuring}$ (Pt 1000)	0.1 ... 0.3 mA

Devices in explosion-protected version

Equipment protection by means of intrinsic safety	
For connecting to circuits with the following peak values	$U_i \leq 30$ V $I_i \leq 100$ mA $P_i = P_o$ (transmitter) $C_i = 700$ pF/m $L_i = 15$ µH/m

Equipment protection by means of non incendive	
For connecting to circuits with the following peak values	$U_n = 30$ V $U_{max} = 32$ V [1]

[1] Maximum safety voltage

Equipment protection by means of Explosionproofed / Dust-Ignition proofed	
For connecting to circuits with the following peak values	$U_{max} = 45$ V ($U_{max} = 35$ V for USA/Canada) P = 25/37/50/100 mW

Effective internal capacitance and internal inductance

	Display	**SITRANS TH100**	**∑**
C_i	16 nF	13 nF	29 nF
L_i	3 µH	106 µH	109 µH

11.4 Measuring tolerances for resistance thermometers

Tolerance classes

The tolerance classes of the resistance thermometers are defined as follows in accordance with IEC 60751:

Tolerance class	Precision	Δt
Class B	Basic accuracy	±(0.30 °C +0.0050|t[°C]|) ±1.8x0.30 °F +0.0050x|t[°F]-32|
Class A	Increased accuracy	±(0.15 °C +0.0020|t[°C]|) ±1.8x0.15 °F +0.0020x|t[°F]-32|
Class AA (1/3 B)	High accuracy	±(0.10 °C +0.0017|t[°C]|) ±1.8x0.10 °F +0.0017x|t[°F]-32|

Tolerances

The following tables provide an overview of the validity ranges of these tolerances. When you use a thermometer above the specified limits, the values of the next lower accuracy class apply.

Action	Tolerance	Precision	Range
Basic version	Class B	Basic accuracy	-50 ... +400 °C (-58 ... +752 °F)
	Class A	Increased accuracy	-30 ... +300 °C (-22 ... +572 °F)
	Class AA (1/3 B)	High accuracy	0 ... +150 °C (+32 ... +302 °F)
With increased vibration resistance	Class B	Basic accuracy	-50 ... +400 °C (-58 ... +752 °F)
	Class A	Increased accuracy	-30 ... +300 °C (-22 ... +572 °F)
	Class AA (1/3 B)	High accuracy	0 ... +150 °C (+32 ... +302 °F)
With extended measuring range	Class B	Basic accuracy	-196 ... +600 °C (-320 ... +1112 °F)
	Class A	Increased accuracy	-100 ... +450 °C (-148 ... +842 °F)
	Class AA (1/3 B)	Increased accuracy	-50 ... +250 °C (-58 ... +482 °F)

If an RTD will be subjected in a higher temperature as specified in the class, the sensor will be declassified to the referring accuracy class. For enduring operation near 400 °C we recommend the use of an extended measuring range RTD, instead of basic and increased vibration versions.

11.5 Measuring accuracy for thermocouples

Tolerance classes

The tolerance classes of the thermocouples are defined in the following table in accordance with IEC 584/DIN EN 60584:

Catalog versions

Type	Basic accuracy, Class 2	Increased accuracy, Class 1
N	-40 °C ... +333 °C ±2.5 °C (-40 °F ... +631 °F ±4.5 °F)	-40 °C ... +375 °C ±1.5 °C (-40 °F ... +707 °F ±2.7 °F)
	333 °C ... 1100 °C ±0.0075x|t[°C]| (631 °F ... 2012 °F ±0.0075x|t[°F]-32|)	375 °C ... 1000 °C ±0.004x|t[°C]| (707 °F ... 1832 °F ±0.004x|t[°F]-32|)
K	-40 °C ... +333 °C ±2.5°C (-40 °F... +631 °F ±4.5 °F)	-40 °C ... +375 °C ±1.5 °C (-40 °F... +707 °F ±2.7 °F)
	333 °C ... 1000 °C ±0.0075x|t[°C]| (631 °F ... 1832 °F ±0.0075x|t[°F]-32|)	375 °C ... 1000 °C ±0.004x|t[°C]| (707 °F ... 1832 °F ±0.004x|t[°F]-32|)
J	-40 °C ... +333 °C ±2.5 °C (-40 °F ... +631 °F ±4.5 °F)	-40 °C ... +375 °C ±1.5 °C (-40 °F ... +707 °F ±2.7 °F)
	333 °C ... 750 °C ±0.0075x|t[°C]| (631 °F ... 1382 °F ±0.0075x|t[°F]-32|)	375 °C ... 750 °C ±0.004x|t[°C]| (707 °F ... 1382 °F ±0.004x|t[°F]-32|)

Further base thermocouples

Type	Basic accuracy, Class 2	Increased accuracy, Class 1
T	-40 °C ... +133 °C ±1 °C (-40 °F ... +271 °F ±1.8 °F)	-40 °C ... +125 °C ±0.5 °C (-40 °F ... +257 °F ±0.9 °F)
	133 °C ... 350 °C ±0.0075x|t[°C]| (271 °F ... 662 °F ±0.0075x|t[°F]-32|)	125 °C ... 350 °C ±0.004x|t[°C]| (257 °F ... 662 °F ±0.004x|t[°F]-32|)
E	-40 °C ... +333 °C ±2.5°C (-40 °F... +631 °F ±4.5 °F)	-40 °C ... +375 °C ±1.5 °C (-40 °F... +707 °F ±2.7 °F)
	333 °C ... 900 °C ±0.0075x|t[°C]| (631 °F ... 1652 °F ±0.0075x|t[°F]-32|)	375 °C ... 800 °C ±0.004x|t[°C]| (707 °F ... 1472 °F ±0.004x|t[°F]-32|)

Further noble thermocouples

Type	Basic accuracy, Class 2	Increased accuracy, Class 1
R,S	0 °C ... 600 °C ±1.5 °C (32 °F ... +1112 °F ±2.7 °F)	0 °C ... 1100 °C ±1 °C (32 °F ... +2012 °F ±1.8 °F)
	600 °C ... 1600 °C ±0.0025x|t[°C]| (1112 °F ... 2912 °F ±0.0025x|t[°F]-32|)	1100 °C ... 1600 °C ±[1 + 0.003 x(t -1100)] °C (2012 °F ... 2912 °F ±1,8+0,003x(t[°F]-2012)
B	600 °C ... 1700 °C ±0.0025x|t[°C]| (1112 °F ... 3092 °F ±0.0025x|t[°F]-32|)	-

11.6 Certificates and approvals

You can find certificates on the Internet at Certificates (http://www.siemens.com/processinstrumentation/certificates) or on an included DVD.

11.6.1 Special conditions of use

Type of protection	
Ex d Flameproof enclosure	The gaps of the equipment are increased to the safety level of EN 60079-1 table 2 (IIC).
	Repairs on flame-proof joints can only be done by original manufacturer.
	Components that are used with this device must be in accordance with actual IECEx standards, consist of actual IECEx certificates, and provide at least the minimum specifications of this device. Especially, unused openings must be closed by IECEx certified blind plugs.
	The enclosure types AG0, AH0, AU0, AV0 of the temperature sensors, series TS 500 must be connected by means of suitable cable entry fittings or conduit systems, which meet the requirements of EN 60079-1, sections 13.1 and 13.2, and for which a separate examination certificate has been issued.
	Cable entry fittings (conduit threads) and sealing plugs of simple design must not be used in the transmitter and receiver enclosures.
	Any openings in the transmitter and receiver enclosures that are not used must be closed as specified in EN 60079-1, section 11.9.
	The connecting lead of enclosure types AG0, AH0, AU0, AV0 of the temperature sensors, series TS 500, must be installed to provide for permanent wiring and adequate protection against damage.
	If the temperature at entry fittings should exceed 70 °C, the connecting cables used must be of the temperature-resistant type.
	If connection is made in the potentially explosive area, the connecting cable (unconnected cable end) of the enclosure types AG0, AH0, AU0, AV0 of the temperature sensors, series TS 500, must be connected in an enclosure that meets the requirements of an approved type of protection as specified in EN 60079-0, section 1.
Ex i Intrinsic Safety	When applied as category-1 equipment, the connection of the temperature sensors to an intrinsically safe circuit of level of protection "ib" is permissible only in combination with a protective tube made of non-corroding material (e.9. stainless steel) with a minimum wall thickness of 1 mm. For those variants of temperature sensors which are provided with a separately certified electronic unit installed in the connection head, the electrical parameters, and specifications of the respective certificate for the installed equipment shall apply. The maximum input power P_i of the installed equipment shall not exceed the value of 1 W. When the temperature sensor SITRANS TS insert is used with flexible leads the ends of the leads shall be shortened as far as to ensure a minimum clearance of 2 mm between bare parts of different electrical circuits among each other and to the grounded enclosure.
Ex e Increased safety	For electrical data for the application as category-3 equipment with type of protection "ec", reference is made to the operating instructions manual.
Ex t Dust ignition proof	The temperature sensors of type series SITRANS TS100 / TS200 must not be operated with plug connectors in hazardous areas due to combustible dusts.
General	

Type of protection	
	For relationship between maximum permissible ambient / medium temperature, temperature class, maximum power of the intrinsically safe circuit and thermal resistance of the sensors, reference is made to the tables given above and in the operating instructions manual.
	When applied as category-1 equipment, the temperature sensors of type series SITRANS TS insert, TS100, TS200 and TS500 shall be electrostatically connected (contact resistances 1 MO) to the local equipotential bonding system (e. g. by means of a grounding terminal).
	For the application as category-1 equipment, those variants of the temperature sensors, type series SITRANS TS insert, TS100, TS200 and TS500 for which the material Aluminium is used, shall be installed as such that the generation of sparks due to impact or friction processes between Aluminium and steel (except for stainless steel, if the existence of rust particles can be excluded) is impossible.
	Components attached or installed (terminal compartments, bushings, cable entry fittings, connectors) must be of a technical standard that complies with the specifications on the CoC as a minimum, and a separate examination certificate must have been issued for them. The operating conditions specified in the component certificates must be followed.
	The capacitance of the labels exceeds the allowed value of 3pF. Operating instructions must be observed.
	Use supply wires suitable for 20 K above Ta

11.6.2 SITRANS TSInsert/TS100/TS200/TS500

SITRANS TSInsert/TS100/TS200/TS500	
NEPSI	Ex ia IIC T6...T1 Ga or Ex ic IIC T6...T1 Gc or Ex ia/ib IIC T6...T1 Ga/Gb or Ex ec IIC T6...T1 Gc
cCSAus 70037146	Class I, Division 1, Groups A, B, C, D T6/T4 ... T1 Class I, Division 2, Groups A, B, C, D T6/T4 ... T1 Class II Division 1 Groups E, F, G T6/T4 ... T1 Class II Division 2 Groups F, G T6/T4 ... T1 Class III Ex ia IIC T6/T4 ... T1 Ga Ex ia IIIC T200 °C Da AEx ia IIC T6/T4 ... T1 Ga AEx ia IIIC T200 °C Da Ex ic IIC T6/T4 ... T1 Gc Class I, Zone 2, AEx ic IIC T6/T4 ... T1 Gc

	KCs	
TSinsert	20-AV4BO-0709X	Ex ia IIC T6/T4~T1
	20-AV4BO-0710X	Ex iaD 20 T200°C
TS100	20-AV4BO-0707X	Ex ia IIC T6/T4~T1
	20-AV4BO-0708X	Ex iaD 20 T200°C
TS200	20-AV4BO-0711X	Ex ia IIC T6/T4~T1
	20-AV4BO-0712X	Ex iaD 20 T200°C
TS500	20-AV4BO-0485X	Ex ia IIC T6/T4~T1
	20-AV4BO-0487X	Ex iaD 20 T200°C
	20-AV4BO-0488X	Ex nA IIC T6/T4~T1

ATEX marking

Table 11-18 Ex marking temperature sensor series SITRANS TS Insert
Measuring insert for SITRANS TS500 series, mineral insulation

	1	2	3	4	5	6	7	-	8	9	10	11	12		13	14	15	16
	7	**M**	**C**	**7**	**0**	**1**	**a**	**-**	**x**	**b**	**c**	**x**	**x**	**-**	**Z**	**d**		

Depending on the index				Marking ATEX / IECEx
a	b	c	d	
0,3,6,8,9	A, B, C, F, G K, J, N, E, L, T, R, S, U, W = Type B	A...F	E01 E64	II 1 G Ex ia IIC T6...T1 Ga II 3 G Ex ic IIC T6...T1 Gc

Table 11-19 Ex marking temperature sensor series SITRANS TS100
Temperature sensor with directly connected connection cable, mineral insulation

	1	2	3	4	5	6	7	-	8	9	10	11	12		13	14	15	16
	7	**M**	**C**	**7**	**1**	**1**	**1**	**-**	**b**	*****	**c**	**d**	**e**	**-**	**Z**	**f**		

Depending on the index					Marking ATEX / IECEx
b	**c**	**d**	**e**	**f**	
0,3,6,8,9	A, B, C, F, G K, J, N, E, L, T, R, S, U, W = Type B	1...6	1...4	E01 E64	II 1 G Ex ia IIC T6...T1 Ga II 3 G Ex ic IIC T6...T1 Gc

Table 11-20 Ex marking temperature sensor series SITRANS TS200
Temperature sensor in compact design, mineral insulation

	1	2	3	4	5	6	7	-	8	9	10	11	12		13	14	15	16
	7	**M**	**C**	**7**	**2**	**1**	**2**	**-**	**b**	*****	**c**	**d**	**e**	**-**	**Z**	**f**		

Depending on the index					Marking ATEX / IECEx
b	**c**	**d**	**e**	**f**	
0,3,6,8,9	A, B, C, F, G K, J, N, E, L, T, R, S, U, W = Type B	1...6	0...5	E01 E64	II 1 G Ex ia IIC T6...T1 Ga II 3 G Ex ic IIC T6...T1 Gc

Table 11-21 Ex marking temperature sensor series SITRANS TS500 "Build in Version"
Temperature sensor for installation in thermocouple sleeve provided by the customer

	1	2	3	4	5	6	7	-	8	9	10	11	12		13	14	15	16		
	7	**M**	**C**	**7**	**5**	**0**	**0**	**-**	*****	*****	*****	*****	*****	**-**	**a**	**b**	**c**	**d**	**-z**	**e**

Depending on the index			Marking ATEX / IECEx
a	**b**	**e**	
0...9	A...C, G...H, M, P, U, V	E01 E64	II 1/2 G Ex ia/ib IIC T6...T1 Ga/Gb II 3 G Ex ic IIC T6...T1 Gc
	A...C, G...H, U, V		II 1/2 D Ex ta/ib IIIC T_{200} Tx°C/T_{50} Ty°C Da/Db
	B, C, G, H, U, V	E04 E66	II 3 G Ex ec IIC T6...T1 Gc
	G, H, U, V	E03 E65	II 1/2 G Ex db IIC T6...T1 Ga/Gb II 1/2 D Ex ta/tb IIIC T_{200} Tx°C/T_{50} Ty°C Da/Db

Table 11-22 Ex marking temperature sensor series SITRANS TS500 "Welded Version"
Temperature sensor in modular design with protective tube made of tube material

	1	2	3	4	5	6	7	-	8	9	10	11	12		13	14	15	16		
	7	**M**	**C**	**7**	**5**	**1**	*****	**-**	*****	*****	*****	*****	*****	**-**	**a**	**b**		**c**	**-z**	**e**

Depending on the index			Marking ATEX / IECEx
a	**b**	**e**	
0, 1, 9	A...C, G...H, M, P, U, V	E01 E64	II 1/2 G Ex ia/ib IIC T6...T1 Ga/Gb II 3 G Ex ic IIC T6...T1 Gc
	A...C, G...H, U, V		II 1/2 D Ex ta/ib IIIC T_{200} Tx°C/T_{50} Ty°C Da/Db
	B, C, G, H, U, V	E04 E66	II 3 G Ex ec IIC T6...T1 Gc
	G, H, U, V	E03 E65	II 1/2 G Ex db IIC T6...T1 Ga/Gb II 1/2 D Ex ta/tb IIIC T_{200} Tx°C/T_{50} Ty°C Da/Db

Table 11-23 Ex marking temperature sensor series SITRANS TS500 "Bar stock Version"
Temperature sensor in modular design with thermometer protective tube of full material

	1	2	3	4	5	6	7	-	8	9	10	11	12		13	14		15	16			
	7	**M**	**C**	**7**	**5**	**2**	*	-	*	*	*	*	*	-	**a**	**b**		**c**	**d**	**-z**		**e**

Depending on the index			Marking ATEX / IECEx
a	**b**	**e**	
1, 9	A...C, G...H, M, P, U, V	E01 E64	II 1/2 G Ex ia/ib IIC T6...T1 Ga/Gb II 3 G Ex ic IIC T6...T1 Gc
	A...C, G...H, U, V		II 1/2 D Ex ta/ib IIIC T_{200} Tx°C/T_{50} Ty°C Da/Db
	B, C, G, H, U, V	E04 E66	II 3 G Ex ec IIC T6...T1 Gc
	G, H, U, V	E03 E65	II 1/2 G Ex db IIC T6...T1 Ga/Gb II 1/2 D Ex ta/tb IIIC T_{200} Tx°C/T_{50} Ty°C Da/Db

SITRANS TSInsert/TS100/TS200	Ex-markings ГОСТ 31610.0-2019
SITRANS TS thermoelectric and/or resistance thermoelectric converter: TSinsert, TS100, TS200	0Ex ia IIC T6...T1 Ga X, or 2Ex ic IIC T6...T1 Gc X, or Ex ia IIIC T200oC Da X or Ex ec IIC T6...T1 Gc
Operating period – 15 years Storage time – 18 months	

See also

Certificates (http://www.siemens.com/processinstrumentation/certificates)

Product documentation (Page 195)

11.6.3 SITRANS TS500

SITRANS TS500	
Type of protection "Flameproof enclosure Ex d dust explosion protection by enclosure Ex tb/tc"	
ATEX/IECEx PTB 22 ATEX 2001 X IECEx PTB 22.0004 X	see tables 7.13...7.18
NEPSI	Ex db IIC T6...T1 Ga/Gb or Ex ta/ib IIIC T200 Tx °C / T50 Ty °C Da/Db or Ex ta/tb IIIC T200 Tx °C / T50 Ty °C Da/Db
cCSAus 70037146	Class I, Division 1, Groups A, B, C, D T6, T4 ... T1 Class I, Division 1, Groups B, C, D T6, T4 ... T1 (type code 7MC65..-.....-.(G;U)..) Class I, Division 2, Groups A, B, C, D T6, T4 ... T1 Class II Division 1 Groups E, F, G T6, T4 ... T1 Class II Division 2 Groups F, G T6, T4 ... T1 Class III Ex d IIC T6, T4,T3 Ga/Gb Ex tb IIIC T85 °C, T100 °C, T150 °C Da/Db AEx tb IIIC T85 °C, T100 °C, T150 °C Da/Db
cFMus FM17US0010X (USA) FM17CA0005X (Canada)	Class I Division 1, Groups A, B, C, D; T* Ta = -40 °C up to +Tx°C Class II, III, Division 1, Groups E, F, G; T* Ta = -40 °C up to +Tx°C Class I, II, III, Division 2, Group A, B, C, D, F, G; T* Ta = -40°C up to +Tx °C Class I, Zone 1, AEx d IIC T* Gb Ta = -40 °C up to +Tx °C (only FMus) Class I, Zone 1, Ex d IIC T* Gb Ta = -40 °C up to +Tx °C (only cFM) Zone 21 AEx tb IIIC T* Db Ta = -40 °C up to +Tx °C (only FMus) Ex tb IIIC T* Db Ta = -40°C up to +Tx °C (only cFM) Type 4X, IP66/67

SITRANS TS500	**Ex-markings ГОСТ 31610.0-2019**
SITRANS TS500 thermoelectric and/or resistance thermoelectric converters: EAC Ex	Ex ia IIC T6...T1 Ga or Ex ic IIC T6...T1 Gc or Ex ia/ib IIC T6...T1 Ga/Gb or Ex ec IIC T6...T1 Gc or Ex db IIC T6...T1 Ga/Gb or Ex ta/ib IIIC T200 Tx °C / T50 Ty °C Da/Db or Ex ta/tb IIIC T200 Tx °C / T50 Ty °C Da/Db
Indicator digital DVM-LCD Type: 7MF4997-1BS, A5E33119275	Ex ia IIC Ga U
Operating period – 15 years Storage time – 18 months	

See also

Certificates (http://www.siemens.com/processinstrumentation/certificates)

Product documentation (Page 195)

SITRANS TSinsert/TS500 (Asia Portfolio 7MC5 + E55/E59)	
NEPSI/CCC	Ex ia IIC T6 Ga Ex ia IIIC T_{200}80°C Da Ex tb IIIC T80°C Db Ta -20°C ~ +60°C Electrical characteristics: Ui=30V Ii=100mA Pi=0.75W Ci≈0 Li≈0 Dust: 0.5 V 5 mA

11.7 Display

Ambient conditions	
Ambient temperature	-20 ... +85 °C (-7 ... +185 °F) You can find the data for use in hazardous areas in the respective certificate.
Storage temperature	-40 ... +85 °C (-40 ... +185 °F) You can find the data for use in hazardous areas in the respective certificate.
Best readability	-10 ... +70 °C (14 ... +158 °F)

Power supply	
Power supply	Is provided by the temperature transmitter
Own power consumption	< 3 mA
Voltage drop over terminals	< 2.5 V

Display	
Area of application	SITRANS TF and SITRANS TS500 temperature transmitter
Measuring frequency	≥ 2 Hz
Local display	Maximum 5 decimal places
Display range	-99999 ... +99999
Decimal point change	Automatically
Error warning	According to NAMUR NE 107

Mechanical construction	
Dimensions	Diameter: 64.3 mm (2.53") Height: 15 ... 22.5 mm (0.6 ... 0.88")
Installation	Plug in
Enclosure material	Plastic
Wiring	Plug-in connection

Ambient conditions	
Pollution degree according to IEC 61010	1 ... 2
Ambient temperature range	0 ... 50 °C (+32 ... +122 °F)
Storage temperature range	-20 ... +65 °C (-4 ... +149 °F)
Relative humidity	5 ... 80% at 25 °C (no condensation)

USB port	
Connection	USB 1.1, compatible with USB 2.0
USB current	Standard, < 200 mA

Power supply of temperature transmitter	
Available power supply	Max. 23 mA
Available supply voltage	Max. 20 V (at 4 mA)

Construction	
Weight	Approx. 250 g
Dimensions (W x H x D)	Approx. 105 x 58 x 26 mm
Degree of protection	IP20

11.8 Factory settings of SITRANS TH320/TH420

11.8.1 Factory setting of SITRANS TH320

Factory settings	**SITRANS TH320/TR320**
Input	Pt100 (IEC 751) in 3-wire connection
Measuring range	+0 ... +100 °C (+32 ... +212 °F)
Fault current	
• Input circuit wire break	22.8 mA
• Input circuit short circuit	22.4 mA

Factory settings	SITRANS TH320/TR320
• Input monitoring wire break and short-circuit	
Sensor calibration	No sensor calibration of the input and output
Damping	0.0 s

11.8.2 Factory setting of SITRANS TH420

Factory settings	SITRANS TH420/TR420
Input 1	Pt100 (IEC 751) in 3-wire connection
Input 2	not configurable (inactive)
Measuring range	+0 ... +100 °C (+32 ... +212 °F)
Fault current	
• Input circuit wire break	22.8 mA
• Input circuit short circuit	22.4 mA
• Input circuit drift	22 mA (active when input 2 is active)
Input monitoring wire break and short-circuit	
Sensor calibration	No sensor calibration of the input and output
Damping	0.0 s

Dimension drawings

12

12.1 Overview

The following tables contain brief descriptions of the temperature sensors as well as references to the corresponding dimensional drawings.

Table 12-1 Overview of SITRANS TS100 dimensional drawings

Versions	Description
Basic version	• Temperature sensors in cable design, for universal use, plastic-insulated version, for unfavorable space conditions. • SITRANS TS100 cable version (7MC71..) (Page 157)
Mineral-insulated cable	• Temperature sensors in cable design, for universal use, mineral-insulated version, for unfavorable space conditions. • SITRANS TS100 cable version (7MC71..) (Page 157)

Table 12-2 Overview of SITRANS TS200 dimensional drawings

Versions	Description
Basic sensor, flying leads, LEMO 1S coupling, M12, thermocouple coupling, mini connection head	• Temperature sensors in cable design, for universal use, mineral-insulated version, for unfavorable space conditions. • SITRANS TS200 compact design (7MC72..) (Page 158)

Table 12-3 Overview of SITRANS TS300 dimensional drawings

Versions	Description
Modular design with a wide range of process connections for hygienic applications	• Temperature sensors for pipe and vessels in a hygienic application. • Design according EHEDG • SITRANS TS300 for food, pharmaceuticals and biotechnology: Modular type (7MC8005..), clamp-on type (7MC8016..) (Page 159)
Clamp-on design with collar, strap, or hook mounting, integrated transmitter or head	• Clamp-on temperature sensor particulary for satured steam sterilization. • SITRANS TS300 for food, pharmaceuticals and biotechnology: Modular type (7MC8005..), clamp-on type (7MC8016..) (Page 159)

Table 12-4 Overview of SITRANS TS500 dimensional drawings

Versions	Description
Type 2, pipe version without process connection	• Temperature sensors for containers and pipelines, pipe version for low to medium stress, without process connection, without extension, for plugging-in or use with sliding compression joints • SITRANS TS500, types 2 (7MC751.-0NA/B..) and 2N (7MC751.-1N...) (Page 163)
Type 2N, pipe version with screw-in nipple	• Temperature sensors for containers and pipelines, pipe version for low to medium stress, protective tube type 2N similar to DIN 43772, for screwing-in, without extension, for process temperatures up to 100 °C (212°F) • SITRANS TS500, types 2 (7MC751.-0NA/B..) and 2N (7MC751.-1N...) (Page 163)
Type 2G, pipe version with screw-in nipple and extension	• Temperature sensors for containers and pipelines, pipe version for low to medium stress, protective tube in accordance with DIN 43772, type 2G, for screwing-in, with extension • SITRANS TS500, types 2G (7MC751.-1.A/B..-1/9...) and 2F (7MC751.-2/3/4.A/B..-1/9...) (Page 165)
Type 2F, pipe version with flange and extension	• Temperature sensors for containers and pipelines, pipe version for low to medium stress, protective tube in accordance with DIN 43772, type 2F, with flange, with extension • SITRANS TS500, types 2G (7MC751.-1.A/B..-1/9...) and 2F (7MC751.-2/3/4.A/B..-1/9...) (Page 165)
Type 3, fast pipe version without process connection	• Temperature sensors for containers and pipelines, pipe version for low to medium stress, without process connection, without extension, for plugging-in or use with sliding compression joints • SITRANS TS500, type 3 (7MC751.-0.K..-0...) (Page 166)
Type 3G, fast pipe version with screw-in nipple and extension	• Temperature sensors for containers and pipelines, pipe version for low to medium stress, protective tube in accordance with DIN 43772, type 3G, for screwing-in, without process connection, with extension • SITRANS TS500, types 3G (7MC751.-1.K..-1/9...) and 3F (7MC751.-2/3/4.K..-1/9...) (Page 167)
Type 3F, fast pipe version with flange and extension	• Temperature sensors for containers and pipelines, pipe version for low to medium stress, protective tube in accordance with DIN 43772, type 3F, with flange, with extension • SITRANS TS500, types 3G (7MC751.-1.K..-1/9...) and 3F (7MC751.-2/3/4.K..-1/9...) (Page 167)
Types 4 and 4F, full material version, with extension	• Temperature sensors for containers and pipelines, full material version for medium to very high stress, protective tube in accordance with DIN 43772, type 4, for welding-in, with extension • Protective tube type 4F, with flange, with extension • SITRANS TS500, types 4 and 4F (7MC752..) (Page 168)
Type ST, threaded tapered well (7MC65..)	• Temperature sensors for vessels and pipelines, threaded process connection, tapered thermowell • SITRANS TS500, type ST, threaded tapered well (7MC65..) (Page 170)
Type SST, threaded tapered well (7MC55..)	• Temperature sensors for vessels and pipelines, threaded process connection, tapered thermowell • SITRANS TS500, type SST, threaded tapered well (7MC55..) (Page 171)

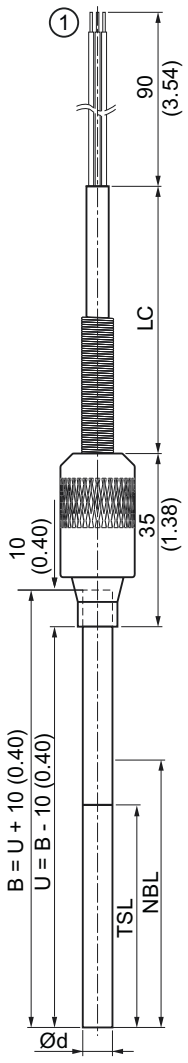
Versions	Description
Type SS, threaded straight well (7MC65..)	• Temperature sensors for vessels and pipelines, threaded process connection, straight thermowell • SITRANS TS500, type SS, threaded straight well (7MC65..) (Page 173)
Type SS, threaded straight well (7MC55..)	• Temperature sensors for vessels and pipelines, threaded process connection, straight thermowell • SITRANS TS500, type SS, threaded straight well (7MC55..) (Page 174)
Type SR, threaded reduced well (7MC65..)	• Temperature sensors for vessels and pipelines, threaded process connection, straight thermowell • SITRANS TS500, type SR, threaded reduced well (7MC65..) (Page 175)
Type SR, threaded reduced well (7MC55..)	• Temperature sensors for vessels and pipelines, threaded process connection, straight thermowell • SITRANS TS500, type SR, threaded reduced well (7MC55..) (Page 176)
Type FT, flanged tapered well (7MC65..)	• Temperature sensors for vessels and pipelines, threaded process connection, straight thermowell • SITRANS TS500, type FT, flanged tapered well (7MC65..) (Page 177)
Type FST, flanged tapered well (7MC55..)	• Temperature sensors for vessels and pipelines, threaded process connection, straight thermowell • SITRANS TS500, type FST, flanged tapered well (7MC55..) (Page 178)
Type FS, flanged straight well (7MC65..)	• Temperature sensors for vessels and pipelines, threaded process connection, straight thermowell • SITRANS TS500, type FS, flanged straight well (7MC65..) (Page 180)
Type FS, flanged straight well (7MC55..)	• Temperature sensors for vessels and pipelines, threaded process connection, straight thermowell • SITRANS TS500, type FS, flanged straight well (7MC55..) (Page 181)
Type FR, flanged reduced well (7MC65..)	• Temperature sensors for vessels and pipelines, threaded process connection, straight thermowell • SITRANS TS500, type FR, flanged reduced well (7MC65..) (Page 182)
Type FR, flanged reduced well (7MC55..)	• Temperature sensors for vessels and pipelines, threaded process connection, straight thermowell • SITRANS TS500, type FR, flanged reduced well (7MC55..) (Page 183)
Type SWT, socket tapered well (7MC65..)	• Temperature sensors for vessels and pipelines, socket well process connection, tapered thermowell • SITRANS TS500, type SWT, socket tapered well (7MC65..) (Page 184)
Type SWT, socket tapered well (7MC55..)	• Temperature sensors for vessels and pipelines, socket well process connection, tapered thermowell • SITRANS TS500, type SWST, socket tapered well (7MC55..) (Page 185)
Type SWS, socket straight well (7MC65..)	• Temperature sensors for vessels and pipelines, socket well process connection, tapered thermowell • SITRANS TS500, type SWS, socket straight well (7MC65..) (Page 186)
Type SWS, socket straight well (7MC55..)	• Temperature sensors for vessels and pipelines, socket well process connection, tapered thermowell • SITRANS TS500, type SWS, socket straight well (7MC55..) (Page 187)

Versions	Description
Type SWR, socket reduced well (7MC65..)	• Temperature sensors for vessels and pipelines, socket well process connection, tapered thermowell • SITRANS TS500, type SWR, socket reduced well (7MC65..) (Page 188)
Type SWR, socket reduced well (7MC55..)	• Temperature sensors for vessels and pipelines, socket well process connection, tapered thermowell • SITRANS TS500, type SWR, socket reduced well (7MC55..) (Page 189)
SITRANS TS500 for installation in existing protective tubes	• Temperature sensors for containers and pipelines, temperature sensors for installation in existing protective sleeves, suitable for sleeves in accordance with DIN 43772 and ASME B40.9-2001, with extension of European or American design • SITRANS TS500 for installation in existing protective tubes (Page 190)
Type GP, general purpose, no well	• Temperature sensors for vessels and pipelines, threaded process connection, no thermowell • SITRANS TS500, type GP, general purpose, no well (Page 192)

Table 12-5 Overview of SITRANS TSinsert dimensional drawings: measuring inserts for retrofitting and upgrading

Versions	Description
European design	• Measuring inserts for temperature sensors, replaceable, mineral-insulated version, European design (DIN ceramic base), spring approx. 8 mm (0.31 inch) • SITRANS TSinsert - measuring inserts for SITRANS TS500 (Page 193)
American design	• Measuring inserts for temperature sensors, replaceable, mineral-insulated version, American design, spring approx. 25 mm (0.98 inch) • SITRANS TSinsert - measuring inserts for SITRANS TS500 (Page 193)

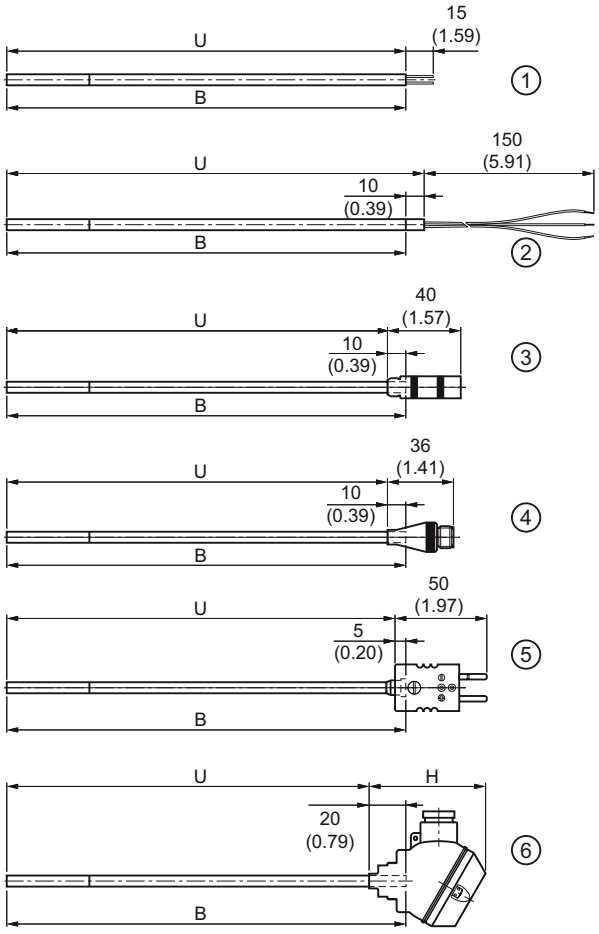
12.2 SITRANS TS100 cable version (7MC71..)



① TS100 mineral-insulated version
Ød External diameter of measuring insert (6 (0.24))
B Length of measuring insert
LC Cable length
NBL Non bendable length
TSL Temperature sensitive length
U Mounting length

Figure 12-1 Dimensional drawings SITRANS TS100 - dimensions in mm (inch)

12.3 SITRANS TS200 compact design (7MC72..)

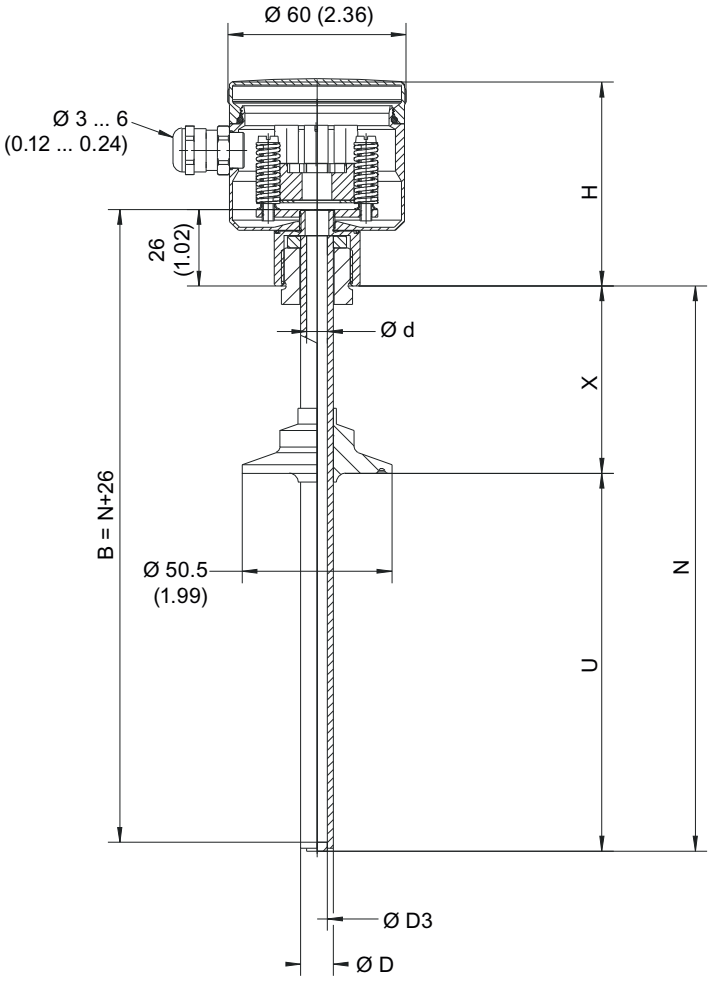


B	Length of measuring insert	U	Mounting length
H	Height of head		
①	Basic sensor	U = B	
②	Flying Leads	U = B + 10 (0.39)	
③	Coupling LEMO 1S	U = B - 10 (0.39)	
④	M12 connector	U = B - 10 (0.39)	
⑤	Thermocouple coupling	U = B - 5 (0.20)	
⑥	Miniature connection head	U = B - 20 (0.79)	

Figure 12-2 Dimensional drawings SITRANS TS200 - dimensions in mm (inch)

12.4 SITRANS TS300 for food, pharmaceuticals and biotechnology: Modular type (7MC8005..), clamp-on type (7MC8016..)

SITRANS TS300 Modular:

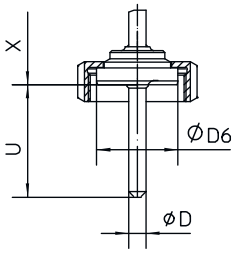


B	Length of measuring insert	H	Height of head
Ød	External diameter of measuring insert	N	Nominal length
ØD	External diameter of process connection	U	Mounting length (see process connection options)
ØD3	Internal diameter of protective tube	X	Extension (see process connection options)

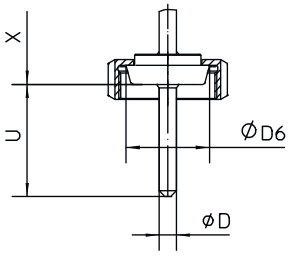
Figure 12-3 Dimensions in mm (inch)

Process connection options:

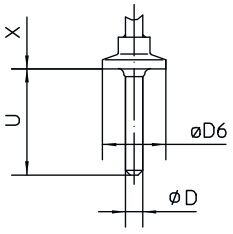
tapered coupling with groove union nut aseptic design per DIN 11864-1



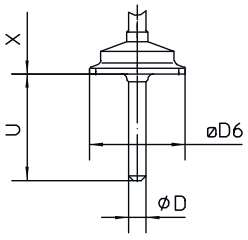
tapered coupling with groove union nut per DIN 11851



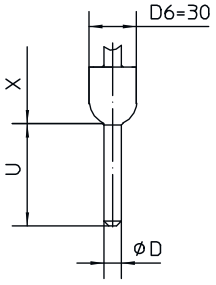
tri-clamp connection



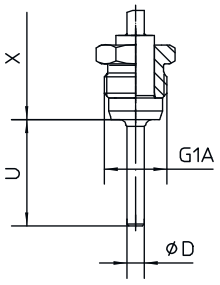
clamp connection per DIN 32676 or ISO 2852



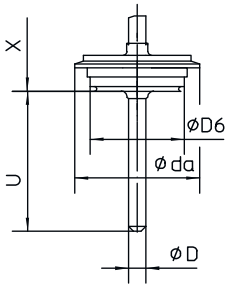
thermowell with welding ball 30 x 40 mm



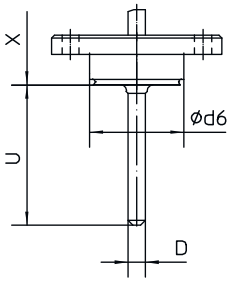
G1A dead-zone free (conical metal taper)



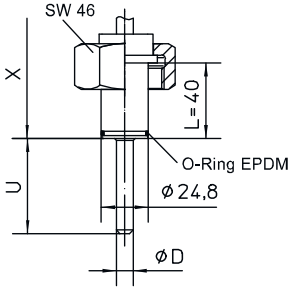
Varivent connection



NEUMO connection

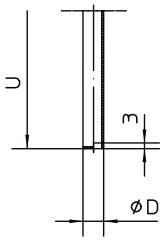


connection per INGOLD DN 25 with coupling nut

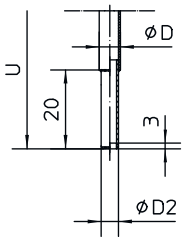


neck tube according to DIN 43772

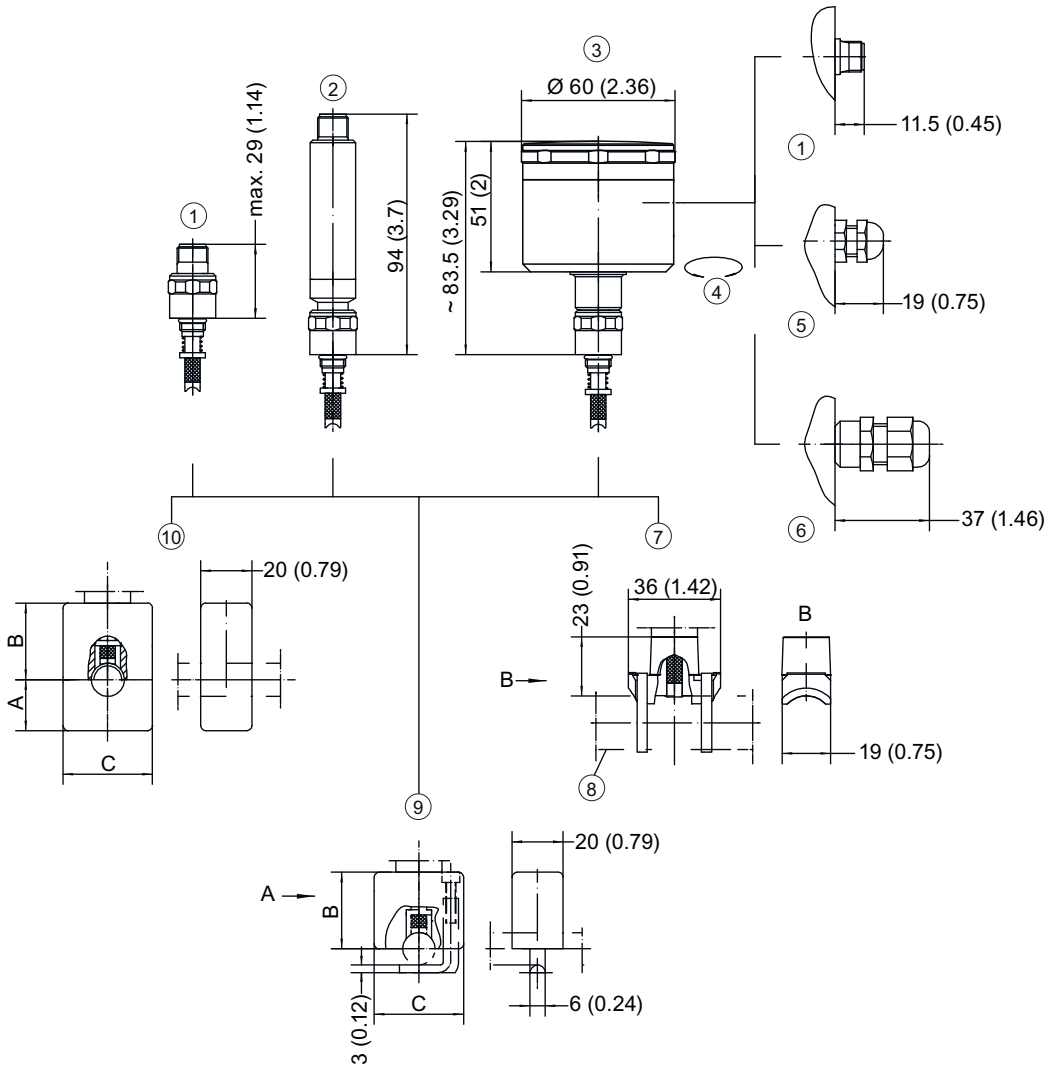
model 2



similar model 3 reduced tip



SITRANS TS300 Clamp-on:



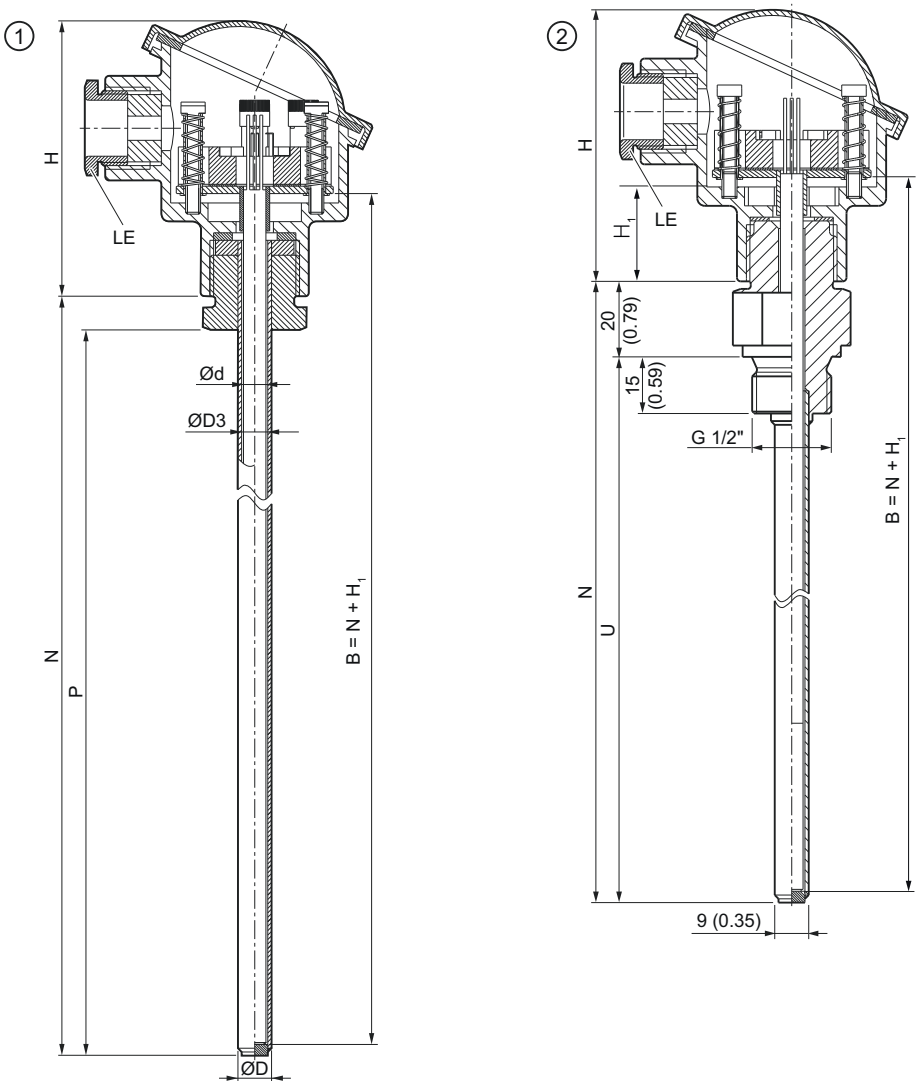
①	circular connector M12 x 1	⑥	cable connection M16 x 1,5 cable Ø4, 5-10
②	transmitter with circular connector M12 x 1	⑦	clamping shoe for pipe ≥ Ø10 - ~Ø300
③	stainless steel connection head housing	⑧	example Ø21 (0.83)
④	electrical connection ± 170° rotatable	⑨	clamping bracket for pipe Ø4-17, 2
⑤	cable connection M12 x 1,5 cable Ø3-6, 5	⑩	clamping block for pipe Ø4-57

pipe Ø	**A**	**B**	**C**
4-17.2 (0.16 - 0.68)	20	30	35
18-38 (0.71 - 1.5)	30	40	70
38.1-57 (1.5 - 2.24)	40	50	85

Figure 12-4 Dimensions in mm (inch)

12.5 SITRANS TS500

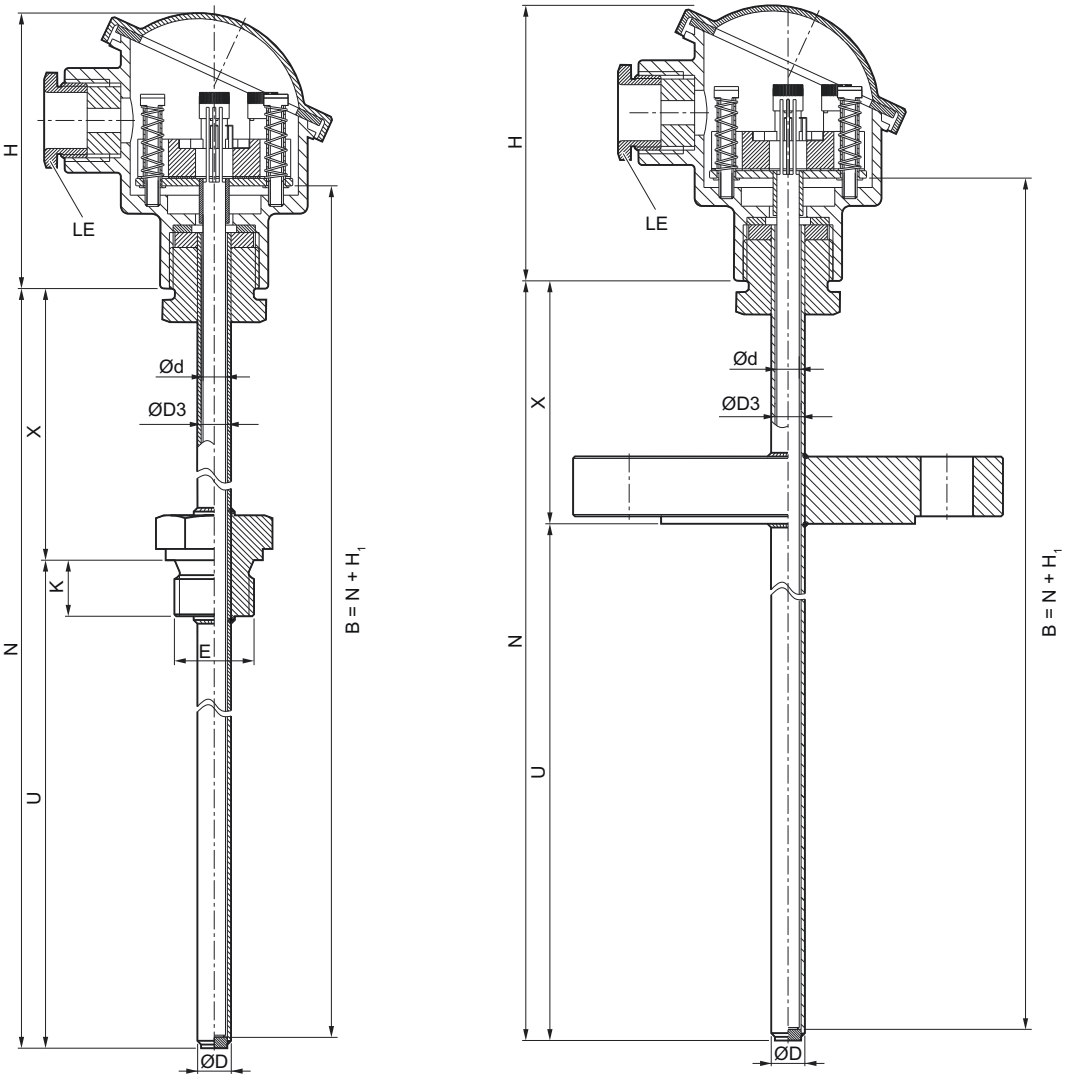
12.5.1 SITRANS TS500, types 2 (7MC751.-0NA/B..) and 2N (7MC751.-1N...)



①	Type 2, pipe version without process connection		
②	Type 2N, pipe version with screw-in nipple		
B	Length of measuring insert	H_1	Type Axx: 41 (1.61) Type Bxx: 26 (1.02)
Ød	External diameter of measuring insert	K	Penetration depth
ØD	To ①: External diameter of fixing point (6 (0.24))	LE	Cable inlet
ØD	To ②: External diameter of process connection	N	Nominal length
ØD3	Internal diameter of protective tube	P	Space for process connection
E	Thread dimension of process connection	U	Mounting length
H	Height of head	X	Extension

Figure 12-5 Dimensional drawings SITRANS TS500, types 2 and 2N - dimensions in mm (inch)

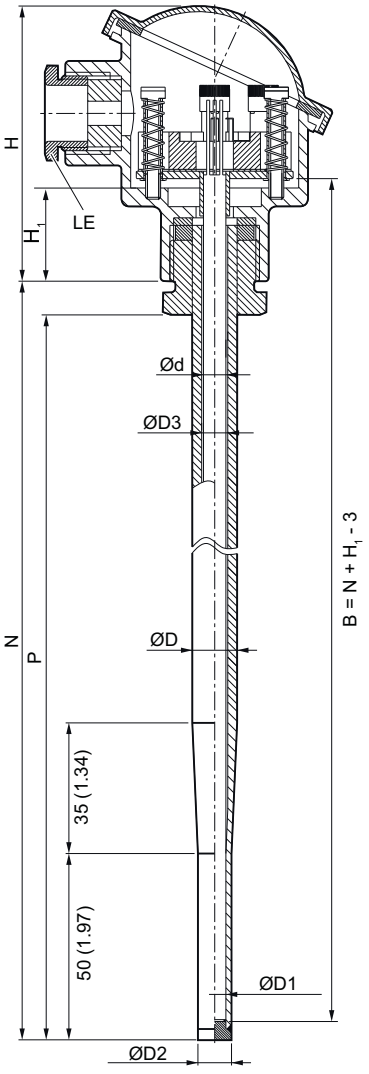
12.5.2 SITRANS TS500, types 2G (7MC751.-1.A/B..-1/9...) and 2F (7MC751.-2/3/4.A/B..-1/9...)



①	Type 2G, pipe version with screw-in nipple and extension		
②	Type 2F, pipe version with flange and extension		
B	Length of measuring insert	H_1	Type Axx: 41 (1.61) Type Bxx: 26 (1.02)
Ød	External diameter of measuring insert (6 (0.24))	K	Penetration depth
ØD	External diameter of process connection	LE	Cable inlet
ØD3	Internal diameter of protective tube	N	Nominal length
E	Thread dimension of process connection	U	Mounting length
H	Height of head	X	Extension

Figure 12-6 Dimensional drawings SITRANS TS500, types 2G and 2F - dimensions in mm (inch)

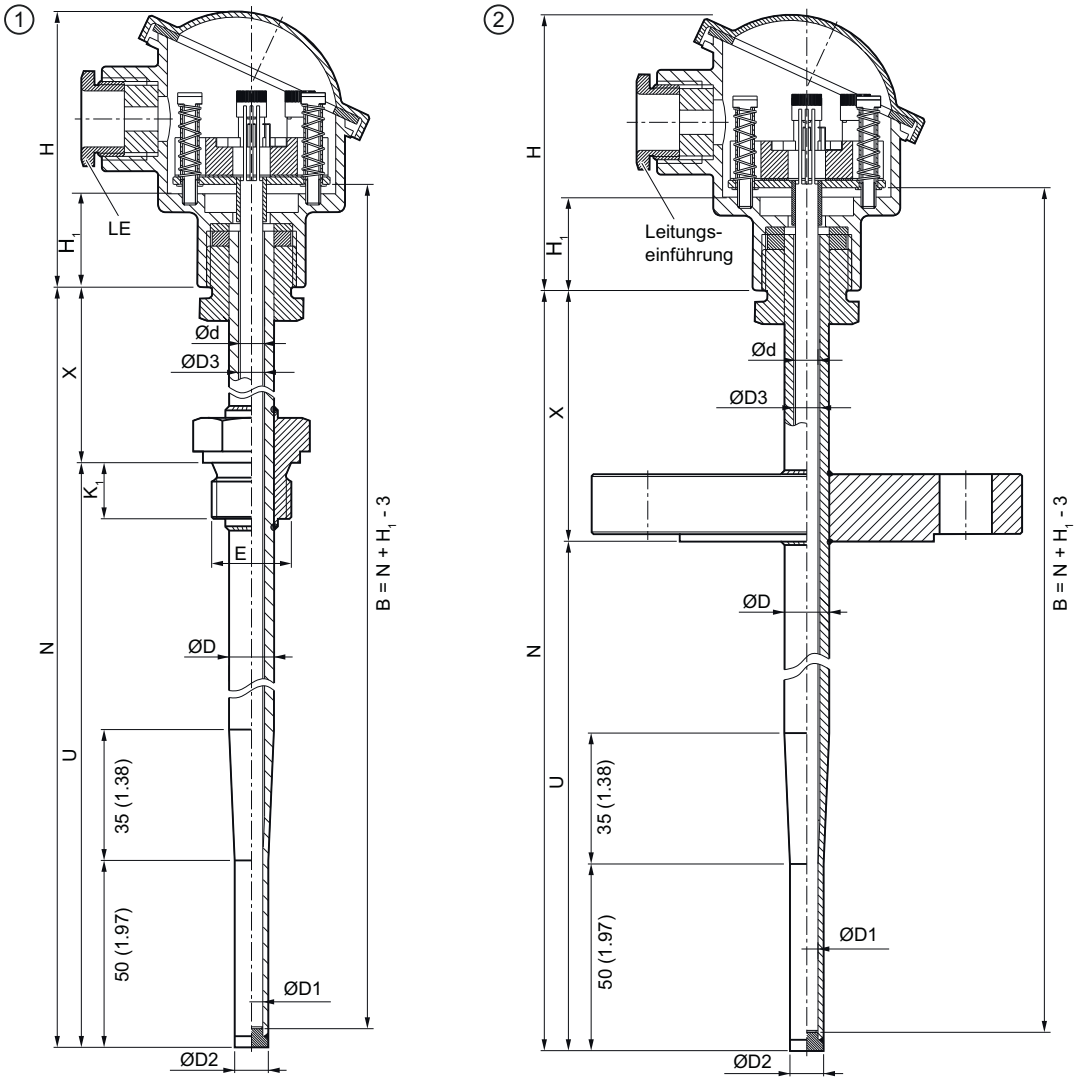
12.5.3 SITRANS TS500, type 3 (7MC751.-0.K..-0...)



①	Type 3, fast pipe version without process connection		
B	Length of measuring insert (European)	H	Height of head
Ød	External diameter of measuring insert (6 (0.24))	H_1	Type Axx: 41 (1.61) Type Bxx: 26 (1.02)
ØD	External diameter of fixing point	LE	Cable inlet
ØD1	Internal diameter of tip	N	Nominal length
ØD2	External diameter of tip	P	Space for process connection
ØD3	Internal diameter of protective tube		

Figure 12-7 Dimensional drawing SITRANS TS500, type 3 - dimensions in mm (inch)

12.5.4 SITRANS TS500, types 3G (7MC751.-1.K..-1/9...) and 3F (7MC751.-2/3/4.K..-1/9...)



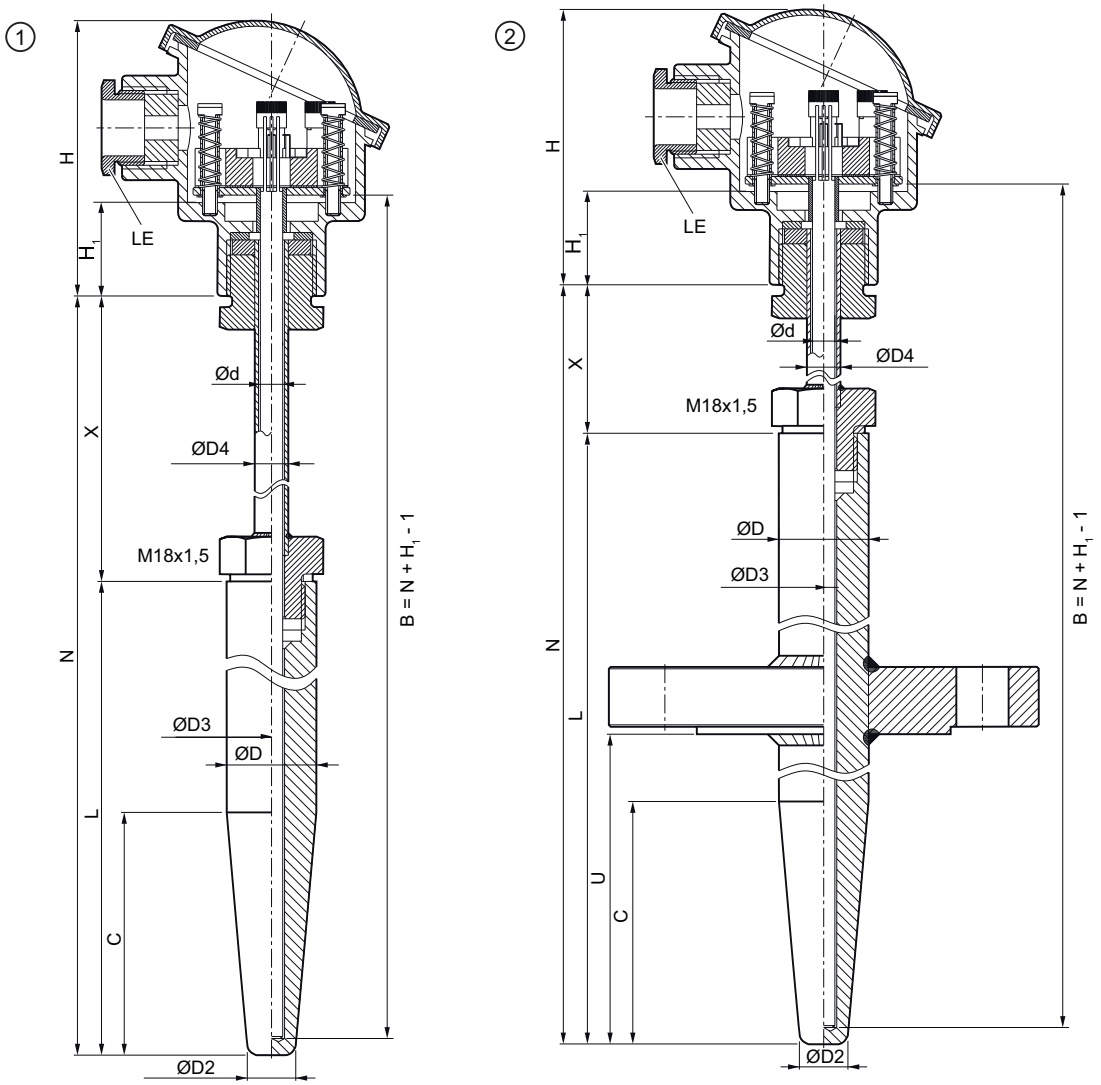
① Type 3G, fast pipe version with screw-in nipple and extension

② Type 3F, fast pipe version with flange and extension

B	Length of measuring insert (European)	H_1	Type Axx: 41 (1.61) Type Bxx: 26 (1.02)
Ød	External diameter of measuring insert (6 (0.24))	H	Height of head
ØD	External diameter of process connection	K	Penetration depth
ØD1	Internal diameter of tip	LE	Cable inlet
ØD2	External diameter of tip	N	Nominal length
ØD3	Internal diameter of protective tube	U	Mounting length
E	Thread dimension of process connection	X	Extension

Figure 12-8 Dimensional drawings SITRANS TS500, types 3G and 3F

12.5.5 SITRANS TS500, types 4 and 4F (7MC752..)



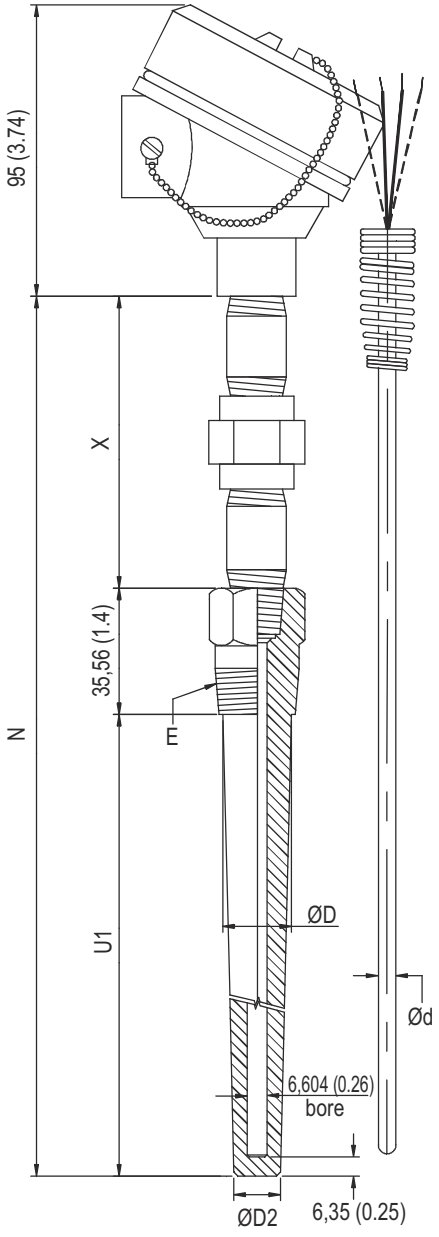
① Type 4, full material version, with extension

② Type 4F, full material version, with flange and extension

B	Length of measuring insert	E	Thread dimension of process connection
C	Cone length = U_{min}	H	Height of head
Ød	External diameter of measuring insert (6 (0.24))	H_1	Type Axx: 41 (1.61) Type Bxx: 26 (1.02)
ØD	External diameter of process connection	K	Penetration depth
ØD1	Internal diameter of tip	L	Length of protective sleeve
ØD2	External diameter of tip	LE	Cable inlet
ØD3	Internal diameter of protective tube	N	Nominal length
ØD4	External diameter of extension	U	Mounting length
		X	Extension

Figure 12-9 Dimensional drawings SITRANS TS500, types 4 and 4F - dimensions in mm (inch)

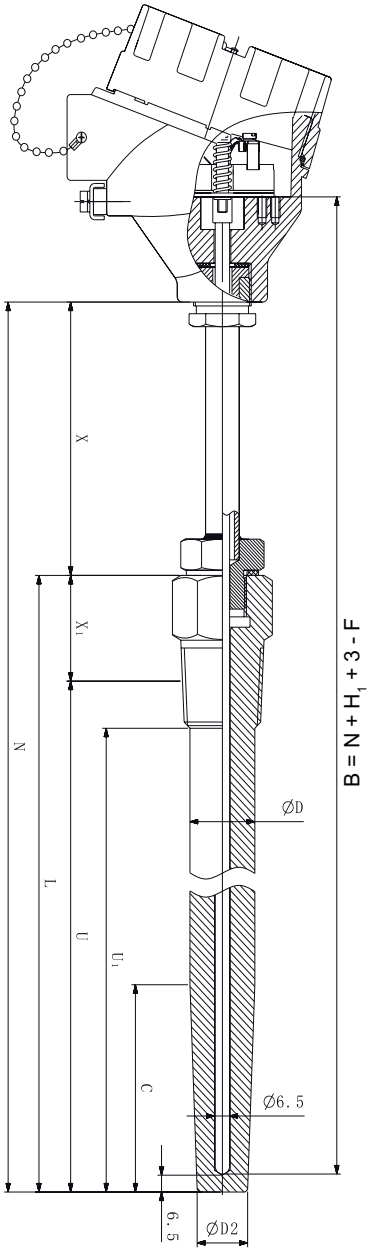
12.5.6 SITRANS TS500, type ST, threaded tapered well (7MC65..)



Ød	External diameter of measuring insert	E	Thread dimension of process connection
ØD	External diameter of process connection	N	Nominal length
ØD2	External diameter of tip	U1	Unsupported length
X	Extension		

Figure 12-10 Dimensional drawings SITRANS TS500, type ST, threaded tapered well - dimensions in mm (inch)

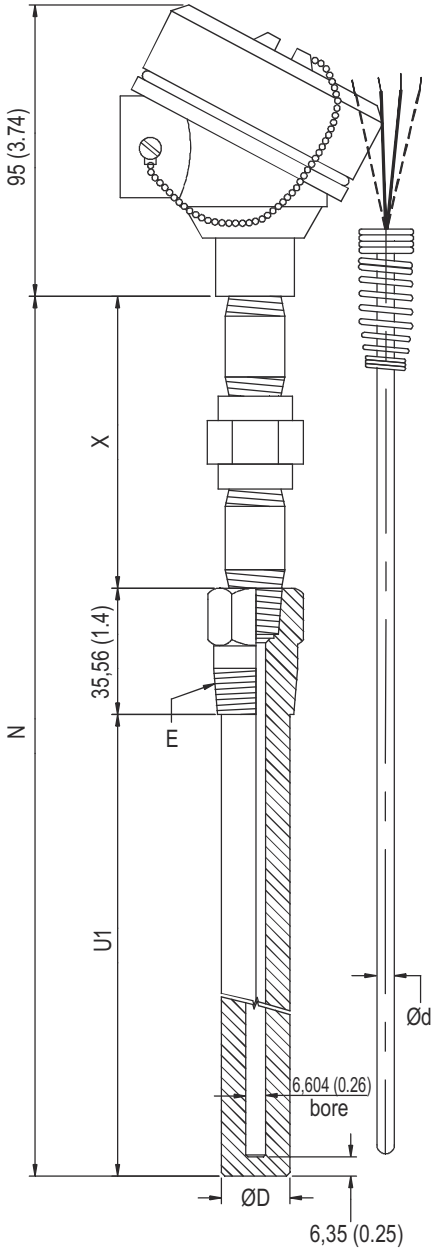
12.5.7 SITRANS TS500, type SST, threaded tapered well (7MC55..)



L	Length of thermowell	B	Length of insert
ØD1	External diameter of process connection	N	Nominal length
ØD2	External diameter of tip	U	Insertion length
		U_1	Unsupported length
X	Extension	H_1	Head bottom thickness: Type Axx = 41 (1.61) Type Bxx = 26 (1.02)
X_1	Lag length	C	Cone length
		F	Thermowell bottom thickness

Figure 12-11 Dimensional drawings SITRANS TS500, type SST, threaded tapered well (7MC55...) - dimensions in mm (inch)

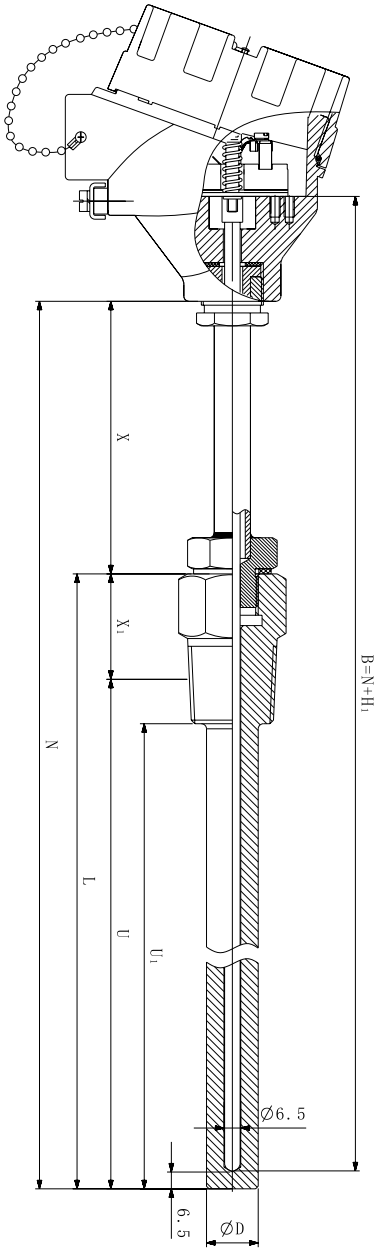
12.5.8 SITRANS TS500, type SS, threaded straight well (7MC65..)



Ød	External diameter of measuring insert	E	Thread dimension of process connection
ØD	External diameter of process connection	N	Nominal length
X	Extension	U1	Unsupported length

Figure 12-12 Dimensional drawings SITRANS TS500, type SS, threaded straight well - dimensions in mm (inch)

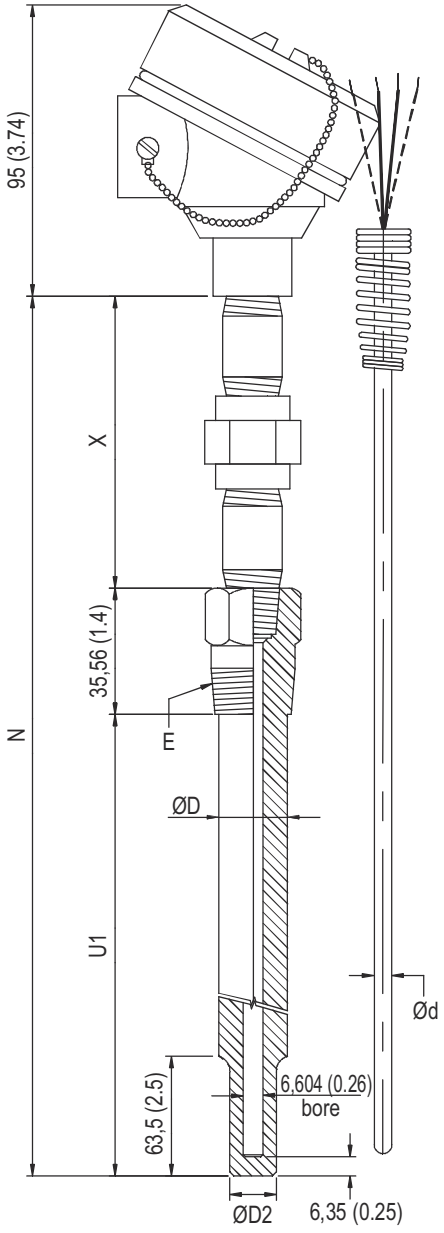
12.5.9 SITRANS TS500, type SS, threaded straight well (7MC55..)



L	Length of thermowell	X_1	Lag length
H_1	Head bottom thickness: Type Axx = 41 (1.61) Type Bxx = 26 (1.02)	B	Length of measuring insert
ØD	External diameter of process connection	N	Nominal length
X	Extension	U	Insertion length
		U_1	Unsupported length

Figure 12-13 Dimensional drawings SITRANS TS500, type SS, threaded straight well (7MC55...)

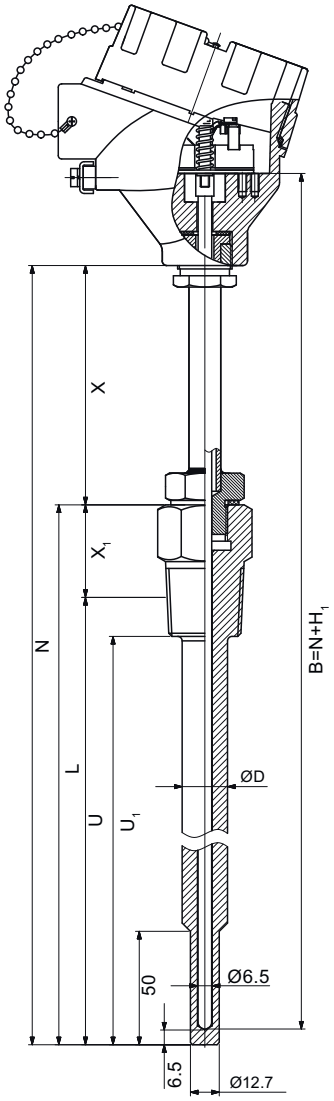
12.5.10 SITRANS TS500, type SR, threaded reduced well (7MC65..)



Ød	External diameter of measuring insert	E	Thread dimension of process connection
ØD	External diameter of process connection	N	Nominal length
ØD2	External diameter of tip	U1	Unsupported length
X	Extension		

Figure 12-14 Dimensional drawings SITRANS TS500, type SR, threaded reduced well - dimensions in mm (inch)

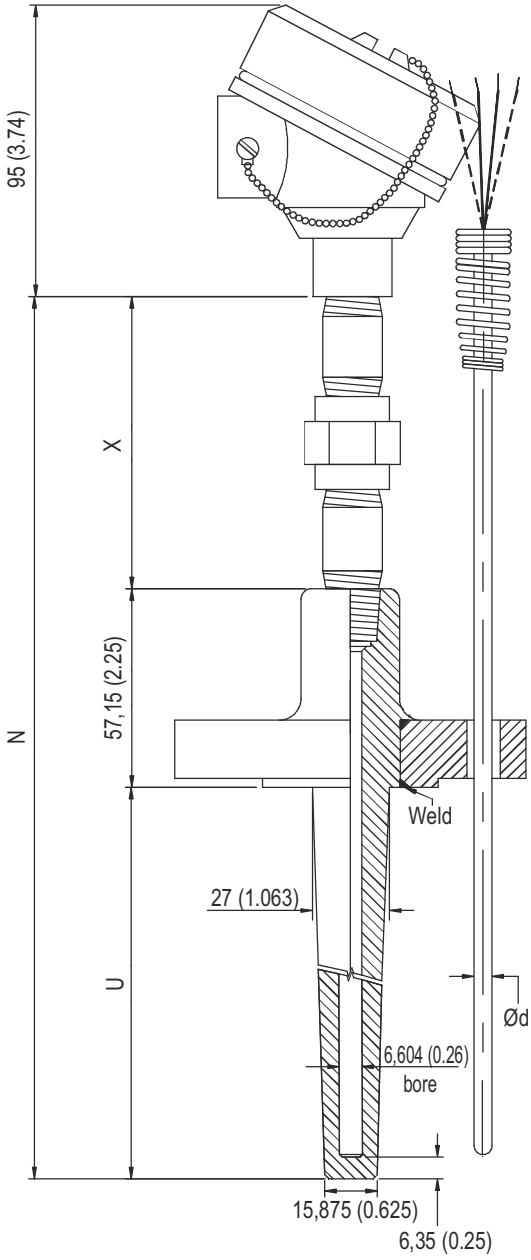
12.5.11 SITRANS TS500, type SR, threaded reduced well (7MC55..)



H_1	Head bottom thickness: Type Axx = 41 (1.61) Type Bxx = 26 (1.02)	B	Length of measuring insert
ØD	External diameter of process connection	N	Nominal length
X	Extension	U	Insertion length
		U_1	Unsupported length
X_1	Lag length	L	Length of thermowell

Figure 12-15 Dimensional drawings SITRANS TS500, type SR, threaded reduced well (7MC55...)

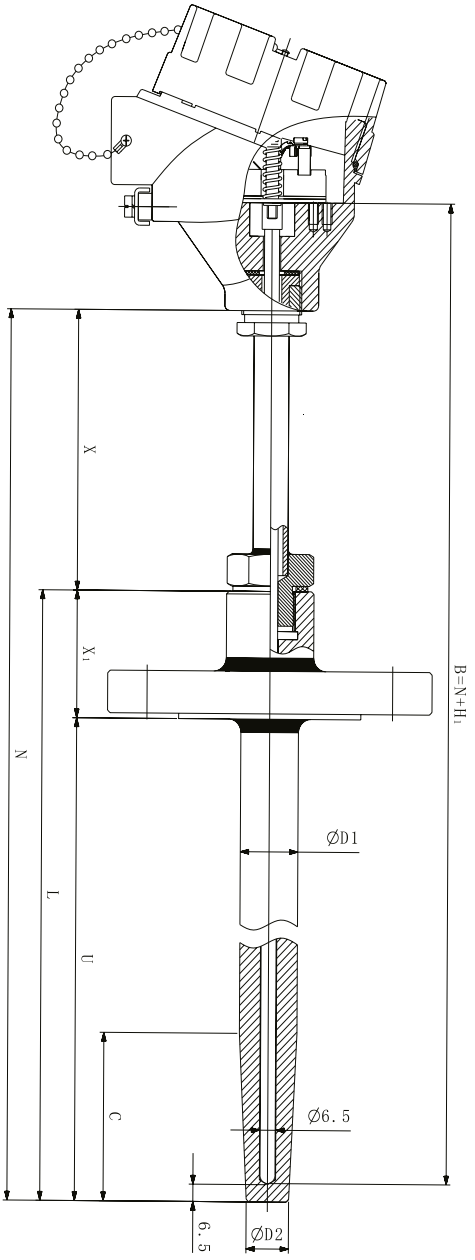
12.5.12 SITRANS TS500, type FT, flanged tapered well (7MC65..)



Ød	External diameter of measuring insert (6 (0.24))	N	Nominal length
X	Extension	U	Mounting length

Figure 12-16 Dimensional drawings SITRANS TS500, type FT, flanged tapered well - dimensions in mm (inch)

12.5.13 SITRANS TS500, type FST, flanged tapered well (7MC55..)

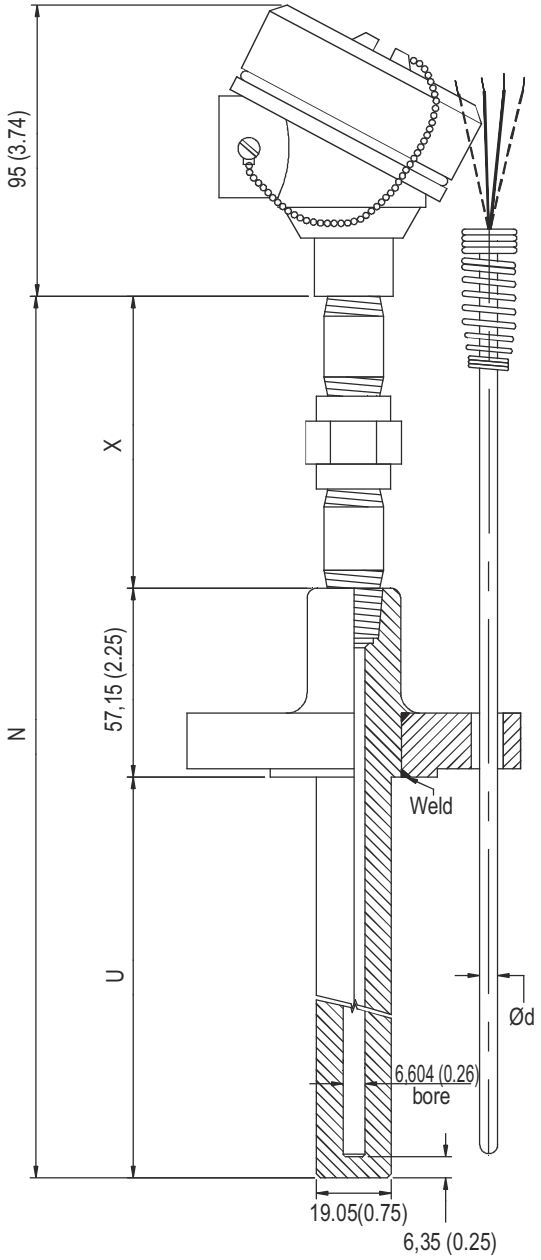


L	Length of thermowell	B	Length of measuring Insert
ØD1	External diameter of process connection	N	Nominal length
ØD2	External diameter of tip	U	Insertion length

X	Extension length	H_1	Head bottom thickness Type Axx = 41 (1.61) Type Bxx = 26 (1.02)
X_1	Lag lenght	C	Cone Length

Figure 12-17 Dimensional drawings SITRANS TS500, type FST, flanged tapered well (7MC55...)

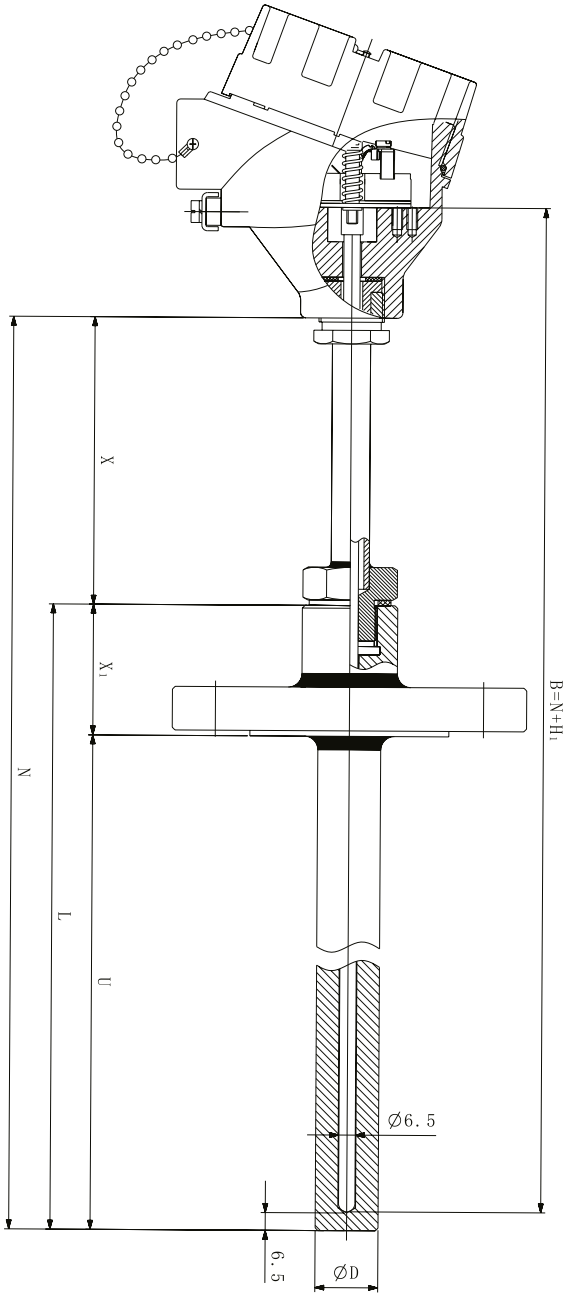
12.5.14 SITRANS TS500, type FS, flanged straight well (7MC65..)



Ød	External diameter of measuring insert (6 (0.24))	N	Nominal length
X	Extension	U	Mounting length

Figure 12-18 Dimensional drawings SITRANS TS500, type FS, flanged straight well - dimensions in mm (inch)

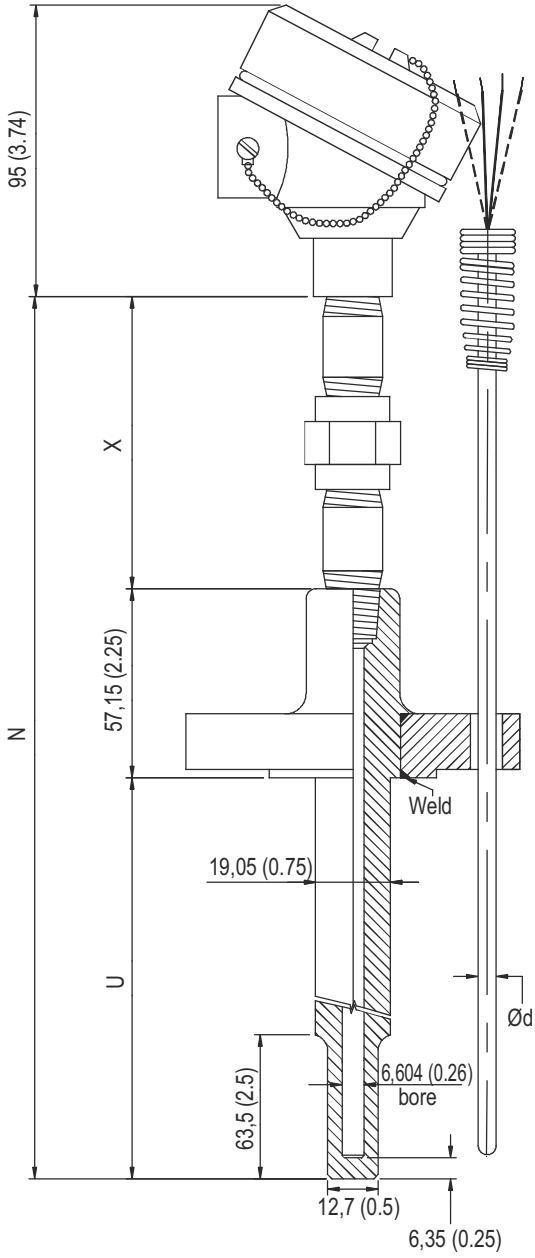
12.5.15 SITRANS TS500, type FS, flanged straight well (7MC55..)



ØD	External diameter of measuring insert	N	Nominal length
X	Extension	U	Mounting length
X_1	Lag length	B	Lenght of measuring insert
H_1	Head bottom thickness		

Figure 12-19 Dimensional drawings SITRANS TS500, type FS, flanged straight well (7MC55...)

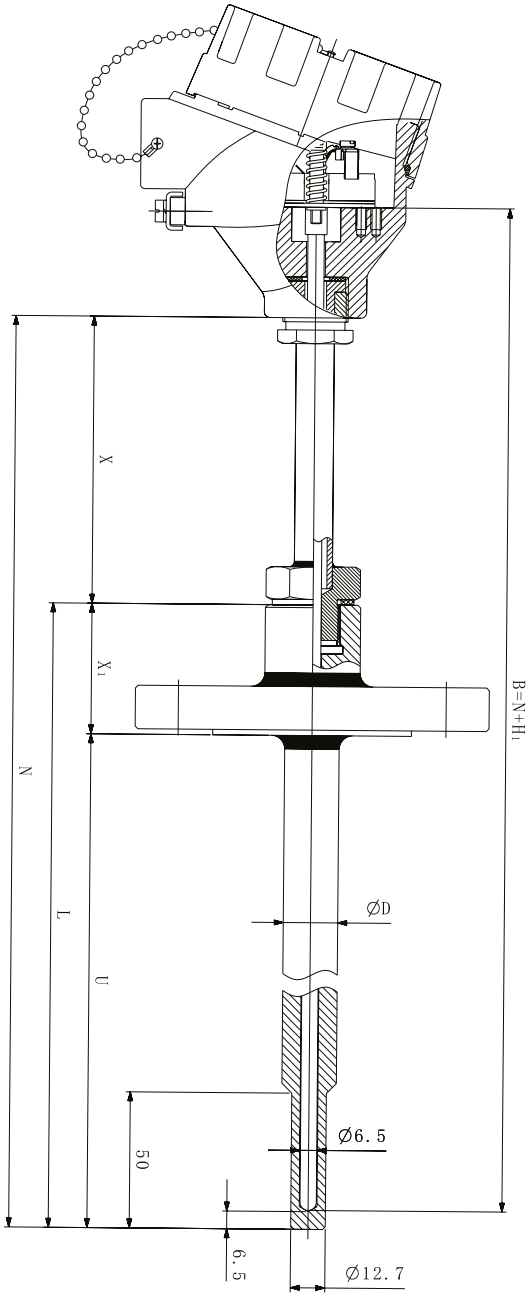
12.5.16 SITRANS TS500, type FR, flanged reduced well (7MC65..)



Ød	External diameter of measuring insert (6 (0.24))	N	Nominal length
X	Extension	U	Mounting length

Figure 12-20 Dimensional drawings SITRANS TS500, type FR, flanged reduced well - dimensions in mm (inch)

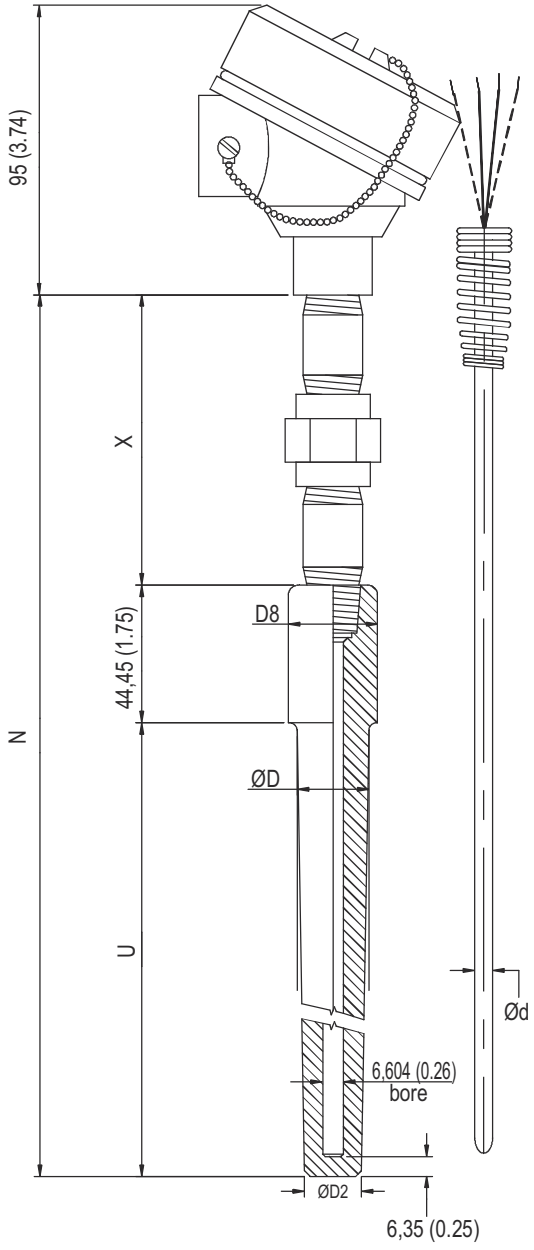
12.5.17 SITRANS TS500, type FR, flanged reduced well (7MC55..)



ØD	External diameter of measuring insert	N	Nominal length
X	Extension	U	Mounting length
B	Lenght of measuring insert	H_1	Head bottom thickness

Figure 12-21 Dimensional drawings SITRANS TS500, type FR, flanged reduced well (7MC55...)

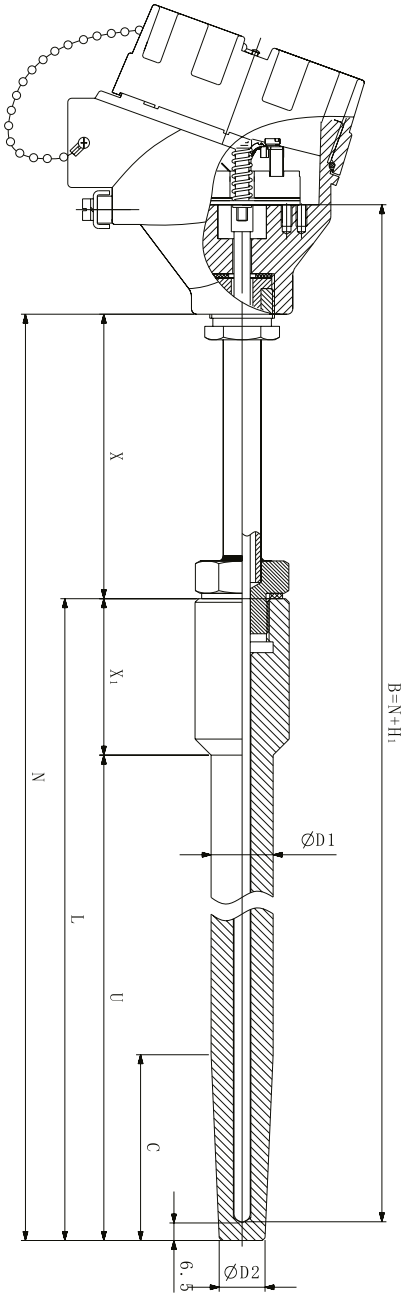
12.5.18 SITRANS TS500, type SWT, socket tapered well (7MC65..)



Ød	External diameter of measuring insert (6 (0.24))	N	Nominal length
ØD	External diameter of process connection	U	Mounting length
ØD2	External diameter of tip	X	Extension
ØD8	Internal diameter of protective tube		

Figure 12-22 Dimensional drawings SITRANS TS500, type SWT, socket tapered well - dimensions in mm (inch)

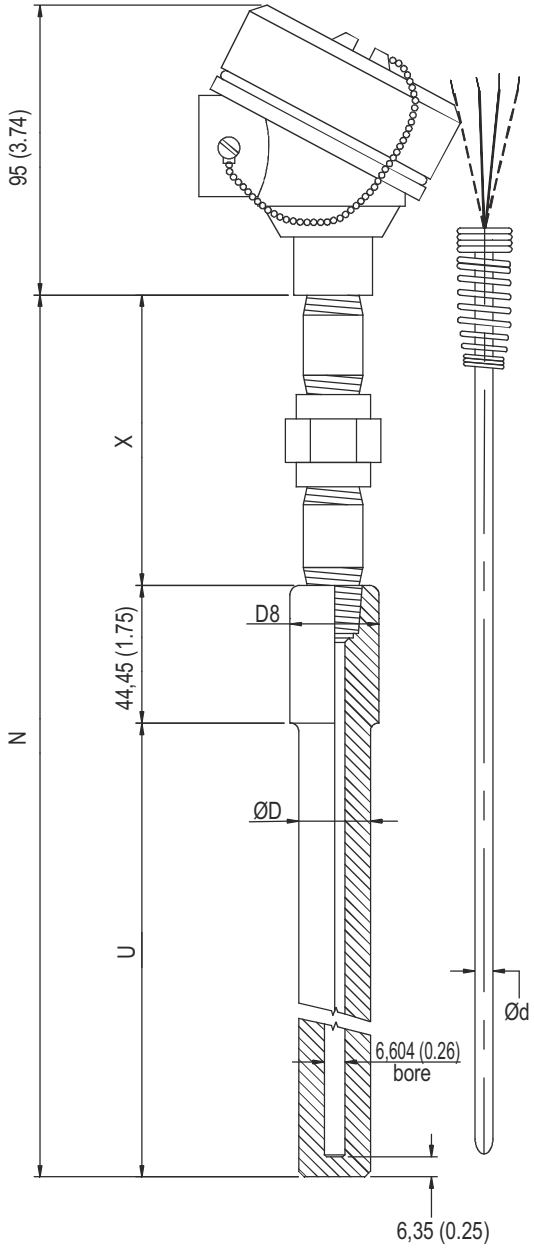
12.5.19 SITRANS TS500, type SWST, socket tapered well (7MC55..)



L	Length of thermowell	B	Length of measuring insert
ØD1	External diameter of process connection	N	Nominal length
ØD2	External diameter of tip	U	Insertion length
X	Extension length	H_1	Head bottom thickness Type Axx = 41 (1.61) Type Bxx = 26 (1.02)
X_1	Lag lenght	C	Cone Length

Figure 12-23 Dimensional drawings SITRANS TS500, type SWST, socket tapered well (7MC55...)

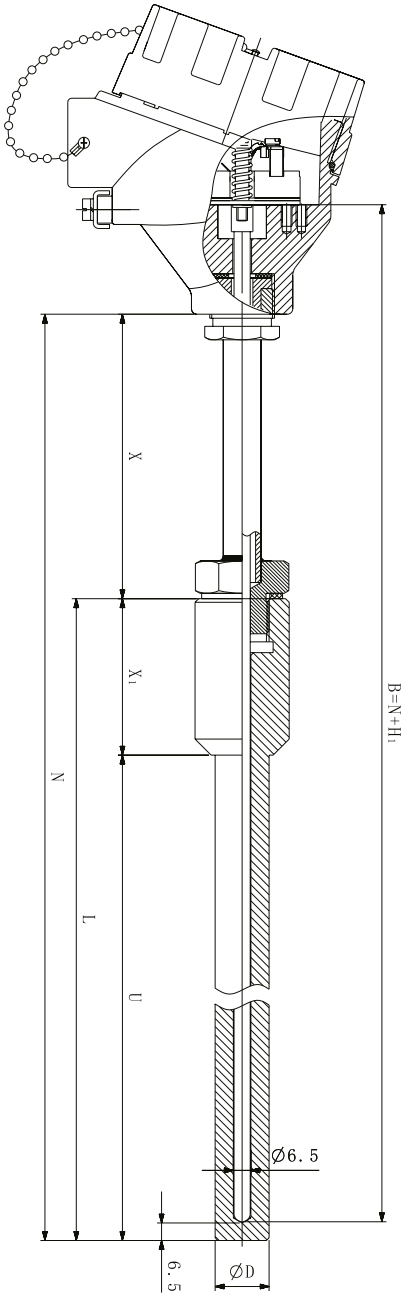
12.5.20 SITRANS TS500, type SWS, socket straight well (7MC65..)



Ød	External diameter of measuring insert (6 (0.24))	N	Nominal length
ØD	External diameter of process connection	U	Mounting length
ØD2	External diameter of tip	X	Extension
ØD8	Internal diameter of protective tube		

Figure 12-24 Dimensional drawings SITRANS TS500, type SWS, socket straight well - dimensions in mm (inch)

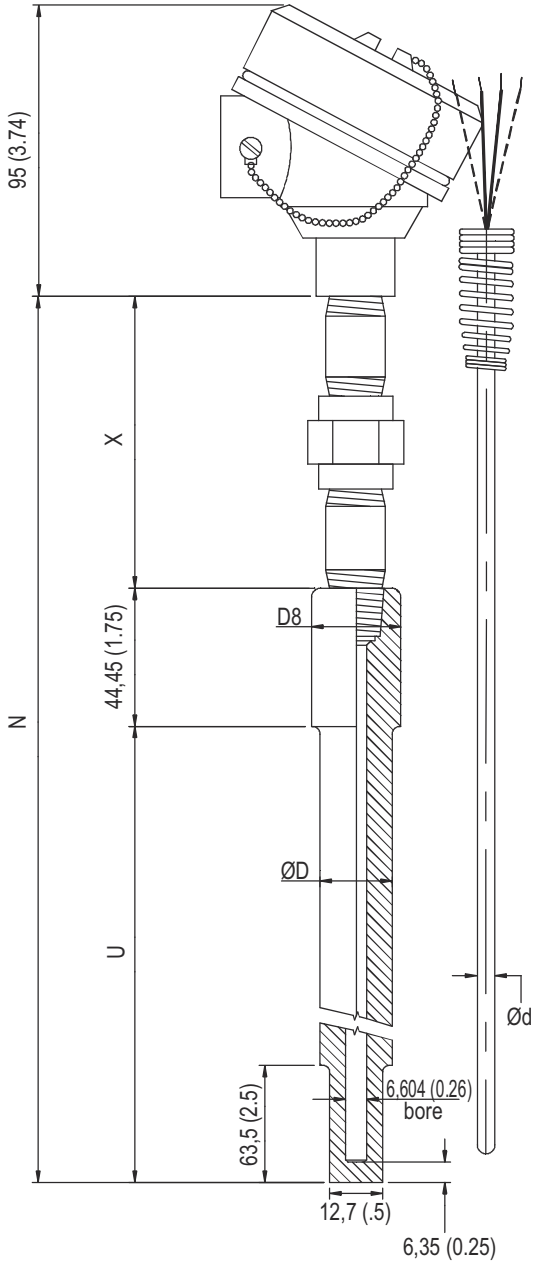
12.5.21 SITRANS TS500, type SWS, socket straight well (7MC55..)



ØD	External diameter of process connection	U	Mounting length
B	Length of measuring Insert	X	Extension
H_1	Head bottom thickness: Type Axx = 41 (1.61) Type Bxx = 26 (1.02)	X_1	Lag length
N	Nominal length	L	Length of thermowell

Figure 12-25 Dimensional drawings SITRANS TS500, type SWS, socket straight well (7MC55...)

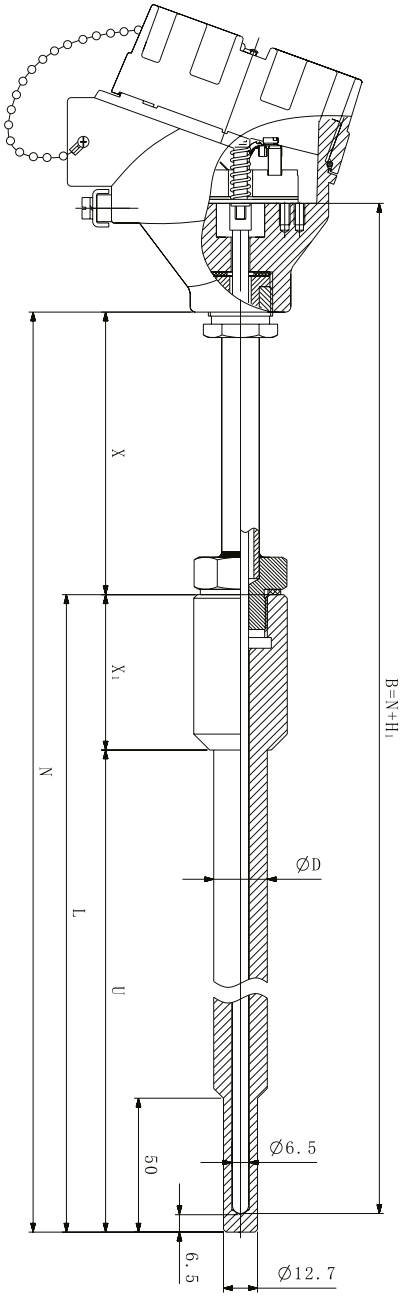
12.5.22 SITRANS TS500, type SWR, socket reduced well (7MC65..)



Ød	External diameter of measuring insert (6 (0.24))	N	Nominal length
ØD	External diameter of process connection	U	Mounting length
ØD8	Internal diameter of tip	X	Extension

Figure 12-26 Dimensional drawings SITRANS TS500, type SWR, socket reduced well - dimensions in mm (inch)

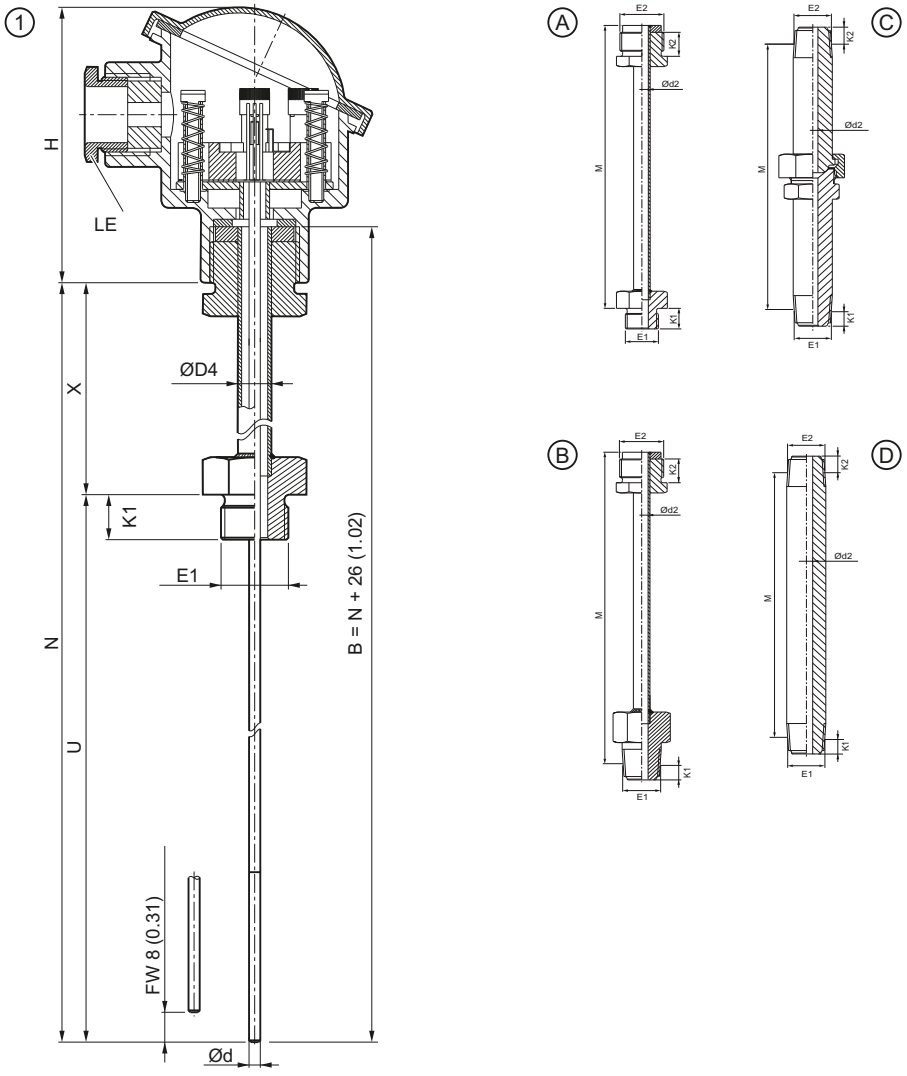
12.5.23 SITRANS TS500, type SWR, socket reduced well (7MC55..)



L	Length of thermowell	N	Nominal length
ØD	External diameter of process connection	U	Mounting length
B	Length of measuring insert	X	Extension
H_1	Head bottom thickness: Type Axx = 41 (1.61) Type Bxx = 26 (1.02)	X_1	Lag length

Figure 12-27 Dimensional drawings SITRANS TS500, type SWR, socket reduced well (7MC55...)

12.5.24 SITRANS TS500 for installation in existing protective tubes

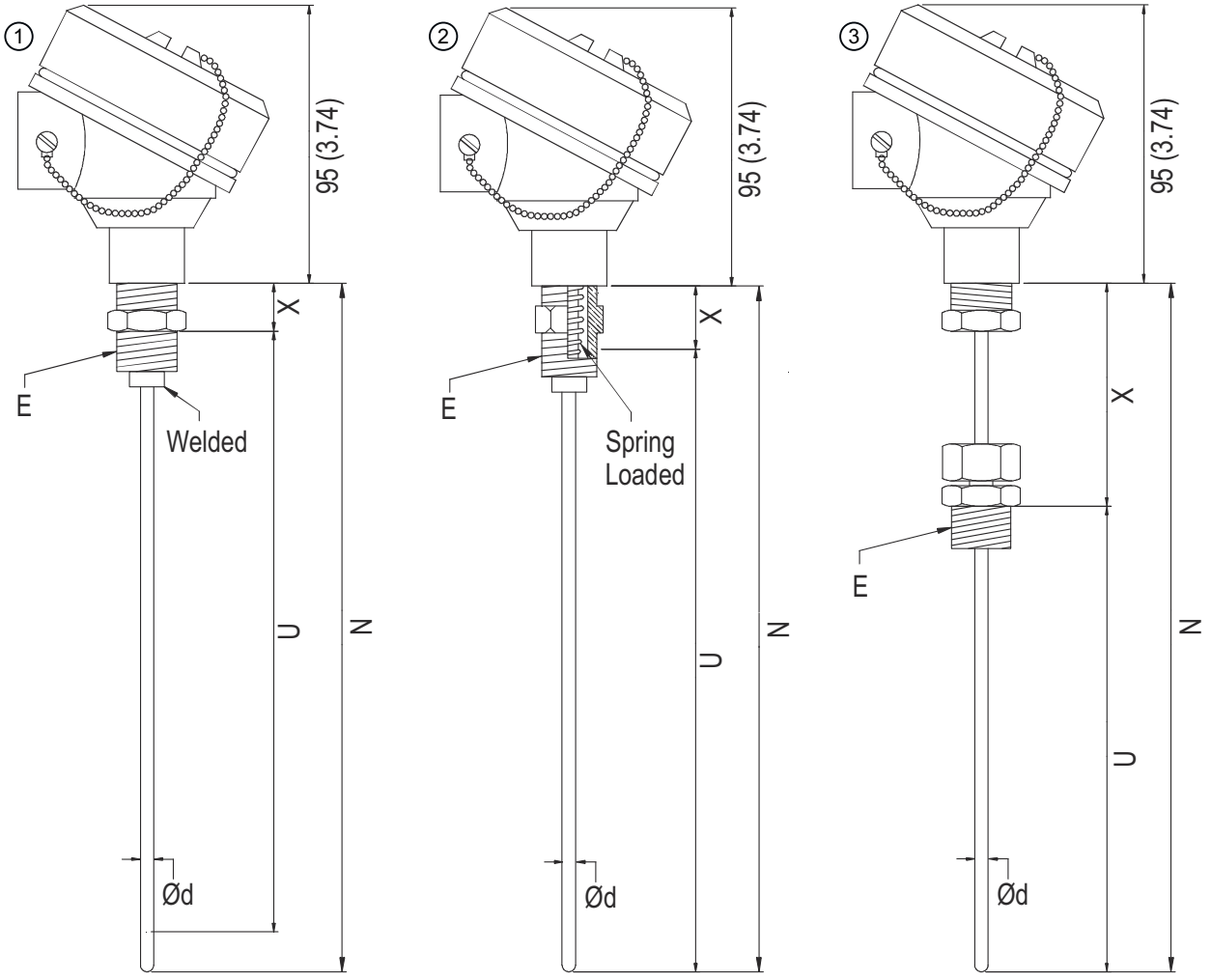


①	SITRANS TS500 for installation in existing protective tubes		
Ⓐ	Extension tube, DIN G	Ⓑ	Extension tube, NPT
Ⓒ	Extension tube, NUN	Ⓓ	Extension tube, nipple
B	Length of measuring insert	K1	Penetration depth
Ød	External diameter of measuring insert	LE	Cable inlet
ØD4	External diameter of extension	N	Nominal length
E1	Thread dimension of process connection	U	Mounting length
FW	Spring excursion	X	Extension
H	Height of head		

Figure 12-28 Dimensional drawings SITRANS TS500 for installation in existing protective tubes - dimensions in mm (inch)

NOTICE
X Extension Please note for executions without extension but with sealing. To consider the height of the sealing screw please add this height to your specified insertion length. $U = X + U_{specified}$ G50 (M24x1,5): X = 12 mm (½ inch) G51 (½" NPT): X = 34 mm (1 1/3 inch)

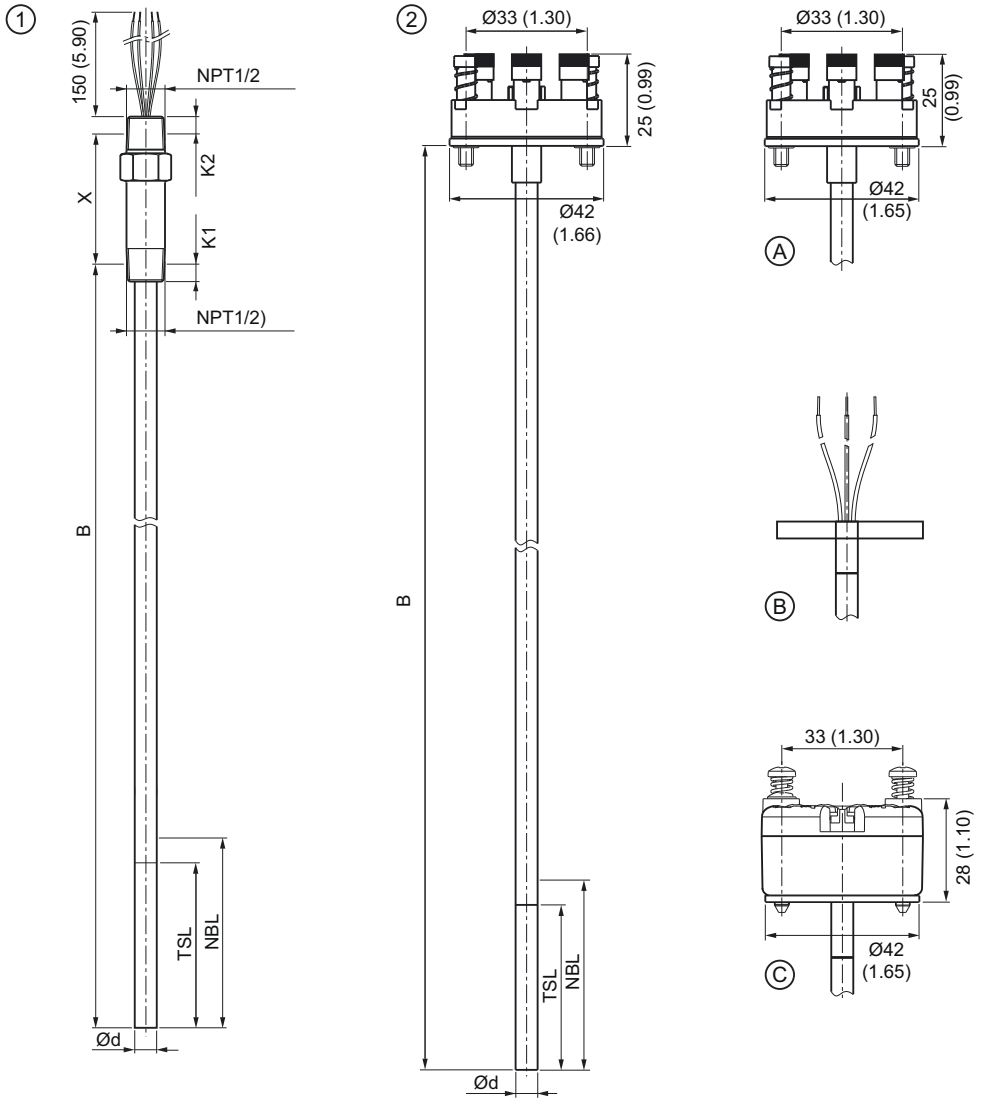
12.5.25 SITRANS TS500, type GP, general purpose, no well



①	SITRANS TS500 type GP (welded)
②	SITRANS TS500 type GP (Spring loaded)
③	SITRANS TS500 type GP (Extension)
Ød	External diameter of measuring insert
N	Nominal length
U	Mounting length
X	Extension

Figure 12-29 Dimensional drawings SITRANS TS500, type GP, general purpose, no well - dimensions in mm (inch)

12.6 SITRANS TSinsert - measuring inserts for SITRANS TS500



①	American version	Ød	External diameter of measuring insert
②	European version	K1, 2	Penetration depth
Ⓐ	To ②, cold end: Ceramic base	NBL	Non bendable length
Ⓑ	To ②, cold end: Free wire ends	TSL	Temperature sensitive length
Ⓒ	To ②, cold end: Mounted transmitter	X	Extension
B	Length of measuring insert		

Figure 12-30 Dimensional drawings SITRANS TSinsert - measuring inserts for SITRANS TS500 - dimensions in mm (inch)

Product documentation and support

A

A.1 Product documentation

Process instrumentation product documentation is available in the following formats:

- Certificates (http://www.siemens.com/processinstrumentation/certificates)
- Downloads (firmware, EDDs, software) (http://www.siemens.com/processinstrumentation/downloads)
- Catalog and catalog sheets (http://www.siemens.com/processinstrumentation/catalogs)
- Manuals (http://www.siemens.com/processinstrumentation/documentation)
  You have the option to show, open, save, or configure the manual.
  - "Display": Open the manual in HTML5 format
  - "Configure": Register and configure the documentation specific to your plant
  - "Download": Open or save the manual in PDF format
  - "Download as html5, only PC": Open or save the manual in the HTML5 view on your PC

You can also find manuals with the Mobile app at Industry Online Support (https://support.industry.siemens.com/cs/ww/de/sc/2067). Download the app to your mobile device and scan the device QR code.

Product documentation by serial number

Using the PIA Life Cycle Portal, you can access the serial number-specific product information including technical specifications, spare parts, calibration data, or factory certificates.

Entering a serial number

1. Open the PIA Life Cycle Portal (ttps://www.pia-portal.automation.siemens.com).
2. Select the desired language.
3. Enter the serial number of your device. The product documentation relevant for your device is displayed and can be downloaded.

To display factory certificates, if available, log in to the PIA Life Cycle Portal using your login or register.

Scanning a QR code

1. Scan the QR code on your device with a mobile device.
2. Click "PIA Portal".

To display factory certificates, if available, log in to the PIA Life Cycle Portal using your login or register.

A.2 Technical support

Technical support

If this documentation does not completely answer your technical questions, you can enter a Support Request (http://www.siemens.com/automation/support-request).

For help creating a support request, view this video here.

Additional information on our technical support can be found at Technical Support (http://www.siemens.com/automation/csi/service).

Service & support on the Internet

In addition to our technical support, Siemens offers comprehensive online services at service & support (http://www.siemens.com/automation/serviceandsupport).

Contact

If you have further questions about the device, contact your local Siemens representative at Personal Contact (http://www.automation.siemens.com/partner).

To find the contact for your product, go to "all products and branches" and select "Products & Services > Industrial automation > Process instrumentation".

Contact address for business unit:
Siemens AG
Digital Industries
Process Automation
Östliche Rheinbrückenstr. 50
76187 Karlsruhe, Germany

A.3 QR code label

A QR code label can be found on the device. With the use of a smart phone, the QR code provides a direct link to a website with information specific to the device, such as manuals, FAQs, certificates, etc.

Remote operation

B

B.1 SIMATIC PDM

B.1.1 Overview SIMATIC PDM

SIMATIC PDM (Process Device Manager) is a general-purpose, manufacturer-independent tool for the configuration, parameter assignment, commissioning, diagnostics and maintenance of intelligent field devices and field components. Follow-up installations and additional information on SIMATIC PDM are available on the Internet at SIMATIC PDM (www.siemens.com/simatic-pdm).

SIMATIC PDM monitors the process values, alarms and status signals of the device. It allows you to display, compare, adjust, verify, and simulate process device data; also to set schedules for calibration and maintenance.

For information on, for example, how to install and integrate devices, commission the software, see Operating Manual 'Help for SIMATIC PDM'. The manual is delivered with SIMATIC PDM software. Once the SIMATIC PDM is installed on your computer you find the manual under: Start > All programs > Siemens Automation > SIMATIC > Documentation. Link at our website: SIMATIC PDM instructions and manuals (https://support.industry.siemens.com/cs/ww/en/ps/16983/man).

Note

Field device parameters

- For a list of parameters and additional information, consult section "Overview of parameters and functions (Page 71)".
- The field device remains in measurement mode during the time you configure the field device.

B.1.2 Check SIMATIC PDM version

Check the support page of our website to make sure you have the latest version of SIMATIC PDM, the most recent Service Pack (SP) and the most recent hot fix (HF). Go to:

Software downloads (https://www.siemens.com/processinstrumentation/downloads).

In the Product tree, navigate: "Automation Technology > Process control systems > SIMATIC PCS 7 > System components > Plant Device Management > SIMATIC PDM".

B.1.3 Updating the Electronic Device Description (EDD) or Field Device Integration (FDI)

Procedure

1. Check that the EDD or FDI revision match the Firmware revision in the device according to the table in section Product compatibility TH320/420 (Page 10).
2. Go to the support page Software downloads (http://www.siemens.de/prozessinstrumentierung/downloads).
3. Enter the product name in the field "Enter search term...".
4. Download the most current EDD or FDI of your device.
5. Save files to your computer in an easily accessed location.
6. Launch SIMATIC PDM – Device Integration Manager.
   From the File menu, click "Read device descriptions from compressed source...".
7. Browse to the compressed EDD or FDI files, select and open it.
8. From the Catalog menu, use the "Integration" function to integrate the EDD or FDI into the device catalog. The EDD or FDI is now accessible via SIMATIC Manager.

Index

K

L

M

N

O

P

Q

R

S

T

U

V

W

M