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71780559
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Technical Information
iTEMP TMT36

Temperature transmitter

IO-Link temperature head transmitter with one RTD sensor input

Field of application

- The temperature transmitter is characterized by its reliability, long-term stability, high precision and diagnostic functions
- For maximum safety and availability
- Installation in terminal head form B (flat face), or on DIN rail with DIN rail clip
- IO-Link
  1x PNP, NPN or push-pull switch output, configurable

Benefits

- Push-in terminals for fast, tool-free wiring during installation or maintenance
- Easy configuration using free software tools (requires SFP20)
- Sensor-transmitter matching with Callendar-Van Dusen linearization for critical measuring points
- Improved RTD measurement accuracy of up to 0.15 K and long-term stability
- Safe and reliable operation
- IO-Link technology for digitalization of the last mile in the plant

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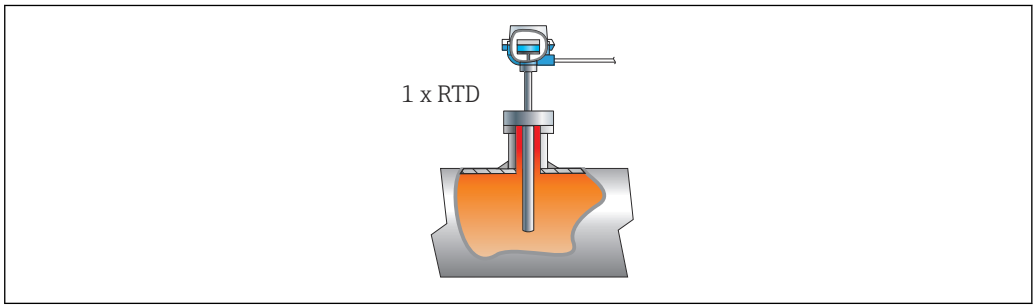
Function and system design

Measuring principle

Electronic recording and conversion of RTD input signals in industrial temperature measurement. An RTD (Resistance Temperature Detector) is a sensor whose resistance changes when its temperature changes. The resistance increases with increasing temperature of the sensor.

Measuring system

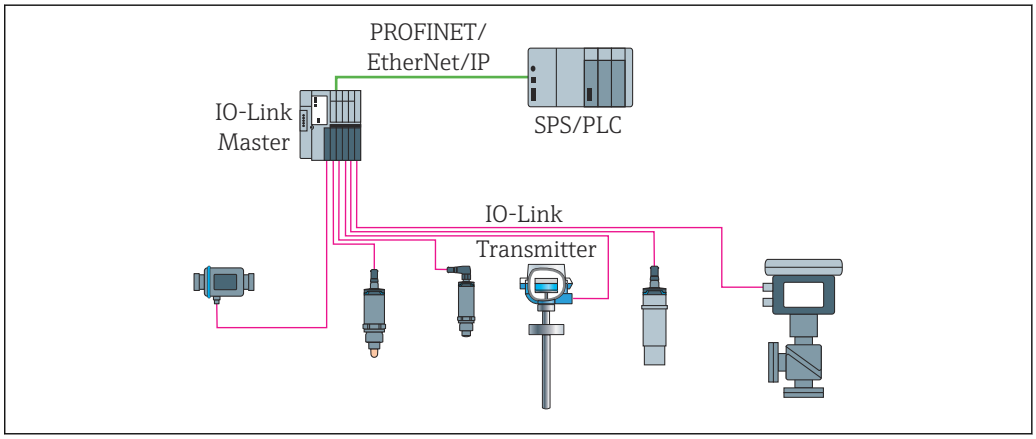


1 *Installed head transmitter - 1 x RTD wired directly*

Endress+Hauser offers a comprehensive range of industrial thermometers with resistance sensors.

When combined with the temperature transmitter, these components form a complete measuring point for a wide range of applications in the industrial sector.

The temperature transmitter is an IO-Link device with a measurement input and an IO-Link interface. The device is mounted in a terminal head form B (flat face) as per DIN EN 50446.



2 *Temperature transmitter with IO-Link interface*

Standard diagnostic functions

- Cable open-circuit, short-circuit of sensor wires
- Internal device errors
- Overrange and underrange detection
- Device temperature overrange/underrange detection
- Low voltage detection
- Simulation
- Overload at the switch output

Input

Measured variable

Temperature

Measuring range

Resistance thermometer (RTD) as per standard	Description	α	Measuring range limits
IEC 60751:2022	Pt100 (1) Pt1000 (4)	0.003851	−200 to 850 °C (−328 to 1 562 °F) −200 to 500 °C (−328 to 932 °F)
-	Callendar-Van Dusen	-	The measuring range limits are specified by entering the limit values that depend on the coefficients A to C and R0.
	▪ Type of connection: 2-wire, 3-wire or 4-wire connection, sensor current: ≤ 0.3 mA ▪ With 2-wire circuit, compensation of the wire resistance possible (0 to 30 Ω) ▪ With 3-wire and 4-wire connection, sensor wire resistance up to max. 50 Ω per wire		

Output

Output signal

C/Q (IO-Link or switch output)

Switch output

- 1 × PNP, NPN or push-pull switch output, configurable
- Switching capacity Ia ≤ 150 mA
- Voltage drop PNP, NPN ≤ 2 V
- Overload protection: The switching current load is automatically tested. The device switches to a safe state if an overload is detected. The diagnostic message **Overload at the switch output** is issued.
- Switch functions:
  - Hysteresis or window function
  - NC contact or NO contact

Failure information

Failure information is generated if the measuring information is missing or not valid. The device displays the three diagnostic messages with the highest priority.

The fault state of the switch output can be configured: On, off, high-impedance.

Damping

Configurable sensor input damping	0 to 120 s
Factory setting	0 s

Protocol-specific data

IO-Link specification	Version 1.1.3
Device ID	0x93FE01
Manufacturer ID	0x0011 (17)
IO-Link Smart Sensor Profile 4.3.1	Supported: ▪ Identification and diagnosis ▪ Measuring and switching sensor, floating point, 1 channel
SIO	Yes
IO-Link transmission rate	COM2; 38.4 kBaud
Minimum cycle time	10 ms
Process data width	6 bytes
IO-Link data storage	Yes
Block configuration	Yes

Switch-on delay

≤ 5 s, until the first valid measured value signal is present

Power supply

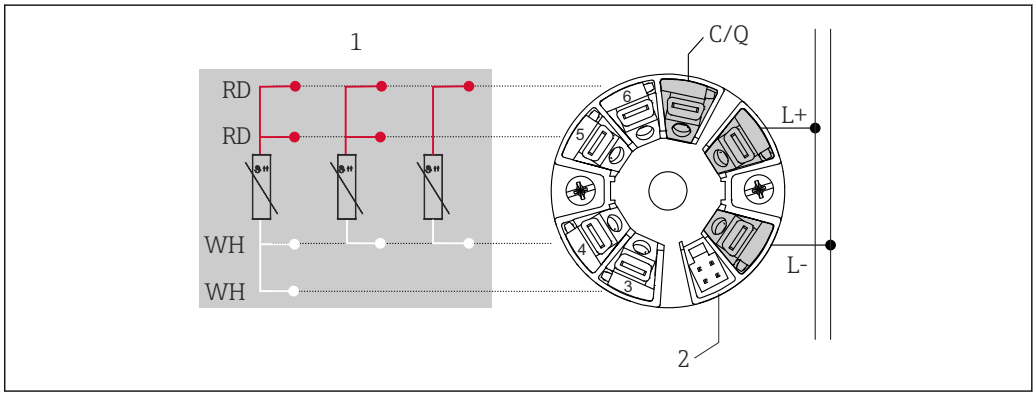
Supply voltage

U = 18 to 30 V_{DC}, protected against reverse polarity

Current consumption

I ≤ 11 mA

Electrical connection



3 Terminal assignment of head transmitter

1 RTD sensor input: 4-, 3- and 2-wire
2 Display connection
L+ 18 to 30 V_{DC} power supply
L- 0 V_{DC} power supply
C/Q IO-Link or switch output

Terminals

Choice of screw-type or push-in terminals:

Terminal design	Cable design	Cable cross-section
Screw terminals	Rigid or flexible	≤ 1.5 mm² (16 AWG)
Push-in terminals [1] (Cable design, stripping length = min. 10 mm (0.39 in)	Rigid or flexible	0.2 to 1.5 mm² (24 to 16 AWG)
	Flexible with ferrules (with or without plastic ferrule)	0.25 to 1.5 mm² (24 to 16 AWG)

1) Ferrules must be used with push-in terminals and when using flexible cables with a cable cross-section of ≤ 0.3 mm².

Performance characteristics

Response time

Response time:

Resistance thermometer (RTD)	≤ 0.5 s

Reference operating conditions

- Calibration temperature: 25 °C ±3 K (77 °F ±5.4 °F)
- Supply voltage: 24 V DC
- 4-wire circuit for resistance adjustment

Maximum measurement error

In accordance with EN IEC 62828 and the reference operating conditions specified above. The measurement error data corresponds to ±2 σ (Gaussian distribution). The data includes non-linearities and repeatability.

	Measurement error (±)
in the entire measuring range	0.15 K

Sensor adjustment

Sensor-Transmitter-Matching

The device enables the following method to improve the temperature measurement accuracy of RTD sensors significantly:

Callendar-Van Dusen equation:
$R_T = R_0[1+AT+BT^2+C(T-100)T^3]$

The coefficients A, B and C are used to match the sensor and transmitter in order to improve the accuracy of the measuring system. The coefficients for a standard sensor are specified in IEC 60751. If no standard sensor is available or if greater accuracy is required, the coefficients for each sensor can be determined specifically with the aid of sensor calibration.

Sensor-transmitter matching using the method mentioned above significantly improves the temperature measurement accuracy of the entire system. This is because the transmitter uses the specific data pertaining to the connected sensor to calculate the measured temperature, instead of using the standardized sensor curve data.

1-point adjustment (offset)

Shifts the sensor value

Operating influences

Influence of ambient temperature and supply voltage on operation for resistance thermometers (RTD) in the entire measuring range

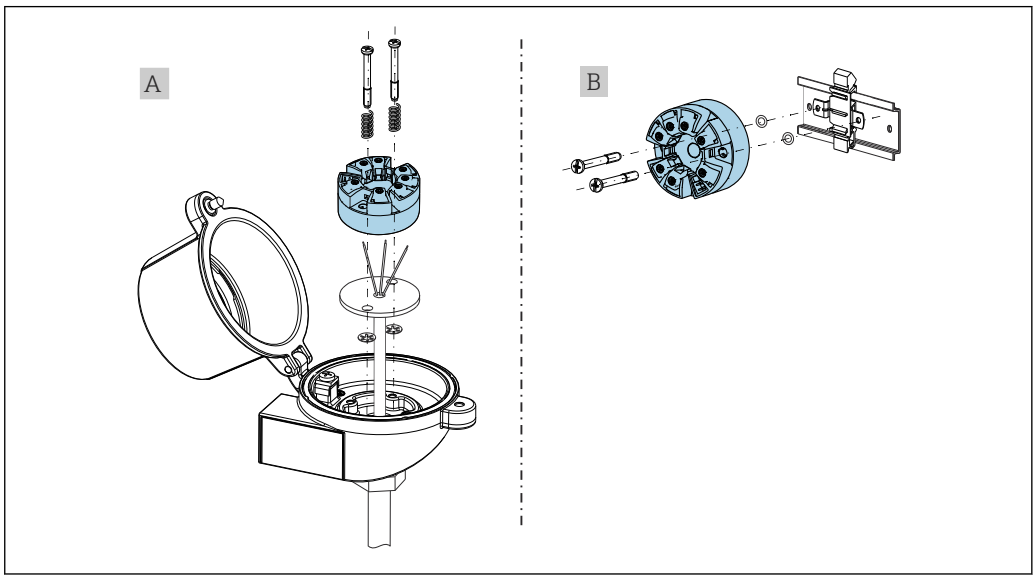
Description	Standard	Ambient temperature: Influence (±) per 1 °C (1.8 °F) change	Supply voltage: Influence (±) per V change
Pt100 (1)	IEC 60751:2022	0.04 °C (0.07 °F)	0.02 °C (0.04 °F)
Pt1000 (4)		0.02 °C (0.03 °F)	0.01 °C (0.02 °F)

Long-term drift (±)		
after 1 year	after 3 years	after 5 years
Based on measured value		
0.05 °C (0.09 °F)	0.06 °C (0.11 °F)	0.07 °C (0.13 °F)

Calculation of the maximum measurement error:
√(Measurement error² + Influence of ambient temperature² + Influence of supply voltage²)

Installation

Installation location



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A Terminal head form B in accordance with DIN EN 50446, direct installation onto insert with cable entry (middle hole 7 mm (0.28 in))
B Mounting on DIN rail in accordance IEC 60715 (TH35) with DIN rail clip

- The head transmitter must not be operated using the DIN rail clip and remote sensors as a substitute for a DIN rail device in a cabinet.
- When installing the head transmitter in a terminal head form B, make sure there is sufficient space in the terminal head.

Orientation

When the DIN rail device is used with a thermocouple measurement, increased measurement deviation may occur depending on the installation situation and ambient conditions. If the DIN rail device is mounted on the DIN rail without any adjacent devices, this may result in deviations of ±1.3 °C. Greater deviations may arise if the DIN rail device is mounted in series between other DIN rail devices.

Environmental conditions

Ambient temperature

−40 to 85 °C (−40 to 185 °F)

Storage temperature

−50 to 100 °C (−58 to 212 °F)

Operating height

Up to 4 000 m (13 123 ft) above sea level.

Humidity

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

Climate class

Climate class C1 as per IEC 60654-1

Degree of protection

Head transmitter with screw-type or push-in terminals: IP 20. In the installed state, it depends on the terminal head used.

Shock and vibration resistance

Vibration resistance according to IEC 60068-2-6:
- 5 to 25 Hz, 1.6 mm
- 25 to 100 Hz, 4 g

Vibration resistance according to IEC 60068-2-27:
- 30 g, 18 ms
- KTA 3505 (Section 5.8.4)

Electromagnetic compatibility (EMC)

CE conformity

Electromagnetic compatibility in accordance with all the relevant requirements of the IEC/EN 61326 series and NAMUR Recommendation EMC (NE 21). For details, refer to the Declaration of Conformity.

Maximum measurement error <1% of measuring range.

Interference immunity as per IEC/EN 61326 series, industrial requirements

Interference emission as per IEC/EN 61326 series (CISPR 11), Class B equipment, Group 1

IO-Link

The requirements of IEC/EN 61131-9 are met in IO-Link mode.

Overvoltage category

Overvoltage category II

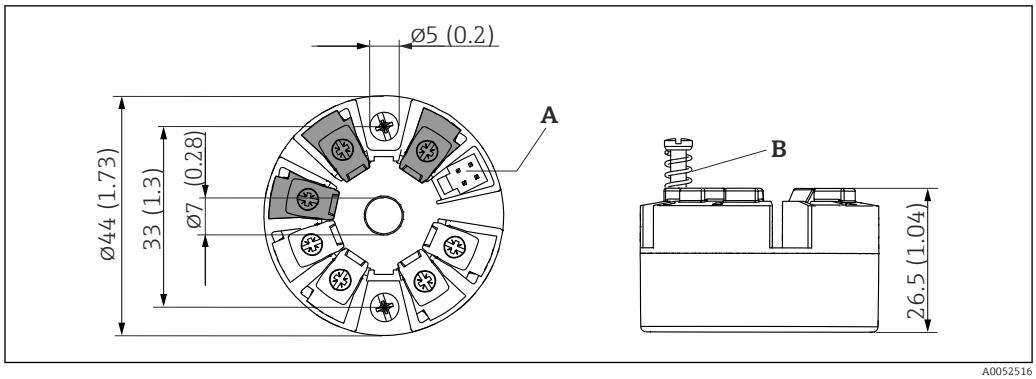
Pollution degree

Pollution degree 2

Mechanical construction

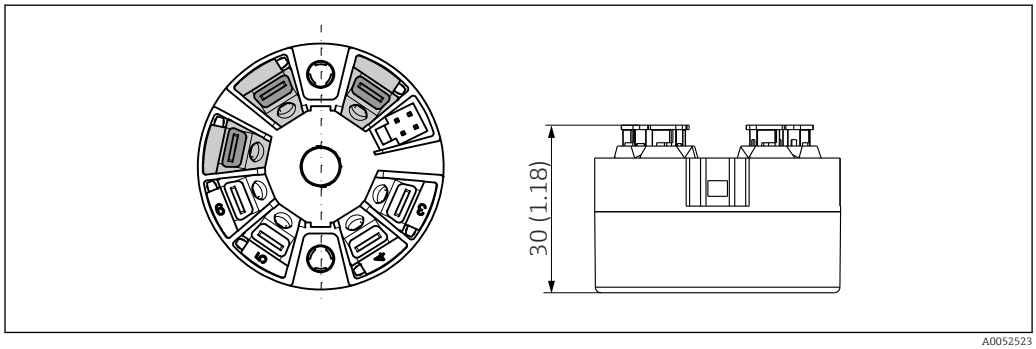
Design, dimensions

Dimensions in mm (in)



4 Version with screw terminals

A Display connection
B Spring travel L ≥ 5 mm (0.2 in) (not for US - M4 securing screws)



5 Version with push-in terminals. Dimensions are identical to the version with screw terminals, apart from housing height.

Weight

40 to 50 g (1.4 to 1.8 oz)

Materials

All the materials used are RoHS-compliant.

- Housing: polycarbonate (PC)
- Terminals:
  - Screw terminals: nickel-plated brass
  - Push-in terminals: tin-plated brass, contact springs 1.4310, 301 (AISI)
- Potting compound: SIL gel

Human interface

Operation concept

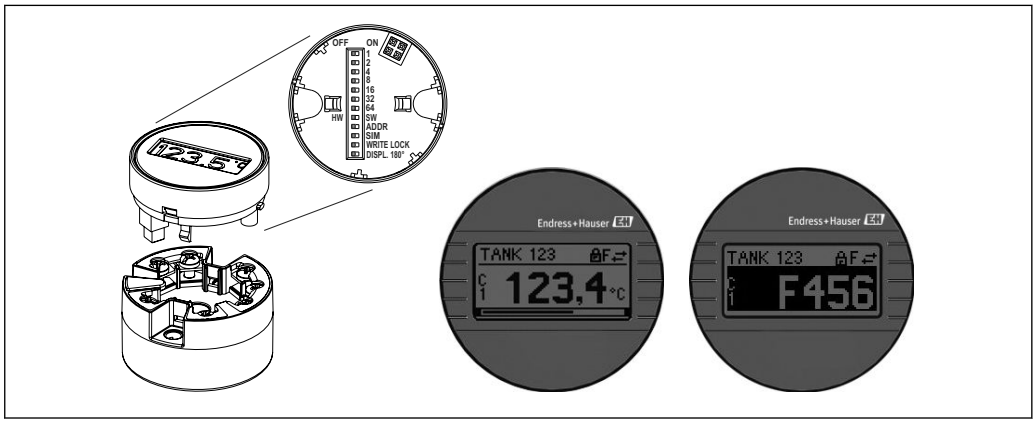
The device-specific parameters are configured via IO-Link. There are specific configuration or operating programs from different manufacturers available to the user for this purpose. The device description file (IODD) is provided for the transmitter.

Onsite operation

There are no operating elements directly on the device. The temperature transmitter is configured via remote operation.

Onsite display

There are no display elements on the device. There is the option of using the attachable measured value display TID10 together with the head transmitter. The display provides plain-text information on the current measured value and the measuring point identification. In the event of a fault in the measurement chain, this will be displayed in inverse color showing the channel ident and error number. DIP switches can be found on the rear of the display. These enable hardware settings to be made e.g. write protection.



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6 *Attachable measured value display TID10 with bar graph indicator (optional)*

If the head transmitter is installed in a field housing and used with a display, an enclosure with a glass window in the cover must be used.

System integration

IO-Link

In order to integrate field devices into a digital communication system, the IO-Link system needs a description of the device parameters, such as output data, input data, data format, data volume and supported transmission rate. This data is available in the IODD (IO Device Description) which is provided to the IO-Link master via generic modules when the communication system is commissioned.

Download via endress.com

1. endress.com/download
2. Select **Device Driver** from the search options shown.
3. For **Type** select "IO Device Description (IODD)".
4. Select the **Product Code** or enter it as text.
   ↳ A list of search results is displayed.
5. Download the appropriate version.

Download via ioddfinder

1. ioddfinder.io-link.com
2. For **Manufacturer** select "Endress+Hauser".
3. Enter the **Product Name**.
   ↳ A list of search results is displayed.
4. Download the appropriate version.

Certificates and approvals

Current certificates and approvals for the product are available at www.endress.com on the relevant product page:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Downloads**.

MTTF

371 years

The mean time to failure (MTTF) denotes the theoretically expected time until the device fails during normal operation. The term MTTF is used for systems that cannot be repaired, e.g. temperature transmitters.

Ordering information

Detailed ordering information is available from your nearest sales organization www.addresses.endress.com or in the Product Configurator at www.endress.com:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Configuration**.

Accessories

The accessories currently available for the product can be selected at www.endress.com:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Spare parts & Accessories**.

Device-specific accessories

Adapter for DIN rail mounting, clip as per IEC 60715 (TH35) without securing screws
Standard - DIN mounting set (2 screws + springs, 4 securing disks and 1 display connector cover)
US - M4 securing screws (2 M4 screws and 1 CDI connector cover)
Attachable display unit for head transmitter TID10

Communication-specific accessories

Accessory	Description
FieldPort SFP20	**Mobile configuration tool for all IO-Link devices:** ▪ The FieldPort SFP20 is a USB interface for the configuration of IO-Link devices. The FieldPort SFP20 can be connected to a laptop or tablet via a USB cable. ▪ A point-to-point connection between the laptop and IO-Link devices is possible with the FieldPort SFP20. ▪ M12 connection for IO-Link field devices

IO-Link master BL20	IO-Link master from Turck for DIN rails supports PROFINET, EtherNet/IP and Modbus TCP. With web server for easy configuration.
Field Xpert SMT50	Universal, high-performance tablet PC for device configuration in non-hazardous areas.

Service-specific accessories

DeviceCare SFE100
DeviceCare is an Endress+Hauser configuration tool for field devices using the following communication protocols: HART, PROFIBUS DP/PA, FOUNDATION Fieldbus, IO/Link, Modbus, CDI and Endress+Hauser Common Data Interfaces.

www.endress.com/sfe100

FieldCare SFE500
FieldCare is a configuration tool for Endress+Hauser and third-party field devices based on DTM technology.
The following communication protocols are supported: HART, WirelessHART, PROFIBUS, FOUNDATION Fieldbus, Modbus, IO-Link, EtherNet/IP, PROFINET and PROFINET APL.

www.endress.com/sfe500

Netilion
With the Netilion IIoT ecosystem, Endress+Hauser enables the optimization of plant performance, digitization of workflows, sharing of knowledge and improved collaboration. Drawing upon decades of experience in process automation, Endress+Hauser offers the process industry an IIoT ecosystem designed to effortlessly extract insights from data. These insights allow process optimization, leading to increased plant availability, efficiency, reliability and ultimately a more profitable plant.

www.netilion.endress.com

Online tools

Product information about the entire life cycle of the device is available at:
www.endress.com/onlinetools

Documentation

The following document types are available in the Downloads area of the Endress+Hauser website (www.endress.com/downloads), depending on the product configuration:

Document type	Purpose and content of the document
Technical Information (TI)	**Planning aid** This document contains all the technical data on the product and provides an overview of everything that can be ordered with the product.
Brief Operating Instructions (KA)	**Quick guide to obtaining the first measured value** The Operating Instructions contain all the essential information about the product from incoming acceptance to initial commissioning.
Operating Instructions (BA)	**Reference** The Operating Instructions contain the information that is required in the various phases of the life cycle of the product: From product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.
Description of Device Parameters (GP)	**Reference for parameters** The document contains detailed explanations of readable or configurable parameters in the product. The description is aimed at those who work with the product over its entire life cycle and perform specific configurations.

Document type	Purpose and content of the document
Safety Instructions (XA)	Safety Instructions for electrical equipment in hazardous areas are supplied with the product depending on the approval. These are an integral part of the Operating Instructions. The nameplate indicates the Safety Instructions (XA) that are relevant to the product.
Supplementary device-dependent documentation (SD/FY)	Always comply strictly with the instructions in the relevant supplementary documentation. The supplementary documentation is an integral part of the product documentation.

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