SIEMENS

SITRANS

Temperature sensors

SITRANS TSinsert/TS100/TS200/TS300/TS500

Compact Operating Instructions

Edition 04/2017

Answers for industry.

SIEMENS

SITRANS

Temperature sensors SITRANS TSinsert/TS100/TS200/TS300/TS500 (7MC71.. 7MC72.. 7MC80.. 7MC75.. 7MC65.. 7MC55..)

Compact Operating Instructions

7MC71.. SITRANS TS100
7MC72.. SITRANS TS200
7MC80.. SITRANS TS300
7MC75.. SITRANS TS500

04/2017
A5E03920348-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 AG. 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.

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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 the device, connecting it electronically, configuring the parameters and commissioning it, as well as service and maintenance engineers.

The temperatur sensor has a modular concept. If you integrate an transmitter or a display, read the instructions of the transmitter and/or the display.

See also

Instructions and manuals (http://www.siemens.com/processinstrumentation/documentation)

1.2 History

The following table contains important changes to the previous version of the documentation:

Edition	Remark
10/2012	First edition of instructions
03/2013	Added warning notes and updated electrical data
07/2013	Added warning notes and updated electrical data, added SITRANS TS300
03/2016	Added SITRANS TS500 7MC65.. (North American portfolio) Added SITRANS TS500 7MC55.. (Asian portfolio)
06/2016	Installing: Special aspects of plastic head type BM0 added
10/2016	Technical data for rated conditions changed

1.3 Checking the consignment

1. Check the packaging and the delivered items for visible damage.
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.

1.4 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.

⚠ CAUTION

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 45).

1.5 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.

See also

Contacts (http://www.siemens.com/processinstrumentation/contacts)

SITRANS T product information (http://www.siemens.com/sitranst)

Instructions and manuals (http://www.siemens.com/processinstrumentation/documentation)

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	Description
	Pay attention to the operating instructions

2.1.1 Laws and directives

Observe the test certification, 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) (Canada)

Further provisions for hazardous area applications are for example:

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

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

online support portal (http://www.siemens.com/processinstrumentation/certificates)

2.2 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.

2.3 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.

2.4 Use in hazardous areas

2.4.1 Qualified personnel for hazardous area applications

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

Unsuitable device for the hazardous area

Risk of explosion.

- Only use equipment that is approved for use in the intended hazardous area and labelled accordingly.

See also

Technical data (Page 45)

⚠ WARNING

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

If the device has 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.

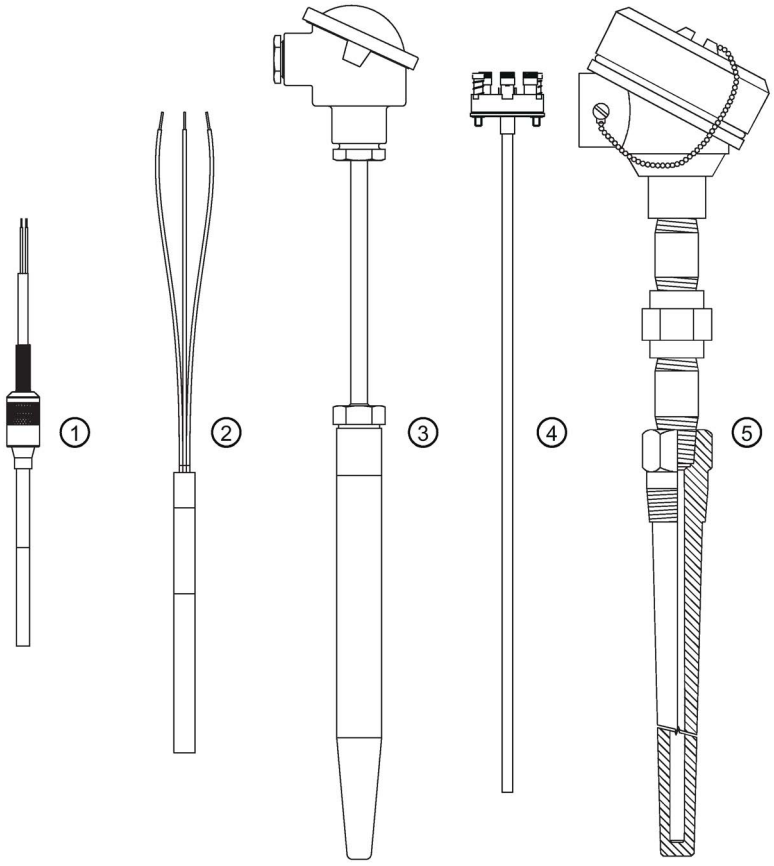
- Connect the device with type of protection "Intrinsic safety" solely to an intrinsically safe circuit.
- Observe the specifications for the electrical data on the certificate and/or in Technical data (Page 45).

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, e.g. in the following sectors:

- Petrochemical industry
- Pharmaceuticals industry
- Biotechnology
- Foodstuffs

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, for example 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 nameplate

Note

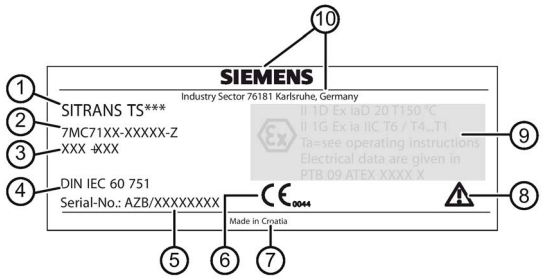
SITRANS TS100/TS200 nameplate

Before commissioning, make sure the nameplate is securely fastened to the temperature sensor in a 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

Device	Positioning of the nameplate
SITRANS TS200 7MC72..	On the connector or on the sensor
SITRANS TS500 7MC.5..	On the connection head

Example of nameplate



① Product name
② Order number (machine-readable product code)
③ Additional information on the type
④ Valid standard for the device
⑤ Serial number
⑥ CE marking
⑦ Place of manufacture
⑧ Consult the operating instructions.
⑨ Type-specific information Explosion protection/electrical data
⑩ Manufacturer´s specifications

3.5 Temperature transmitter for SITRANS TS500

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

Transmitter	Features	Sensor
TH100	• Base device • Output 4 ... 20 mA • Can be configured using simple software • P_o: 12.5 mW	only [1]
TH200	• Universal device • Output 4 ... 20 mA • Can be configured using simple software • P_o: 37 mW	[1] or [2]

Transmitter	Features	Sensor
TH300	• Universal • Output 4 ... 20 mA / HART • Diagnostic functions • P_o: 37 mW	[1] or [2]
TH400	• Output: PROFIBUS PA or FOUNDATION Fieldbus. • Sensor redundancy • Diagnostics • P_o: 12 mW	[1] or [2]

[1] Resistance thermometers

[2] Thermocouple

Note

SITRANS TS500 IEC Ex

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

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

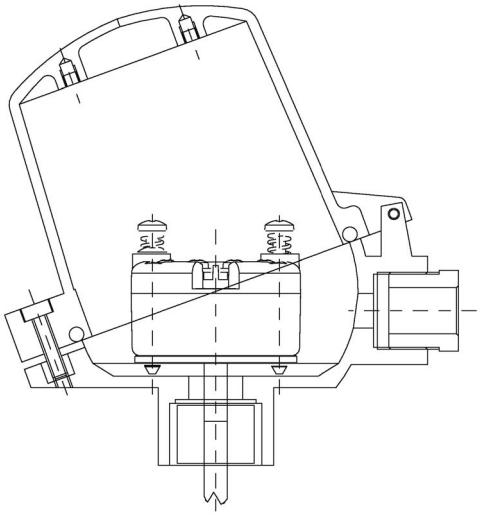


Figure 3-1 Measuring insert mounting of transmitter

- 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.

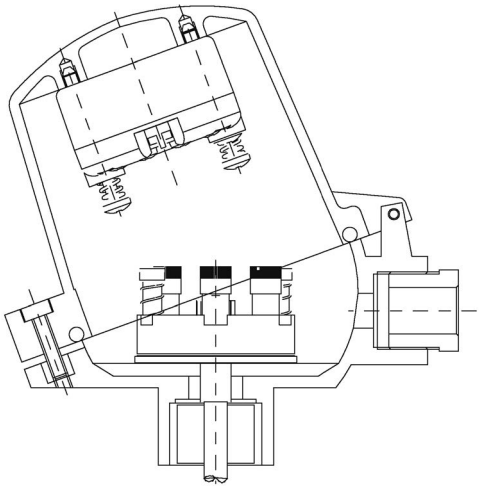


Figure 3-2 Hinged cover mounting of transmitter

Installing

4

4.1 Basic safety instructions

⚠ 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 Construction (Page 55).
- Close unused cable inlets for the electrical connections.
- When replacing cable glands use only cable glands of the same type.
- After installation check that the cables are seated firmly.

See also

Technical data (Page 45)

⚠ CAUTION

Hot surfaces resulting from hot process media

Risk of burns resulting from surface temperatures above 70 °C (155 °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 45).

⚠ 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.

See also

Technical data (Page 45)

4.1.1 Exceeded maximum permissible operating pressure

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 45).

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

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.

4.1.2 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.

⚠ CAUTION

Direct sunlight

Device damage.

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 45).

4.1.3 Proper mounting

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 45) for installation torque requirements.

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.

CAUTION

Loss of IP protection

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

4.1.3.1 Special aspects of plastic head type BM0

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 bellow).

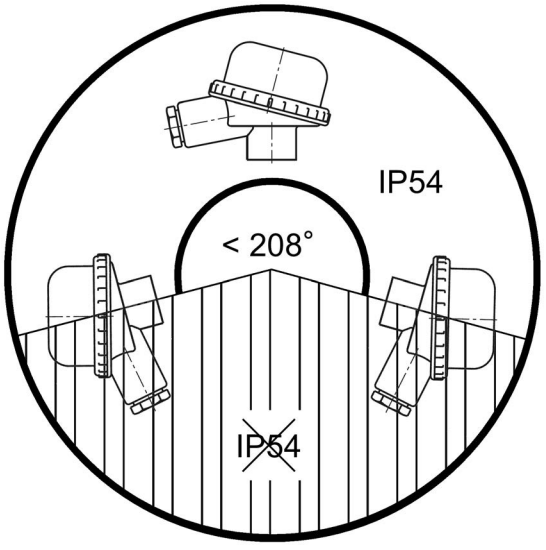


Figure 4-1 Mounting angle of plastic head type BM0

4.2 Install

Process connection

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.

The devices are delivered with different connection heads and different process connections depending on the specifications. The following guidelines apply:

- Assemble the process prior to the electrical installation.
- Make sure prior to mounting that the device is appropriate with regard to the process connection, media compatibility, temperature resistance and measuring range.
- The gaskets used must be suitable for the process connection and resistant to the measured media.

Note

SITRANS TS500 barstock version (only European portfolio 7MC752..)

For SITRANS TS500 barstock version without flange (type 4), the customer has to complete the mounting of the device extension to the protective tube, see **Device extension and protective tube torque requirements** table below

CAUTION

Gasket between extension and protective tube

Gasket between device extension and protective tube can only be used once

- Use required torque values between device extension and protective tube, see **Device extension and protective tube torque requirements** table below.
- Use required torque values between the device head and extension if customer adjustments are necessary (M24 connections only), see **Device head and extension torque requirements** table below.

Table 4- 1 Device extension and protective tube torque requirements

Connection type	Torque value
M14 thread	25 Nm
M18 thread	40 Nm

Connection type	Torque value
G½ thread	50 Nm
½ inch NPT	Hand-tight and one to two complete turns with a wrench

Table 4- 2 Device head and extension torque requirements

Head type	Torque value
Metal head	28 Nm
Plastic head (BP0)	15 Nm
Plastic head (BM0)	5 Nm

Rule of thumb for installation

Prevent faults caused by heat dissipation by observing the following rules:

- Select the largest possible immersion depth. Estimate the immersion depth using the formulas specified below.
- Select a measuring location with a high flow rate.
- Ensure that there is sufficient thermal insulation of the external components of the thermometer.
- Ensure that external parts have as small surfaces as possible.
- Select the optimum mounting position for the process in question.

Estimation of immersion depth

Medium	Immersion depth (calculation)[1)]
Water	Immersion depth ≥ TSL + (5 x $\varnothing_{\text{protective tube}}$)
Air	Immersion depth ≥ TSL + (10 to 15 x $\varnothing_{\text{protective tube}}$)

1) TSL = Temperature Sensitive Length

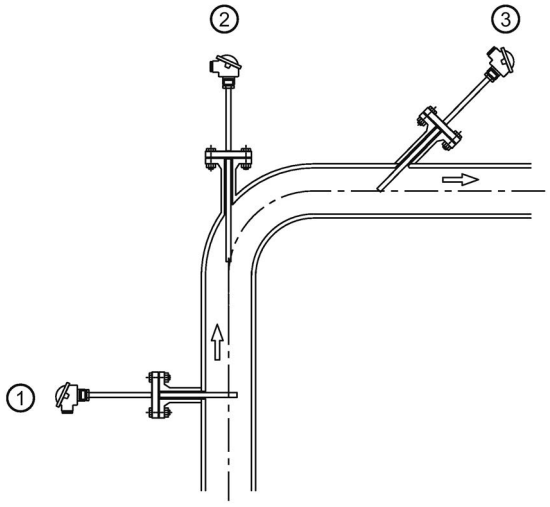
Mounting positions

Note

Mounting positions for small pipe diameters

With small pipe diameters, mount the sensors upstream at an angle or in an elbow, see ② and ③ in the diagram "Mounting positions".

The following diagram shows the possible mounting positions of the sensors:



① At a right angle to the flow
② In a bend upstream
③ In a narrow cable at an angle upstream

Figure 4-2 Mounting positions

4.3 Install SITRANS TS300 Clamp-on

Note

Measurement position

Install on circular pipes only, avoid installation next to angled pipes, near slide valves, valves, pumps, etc.

1. Define the measurement position.
2. Apply heat sink compound to the metallic part of the temperature sensor.
3. For standard version: halved pipe collar allows for quick and easy mounting on the pipe using two mounting screws.
   For bracket version: mount on pipe using one mounting screw.
   – If the pipe is not fully occupied by medium during installation, mount the temperature sensor on the underside of the pipe.

4. Firmly tighten the mounting screws (4 Nm torque).
5. Mount the vibration protection and hand-tighten.
   - You can remove the measuring insert only after you have released the RTD recessed grip screw(s).
   - Do not twist the housing.
   - Use RTD recessed grip screw for installation, only.
   - Do not apply force to the transmitter housing (e. g. during opening/closing of lid).
   - Because the locking plugs are fitted with internal gaskets they are only suited for ambient temperatures to 100 °C (212 °F).

4.4 Disassembly

WARNING

Incorrect disassembly

The following risks may result through 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 instructions

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, e.g. using direct current instead of alternating current.

- Connect the device in accordance with the specified power supply and signal circuits. The relevant specifications can be found in the certificates, in Electrical data (Page 55) or on the nameplate.

WARNING

Unsafe extra-low voltage

Risk of explosion in hazardous areas due to voltage flashover.

- Connect the device to an extra-low voltage with safe isolation (SELV).

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 device in energized state

Risk of explosion in hazardous areas.

- Connect devices in hazardous areas only in a de-energized state.

Exceptions:

- Devices having the type of protection "Intrinsic safety Ex i" may also be connected in energized state in hazardous areas.
- Exceptions for type of protection "Non-sparking nA" (Zone 2) are regulated in the relevant certificate.

Note

Electromagnetic compatibility (EMC)

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

For metal housings there is an increased electromagnetic compatibility compared to high-frequency radiation. This protection can be increased by grounding the housing, see Electrical connection (Page 35).

Note

Improvement of interference immunity

- Lay signal cables separate from cables with voltages > 60 V.
- Use cables with twisted wires.
- Keep device and cables in distance to strong electromagnetic fields.
- Take account of the conditions for communication specified in the Technical data (Page 45).
- HART: Use shielded cables to guarantee the full specification according to HART.

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 Electrical connection

Procedure

Note
Connection sequence

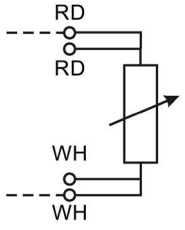
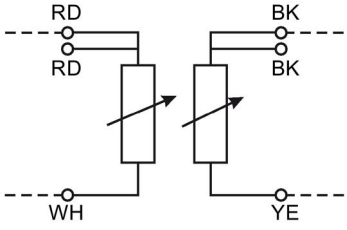
Install the temperature transmitter before connecting the temperature sensor electrically.

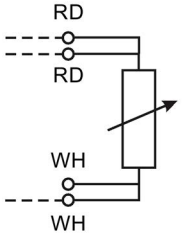
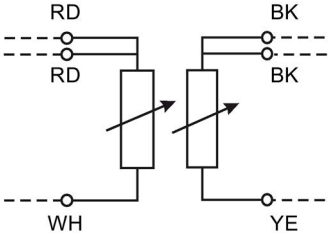
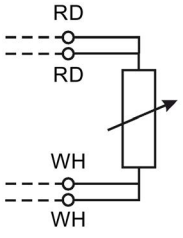
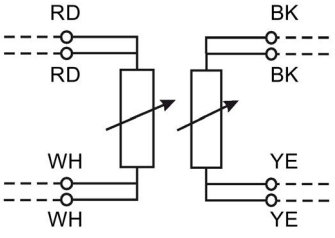
1. Release the fixing screws on the enclosure cover and remove the enclosure cover.
2. Insert the connecting cable through the cable gland.
3. Connect the wires to the relevant connecting terminals. Observe the terminal assignment.
   - Electrical connection of resistance thermometers (Page 35)
   - Electrical connection of thermocouples (Page 36)
   - Electrical connection of connectors (Page 37)

See also

Electrical data (Page 55)

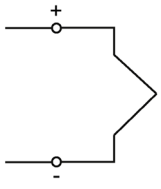
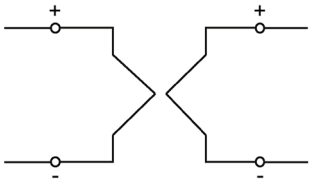
5.3 Electrical connection of resistance thermometers

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

 3-wire connection	 3-wire connection
 4-wire connection	 4-wire connection

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

5.4 Electrical connection of thermocouples

1 thermocouple	2 thermocouples
	

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

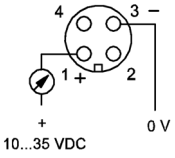
Note

2 thermocouples

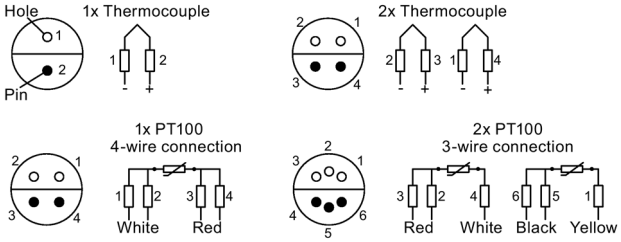
On the terminal block is an additional mark to differentiate between sensor 1 and sensor 2.

5.5 Electrical connection of connectors

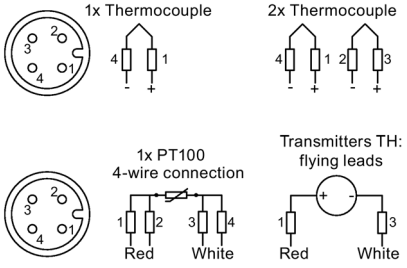
M12 x 1 connection with SITRANS TH100 transmitter



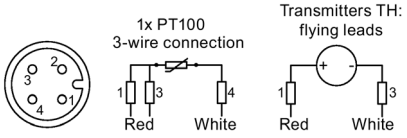
Lemo 1S coupling for SITRANS TS100/TS200



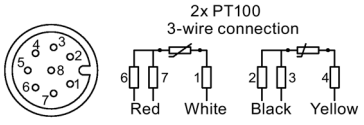
M12 connector for single sensors for SITRANS TS100/TS200/TS500



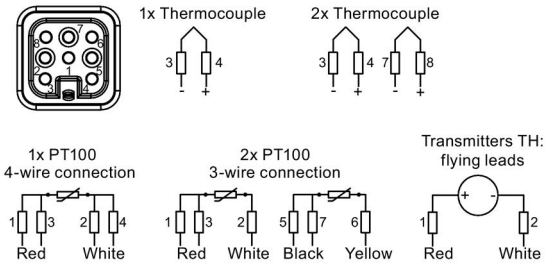
M12 connector for single sensors SITRANS TS300



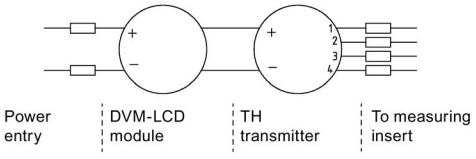
M12 connector for double sensors SITRANS TS100



HAN7 D connector for SITRANS TS500



LCD and transmitter connection



Commissioning 6

6.1 Basic safety instructions

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 Technical data (Page 45).
- 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

Loss of explosion protection

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

WARNING

Opening device in energized state

Risk of explosion in areas subject to explosion hazard.

- 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.

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

Verify that the following commissioning conditions are satisfied:

- You have connected the sensors correctly. For further details, see:
  - Electrical connection of resistance thermometers (Page 35)
  - Electrical connection of thermocouples (Page 36)
- Verify that the electrical connections are firmly tightened to the suitable torque.
- The following applies in particular with device versions with explosion protection:
  - Verify whether the cable glands are appropriate for the process and are correctly tightened.
  - 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 in the process to the power supply.

Service and maintenance

7

⚠ 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.

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.

Description	Recalibration procedure	
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.

7.1 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.

⚠ 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.

7.2 Return procedure

Enclose the bill of lading, return document and decontamination certificate in a clear plastic pouch and attach it firmly to the outside of the packaging.

Required forms

- Delivery note
- Return goods delivery note (http://www.siemens.com/processinstrumentation/returngoodsnote)

  with the following information:

  – Product (item description)

  – Number of returned devices/replacement parts

  – Reason for returning the item(s)
- Decontamination declaration (http://www.siemens.com/sc/declarationofdecontamination)

  With this declaration you warrant "that the device/replacement part has been carefully cleaned and is free of residues. The device/replacement part does not pose a hazard for humans and the environment."

  If the returned device/replacement part has come into contact with poisonous, corrosive, flammable or water-contaminating substances, you must thoroughly clean and decontaminate the device/replacement part before returning it in order to ensure that all hollow areas are free from hazardous substances. Check the item after it has been cleaned.

  Any devices/replacement parts returned without a decontamination declaration will be cleaned at your expense before further processing.

7.3 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, 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 about battery / product return (WEEE) (https://support.industry.siemens.com/cs/document/109479891/)

Technical data

8

8.1 Rated conditions

Storage	
Storage temperature	-40 ... +80 °C (-40 ... +176 °F)
Degree of protection in accordance with EN 60529	See nameplate. Degree of protection is archived, when the device is correctly installed. See chapter Installing (Page 23).

SITRANS TSinsert/SITRANS TS100/TS200/TS500	
SITRANS TS300	-20 °C
SITRANS TSinsert/SITRANS TS100/TS200/TS500	-40 °C
SITRANS TS500 type 7MC75.. with head type AU0 and AV0 (option U and V)	-50 °C

Caution

Ambient temperature of electronic and cable glands assembled to SITRANS TS500

If electronic and cable glands are assembled their minimum permitted ambient temperature must also be rated up to the minimum ambient temperature shown in the table above, otherwise the minimum ambient temperature of the complete SITRANS TS500 is derated accordingly. Check the manual of your used electronic and gable gland for more information.

Note

Siemens temperature transmitter SITRANS TH100/TH200/TH300/TH400 as well as the display type DVM-LCD are not rated up to -50 °C but -40 °C.

See also

Nameplate structure (Page 18)

8.1.1 Maximum permitted ambient temperatures in the connection area of the sensor

8.1.1.1 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 34).

8.1.1.2 SITRANS TS500

	Gas		Dust
SITRANS TS500	**in "Intrinsic safety Ex i"** **- or -** **in "Non-sparking nA"**	**in flameproof enclosure (Ex d)**	**is part of a "Intrinsic safety Ex i"** **- or -** **in non-intrinsically safe circuits (Ex tb)**
without electronic (only enclosure with terminal base)	See your used head and relevant temperature class in the Table 8-3 Gas Ex i/nA (Page 49), Table 8-4 Gas Ex i/nA (Page 50), Table 8-5 Type 2N (Page 50) and Table 8-6 Type 2N (Page 51).	See your used head without electronic in the Table 8-7 Gas Ex d (Page 51) and Table 8-8 Type 2N (Page 52).	See your used head without electronic in the Table 8-9 Dust Ex i/tb (Page 52) and Table 8-10 Type 2N (Page 53).
with temperature transmitters SITRANS TH100/200/300/TH400 or third party transmitters	$T_{a\_max} = T_1 - \Delta T2G \leq T_2$ T_1 = see relevant certificate of the temperature transmitters. $\Delta T2G$ and T_2 = see Table 8-3 Gas Ex i/nA (Page 49), Table 8-4 Gas Ex i/nA (Page 50), Table 8-5 Type 2N (Page 50) and Table 8-6 Type 2N (Page 51).	See your used head with electronic in Table 8-7 Gas Ex d (Page 51) and Table 8-8 Type 2N (Page 52). For installing of third party transmitter keep in mind the max. permitted power consumption of 3 W.	See your used head with electronic" in Table 8-9 Dust Ex i/tb (Page 52) and Table 8-10 Type 2N (Page 53). For installing of third party transmitter keep in mind the max. permitted power consumption of 1 W. Assumed max. surface temperature of the TS500 enclosure is 85 °C. **Notice!** If the max. permissible ambient temperature of third party transmitters is lower then 85 °C calculate as follow: $T_{a\_max} = T_1 - \Delta T1D - \Delta T2D$ T_1 = see relevant certificate of the temperature transmitters. $\Delta T1D$ = 22K (max. permitted power consumption of 1 W) $\Delta T2D$ = See Table 8-9 Dust Ex i/tb (Page 52) and Table 8-10 Type 2N (Page 53).

	Gas		Dust
SITRANS TS500	**in "Intrinsic safety Ex i"** **- or -** **in "Non-sparking nA"**	**in flameproof enclosure (Ex d)**	**is part of a "Intrinsic safety Ex i"** **- or -** **in non-intrinsically safe circuits (Ex tb)**
with temperature transmitters SITRANS TH100/200/300 and Display DVM-LCD (A5E33119275 respectively 7MF4997-1BS)	$T_{a\_max} = T_3 \leq T_2$ T_3= see Table 8-1 Gas hazardous area Zone 1 / 21 / Div. 1 (Page 48). T_2 = see Table 8-3 Gas Ex i/nA (Page 49), Table 8-4 Gas Ex i/nA (Page 50), Table 8-5 Type 2N (Page 50) and Table 8-6 Type 2N (Page 51).	See your used head with electronic in the Table 8-7 Gas Ex d (Page 51) and Table 8-8 Type 2N (Page 52).	$T_{a\_max} = T_3$ T_3 = see Table 8-2 Dust hazardous area Zone 21 / Div. 1 (Page 48).

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

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

T_3 = Max. permissible ambient temperature SITRANS TH100/200/300 and display DVM-LCD

See also

SITRANS TH100/200/300 and display DVM-LCD (Page 48)

Certificates (Page 101)

Gas hazardous area: Ex i / IS / Ex nA/ec / NI (Page 49)

Gas hazardous area: Ex d / XP (Page 51)

SITRANS TH100/200/300 and display DVM-LCD

You can find the values of ΔT2G in the tables
Table 8-3 Gas Ex i/nA (Page 49),
Table 8-4 Gas Ex i/nA (Page 50),
Table 8-5 Type 2N (Page 50) and
Table 8-6 Type 2N (Page 51) and
ΔT2D in the table Table 8-9 Dust Ex i/tb (Page 52) and
Table 8-10 Type 2N (Page 53).

Table 8- 1 **Gas hazardous area Zone 1 / 21 / Div. 1**

Permitted electrical supply parameters	T_3 = Permissible ambient temperature	
	Assembly of DVM-LCD A5E33119275 (HW: 05)	Assembly of DVM-LCD 7MF4997-1BS (HW: 03)
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 °C ≤ T_3 ≤ +67 °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 °C ≤ T_3 ≤ 80 °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	T4: -40 °C ≤ T_3 ≤ +85 °C - ΔT2G

Table 8- 2 **Dust hazardous area Zone 21 / Div. 1**

Permitted electrical supply parameters	T_3 = Permissible ambient temperature	
	Assembly of DVM-LCD A5E33119275 (HW: 05)	Assembly of DVM-LCD 7MF4997-1BS (HW: 03)
U_i = 30 V I_i = 100 mA P_i = 750 mW	T85 °C: -40 °C ≤ T_3 ≤ +53°C - ΔT2D	T85 °C: -40 °C ≤ T_3 ≤ +45°C - ΔT2D
U_i = 27 V I_i = 90 mA P_i = 610 mW	T85 °C: -40 °C ≤ T_3 ≤ +63 °C - ΔT2D	T85 °C: -40 °C ≤ T_3 ≤ +60 °C - ΔT2D
U_i = 25,2 V I_i = 84 mA P_i = 530 mW	T85 °C: -40 °C ≤ T_3 ≤ +63 °C - ΔT2D	T85 °C: -40 °C ≤ T_3 ≤ +63 °C - ΔT2D

See also

Gas hazardous area: Ex i / IS / Ex nA/ec / NI (Page 49)

Dust hazardous area: Ex i / IS / Ex tb / DIP (Page 52)

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

The maximum ambient temperatures T_2 for the respective connection head **without transmitter** can be obtained from the cells in the following tables. The temperature increase given by the medium is already considered there.

Table 8- 3 Gas Ex i/nA

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
Medium temperature (°C)	Temperature increase 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 8- 4 Gas Ex i/nA

Head type					BT0, AH0	BMO	BP0	
T_{max} head					80 °C	80 °C	100 °C	
Temperature class					T6	T6	T4	T6
Medium temperature (°C)	Temperature increase 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 head type BP0 and BMO

Table 8- 5 Type 2N

Head type			AU0		AV0, SITRANS TF	
T_{max} head			120 °C		85 °C	
Temperature class			T4	T6	T4	T6
Medium temperature (°C)	Temperature increase 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 8- 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
Medium temperature (°C)	Temperature increase 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 8- 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 8- 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 8- 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

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
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 TH100/200/300/400 without Display DVM-LCD

Table 8- 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 e.g. SITRANS TH100/200/300/400

8.1.2 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 53)

Resistance thermometers

Table 8- 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
T4 = 135 °C - 5K	100	92	126	118
T6 = 85 °C - 5K	60	52	76	68

[1] e.g. SIEMENS SITRANS TH100/TH200/TH300/TH400

Thermocouples

Table 8- 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

8.1.3 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 if 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.

8.2 Construction

Torques for cable gland	Plastic head	Metal head	Cable diameter
Integrated cable gland (when gland is an integral part of the head)	2.5 Nm	4.2 Nm	5.5 ... 7.5 mm
Additional metal cable gland	-	10 Nm	5 ... 14 mm
Additional plastic cable gland	-	4.6 Nm	6 ... 12 mm

8.3 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

	DVM-LCD	SITRANS TH100	Σ
C_i	16 nF	13 nF	29 nF
L_i	3 µH	106 µH	109 µH

8.4 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 [°C (°F)]
Basic version	Class B	Basic accuracy	-50 ...400 (-58 ... +752)
	Class A	Increased accuracy	-30°... 300 (-58 ... +572)
	Class AA (1/3 B)	High accuracy	0°... 150 (32 ... 302)

Action	Tolerance	Precision	Range [°C (°F)]
With increased vibration resistance	Class B	Basic accuracy	-50°... 400 (-58 ... +752)
	Class A	Increased accuracy	-30°... 300 (-58 ... +662)
	Class AA (1/3 B)	High accuracy	0°... 150 (32 ... 302)
With extended measuring range	Class B	Basic accuracy	-196 ... 600 (392 ... 1112)
	Class A	Increased accuracy	-196 ... 600 (392 ... 1112)

8.5 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) 600 °C ... 1600 °C ±0.0025x|t[°C]| (1112 °F ... 2912 °F ±0.0025x|t[°F]-32|)	0 °C ... 1100 °C ±1 °C (32 °F ... +2012 °F ±1.8 °F) 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|)	-

8.6 Certificates and approvals

SITRANS TSInsert/TS100/TS200	
"Intrinsic safety" type of protection	
ATEX/IECEx **PTB 09 ATEX 2014 X** EN 60079-0:2012/A11:2013 EN 60079-11:2012 EN 60079-15:2010 EN 60079-7:2015 EN 60079-26:2015 **IECEx PTB 11.0010 X** IEC 60079-0 Ed 6 2011 IEC 60079-11 Ed 6 2011 IEC 60079-15 Ed 4 2010 IEC 60079-7 Ed 5 2015 IEC 60079-26 Ed 3 2014	II 1 D Ex ia IIIC T 200°C Da II 1 G Ex ia IIC T6 / T4...T1 Ga II 3 G Ex ic IIC T6 / T4...T1 Gc
NEPSI	Ex iaD 20 T200 Ex ibD 21 T200 Ex ia IIC T1/T2/T3/T4/T6 Ga Ex ib IIC T1/T2/T3/T4/T6 Gb Ex ic IIC T1/T2/T3/T4/T6 Gc
EACEx	Ex ia IIIC T200°C Da X 0Ex ia IIC T6/T4…T1 Ga X 2Ex ic IIC T6/T4…T1 Gc X

SITRANS TSInsert/TS100/TS200	
cCSAus	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

SITRANS TS500	
"Explosionproofed" and "dust-ignition proofed" type of protection	
ATEX/IECEx **PTB 10 ATEX 1005 X** EN 60079-0:2012/A11:2013 EN 60079-1:2014 EN 60079-26:2015 EN 60079-31:2014 **IECEx PTB 10.0018 X** IEC 60079-0 Ed. 6 2011 IEC 60079-1 Ed. 7 2014 IEC 60079-26 Ed. 3 2014 IEC 60079-31 Ed. 2 2013	II 1/2 G Ex d IIC T6, T4, T3 Ga/Gb II 1/2 D Ex tb IIIC T85 °C, 100 °C or 150 °C
NEPSI	Ex d IIC T3/T4/T6 Ga/Gb DIP A20/21 TA85°C/100°C/150°C IP65
EACEx	Ga/Gb Ex d IIC, T6, T4, T3 X Ex tb IIIC T85°C,T100°C,T150°C Da/Db X
cCSAus	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
"Intrinsic safety", "increased safety" and "Non-incendive" type of protection	

SITRANS TS500	
ATEX/IECEx **PTB 09 ATEX 2014 X** EN 60079-0:2012/A11:2013 EN 60079-11:2012 EN 60079-15:2010 EN 60079-7:2015 EN 60079-26:2015 **IECEx PTB 11.0010 X** IEC 60079-0 Ed 6 2011 IEC 60079-11 Ed 6 2011 IEC 60079-15 Ed 4 2010 IEC 60079-7 Ed 5 2015 IEC 60079-26 Ed 3 2014	II 1/2 D Ex ia/ib IIIC T 200°C Da/Db II 1/2 G Ex ia/ib IIC T6 / T4...T1 Ga/Gb II 3 G Ex ic IIC T6 / T4...T1 Gc II 3 G Ex nA IIC T6 / T4…T1 Gc II 3 G Ex ec IIC T6 / T4…T1 Gc
NEPSI	Ex iaD 20 T200 Ex ibD 21 T200 Ex ia IIC T1/T2/T3/T4/T6 Ga Ex ib IIC T1/T2/T3/T4/T6 Gb Ex ic IIC T1/T2/T3/T4/T6 Gc Ex nA IIC T1/T2/T3/T4/T6 Gc
EACEx	Ex ia/ib IIIC T200°C Da/Db X Ga/Gb Ex ia/ib IIC T6/T4…T1 X 2Ex ic IIC T6/T4…T1 Gc X 2Ex nA IIC T6/T4…T1 Gc X
cCSAus	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/ib IIC T6/T4…T1 Ga/Gb Ex ia/ib IIIC T200°C Da/Db Ex ic IIC T6/T4…T1 Gc AEx ia/ib IIC T6/T4…T1 Ga/Gb AEx ia/ib IIIC T200°C Da/Db Class I, Zone 2, AEx ic T6/T4…T1 Gc Ex nA IIC T6/T4…T1 Gc Class I, Zone 2, AEx nA T6/T4…T1 Gc

Dimension drawings

9

9.1 Overview

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

Table 9- 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 (Page 65)
Mineral-insulated cable	• Temperature sensors in cable design, for universal use, mineral-insulated version, for unfavorable space conditions. • SITRANS TS100 (Page 65)

Table 9- 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 (Page 66)

Table 9- 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 (Page 67)
Clamp-on design with collar, strap, or hook mounting, integrated transmitter or head	• Clamp-on temperature sensor particulary for satured steam sterilization. • SITRANS TS300 (Page 67)

Table 9- 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 and 2N (Page 71)
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 and 2N (Page 71)
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 and 2F (Page 72)
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 and 2F (Page 72)
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 (Page 73)
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 and 3F (Page 74)
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 and 3F (Page 74)
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 (Page 75)
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 77)
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 78)

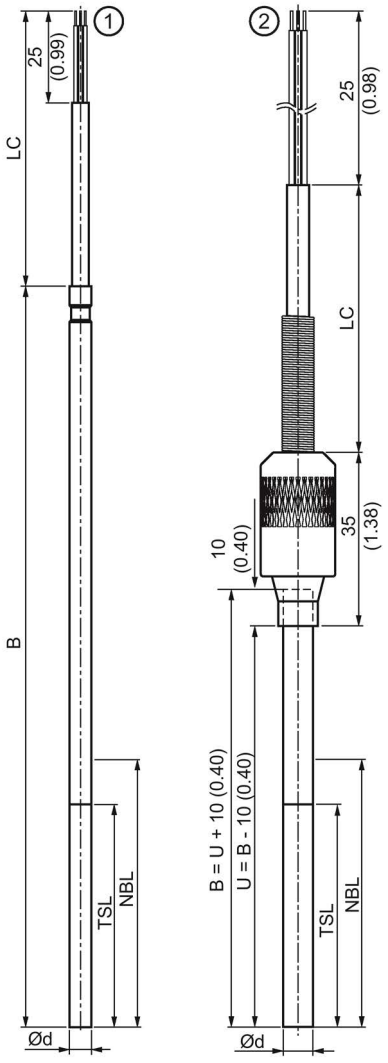
Versions	Description
Type SS, threaded straight well (7MC65..)	• Temperature sensors for vessels and pipelines, threaded process connection, straight thermowell • SITRANS TS500, type SS, threaded straight well (7MC65..) (Page 80)
Type SS, threaded straight well (7MC55..)	• Temperature sensors for vessels and pipelines, threaded process connection, straight thermowell • SITRANS TS500, type SS, threaded straight well (7MC55..) (Page 81)
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 82)
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 83)
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 84)
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 85)
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 87)
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 88)
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 89)
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 90)
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 91)
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 92)
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 94)

Versions	Description
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 95)
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 96)
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 97)
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 98)
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 99)

Table 9- 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 100)
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 100)

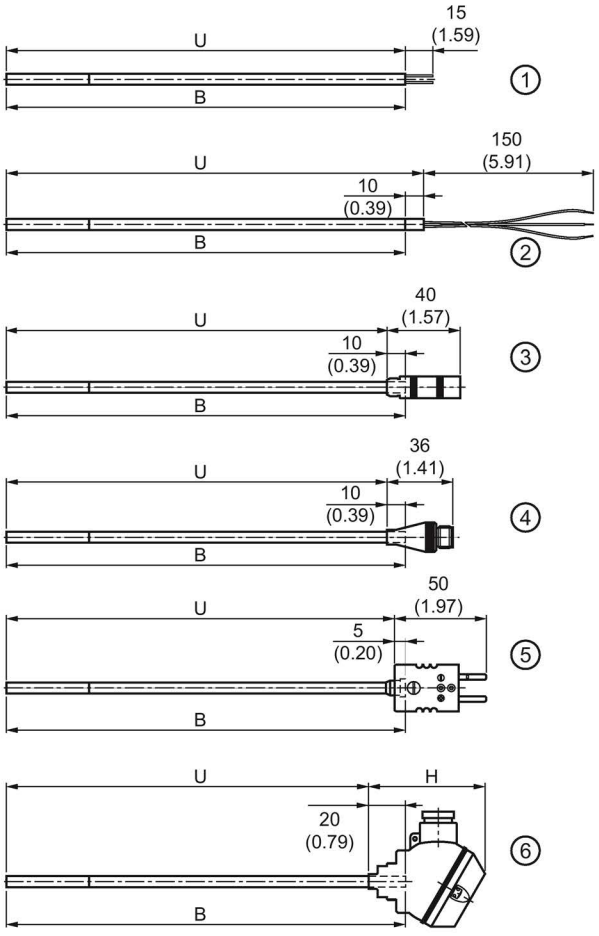
9.2 SITRANS TS100



Dimensional drawings SITRANS TS100 - dimensions in mm (inch)

①	TS100 basic version
②	TS100 mineral-insulated version
∅d	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

9.3 SITRANS TS200

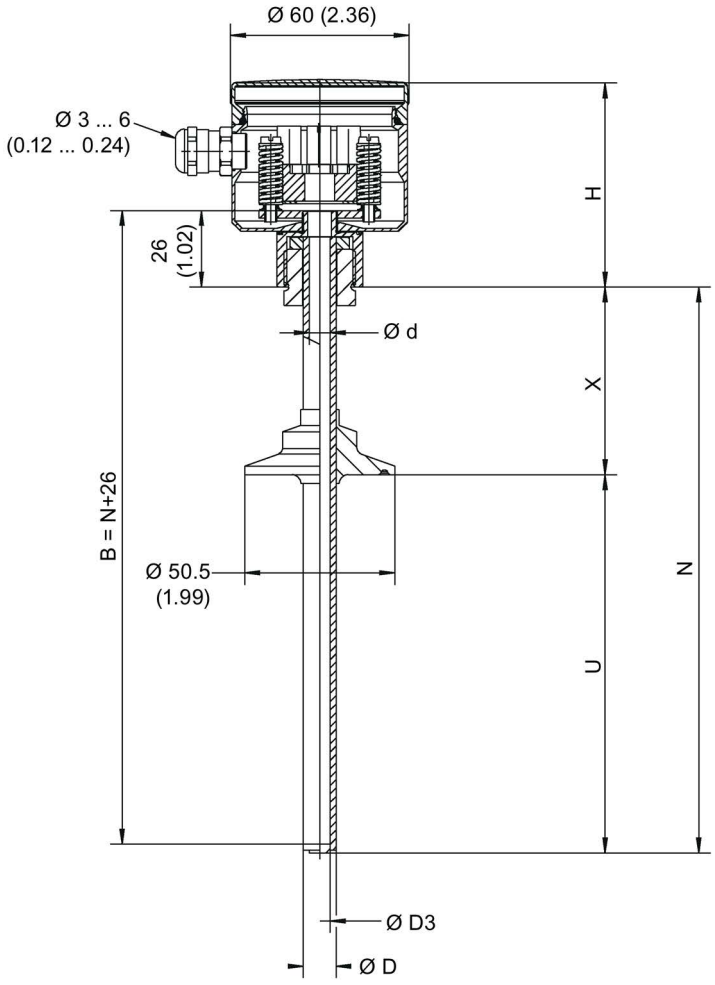


B	Length of measuring insert	U	Mounting length
H	Height of head		
①	Basic sensor	U = B	
②	Flying Leads	U = B + 10 (0.39)	
③	Coupling LEMO 1S	U = B - 10 (0.39)	
④	M12 connector	U = B - 10 (0.39)	
⑤	Thermocouple coupling	U = B - 5 (0.20)	
⑥	Miniature connection head	U = B - 20 (0.79)	

Figure 9-1 Dimensional drawings SITRANS TS200 - dimensions in mm (inch)

9.4 SITRANS TS300

SITRANS TS300 Modular:

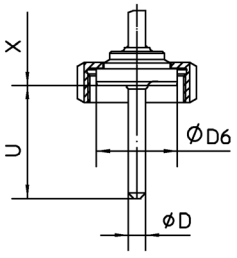


B	Length of measuring insert	H	Height of head
∅d	External diameter of measuring insert	N	Nominal length
∅D	External diameter of process connection	U	Mounting length (see process connection options)
∅D3	Internal diameter of protective tube	X	Extension (see process connection options)

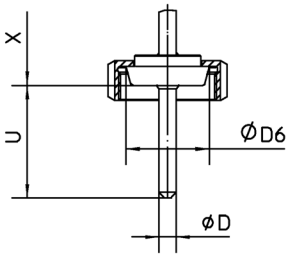
Figure 9-2 Dimensions in mm (inch)

Process connection options:

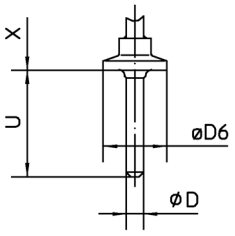
tapered coupling with groove union nut aseptic design per DIN 11864-1



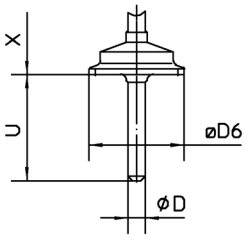
tapered coupling with groove union nut per DIN 11851



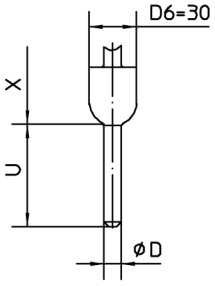
tri-clamp connection



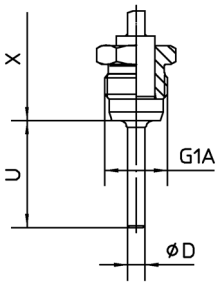
clamp connection per DIN 32676 or ISO 2852



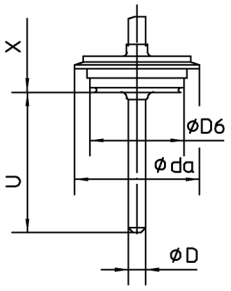
thermowell with welding ball 30 x 40 mm



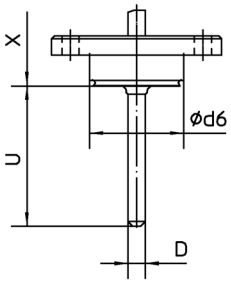
G1A dead-zone free (conical metal taper)



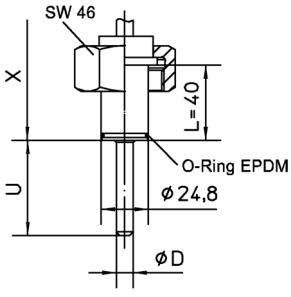
Varivent connection



NEUMO connection

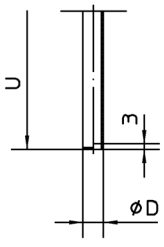


connection per INGOLD DN 25 with coupling nut

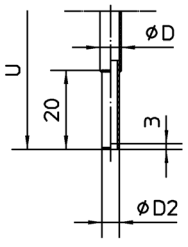


neck tube according to DIN 43772

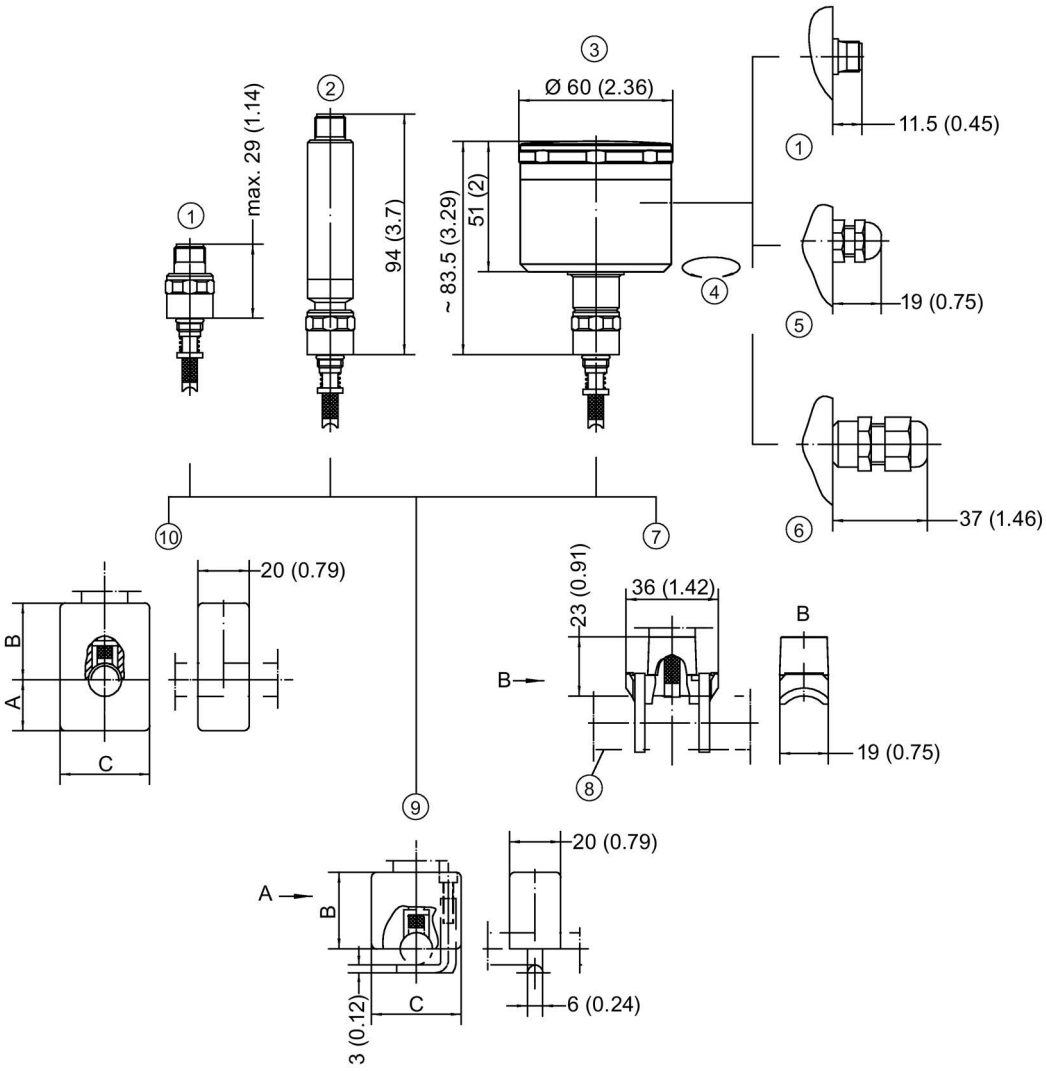
model 2



similar model 3 reduced tip



SITRANS TS300 Clamp-on:



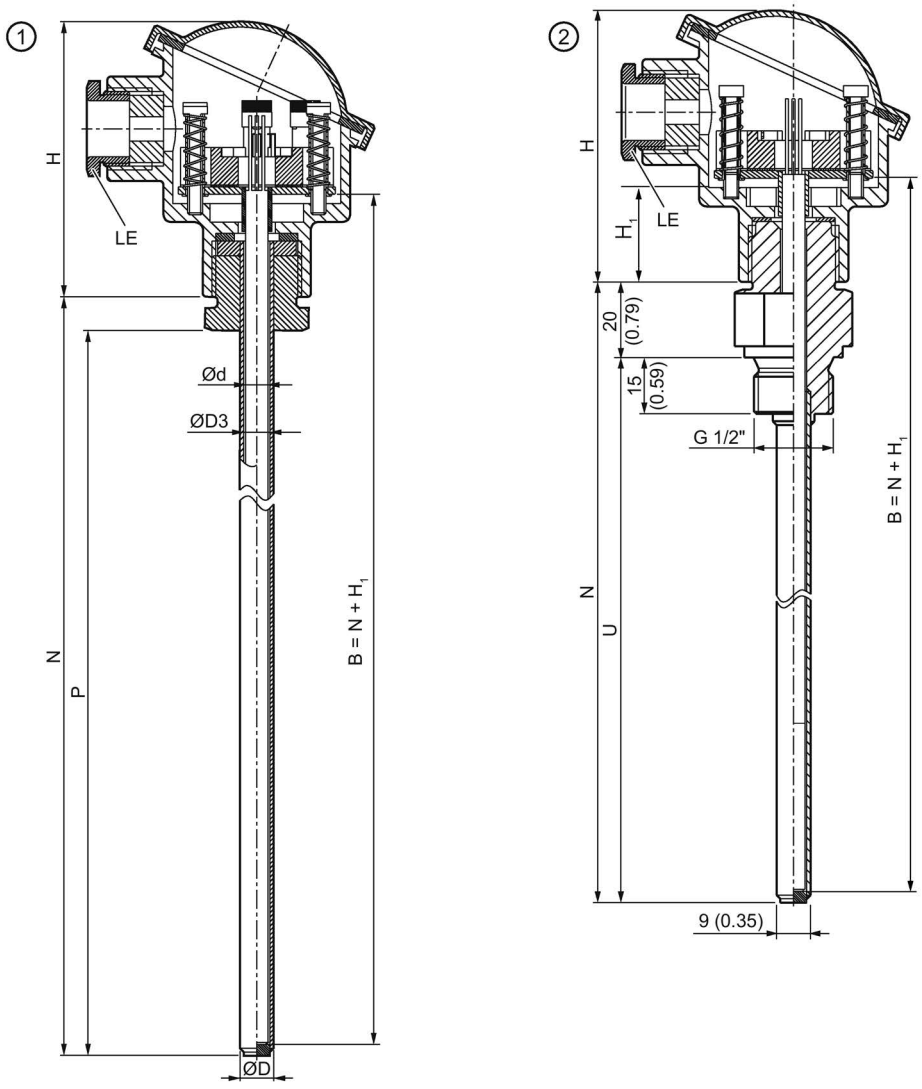
①	circular connector M12 x 1	⑥	cable connection M16 x 1,5 cable ∅4, 5-10
②	transmitter with circular connector M12 x 1	⑦	clamping shoe for pipe ≥ ∅10 - ~∅300
③	stainless steel connection head housing	⑧	example ∅21 (0.83)
④	electrical connection ± 170° rotatable	⑨	clamping bracket for pipe ∅4-17, 2
⑤	cable connection M12 x 1,5 cable ∅3-6, 5	⑩	clamping block for pipe ∅4-57

pipe ∅	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 9-3 Dimensions in mm (inch)

9.5 SITRANS TS500

9.5.1 SITRANS TS500, types 2 and 2N

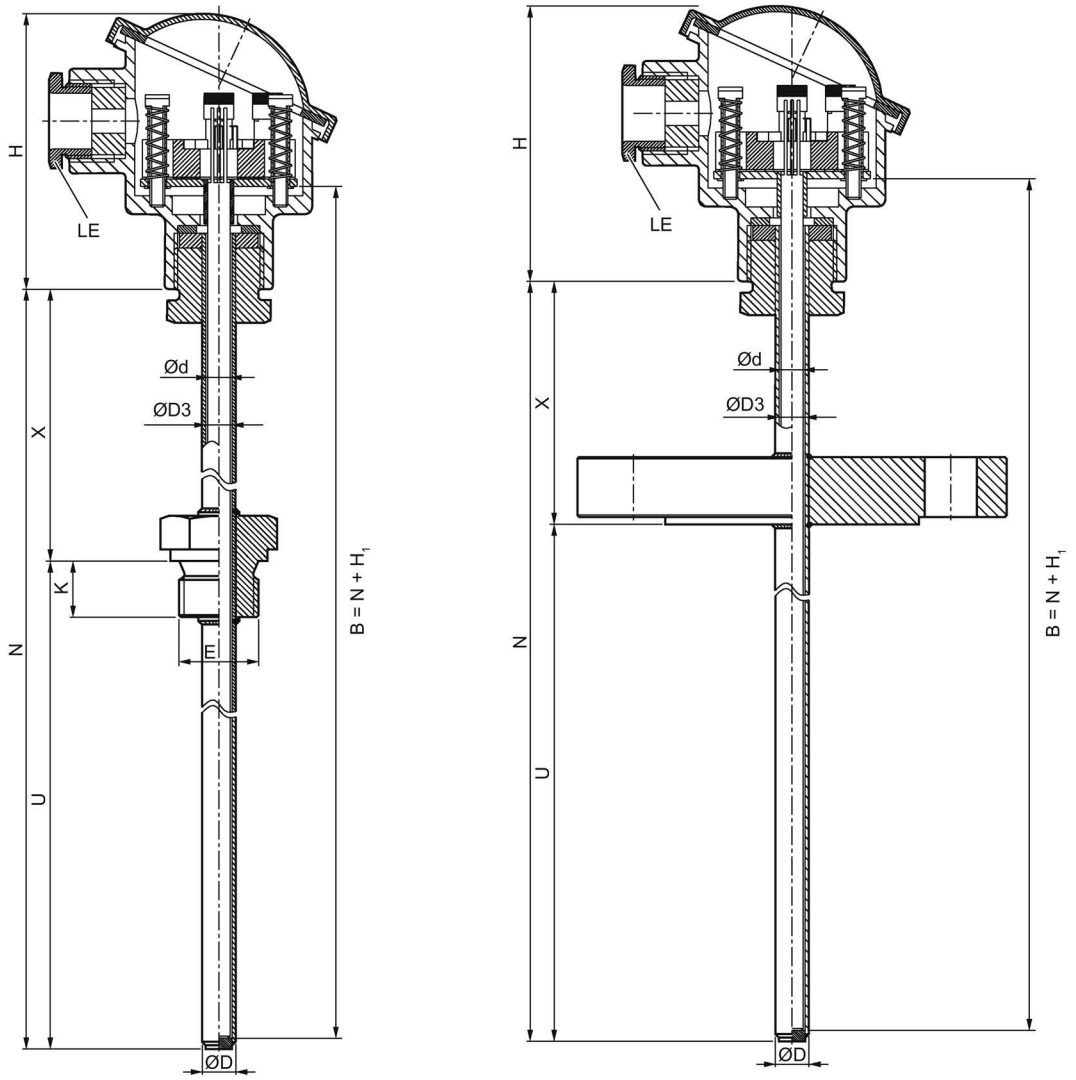


①	Type 2, pipe version without process connection
②	Type 2N, pipe version with screw-in nipple

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 9-4 Dimensional drawings SITRANS TS500, types 2 and 2N - dimensions in mm (inch)

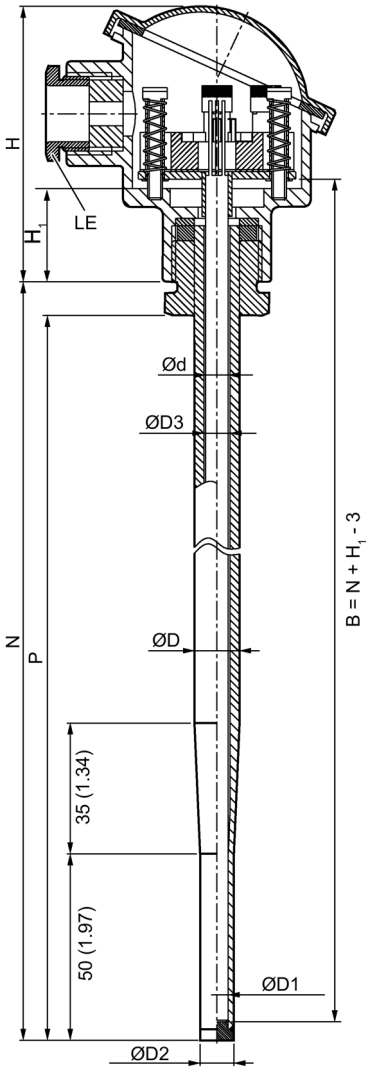
9.5.2 SITRANS TS500, types 2G and 2F



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)
∅d	External diameter of measuring insert (6 (0.24))	K	Penetration depth
∅D	External diameter of process connection	LE	Cable inlet
∅D3	Internal diameter of protective tube	N	Nominal length
E	Thread dimension of process connection	U	Mounting length
H	Height of head	X	Extension

Figure 9-5 Dimensional drawings SITRANS TS500, types 2G and 2F - dimensions in mm (inch)

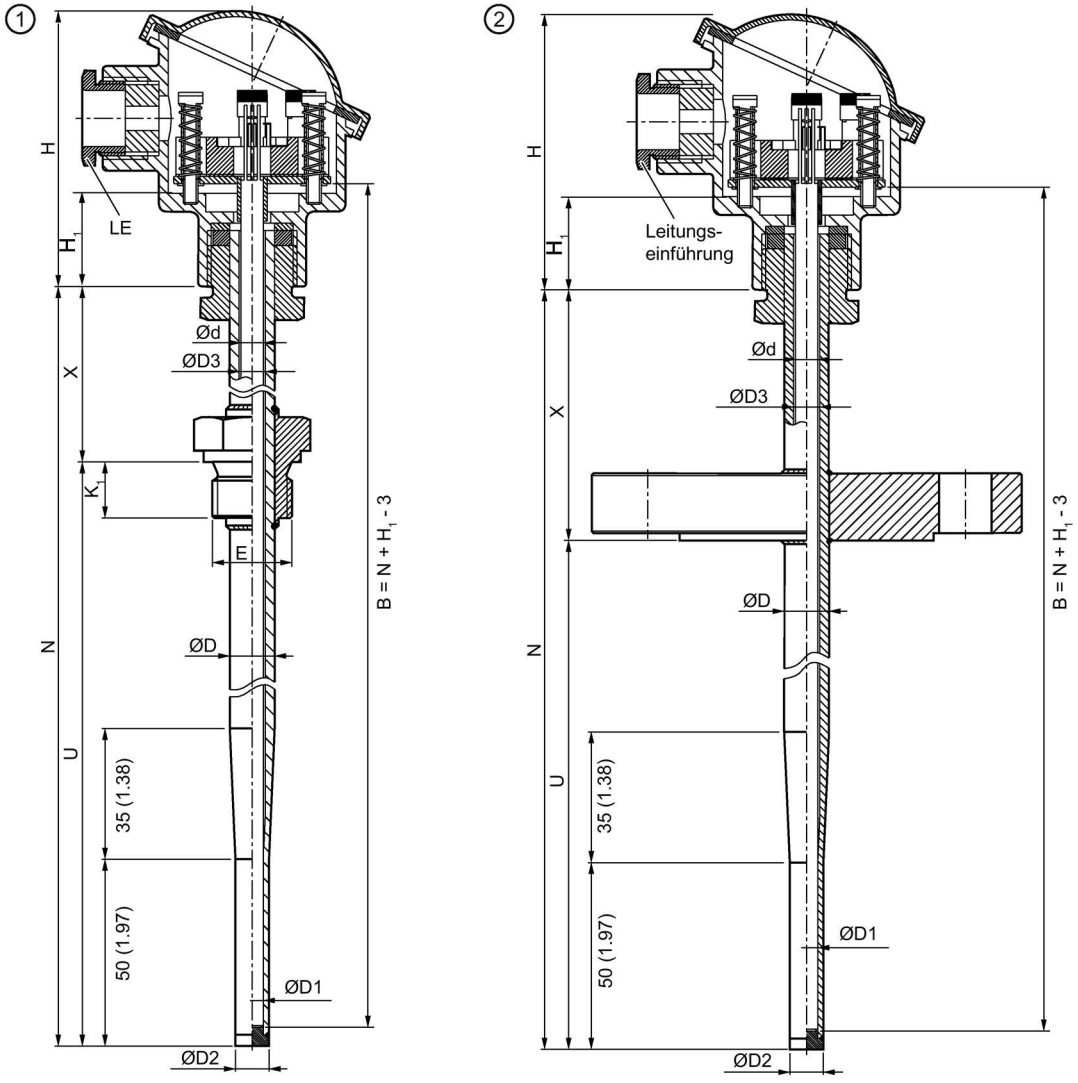
9.5.3 SITRANS TS500, type 3



①	Type 3, fast pipe version without process connection		
B	Length of measuring insert (European)	H	Height of head
∅d	External diameter of measuring insert (6 (0.24))	H_1	Type Axx: 41 (1.61) Type Bxx: 26 (1.02)
∅D	External diameter of fixing point	LE	Cable inlet
∅D1	Internal diameter of tip	N	Nominal length
∅D2	External diameter of tip	P	Space for process connection
∅D3	Internal diameter of protective tube		

Figure 9-6 Dimensional drawing SITRANS TS500, type 3 - dimensions in mm (inch)

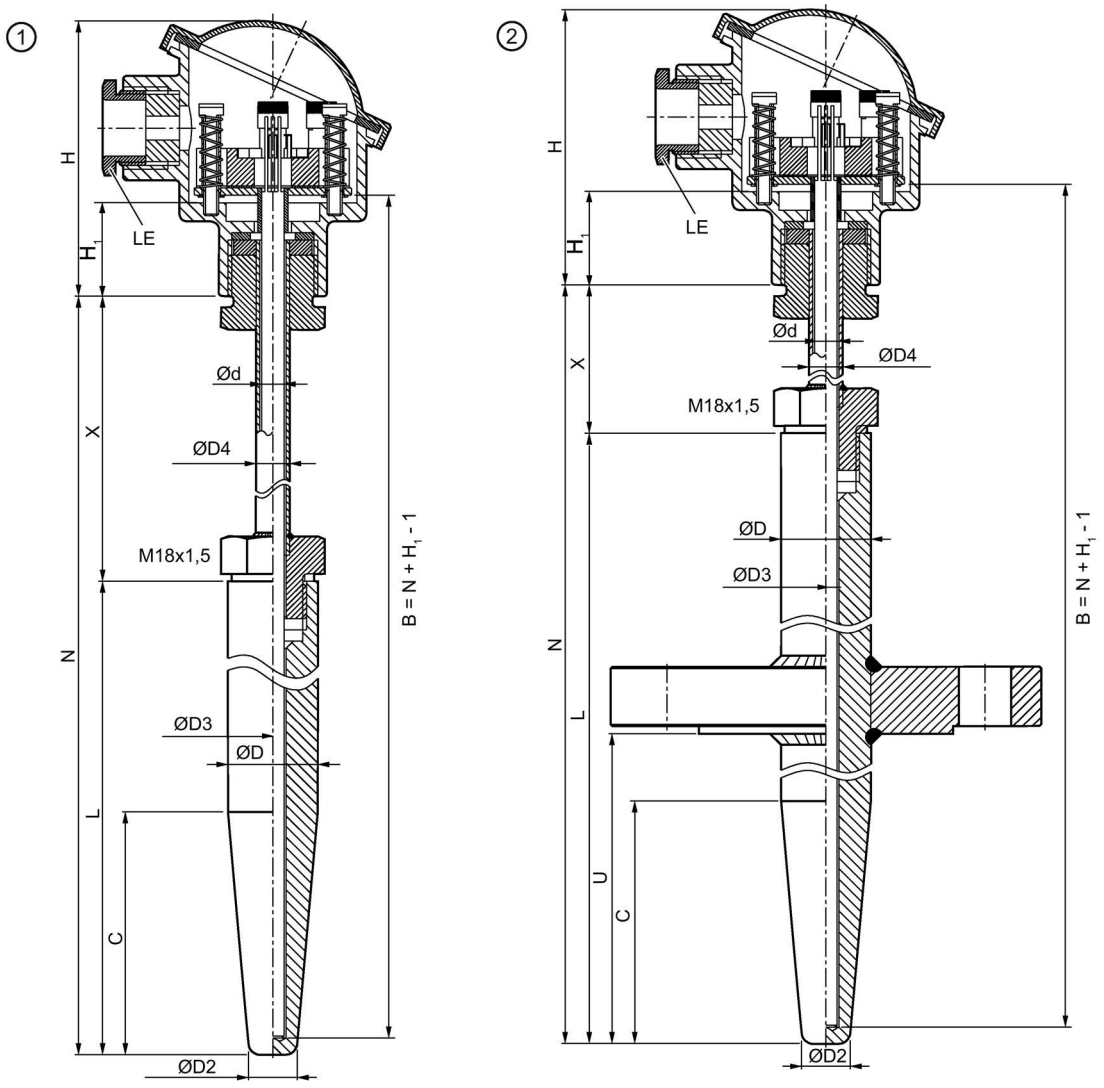
9.5.4 SITRANS TS500, types 3G and 3F



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)
∅d	External diameter of measuring insert (6 (0.24))	H	Height of head
∅D	External diameter of process connection	K	Penetration depth
∅D1	Internal diameter of tip	LE	Cable inlet
∅D2	External diameter of tip	N	Nominal length
∅D3	Internal diameter of protective tube	U	Mounting length
E	Thread dimension of process connection	X	Extension

Figure 9-7 Dimensional drawings SITRANS TS500, types 3G and 3F

9.5.5 SITRANS TS500, types 4 and 4F

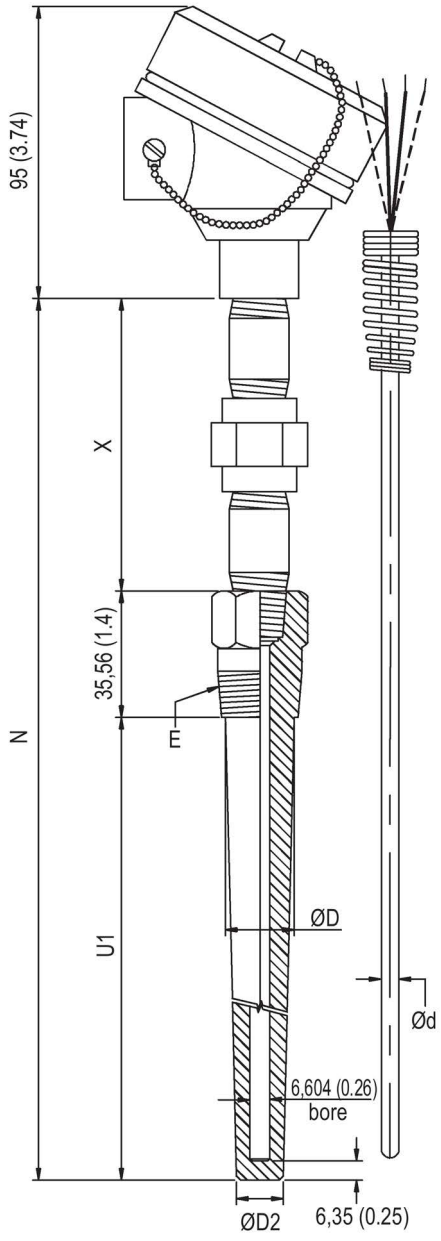


① Type 4, full material version, with extension
② Type 4F, full material version, with flange and extension

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 9-8 Dimensional drawings SITRANS TS500, types 4 and 4F - dimensions in mm (inch)

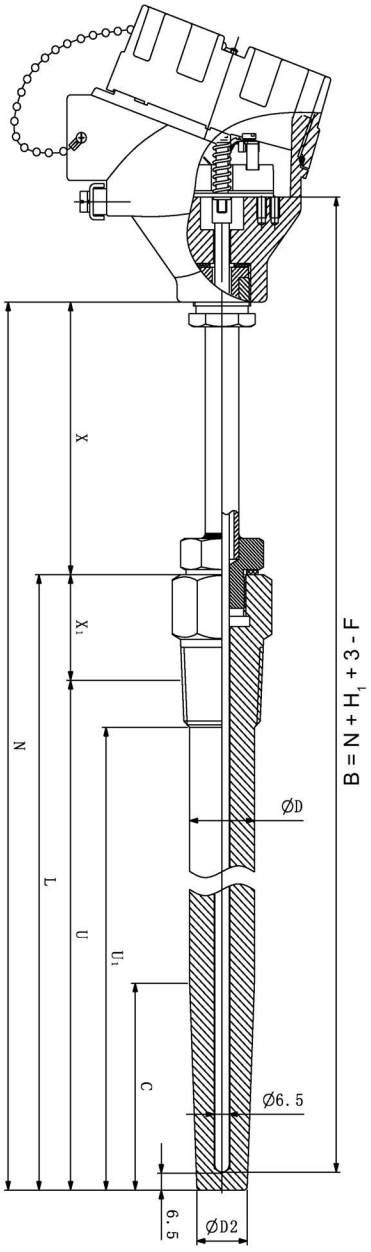
9.5.6 SITRANS TS500, type ST, threaded tapered well (7MC65..)



∅d	External diameter of measuring insert	E	Thread dimension of process connection
∅D	External diameter of process connection	N	Nominal length
∅D2	External diameter of tip	U1	Unsupported length
X	Extension		

Figure 9-9 Dimensional drawings SITRANS TS500, type ST, threaded tapered well - dimensions in mm (inch)

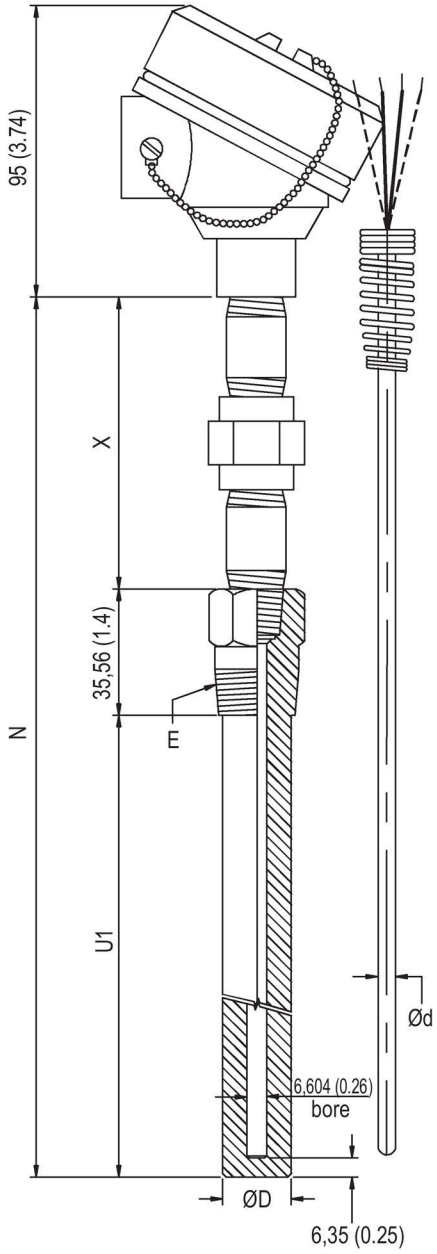
9.5.7 SITRANS TS500, type SST, threaded tapered well (7MC55..)



L	Length of thermowell	B	Length of insert
∅D1	External diameter of process connection	N	Nominal length
∅D2	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 9-10 Dimensional drawings SITRANS TS500, type SST, threaded tapered well (7MC55…) - dimensions in mm (inch)

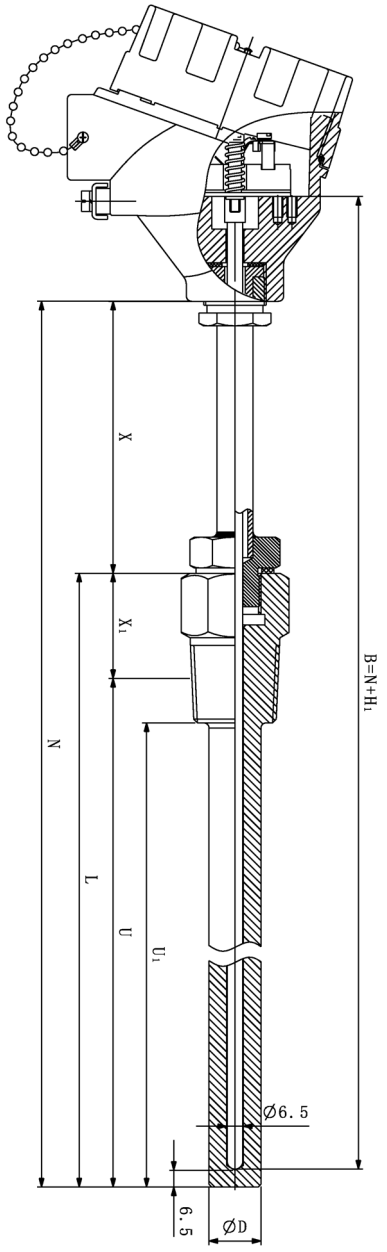
9.5.8 SITRANS TS500, type SS, threaded straight well (7MC65..)



∅d	External diameter of measuring insert	E	Thread dimension of process connection
∅D	External diameter of process connection	N	Nominal length
X	Extension	U1	Unsupported length

Figure 9-11 Dimensional drawings SITRANS TS500, type SS, threaded straight well - dimensions in mm (inch)

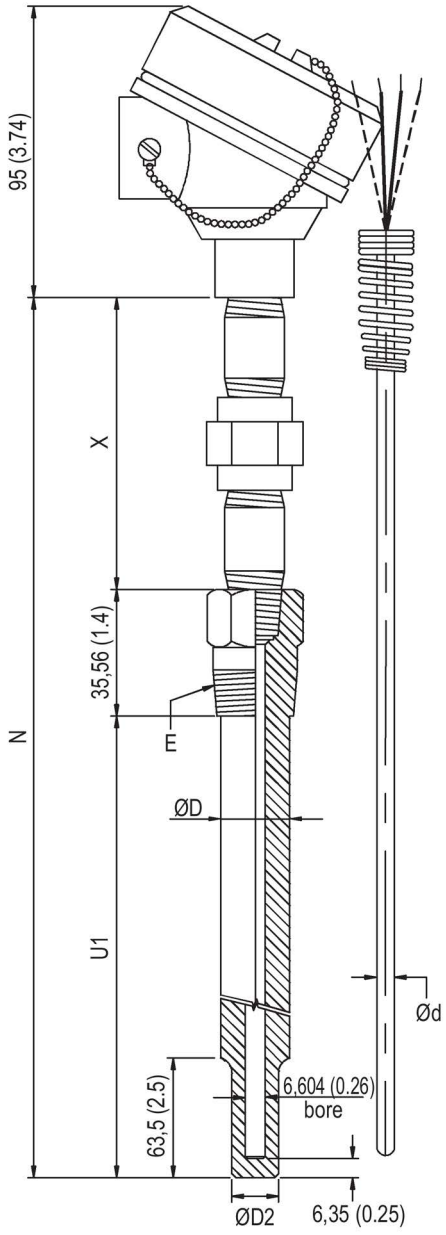
9.5.9 SITRANS TS500, type SS, threaded straight well (7MC55..)



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

Figure 9-12 Dimensional drawings SITRANS TS500, type SS, threaded straight well (7MC55…)

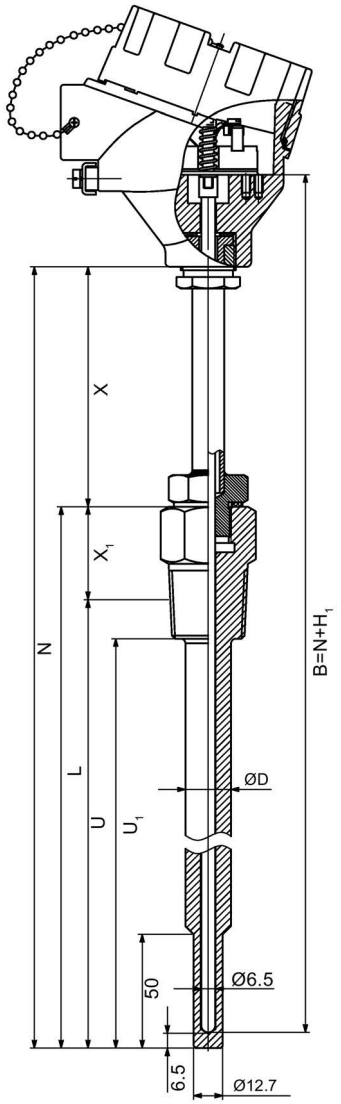
9.5.10 SITRANS TS500, type SR, threaded reduced well (7MC65..)



∅d	External diameter of measuring insert	E	Thread dimension of process connection
∅D	External diameter of process connection	N	Nominal length
∅D2	External diameter of tip	U1	Unsupported length
X	Extension		

Figure 9-13 Dimensional drawings SITRANS TS500, type SR, threaded reduced well - dimensions in mm (inch)

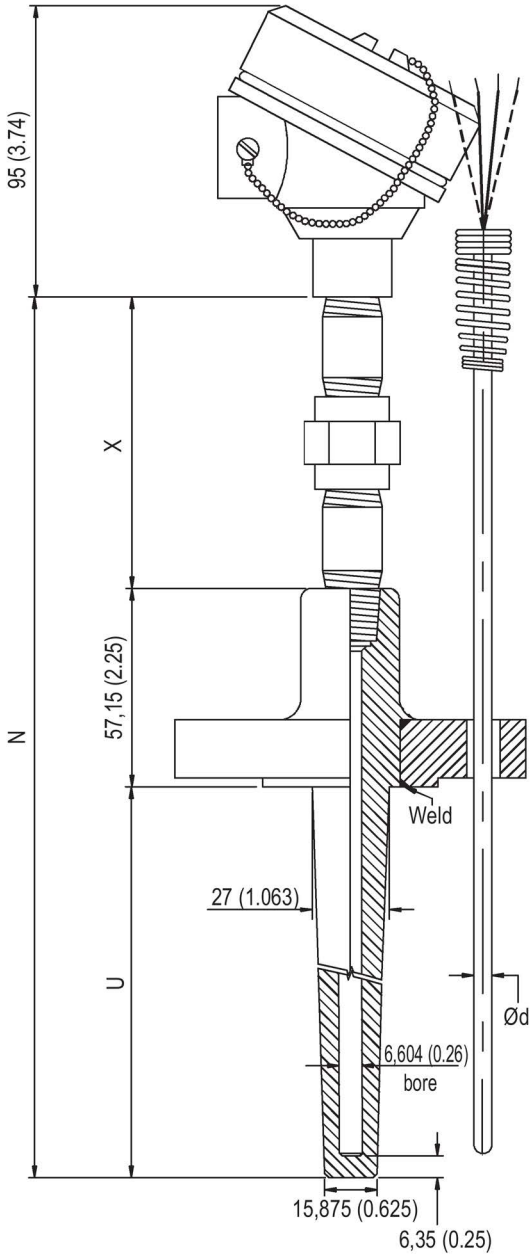
9.5.11 SITRANS TS500, type SR, threaded reduced well (7MC55..)



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

Figure 9-14 Dimensional drawings SITRANS TS500, type SR, threaded reduced well (7MC55…)

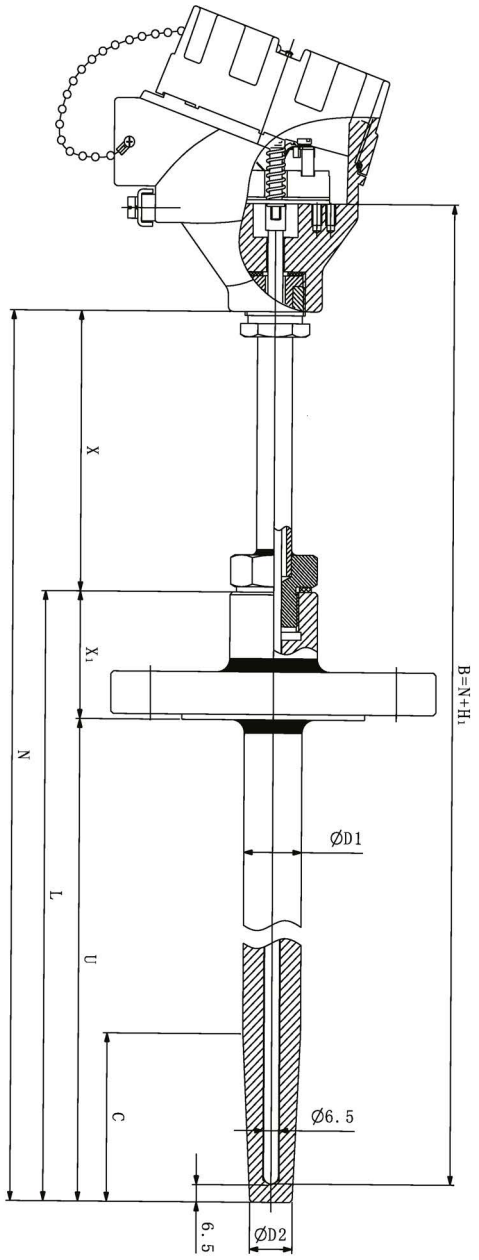
9.5.12 SITRANS TS500, type FT, flanged tapered well (7MC65..)



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

Figure 9-15 Dimensional drawings SITRANS TS500, type FT, flanged tapered well - dimensions in mm (inch)

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

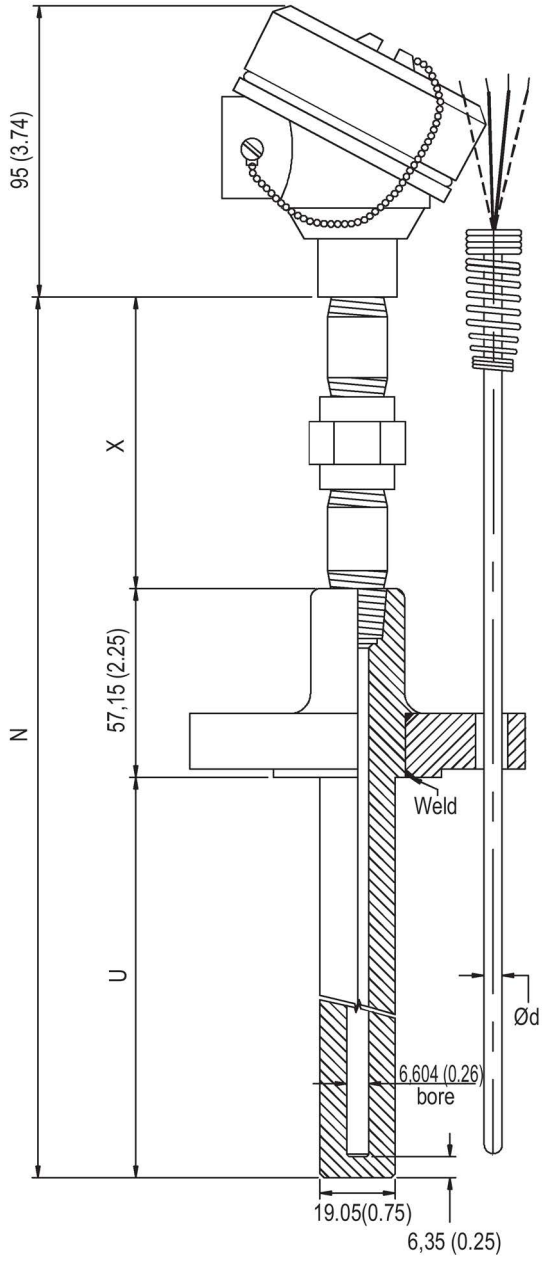


L	Length of thermowell	B	Length of measuring Insert
∅D1	External diameter of process connection	N	Nominal length
∅D2	External diameter of tip	U	Insertion length
X	Extension length	H_1	Head bottom thickness Type Axx = 41 (1.61) Type Bxx = 26 (1.02)

X_1 Lag lenght C Cone Length

Figure 9-16 Dimensional drawings SITRANS TS500, type FST, flanged tapered well (7MC55…)

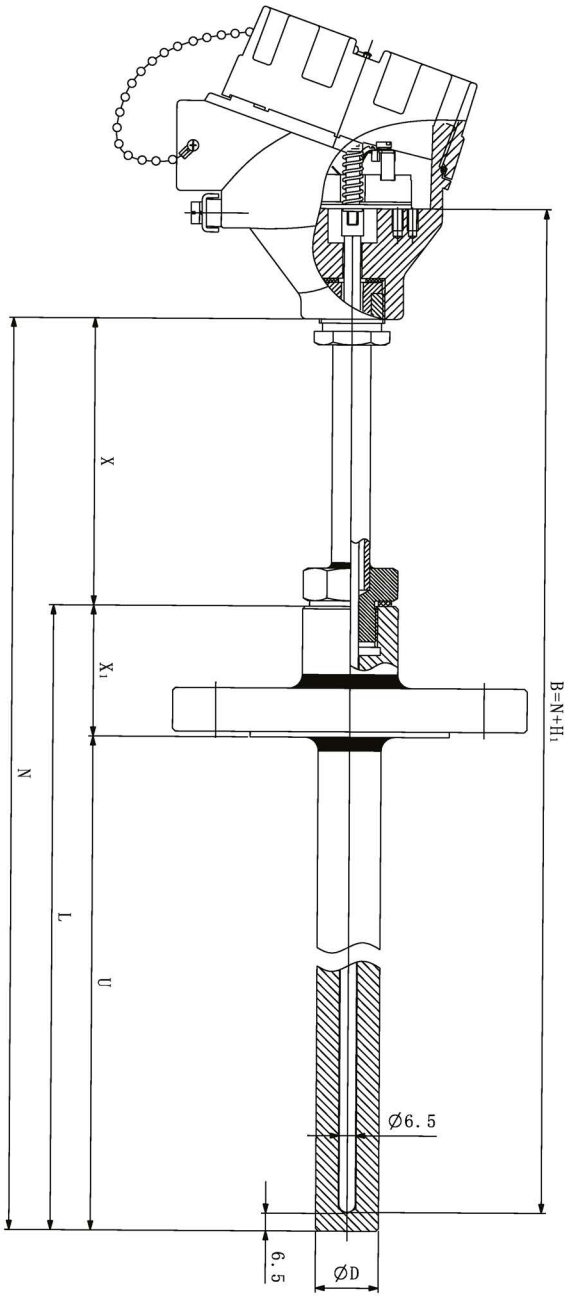
9.5.14 SITRANS TS500, type FS, flanged straight well (7MC65..)



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

Figure 9-17 Dimensional drawings SITRANS TS500, type FS, flanged straight well - dimensions in mm (inch)

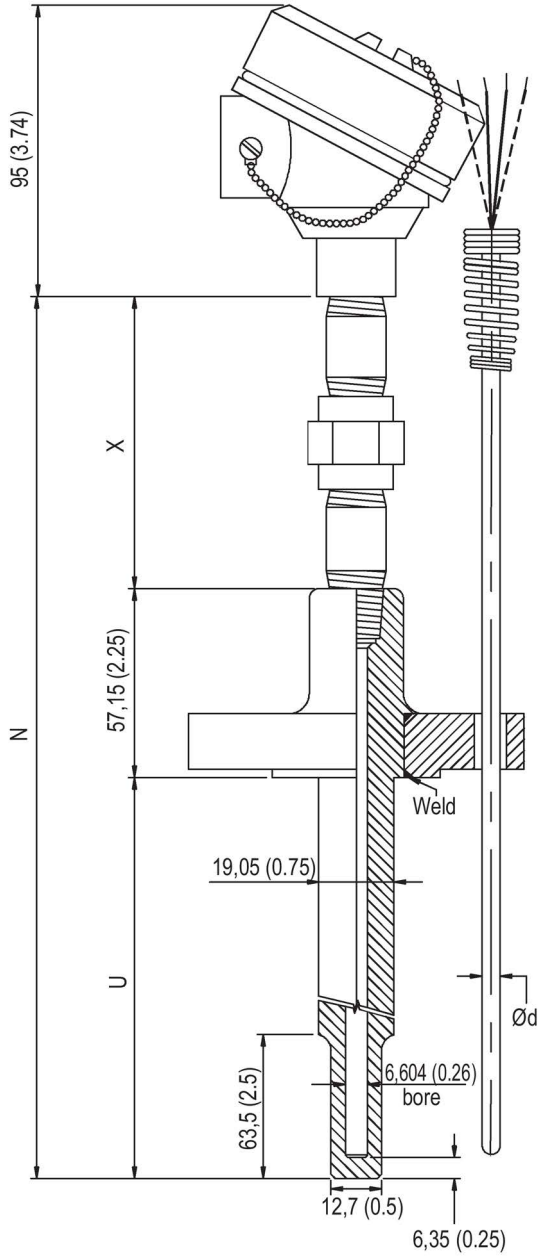
9.5.15 SITRANS TS500, type FS, flanged straight well (7MC55..)



∅D	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 9-18 Dimensional drawings SITRANS TS500, type FS, flanged straight well (7MC55…)

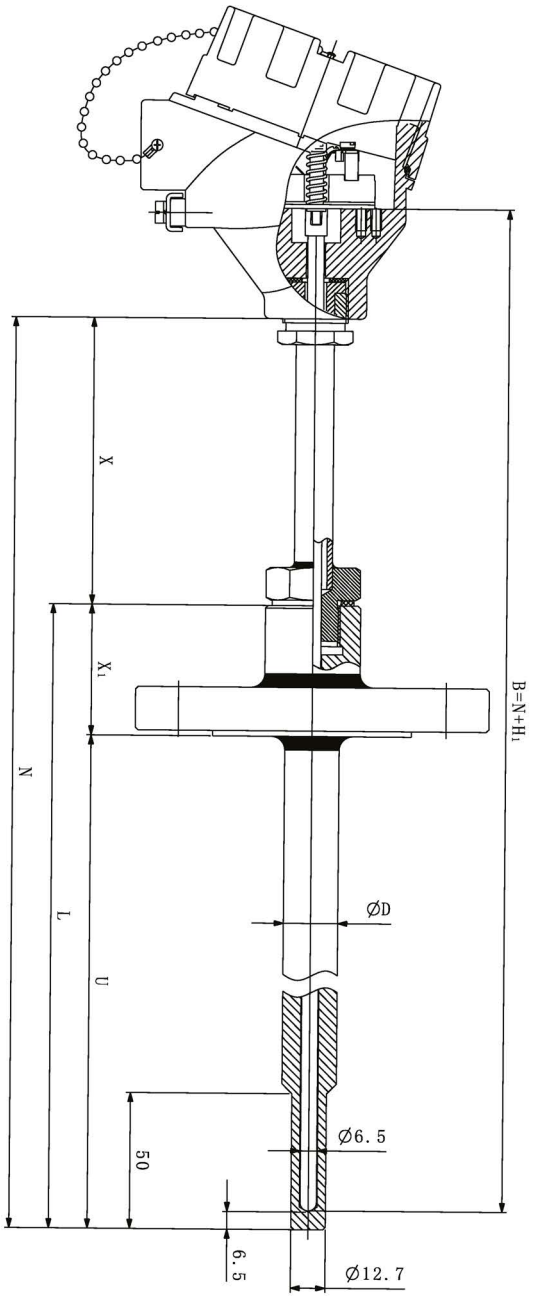
9.5.16 SITRANS TS500, type FR, flanged reduced well (7MC65..)



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

Figure 9-19 Dimensional drawings SITRANS TS500, type FR, flanged reduced well - dimensions in mm (inch)

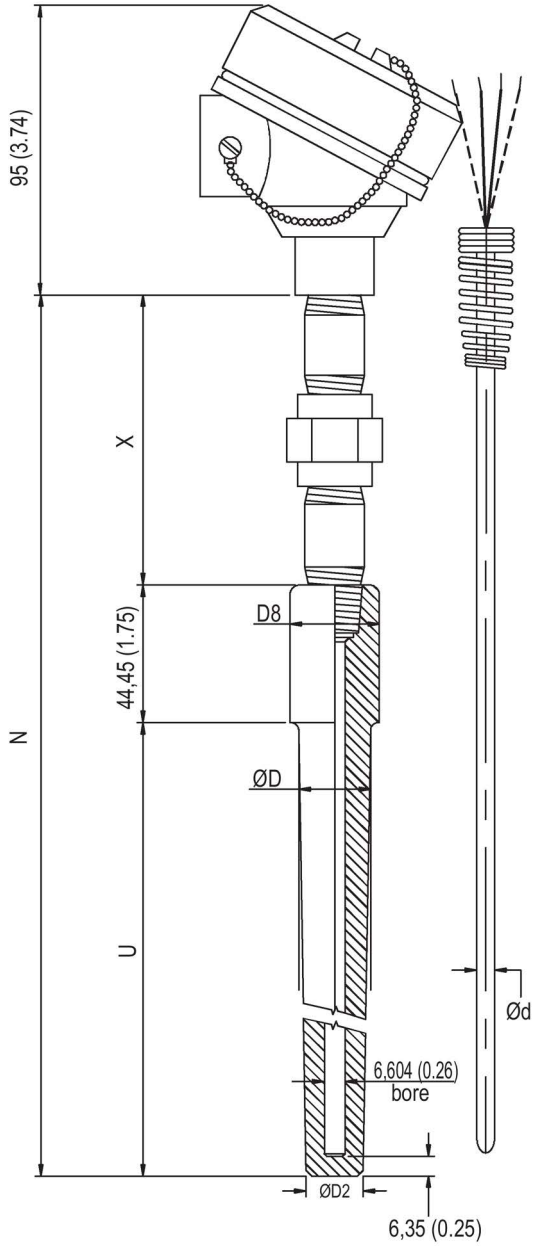
9.5.17 SITRANS TS500, type FR, flanged reduced well (7MC55..)



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

Figure 9-20 Dimensional drawings SITRANS TS500, type FR, flanged reduced well (7MC55…)

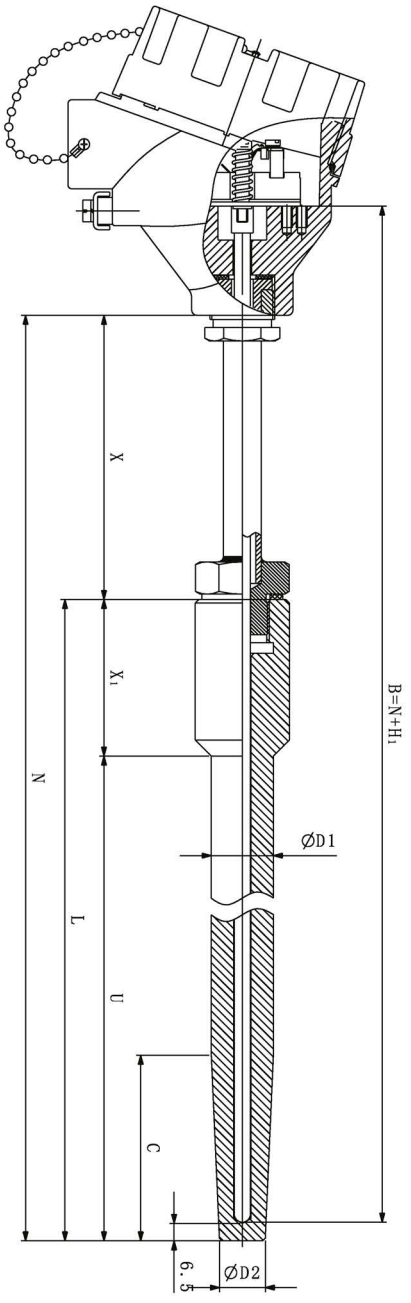
9.5.18 SITRANS TS500, type SWT, socket tapered well (7MC65..)



∅d	External diameter of measuring insert (6 (0.24))	N	Nominal length
∅D	External diameter of process connection	U	Mounting length
∅D2	External diameter of tip	X	Extension
∅D8	Internal diameter of protective tube		

Figure 9-21 Dimensional drawings SITRANS TS500, type SWT, socket tapered well - dimensions in mm (inch)

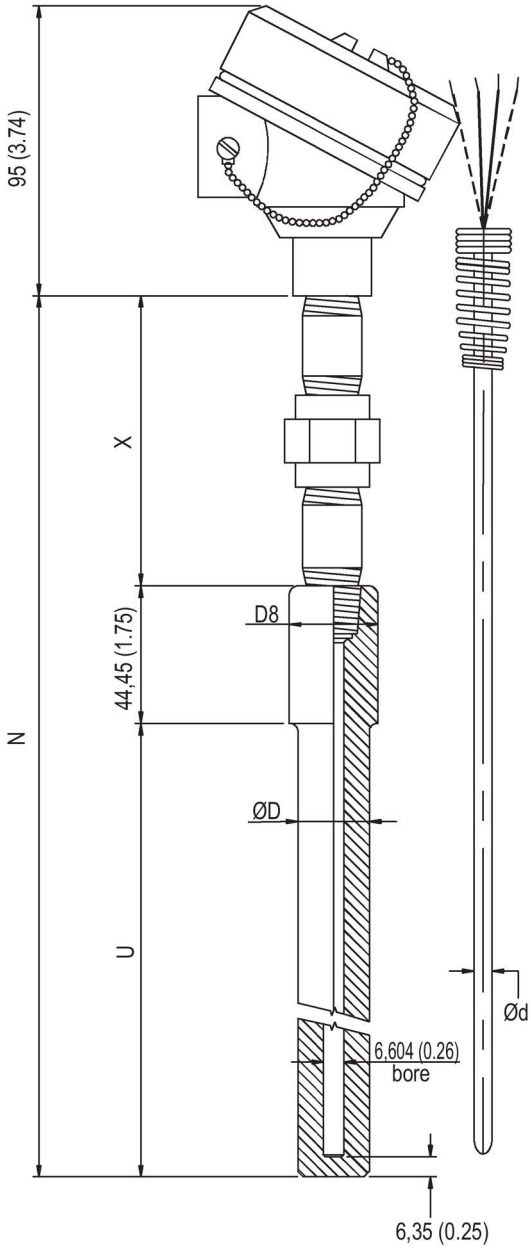
9.5.19 SITRANS TS500, type SWST, socket tapered well (7MC55..)



L	Length of thermowell	B	Length of measuring insert
∅D1	External diameter of process connection	N	Nominal length
∅D2	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 9-22 Dimensional drawings SITRANS TS500, type SWST, socket tapered well (7MC55…)

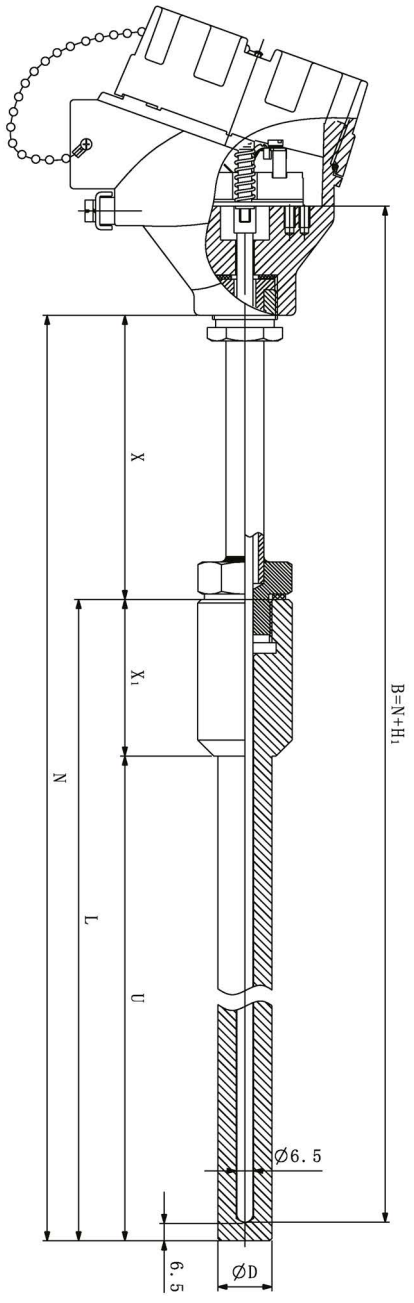
9.5.20 SITRANS TS500, type SWS, socket straight well (7MC65..)



∅d	External diameter of measuring insert (6 (0.24))	N	Nominal length
∅D	External diameter of process connection	U	Mounting length
∅D2	External diameter of tip	X	Extension
∅D8	Internal diameter of protective tube		

Figure 9-23 Dimensional drawings SITRANS TS500, type SWS, socket straight well - dimensions in mm (inch)

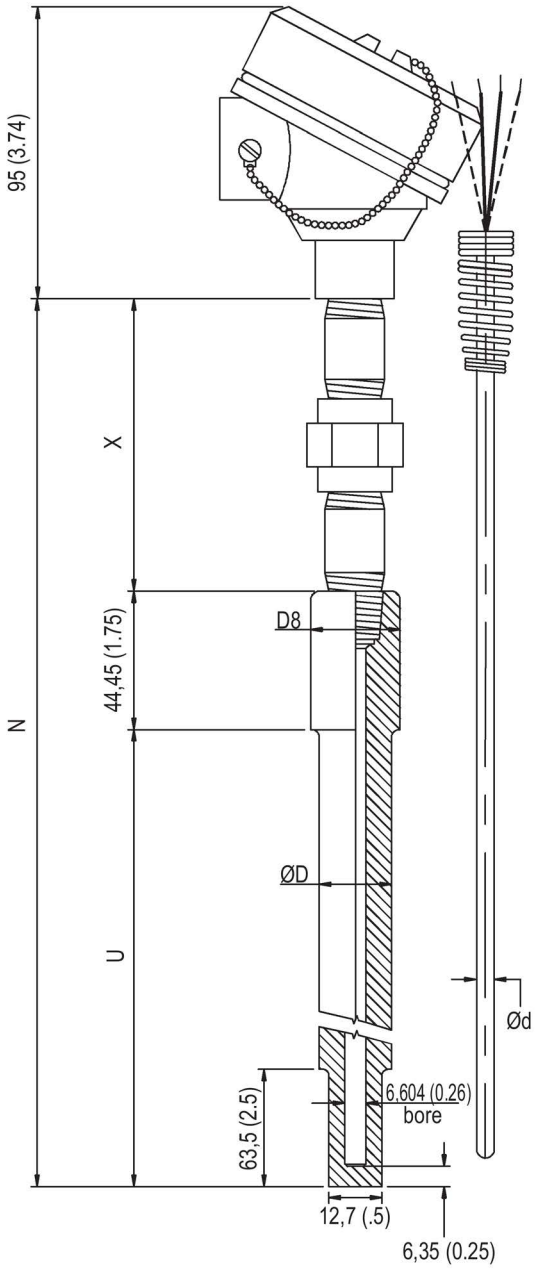
9.5.21 SITRANS TS500, type SWS, socket straight well (7MC55..)



∅D	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 lenght
N	Nominal lenght	L	Length of thermowell

Figure 9-24 Dimensional drawings SITRANS TS500, type SWS, socket straight well (7MC55…)

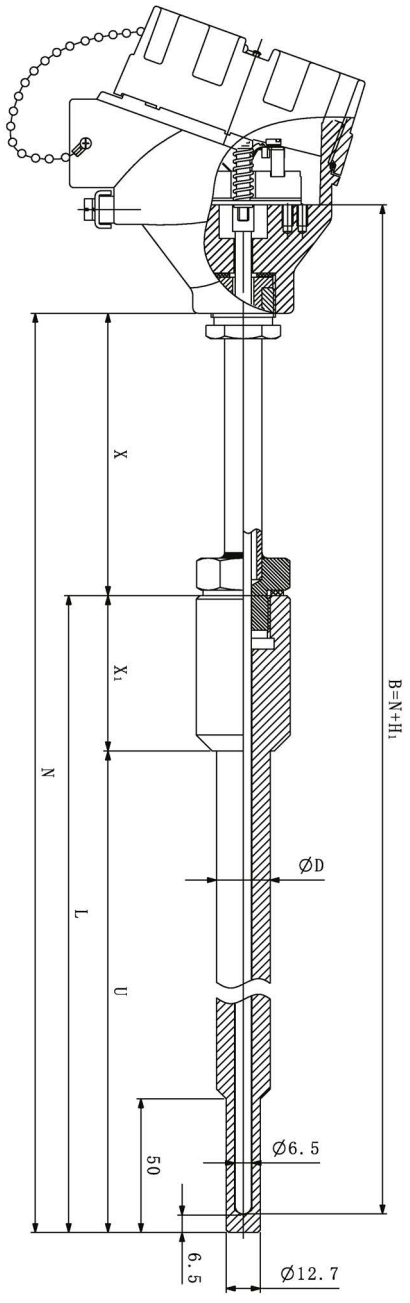
9.5.22 SITRANS TS500, type SWR, socket reduced well (7MC65..)



∅d	External diameter of measuring insert (6 (0.24))	N	Nominal length
∅D	External diameter of process connection	U	Mounting length
∅D8	Internal diameter of tip	X	Extension

Figure 9-25 Dimensional drawings SITRANS TS500, type SWR, socket reduced well - dimensions in mm (inch)

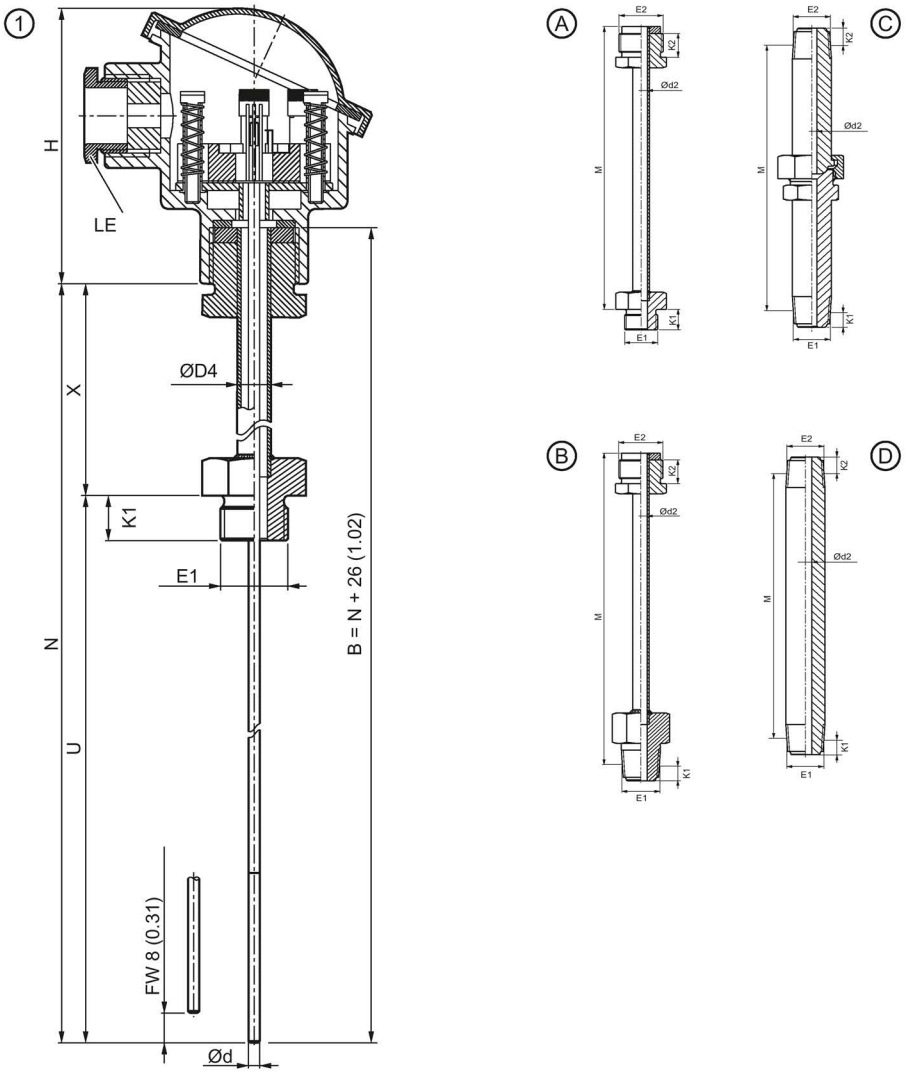
9.5.23 SITRANS TS500, type SWR, socket reduced well (7MC55..)



L	Length of thermowell	N	Nominal length
∅D	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 lenght

Figure 9-26 Dimensional drawings SITRANS TS500, type SWR, socket reduced well (7MC55…)

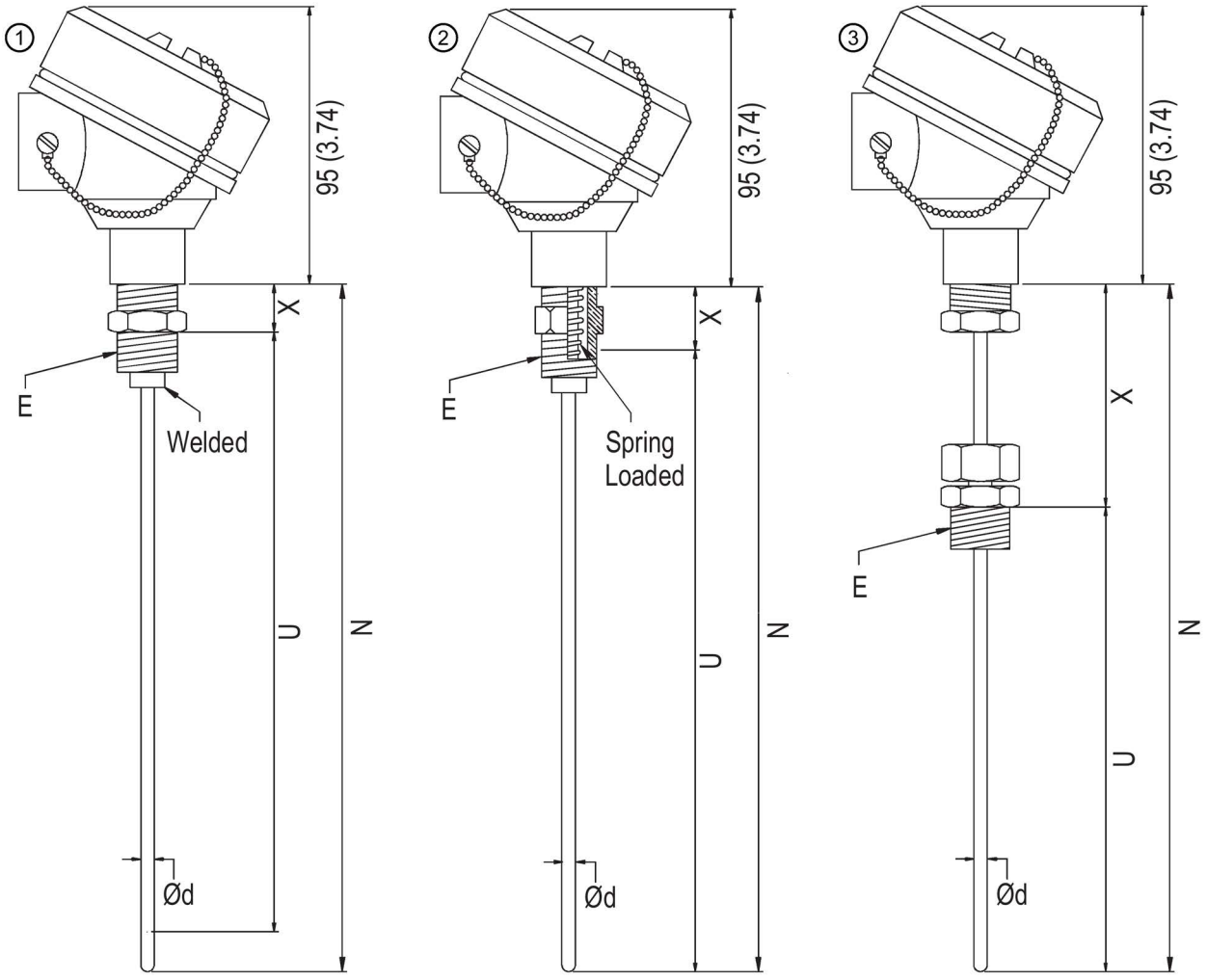
9.5.24 SITRANS TS500 for installation in existing protective tubes



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
∅d	External diameter of measuring insert	LE	Cable inlet
∅D4	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 9-27 Dimensional drawings SITRANS TS500 for installation in existing protective tubes - dimensions in mm (inch)

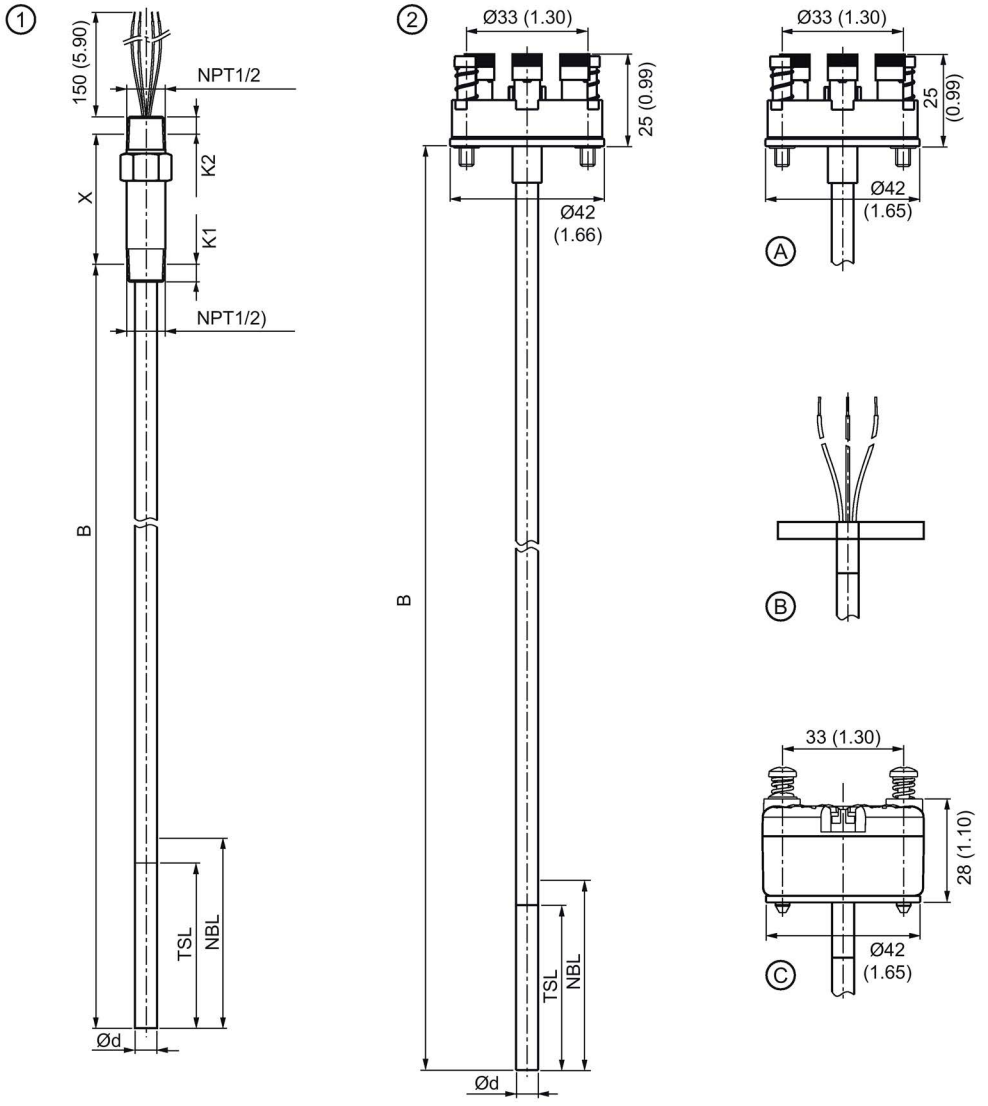
9.5.25 SITRANS TS500, type GP, general purpose, no well



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

Figure 9-28 Dimensional drawings SITRANS TS500, type GP, general purpose, no well - dimensions in mm (inch)

9.6 SITRANS TSinsert - measuring inserts for SITRANS TS500



①	American version	∅d	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 9-29 Dimensional drawings SITRANS TSinsert - measuring inserts for SITRANS TS500 - dimensions in mm (inch)

Appendix A

A.1 Certificates

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

A.2 Technical support

Technical Support

If this documentation does not provide complete answers to any technical questions you may have, contact Technical Support at:

- Support request (http://www.siemens.com/automation/support-request)
- More information about our Technical Support is available at Technical Support (http://www.siemens.com/automation/csi/service)

Internet Service & Support

In addition to our documentation, Siemens provides a comprehensive support solution at:

- Services & Support (http://www.siemens.com/automation/service&support)

Personal contact

If you have additional questions about the device, please contact your Siemens personal contact at:

- Partner (http://www.automation.siemens.com/partner)

In order to find the contact for your product, select under 'All Products and Branches' the path 'Automation Technology > Sensor Systems'.

Documentation

You can find documentation on various products and systems at:

- Instructions and manuals Instructions and manuals (http://www.siemens.com/processinstrumentation/documentation)

See also

SITRANS T product information (http://www.siemens.com/sitranst)

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