



OPTITEMP TT 10 C/R Technical Datasheet

Analogue 2-wire temperature transmitter, Pt100 or thermocouple input

- Temperature linear 4...20 mA output
- Rangeable with solder pads and potentiometers
- Easy wiring through large center hole



The documentation is only complete when used in combination with the relevant documentation for the sensor.

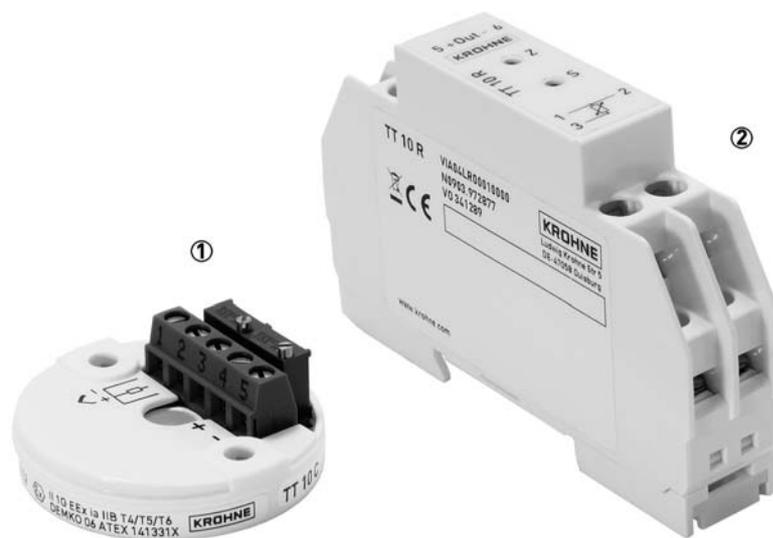
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1.1 The analogue, adjustable 2-wire temperature transmitter

The **OPTITEMP TT 10** is an analogue, multirange 2-wire temperature transmitter which works together with RTDs of the type Pt100 and single thermocouple input of type J, L, T, K and N. The main field of application is an industrial environment, therefore the device has a high reliability and an excellent industrial performance.

The **OPTITEMP TT 10** series consists of 2 different versions in terms of the mounting. The **TT 10 R** is the rail-mount version for DIN rails whereas the **TT 10 C** is primarily intended to be mounted in a "B connection head" or larger according to DIN 43729. As an alternative you can also mount the in-head version on a DIN rail according to DIN 50022 / EN 60715 with the help of an optionally available rail mounting kit.

The whole TT 10 transmitter series utilizes a modular design in hardware to ensure the quality and reliability of the transmitter signal output. In the standard delivery condition the transmitters are not preset. Therefore you have to make a complete solder pad configuration before using the devices for the first time. As an option the manufacturer offers preset transmitters according to the customer's order.



- ① In-head transmitter
- ② Rail-mount transmitter

Highlights

- Rangeable with solder pads and potentiometers
- Temperature linear output for Pt100 and thermocouple
- Sensor break monitoring
- Short-circuit protected output
- Polarity protected power supply
- Easy wiring, in-head version with large center hole
- In-head version with moulded electronics for high protection
- In-head RTD version optionally available in an intrinsically safe version for installation in hazardous areas (zone 0)
- Cold Junction Compensation

Industries

- Chemicals
- Oil & Gas
- Power industry
- Iron, Steel & Metal
- Pulp & Paper
- Food & Beverage
- Pharmaceuticals

1.2 Options and variants

In-head transmitter (TT 10 C)



The in-head version distinguishes itself by an easy wiring and the large centre hole. The "low profile" housing is extremely durable and facilitates easy connections and adjustments. The RTD version of the transmitter is optionally available in an intrinsically safe version for installation hazardous areas. The nameplate of these transmitters has an "Ex" symbol (TT 10 C Ex), they are approved for use in zone 0.

There are two different installation situations for the in-head version. Primarily it is intended to be mounted in a "B connection head" or larger according to DIN 43729. As an alternative you can also mount it on a DIN rail according to DIN 50022 / EN 60715 with the help of an optionally available rail mounting kit.

Rail-mount transmitter (TT 10 R)



The distinctive feature of the rail-mount version is the combination of a compact housing with an easy wiring and a very economic operation. The rail-mount transmitter is intended for installation on a DIN rail according to DIN 50022 / EN 60715. This allows to group several devices in limited space.

1.3 Resistance thermometer

The transmitter works together with a measuring insert that has a Pt100 RTD. This kind of measuring inserts features a temperature-sensitive sensor made from a platinum RTD, whose value at 0°C / +32°F is 100 Ω. That is where the name "Pt100" comes from.

It is generally valid that the electric resistance of metals increases according to a mathematical function as the temperature rises. This effect is taken advantage of by resistance thermometers to measure temperature. The "Pt100" thermometer features a measuring resistance with defined characteristics, standardised in IEC 60751. The same is true for the tolerances. The average temperature coefficient of a Pt100 is $3.85 \times 10^{-3} \text{ K}^{-1}$ in the range from 0...+100°C / +32...+212°F.

During operation, a constant current $I (\leq 1 \text{ mA})$ flows through the Pt100 RTD, which brings about a voltage drop U . The resistance R is calculated using Ohm's Law ($R=U/I$). As the voltage drop U at 0°C / +32°F is 100 mV, the resulting resistance of the Pt100 thermometer is 100 Ω (100 mV / 1 mA = 100 Ω).

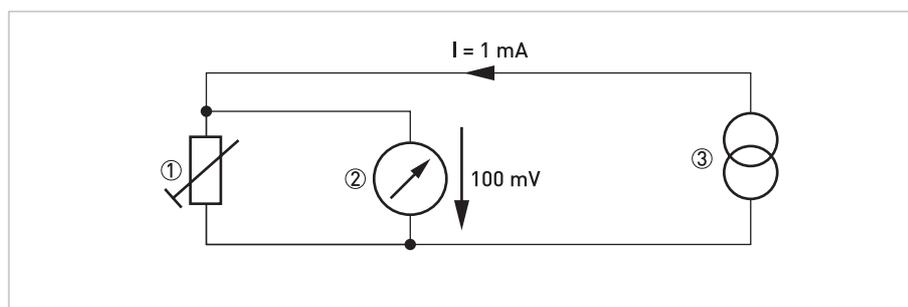


Figure 1-1: Pt100 resistance thermometer in 3-wire connection at 0°C / +32°F, schematic.

- ① Pt100 RTD
- ② Voltage meter
- ③ Current source

1.4 Thermocouples

The thermocouple features two electric conductors made from different metals, connected at one end. Each free end is connected to a compensation cable extension or direct connected to a millivolt meter. This circuitry forms a "thermal circuit". The point at which the two electric conductors connect is called the measuring point or hot junction and the point at which the compensation cables connect to the conductors of the millivolt meter is called the cold junction.

If the measuring point of this thermal circuit is heated up, a small electrical voltage (thermal voltage) can be measured. If, however, the measuring point and the cold junction are at the same temperature, no thermoelectric voltage is generated. The degree of thermoelectric voltage, also known as electromotive force (EMF), depends on the thermocouple material and the extent of the temperature difference between the measuring point and the cold junction. It can be measured using the millivolt meter with no auxiliary power.

Compensation cable has the same thermoelectric behavior as the thermocouple in a limited temperature range.

Extension cable is a thermocouple but designed as an installation cable.

Simply put, the thermocouple behaves like a battery, the voltage of which also increases as the temperature rises.

The characteristic curves and tolerances of commercially available thermocouples are standardised in IEC 60584.

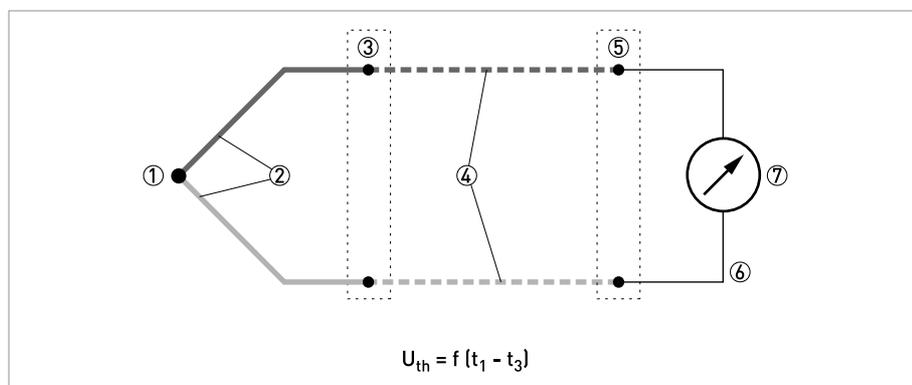


Figure 1-2: Thermocouple measuring circuit, schematic.

- ① Measuring point t_1 (hot junction)
- ② Thermocouple
- ③ Transition junction t_2
- ④ Compensation cable / extension cable
- ⑤ Reference junction t_3 (cold junction)
- ⑥ Copper conductor
- ⑦ Voltage meter U_{th}

2.1 Technical data

- *The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local sales office.*
- *Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website (Download Center).*

Measuring system

Application range	Temperature measurements in an industrial environment.
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Design

Versions	
TT 10 C	In-head transmitter for RTD input, optionally available in an intrinsically safe version for installation in potentially explosive areas (zone 0).
TT 10 C T/C	In-head transmitter for thermocouple input, not available as intrinsically safe version.
TT 10 R	Rail-mount transmitter for RTD input, not available as intrinsically safe version.
TT 10 R T/C	Rail-mount transmitter for thermocouple input, not available as intrinsically safe version.
Special feature	
Sensor break monitoring	User-definable output: ≤ 3.6 mA or ≥ 23 mA

Measuring accuracy

Accuracy	Calibration: $\pm 0.1\%$ of span Linearity: $\pm 0.1\%$ of span
Cold Junction Compensation (CJC) for TT 10 T/C	± 1.0 °C / ± 1.8 °F
Temperature influence	Pt100: $\pm 0,024\%$ of span per °C
	Thermocouple: $\pm 0,024\%$ of span per °C plus temperature influence CJC $\pm 0,05$ °C per °C

Operating conditions

Temperature	
In-head transmitter	Operating and storage temperature:
	Non-Ex version: $-40\dots+85$ °C / $-40\dots+185$ °F Ex version: $-40\dots+85$ °C / $-40\dots+185$ °F (storage temperature), for detailed information about the ambient temperatures refer to <i>Temperature data for potentially explosive areas</i> on page 11.
Rail-mount transmitter	Operating and storage temperature: $-20\dots+70$ °C / $-4\dots+158$ °F
Humidity	5...95% RH (non-condensing)
Protection category	
In-head transmitter	IP20 (with cover), IP10 (without cover)
Rail-mount transmitter	IP20

Installation conditions

Mounting	In-head transmitter: "B connection head" or larger according to DIN 43729; with the help of the rail mounting kit you can also fix this transmitters on a DIN rail according to EN 60715 TH35 (formerly EN 50022) (refer to <i>Rail mounting kit for in-head transmitters</i> on page 17).
	Rail-mount transmitter: rail according to EN 60715 TH35 (formerly EN 50022), 35 mm / 1.38".
	For detailed information refer to chapter "Installation".
Weight	In-head transmitter (Non-Ex and Ex version): 40 g / 0.09 lb
	Rail-mount transmitter: 55 g / 0.12 lb
Dimensions	For detailed information refer to <i>Dimensions</i> on page 10.

Materials

Housing	In-head transmitter: PC (Non-Ex), Zinc alloy + PC (Ex version)
	Rail-mount transmitter: PC + Glassfibre
Flammability acc. to UL	V0 (all versions)

Electrical connections

Power supply	In-head transmitter: 6.5...32 VDC (Non-Ex version), 8.5...30 VDC (Ex version)
	Rail-mount transmitter: 6.5...32 VDC
Galvanic isolation	No
Connection	Single/stranded wires: max. 1.5 mm ² / AWG 16
Polarity protection	Standard for all versions

Inputs / Outputs

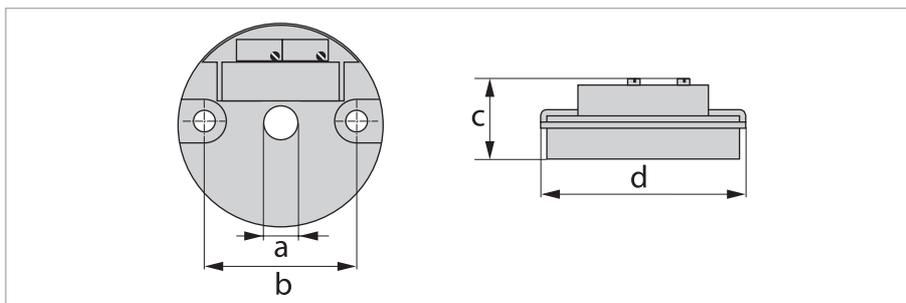
Input	
Pt100 (IEC 60751, $\alpha=0.00385$)	Type of connection: 3-wire
	Span: 50/100/150/200/300/400/500°C and 100/200/300/400/600/800/1000°F
	Zero point: -50...+50°C / -60...+120°F
	Fine adjustment of span: $\pm 10\%$ of span ($\pm 5\%$ for 600, 800 and 1000°F)
Thermocouple	Configuration span: 9 mV to 55 mV continuous Corresponding to: T/C J: 170-950 °C / 305-1710 °F T/C L: 165-900 °C / 300-1620 °F T/C K: 220-1370 °C / 400-2470 °F T/C N: 290-1300 °C / 520-2340 °F T/C T: 200-400 °C / 360-720 °F
	Zero point: $\pm 10\%$ of span
Output	
Output signal	4...20 mA, temperature linear, 2-wire connection 4...20 mA, mV linear, 2-wire connection
Update time	≤ 200 ms
Permissible load	In-head (Non-Ex) and rail-mount transmitter: 700 Ω at 24 VDC and 25 mA
	In-head transmitter (Ex): 620 Ω at 24 VDC and 25 mA
NAMUR compliance	NAMUR NE 21 (for frequencies ≥ 150 kHz)

Approvals and certifications

CE	The device fulfils the statutory requirements of the EC directives. The manufacturer certifies that these requirements have been met by applying the CE marking.
Ex approvals	
Non-Ex version	Without
Ex version (only TT 10 C Ex, RTD version)	Intrinsically safe according to II 1 G Ex ia IIB T4/T5/T6 ATEX Directive 94/9/EC, harmonized standards EN 60079-0:2006, EN 60079-11:2007 and EN 60079-26:2007
Other standards and approvals	
Electromagnetic compatibility	Directive: 2004/108/EC
	Harmonized standard EN 61326-1:2006

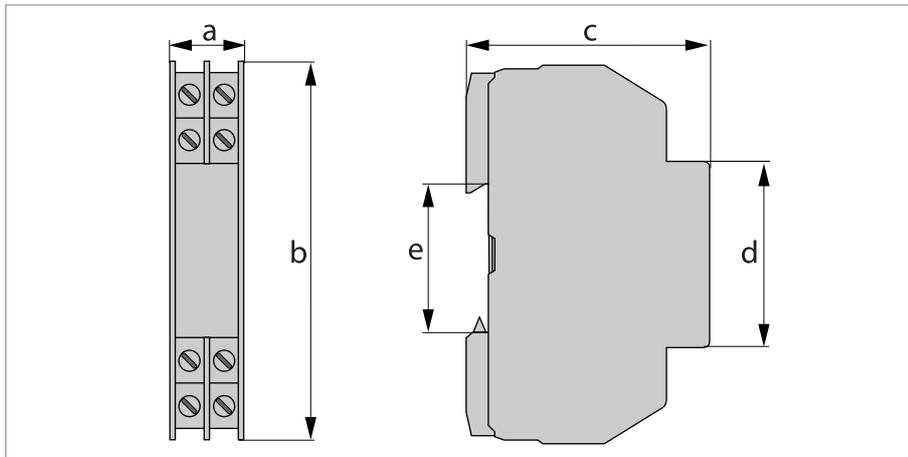
2.2 Dimensions

In-head transmitter (Ex and Non-Ex)



	Dimensions	
	[mm]	[inches]
a	7,5	0.29
b	33	1.30
c	18,5	0.73
d	44	1.73

Rail-mount transmitter (Non-Ex)



	Dimensions	
	[mm]	[inches]
a	17.5	0.69
b	90	3.54
c	58	2.28
d	45	1.77
e	35	1.38

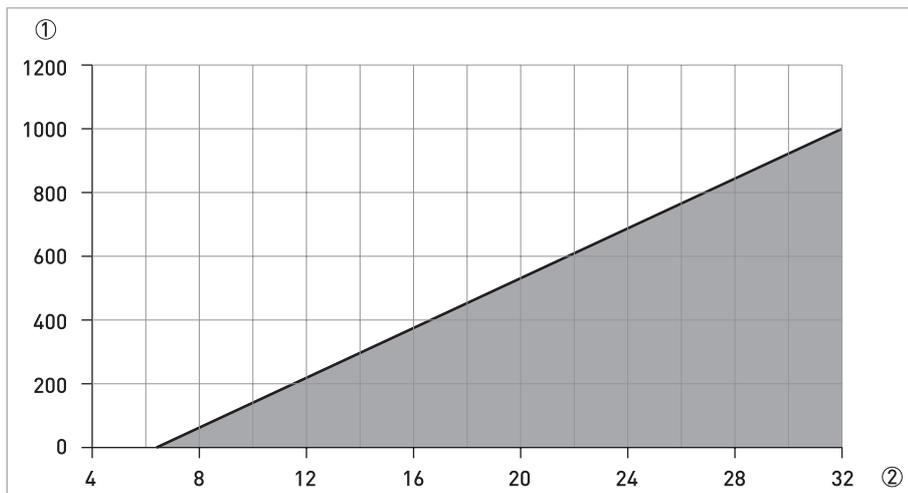
2.3 Temperature data for potentially explosive areas

In-head transmitter (Ex version)

Temperature class	Ambient temperature T_a
T6	$-40^{\circ}\text{C} \leq T_a \leq +40^{\circ}\text{C}$ / $-40^{\circ}\text{F} \leq T_a \leq +104^{\circ}\text{F}$
T5	$-40^{\circ}\text{C} \leq T_a \leq +55^{\circ}\text{C}$ / $-40^{\circ}\text{F} \leq T_a \leq +131^{\circ}\text{F}$
T4	$-40^{\circ}\text{C} \leq T_a \leq +85^{\circ}\text{C}$ / $-40^{\circ}\text{F} \leq T_a \leq +185^{\circ}\text{F}$

2.4 Output load diagrams

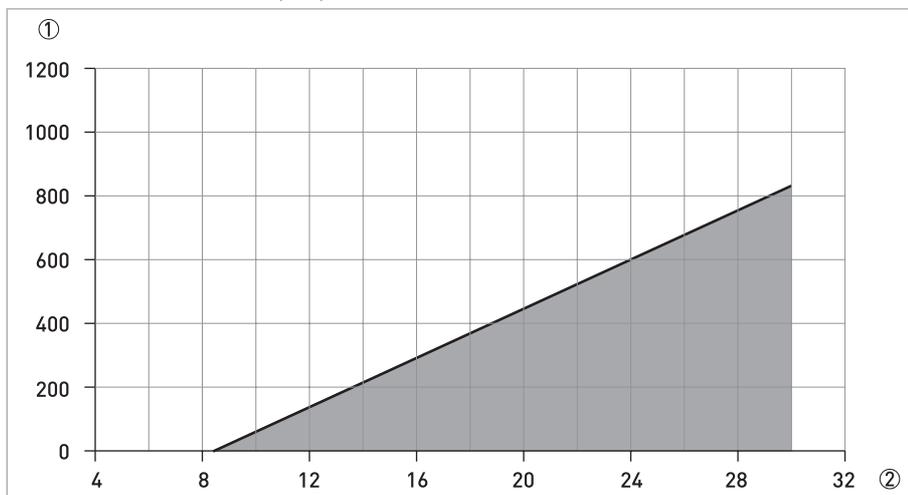
In-head transmitter (Non-Ex)



- ① Total output load R_{Load} [Ω]
- ② Supply voltage U [VDC]

Formula for the maximum permissible output load of the in-head version (Non-Ex):
 permissible R_{Load} [Ω] = (U-6.5)/0.025

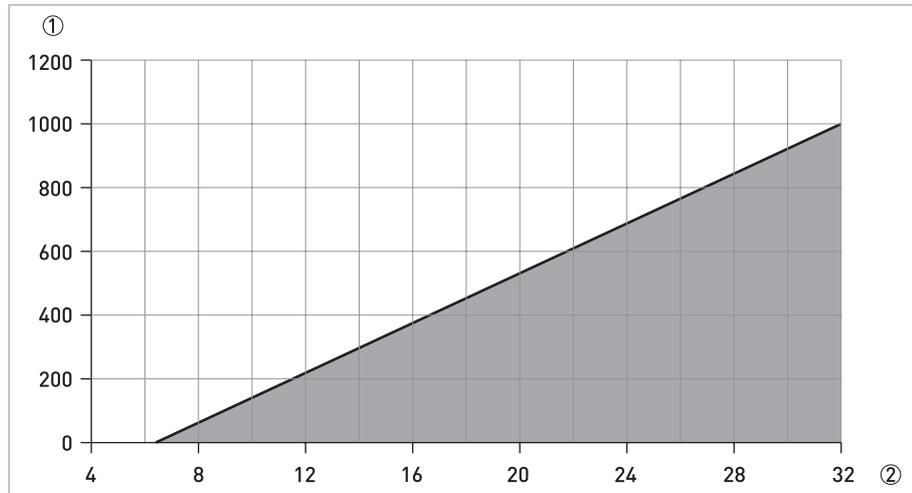
In-head transmitter (Ex)



- ① Total output load R_{Load} [Ω]
- ② Supply voltage U [VDC]

Formula for the maximum permissible output load of the in-head version (Ex):
 permissible R_{Load} [Ω] = (U-8.5)/0.025

Rail-mount transmitter



① Total output load R_{Load} [Ω]

② Supply voltage U [VDC]

Formula for the maximum permissible output load of the rail-mount version:
 permissible R_{Load} [Ω] = $(U - 6.5) / 0.025$

2.5 Electrical data for outputs and inputs

In-head transmitter (Ex version)

Output terminals 4, 5		Input terminals 1, 2, 3	
Max. voltage to transmitter	$U_i = 30$ VDC	Max. voltage from transmitter	$U_o = 30$ VDC
Max. current to transmitter	$I_i = 100$ mA	Max. current from transmitter	$I_o = 100$ mA
Max. power to transmitter	$P_i = 700$ mW	Max. power from transmitter	$P_o = 700$ mW
Internal inductance	$L_i \sim 10$ μ H	Max. inductance (input loop)	$L_o \sim 12$ mH
Internal capacitance	$C_i \sim 30$ nF	Max. capacitance (input loop)	$C_o \sim 220$ nF

3.1 Notes on installation

Inspect the cartons carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

Do a check of the packing list to make sure that you have all the elements given in the order.

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

3.2 Intended use

You may only use transmitters labelled with the "Ex" symbol in potentially explosive areas or connect them to a sensor located in those areas. Additionally always note the zone(s) for which the devices have an approval. Otherwise the transmitters might cause an explosion that can result in fatal injuries.

Responsibility for the correct use of the devices with special regard to suitability, intended use and the field of application lies solely with the operator. To avoid any kind of incorrect use, also note the information in the chapter "Device description".

The transmitters do not contain any serviceable parts inside. Any substitution of components may impair the intrinsic safety of the versions with an Ex approval. Always send defective devices to the manufacturer or the local distributor for repair or exchange. If this is the case, attach a clear description of the malfunction for warranty claims.

The manufacturer is not liable for any damage resulting from improper use or use for other than the intended purpose. To avoid any kind of incorrect use, also note the information in the chapter "Device description"!

The manufacturer has constructed these transmitters only for temperature measurements with single resistance thermometers of the type Pt100 or with thermocouples type J, L, T, K, N. The main field of application is industrial environment.

3.3 In-head transmitter (Ex and Non-Ex)

Never install or operate the Non-Ex version in potentially explosive areas, it might cause an explosion that can result in fatal injuries! Only use the Ex version in potentially explosive areas! Also note the following items which concern the Ex version:

- *It must be installed in a housing that has the protection category IP20 or better according to DIN IEC 60529 (an exception are in-head transmitters mounted on a rail as described in the next section). Additionally the magnesium component of the housing must not exceed 6% as a higher magnesium component may increase the flammability and the Ex capability.*
- *If it is mounted in a housing which is isolated from the ground and can be charged to an ignition capable level, then the housing must be electrostatically grounded when installed in hazardous areas.*
- *It is approved for potentially explosive areas (zone 0).*
- *It must be electrically connected (terminal 4 and 5) via a certified isolating interface/zener barrier having double or reinforced insulation which shall be placed outside the hazardous area.*

The manufacturer has developed the Non-Ex version for an operating temperature range of -40...+85°C / -40...+185°F (the Ex version has the same ambient temperature range). To avoid destruction or damage of the device, always assure that the operating temperature or the ambient temperature does not exceed the permissible range and note the following items:

- *If you operate the Ex version in potentially explosive areas, the ambient temperature also depends on the temperature classification. For detailed information refer to the section about the temperature data for potentially explosive areas on page 11.*
- *The thermowell also transfers the process temperature to the transmitter housing. If the process temperature is close to or exceeds the maximum temperature of the transmitter, then the temperature in the transmitter housing can rise above the maximum permissible temperature!*

One way to decrease the heat transfer via the thermowell is to install the transmitter farther away from the heat source. An alternative is to make the thermowell longer. Inversely you can take similar measures if the temperature is below the specified minimum temperature.

The in-head transmitters (Ex and Non-Ex version) are intended for installation in DIN B connection heads or larger. The large $\varnothing 7.5$ mm / 0.29" center hole facilitates the electrical connection of the measurement sensor and the installation (for detailed information refer to the chapter "Dimensions and weights"). The following drawing shows the installation of the in-head transmitter with the help of the connection head installation kit:

The connection head installation kit does not belong to the standard scope of delivery of the transmitter, you have to order it separately.

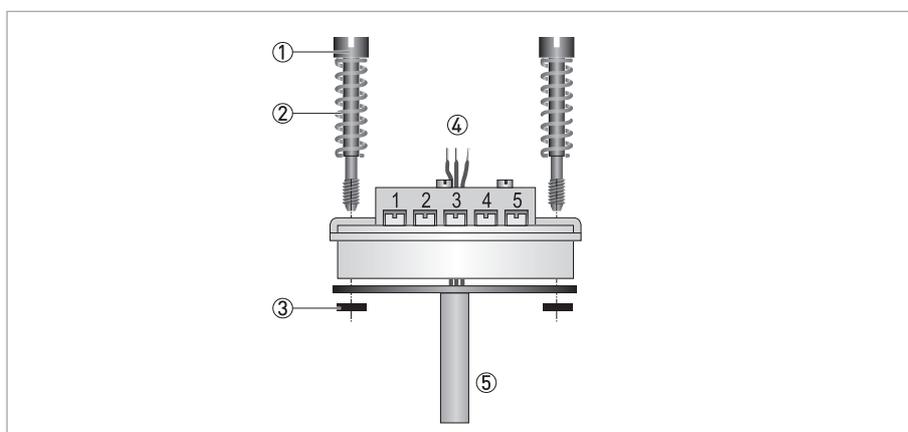


Figure 3-1: Connection head installation kit

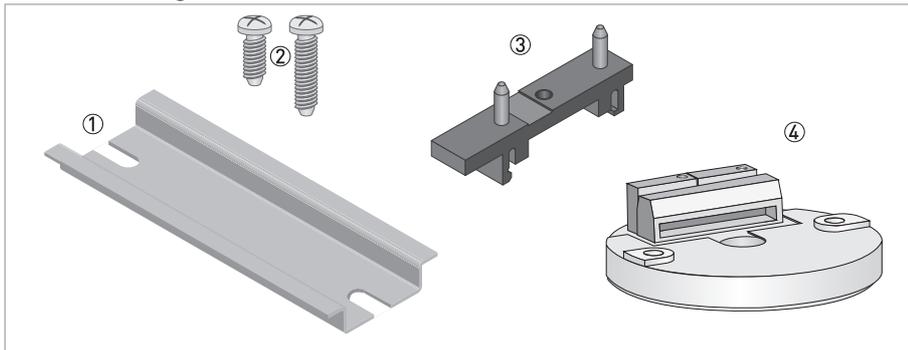
- ① M4 screw
- ② Spring
- ③ Lock washer
- ④ Wires of measuring insert
- ⑤ Sheath

3.4 Rail mounting kit for in-head transmitters

To avoid fatal injuries, destruction or damage of the transmitter, always note the relevant admonitions in the previous section if you install the in-head-transmitter on a rail!

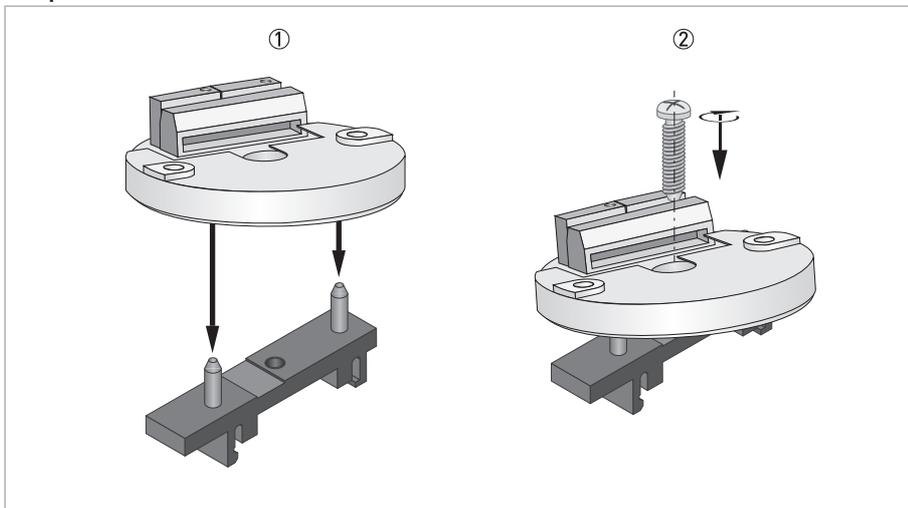
The rail mounting kit allows to install the in-head transmitter on a rail according to EN 60715 TH35. The kit does not belong to the standard scope of delivery, you have to order it separately. For more information refer to the section about the accessory parts in the chapter "Service".

Rail mounting kit for in-head transmitters



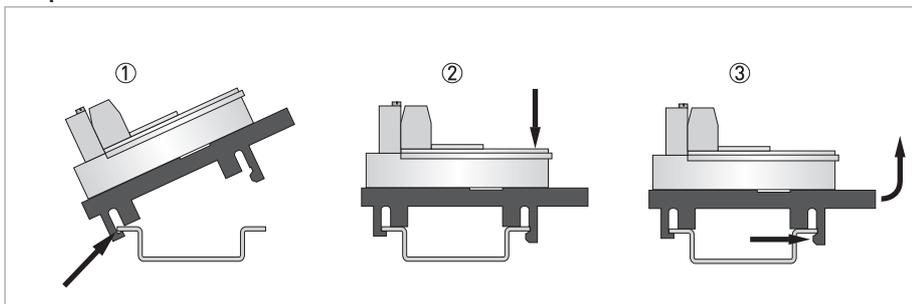
- ① Rail (not included in the kit)
- ② Screws
- ③ Clamp
- ④ Transmitter (not included in the kit)

Step 1



- ① Place the transmitter on the clamp as shown above.
- ② Push the transmitter down until it reaches the plate and secure with a screw.

Step 2



- ① Hook one end of the clamp into the rail as shown above.
- ② Push the other end of the the kit down until it snaps onto the rail.
- ③ Release by pushing the hook, shown in the picture, and at the same time lift the clip out of the rail.

3.5 Rail-mount transmitter

Neither operate this transmitter in potentially explosive areas, nor connect it to a sensor located in a potentially explosive area! Otherwise the transmitter might cause an explosion that can result in fatal injuries!

The rail-mount transmitter is intended for installation on a rail according to EN 60715 TH35.

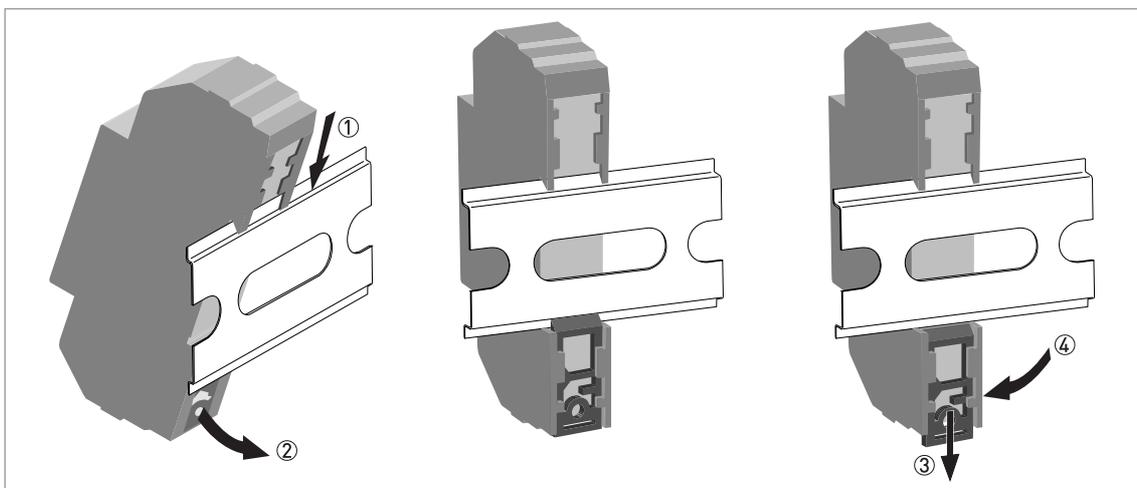


Figure 3-2: Installation of the rail-mount version

- ① Hook the upper groove of the transmitter onto the rail.
- ② Press the lower part of the transmitter against the rail.
- ➡ When you hear a "click" from the snap fastener, the transmitter is fixed onto the rail (drawing in the centre).
- ③ To remove the transmitter, use a small screwdriver to push the snap fastener downwards.
- ④ Carefully move the lower part of the transmitter in the forward direction and then upwards.

4.1 Safety instructions

All work on the electrical connections may only be carried out with the power disconnected.

Observe the national regulations for electrical installations!

Before you connect and operate a transmitter, always note the following items to avoid an electric shock:

- *For all work on the electrical connections use an electrostatic safe (i.e. grounded) workplace! In this way you minimize the risk of electrostatic discharge (ESD).*
- *Assure that the cover was closed after any work on the device. The cover prevents electrostatic discharge if the solder pads are touched inadvertently; furthermore it protects the solder pads against dirt.*

Never connect or operate a non-Ex version of a transmitter in potentially explosive areas, otherwise it might cause an explosion that can result in fatal injuries! Before you connect and operate a transmitter version with an Ex approval, always note the following items to avoid an explosion which may result in fatal injuries:

- *Never do any soldering work in potentially explosive areas!*
- *Connect the Ex version only to Ex approved sensors or sensors that meet the requirements for "simple apparatus" in EN 60079-11:2007, section 5.7.*
- *Observe the corresponding regulations, the declaration of conformity, the type test certificate of the device, the ATEX certificate "Special conditions for safe use" for Ex versions and the relevant instructions of this document.*

Observe without fail the local occupational health and safety regulations. Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.

Look at the device nameplate to ensure that the device is delivered according to your order.

The transmitter is protected against polarity reversal. No damage will occur to the device if the polarity of the supply voltage is switched. The output will then indicate 0 mA.

The calibration of this transmitter works with potentiometers. Therefore assure that the transmitter is protected against heavy impacts or strong vibrations. Otherwise the calibration data could change.

4.2 Electrical input connections

Always establish the electrical connections according to the following diagrams. Otherwise it can come to destruction or damage of the transmitter.

To avoid measuring errors, assure that all cables are connected properly and that the screws are tightened correctly.

4.2.1 In-head transmitter (Ex and Non-Ex)

RTD

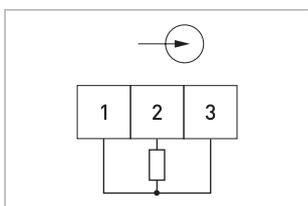


Figure 4-1: Pt100, 3-wire input connection (Ex and Non-Ex version)

Thermocouple

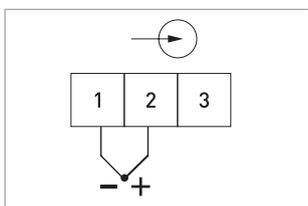


Figure 4-2: Thermocouple, 2-wire input connection

4.2.2 Rail-mount transmitter

RTD

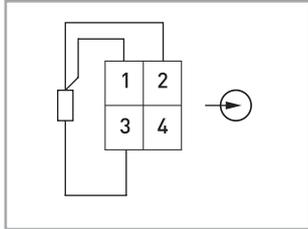


Figure 4-3: Pt100, 3-wire connection

Thermocouple

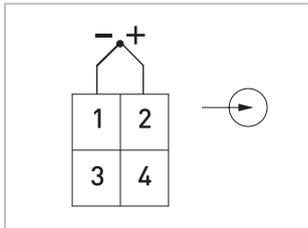


Figure 4-4: Thermocouple, 2-wire input connection

4.3 Electrical connection diagrams

Always establish the electrical connections according to the following diagrams. Otherwise it can come to destruction or damage of the transmitter.

To avoid measuring errors, assure that all cables are connected properly and that the screws are tightened correctly.

4.3.1 In-head transmitter (Non-Ex)

Neither operate this transmitter in potentially explosive areas, nor connect it to a sensor located in a potentially explosive area! Otherwise the transmitter might cause an explosion that can result in fatal injuries!

Note that the maximum output load always depends on the power supply. If the maximum output load is exceeded, then the measured value will become incorrect. For further information refer to the output load diagrams in the chapter "Technical data".

The transmitter has a polarity protection. Connecting the power supply with a wrong polarity will not damage the transmitter.

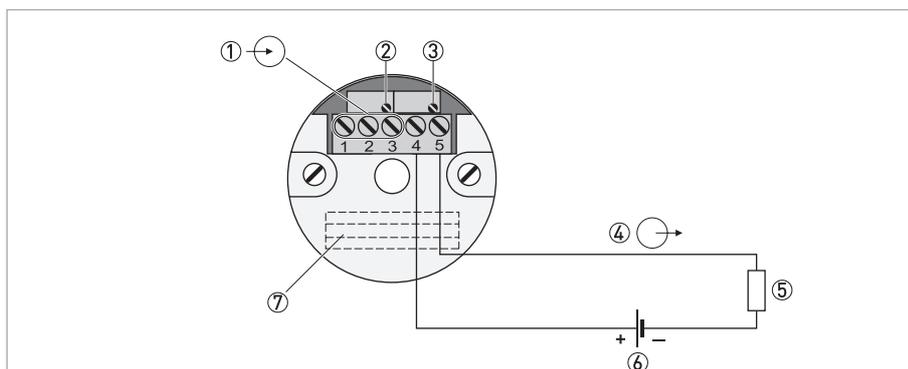


Figure 4-5: Connection diagram of the in-head transmitter (Non-Ex)

- ① Terminals for input signal (1, 2 and 3)
- ② Potentiometer for zero point setting
- ③ Potentiometer for measuring span setting
- ④ Output signal, terminals 4 and 5 (4...20 mA)
- ⑤ Load resistance
- ⑥ Power supply (6.5...32 VDC)
- ⑦ Solder pads

4.3.2 In-head transmitter (Ex)

The Ex transmitter can be installed in potentially explosive areas of zone 0. It may only be connected to sensors that meet the requirements for "simple apparatus" in EN 60079-11:2007, section 5.7. During operations in potentially explosive areas always note the relevant safety instructions and especially the following items:

- The transmitter must be electrically connected (terminal 4 and 5) via a certified isolating interface/zener barrier having double or reinforced insulation which shall be placed outside the hazardous area.
- The output parameters of the Ex approved Zener barrier or voltage supply have to be less or equal than the input parameters of the transmitter (i.e. U_i , I_i , P_i , L_i , C_i).

Note that the maximum output load always depends on the power supply. If the maximum output load is exceeded, then the measured value will become incorrect. For further information refer to the output load diagrams in the chapter "Technical data".

The transmitter has a polarity protection. Connecting the power supply with a wrong polarity will not damage the transmitter.

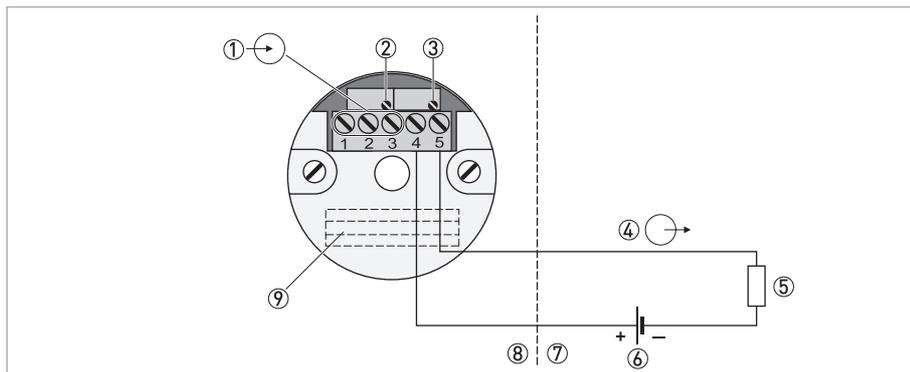


Figure 4-6: Connection diagram of the in-head transmitter (Ex)

- ① Input signal (terminals 1, 2 and 3)
- ② Potentiometer for zero point setting
- ③ Potentiometer for measuring span setting
- ④ Output signal, terminals 4 and 5 (4...20 mA)
- ⑤ Load resistance
- ⑥ Power supply
- ⑦ Safe area
- ⑧ Potentially explosive area
- ⑨ Solder pads

4.3.3 Rail-mount transmitter

Neither operate this transmitter in potentially explosive areas, nor connect it to a sensor located in a potentially explosive area! Otherwise the transmitter might cause an explosion that can result in fatal injuries!

Note that the maximum output load always depends on the power supply. If the maximum output load is exceeded, then the measured value will become incorrect. For further information refer to the output load diagrams in the chapter "Technical data".

The transmitter has a polarity protection. Connecting the power supply with a wrong polarity will not damage the transmitter.

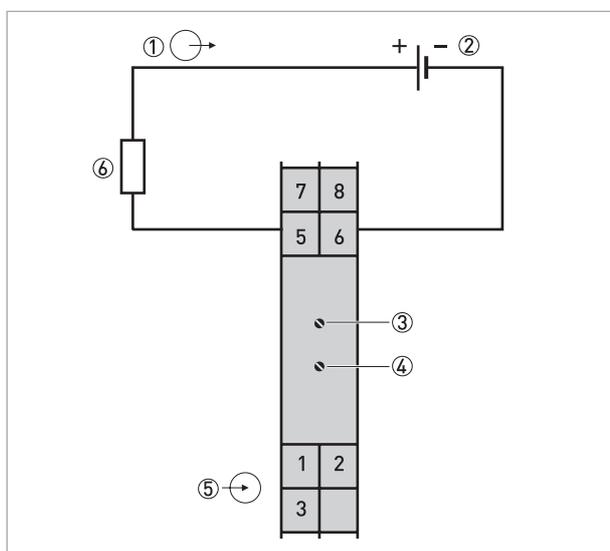


Figure 4-7: Connection diagram of the rail-mount transmitter (2-wire connection)

- ① Output signal (4...20 mA)
- ② Power supply
- ③ Potentiometer for zero point setting [Z]
- ④ Potentiometer for measuring span setting [S]
- ⑤ Terminals for input signal
- ⑥ Load resistance

5.1 Order code

The characters of the order code highlighted in light grey describe the standard.

VTT1	4	1.Design	
	1	Head mounting (type C)	
	2	DIN-rail mounting, 35 mm / 1.38" (type R)	
		2.Type	
	0	TT 10, analogue, 4...20 mA, RTD type Pt100	
	1	TT10, analogue, 4...20 mA, thermocouple type J, L, T, K and N	
		3.Approvals	
	0	Without	
	1	ATEX: II 1G Ex ia (only type C)	
		4.Sensor	
	0	Without	
	3	Pt100 ($\alpha = 0.00385$)	
	H	Thermocouple type J	
	K	Thermocouple type K	
	L	Thermocouple type L	
	N	Thermocouple type N	
	T	Thermocouple type T	
		5.Wiring	
	0	Without	
	2	2-wire (1 x sensor)	
	3	3-wire (1 x sensor)	
		6.Measuring range	
	0	Without	
	1	-50...+50°C / -58...+122°F	
	2	-50...+100°C / -58...+212°F	
	3	-50...+150°C / -58...+302°F	
	4	0...+50°C / +32...+122°F	
	5	0...+100°C / +32...+212°F	
	6	0...+150°C / +32...+302°F	
	7	0...+200°C / +32...+392°F	
	8	0...+250°C / +32...+482°F	
VTT1	4		Continued on next page

							A	0...+300°C / +32...+572°F	
							B	0...+350°C / +32...+662°F	
							C	0...+400°C / +32...+752°F	
							D	0...+450°C / +32...+842°F	
							E	0...+500°C / +32...+932°F	
							F	0...+600°C / +32...+1112°F	
							G	0...+800°C / +32...+1472°F	
							H	0...+1000°C / +32...+1832°F	
							K	0...+1200°C / +32...+2192°F	
							7.Versions		
							0	Without	
							8.Accessories / phys. characteristics		
							0	Without	
							1	With rail mounting kit for in-head transmitters, i.e. in-head transmitter is assembled to DIN rail clip to fix it on a rail (35 mm / 1.38").	
							9.Calibration certificate		
							0	Without	
							2	2 points (0 and 100%)	
							3	3 points (0, 50 and 100%)	
							4	5 points (0, 25, 50, 75 and 100%)	
							5	11 points (0, 10, ..., 100%)	
							Z	Customised	
							10.Manuals		
							0	Without	
							1	German	
							3	English	
							4	French	
							5	Spanish	
							G	German / English	
VTT1		4						0	Complete order code





KROHNE product overview

- Electromagnetic flowmeters
- Variable area flowmeters
- Ultrasonic flowmeters
- Mass flowmeters
- Vortex flowmeters
- Flow controllers
- Level meters
- Temperature meters
- Pressure meters
- Analysis products
- Products and systems for the oil & gas industry
- Measuring systems for the marine industry

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