Digital temperature transmitter
With HART® protocol, head and rail-mounted version
Model T38

for further approvals, see page 10

Applications

- Process industry
- Machine building and plant construction

Special features

- TÜV certified SIL version for protection systems developed per IEC 61508 (option)
- Operation in safety applications to SIL 2 (single instrument) and SIL 3 (redundant configuration)
- Configurable with almost all soft- and hardware tools
- Universal for the connection of 1 or 2 sensors
  - Resistance thermometer,resistance sensor (up to 2 x 3-wire)
  - Thermocouple, mV sensor
  - Potentiometer
- Signalling in accordance with NAMUR NE43, sensor monitoring in accordance with NE89, EMC in accordance with NE21, self-monitoring and diagnostics of field instruments in accordance with NE107

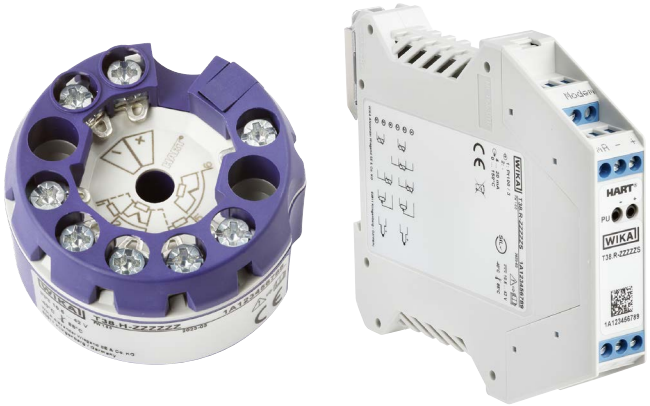


Fig. left: head-mounted version, model T38.H
Fig. right: rail-mounted version, model T38.R

Description

These temperature transmitters are designed for universal use in the process industry. They offer high accuracy through sensor-transmitter matching, highest reliability and excellent protection against electromagnetic influences. Via HART® protocol, the T38 temperature transmitters are configurable (interoperable) with a variety of open configuration tools. In addition, the T38 temperature transmitters, via the WIKAsoft-TT configuration software and the model PU-548 programming unit, can be parameterised very easily, quickly and with a clear overview.

Besides the selection of the sensor type and the measuring range, the software enables the error signalling operation, damping, several measuring location descriptions and process adjustment to be stored. The T38 transmitters offer a wide range of sensor connection combinations.

Through the configuration of a sensor with redundancy (dual sensor), on a sensor failure it will automatically change over to the working sensor. Furthermore, there is the possibility to activate sensor drift detection. With the WIKA True Drift Detection technology, sensors can be monitored continuously, and erroneous measuring locations can be identified immediately.

Additionally, the T38 transmitters also have numerous sophisticated supervisory functionalities such as monitoring of the sensor lead resistance and sensor break monitoring in accordance with NAMUR NE89 as well as monitoring of the measuring range. In addition, extended diagnostic functions in accordance with NE107 are integrated and extensive cyclical self-monitoring functions are carried out, which contribute to the high level of system security.

WIKA
Smart in sensing

Specifications

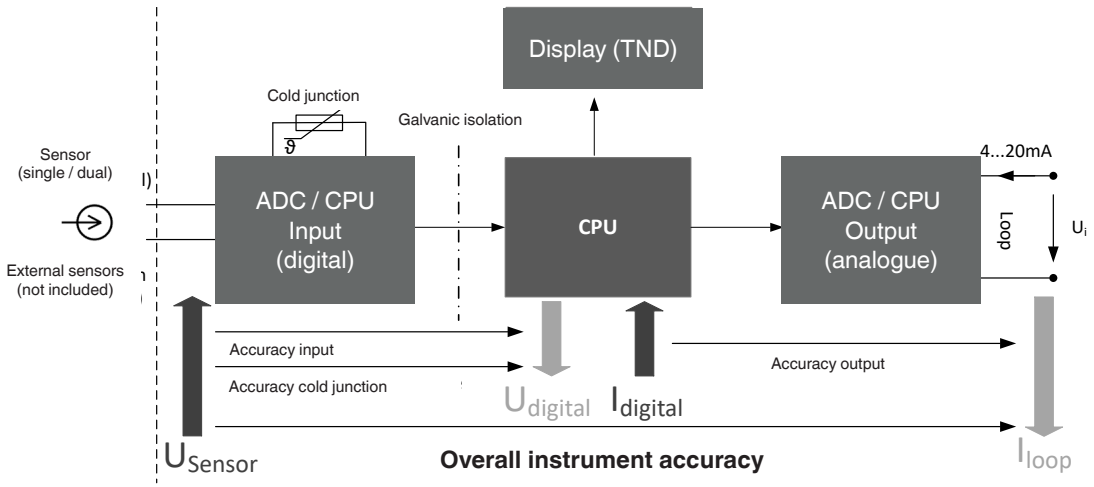
Measuring element				
	Sensor type	**Max. configurable measuring range [1]**	**Standard**	**Min. measuring span (MS) [1]**
Resistance sensor	Pt100	-200 ... +850 °C [-328 ... +1,562 °F]	IEC 60751:2008	■ 10 K ■ 3.8 Ω
	Pt1000	-200 ... +850 °C [-328 ... +1,562 °F]	IEC 60751:2008	
	CvD	-200 ... +850 °C [-328 ... +1,562 °F]	n. a.	
	Pt1000 Cryogenic design	-260 ... +200 °C [436 ... +392 °F]	Internal + IEC 60751:2008	
	JPt100	-200 ... +500 °C [-328 ... +932 °F]	JIS C1606: 1989	
	JPt1000	-200 ... +500 °C [-328 ... +932 °F]	Based on JIS C 1606:1989	
	Ni100	-60 ... +250 °C [-76 ... +482 °F]	DIN 43760: 1987	
	Resistance sensor [3]	0 ... 4,100 Ω	n.a.	4 Ω
Potentiometer [2]	Reed chains	0 ... 100 %	n.a.	10 %
Thermocouple type	J	-210 ... +1,200 °C [-346 ... +2,192 °F]	IEC 60584-1	■ 50 K ■ 2 mV
	K	-270 ... +1,300 °C [-454 ... +2,372 °F]	IEC 60584-1	
	L (DIN 43710)	-200 ... +900 °C [-328 ... +1,652 °F]	DIN 43710	
	L (GOST R 8.585 - 2001)	-200 ... +800 °C [-328 ... +1,472 °F]	-	
	E	-270 ... +1,000 °C [-454 ... +1,832 °F]	IEC 60584-1	
	N	-270 ... +1,300 °C [-454 ... + 2,372 °F]	IEC 60584-1	
	T	-270 ... +400 °C [-454 ... +752 °F]	IEC 60584-1	
	U	-200 ... +600 °C [-328 ... +1,112 °F]	IEC 60584-1: 1995	
	R	-50 ... +1,768 °C [-58 ... +3,214 °F]	IEC 60584-1	150 K
	S	-50 ... +1,768 °C [-58 ... +3,214 °F]	IEC 60584-1	150 K
	B	-50 ... 1.820 °C [-58 ... 3.308 °F]	IEC 60584-1	200 K
	C	-50 ... 2.315 °C [-58 ... 4.199 °F]	IEC 60584-1	150 K
	A	-50 ... 2.500 °C [-58 ... 4.532 °F]	IEC 60584-1	150 K
	mV sensor [3]	-500 ... +1,000 mV	-	2 mV

1) The transmitter can be configured below these limit values, but this is not recommended due to loss of accuracy.
2) R_{total}: 1 ... 35 Ω
3) This operating mode is not allowed for the SIL option.

Further details on: Measuring element	
Measuring current during measurement	Max. 0.33 mA (Pt100)
Connection methods	
Resistance thermometer (RTD)	■ 1 sensor in 2-/3-/4-wire connection ■ 2 sensors in 2-/3-wire connection
	→ for further information, see “Assignment of connection terminals”
Thermocouples (TC)	1 sensor or 2 sensors
	→ for further information, see “Assignment of connection terminals”
Cold junction compensation, configurable	■ Internal compensation ■ External with Pt100 ■ Fixed valued with fixed temperature specification ■ Disabled

Overall instrument accuracy

The product-specific accuracy specifications refer to the overall insturment. To determine the total error, all possible types of error must be considered - these are summarised in the following table.



Accuracy specifications				
Input + output in accordance with DIN EN 60770				
Input sensor type	**Mean temperature coefficient (TC) for each 10 K change in ambient temperature in the range -40 ... +85 °C [-40 ... +185 °F]**	**Measuring deviation at reference conditions in accordance with DIN EN 60770, NE 145 1), valid at 23 °C [73 °F] ±3 K**	**Influence of lead resistance**	**Long-term stability after 1 year**
Pt100 [1] / Pt1000 [2] / JPt100 / JPt1000 / Ni100	±(0.06 K + 0.015 % MV)	-200 °C [-328 °F] ≤ MV ≤ +200 °C [+392 °F] : ±0.10 K MV > +200 °C [+392 °F]: ±(0.1 K + 0.01 % |MV-200 K|)	4-wire: no effect (0 ... 50 Ω per wire) 3-wire: ±0.02 Ω / 10 Ω (0 ... 50 Ω per wire) 2-wire: Resistance of the supply lines [3]	±60 mΩ or 0.05 % of MV, greater value applies
Pt1000, cryogenic design	±(0.06 K + 0.015 % MV)	-260 ... -200 ± (0.1 K + 0.6 % |MV+200 K|) -200 ... +200 ± 0.1 K		
Resistance sensor	±(0.01 Ω + 0.01 % MV)	4-wire: ± (0.05 Ω or 0.02 % MV) 3-wire: ± (0.1 Ω or 0.02 % MV)		
Potentiometer	±(0.1 % MV)	R_{part}/R_{total} is max. ±0.5 %	-	-
FLR sensor	±(0.1 % MV)	R_{part}/R_{total} is max. ±0.2 % [4]	-	±(0.1 % MV)
TC type J (Fe-CuNi)	MV > -150 °C [-238 °F]: ±(0.07 K + 0.02 % |MV|)	-150 °C [-238 °F] < MV < 0 °C [+32 °F]: ±(0.3 K + 0.2 % |MV|) MV > 0 °C [+32 °F]: ±(0.3 K + 0.03 % MV)	6 µV / 1,000 Ω	±20 µV or 0.05 % of MV, greater value applies
TC type K (NiCr-Ni)	-150 °C [-238 °F] < MV < 1,300 °C [+2,372 °F]: ±(0.1 K + 0.02 % |MV|)	-150 °C [-238 °F] < MV < 0 °C [+32 °F]: ±(0.4 K + 0.2 % |MV|) 0 °C [+32 °F] < MV < 1,300 °C [+2,372 °F]: ±(0.4 K + 0.04 % MV)	6 µV / 1,000 Ω	±20 µV or 0.05 % of MV, greater value applies
TC type L (DIN / Fe-CuNi)	MW > 0 °C [+32 °F]: ±(0.07 K + 0.015 % MV)	MW > 0 °C [+32 °F]: ±(0.3 K + 0.03 % MV)	6 µV / 1,000 Ω	±20 µV or 0.05 % of MV, greater value applies

Accuracy specifications				
Input + output in accordance with DIN EN 60770				
Input sensor type	**Mean temperature coefficient (TC) for each 10 K change in ambient temperature in the range -40 ... +85 °C [-40 ... +185 °F]**	**Measuring deviation at reference conditions in accordance with DIN EN 60770, NE 145 1), valid at 23 °C [73 °F] ±3 K**	**Influence of lead resistance**	**Long-term stability after 1 year**
TC type L (GOST / Fe-CuNi)	MV > -150 °C [-238 °F]: ±(0.1 K + 0.015 % |MV|)	-150 °C [-238 °F] < MV < 0 °C [+32 °F]: ±(0.3 K + 0.2 % |MV|) MV > 0 °C [+32 °F]: ±(0.3 K + 0.03 % MV)	6 µV / 1,000 Ω	±20 µV or 0.05 % of MV, greater value applies
TC type E (NiCr-Cu)	MV > -150 °C [-238 °F]: ±(0.1 K + 0.015 % |MV|)	-150 °C [-238 °F] < MV < 0 °C [+32 °F]: ±(0.3 K + 0.2 % |MV|) MV > 0 °C [+32 °F]: ±(0.3 K + 0.03 % MV)	6 µV / 1,000 Ω	±20 µV or 0.05 % of MV, greater value applies
TC type N (NiCrSi-NiSi)	-150 °C [-238 °F] < MV < 0 °C [+32 °F]: ±(0.1 K + 0.05 % |MV|) MV > 0 °C [+32 °F]: ±(0.1 K + 0.02 % MV)	-150 °C [-238 °F] < MV < 0 °C [+32 °F]: ±(0.5 K + 0.2 % |MV|) MV > 0 °C [+32 °F]: ±(0.5 K + 0.03 % MV)	6 µV / 1,000 Ω	±20 µV or 0.05 % of MV, greater value applies
TC type T (Cu-CuNi)	-150 °C [-238 °F] < MV < 0 °C [+32 °F]: ±(0.07 K + 0.04 % MV) MV > 0 °C [+32 °F]: ±(0.07 K + 0.01 % MV)	-150 °C [-238 °F] < MV < 0 °C [+32 °F]: ±(0.4 K + 0.2 % |MV|) MV > 0 °C [+32 °F]: ±(0.4 K + 0.01 % MV)	6 µV / 1,000 Ω	±20 µV or 0.05 % of MV, greater value applies
TC type U (Cu-CuNi)	MW > 0 °C [32 °F]: ±(0.07 K + 0.01 % MV)	MW > 0 °C [32 °F]: ±(0.4 K + 0.01 % MV)	6 µV / 1,000 Ω	±20 µV or 0.05 % of MV, greater value applies
TC type R (PtRh-Pt)	50 °C [122 °F] < MV < 1,600 °C [2,912 °F]: ±(0.3 K + 0.01 % |MV - 400 K|)	50 °C [122 °F] < MV < 400 °C [752 °F]: ±(1.45 K + 0.12 % |MV - 400 K|) 400 °C [752 °F] < MV < 1,600 °C [2,912 °F]: ±(1.45 K + 0.005 % |MV - 400 K|)	6 µV / 1,000 Ω	±20 µV or 0.05 % of MV, greater value applies
TC type S (PtRh-Pt)	50 °C [122 °F] < MV < 1,600 °C [2,912 °F]: ±(0.3 K + 0.015 % |MV - 400 K|)	50 °C [122 °F] < MV < 400 °C [752 °F]: ±(1.45 K + 0.12 % |MV - 400 K|) 400 °C [752 °F] < MV < 1,600 °C [2,912 °F]: ±(1.45 K + 0.01 % |MV - 400 K|)	6 µV / 1,000 Ω	±20 µV or 0.05 % of MV, greater value applies
TC type B (PtRh-Pt)	450 °C [842 °F] < MV < 1,000 °C [1,832 °F]: ±(0.4 K + 0.02 % |MV - 1,000 K|) MV > 1,000 °C: ±(0.4 K + 0.005 % (MV - 1,000 K))	450 °C [842 °F] < MV < 1,000 °C [1,832 °F]: ±(1.7 K + 0.2 % |MV - 1,000 K|) MV > 1,000 °C: ±1.7 K	6 µV / 1,000 Ω	±20 µV or 0.05 % of MV, greater value applies
TC type C (W5Re-W26Re)	0 °C [32 °F] < MV < 400°C [752 °F]: ±(0.25 K + 0.05 % (MV - 400 K))	0 °C [32 °F] < MV < 400 °C [752 °F]: ±(0.85 K + 0.04 % |MV - 400 K|) MW > 400 °C [752 °F] ±(0.85 K + 0.1 % |MV - 400 K|)	6 µV / 1,000 Ω	±20 µV or 0.05 % of MV, greater value applies
TC type A (W5Re-W20Re)	0 °C [32 °F] < MV < 400 °C [752 °F]: ± 0,25 K MV > 400 °C [752 °F] ±(0.25 K + 0.05 % (MV - 400 K))	0 °C [32 °F] < MV < 400 °C [752 °F]: ±(0.85 K + 0.04 % |MV - 400 K|) MV > 400 °C [752 °F] ±(0.85 K + 0.1 % |MV - 400 K|)	6 µV / 1,000 Ω	±20 µV or 0.05 % of MV, greater value applies
mV sensor	±(2 µV + 0.02 % |MV|)	±(10 µV + 0.03 % |MV|)	6 µV / 1,000 Ω	±20 µV or 0.05 % of MV, greater value applies

Accuracy specifications				
Input + output in accordance with DIN EN 60770				
Input sensor type	**Mean temperature coefficient (TC) for each 10 K change in ambient temperature in the range -40 ... +85 °C [-40 ... +185 °F]**	**Measuring deviation at reference conditions in accordance with DIN EN 60770, NE 145 1), valid at 23 °C [73 °F] ±3 K**	**Influence of lead resistance**	**Long-term stability after 1 year**
Cold junction (only with TC)	±0.1 K	±0.8 K	-	±0.2 K
Output	±0.03 % of measuring span	±0.03 % of measuring span	-	±0.05 % of span

MV = measured value (temperature measured values in °C)
Measuring span = configured end of measuring range - conf. start of measuring range

1) In the event of interference caused by high-frequency electromagnetic fields in a frequency range from 80 to 400 MHz, an increased measuring deviation of up to 0.8 % is to be expected. During transient interferences (e.g. burst, surge, ESD) take into account an increased measuring deviation of up to 1.5 %.

2) Dual sensor only up to 450 °C [842 °F] within specification.

3) The specified resistance value of the sensor wire can be subtracted from the calculated sensor resistance. Dual sensor: Configurable for each sensor separately.

4) For dual sensors, the doubled value can be taken.

Output signal		
Analogue output (configurable)	■ 4 ... 20 mA, 2-wire ■ 20 ... 4 mA, 2-wire	
Temperature linearity	For RTD	Linear to temperature per IEC 60751, JIS C1606, DIN 43760
	For TC	Linear to temperature per IEC 60584, DIN 43710
Load R_A	The permissible load depends on the loop supply voltage.	
With HART®	$R_A \leq (U_B - 10.5\ V) / 0.022\ A$ with R_A in Ω and U_B in V	
Output limits (configurable)		
In accordance with NAMUR NE43	Lower limit	3.8 mA
	Upper limit	20.5 mA
Customer-specifically adjustable	Lower limit	3.6 ... 4.0 mA
	Upper limit	20.0 ... 21.5 mA
SIL option	Lower limit	3.8 ... 4.0 mA
	Upper limit	20.0 ... 20.5 mA
Simulation	In simulation mode, independent from input signal, simulation value configurable from 3.5 ... 23.0 mA	
Current value for signalling		
In accordance with NAMUR NE43	Downscale	< 3.6 mA (3.5 mA)
	Upscale	> 20.5 mA (21.5 mA)
Setting range	Downscale	3.5 ... 3.6 mA
	Upscale	21.0 ... 22.0 mA
PV, primary value (digital HART® measured value)	Signalling on sensor and hardware error through default value [+/- 9,999]	
Damping (configurable)	Configurable between 1 ... 60 s (0 = disabled)	
Factory configuration		
Sensor	Pt100	
Connection method	3-wire connection	
Measuring range	0 ... 150 °C [32 ... 302 °F]	
Damping	Disabled	
Error signalling	Downscale	
Output limits	Lower limit	3.8 mA
	Upper limit	20.5 mA
Current value for signalling	Downscale	< 3.6 mA (3.5 mA)

Output signal		
Communication		
Communication protocol	HART® protocol rev. 7.6	
	→ for further information, see page 13	
Integration software	HART® instrument driver and integration software	
	→ free download from www.wika.com	
WIKA configuration software	WIKAsoft-TT	
	→ free download from www.wika.com	
Configuration		
User linearisation	Store customer-specific sensor characteristics in the transmitter using software (other sensor types can be used in this way) Number of data points: min. 2 / max. 30	
	Sensor 1, sensor 2 redundant	The 4 … 20 mA output signal delivers the process value of sensor 1. If sensor 1 fails, the process value of sensor 2 is output (sensor 2 is redundant).
	Mean value	The 4 ... 20 mA output signal delivers the mean value of the two values from sensor 1 and sensor 2. If one sensor fails, the process value of the error-free sensor is output.
	Minimum value	The 4 ... 20 mA output signal delivers the minimum value of the two values from sensor 1 and sensor 2. If one sensor fails, the process value of the error-free sensor is output.
	Maximum value	The 4 ... 20 mA output signal delivers the maximum value of the two values from sensor 1 and sensor 2. If one sensor fails, the process value of the error-free sensor is output.
	Difference [1]	The 4 ... 20 mA output signal delivers the difference between sensor 1 and sensor 2. If one sensor fails, an error signalling will be activated.
Monitoring functions		
Test current for sensor monitoring	Nom. 20 µA during test cycle, otherwise 0 µA	
Monitoring NAMUR NE89 (monitoring of supply line resistance)	Resistance thermometer (Pt100, 4-wire)	$R_{L1} + R_{L4} > 100\ \Omega$ with hysteresis 5 Ω
		$R_{L2} + R_{L3} > 100\ \Omega$ with hysteresis 5 Ω
	Thermocouple	$R_{L1} + R_{L4} + R_{thermocouple} > 10\ k\Omega$ with hysteresis 100 Ω
	3-wire	Monitoring of the resistance difference between lines 2 & 3 and lines 5 & 6. An error will be signalled if there is a difference of > 0.5 Ω.
Sensor break monitoring	Configurable via software Default: Downscale	
Sensor short-circuit monitoring	Configurable via software Default: Downscale	
Self-monitoring	Active permanently, e.g. RAM/ROM test, logical program operating checks and validity check	
Measuring range monitoring	Monitoring of the set measuring range for upper/lower deviations Standard: Deactivated	

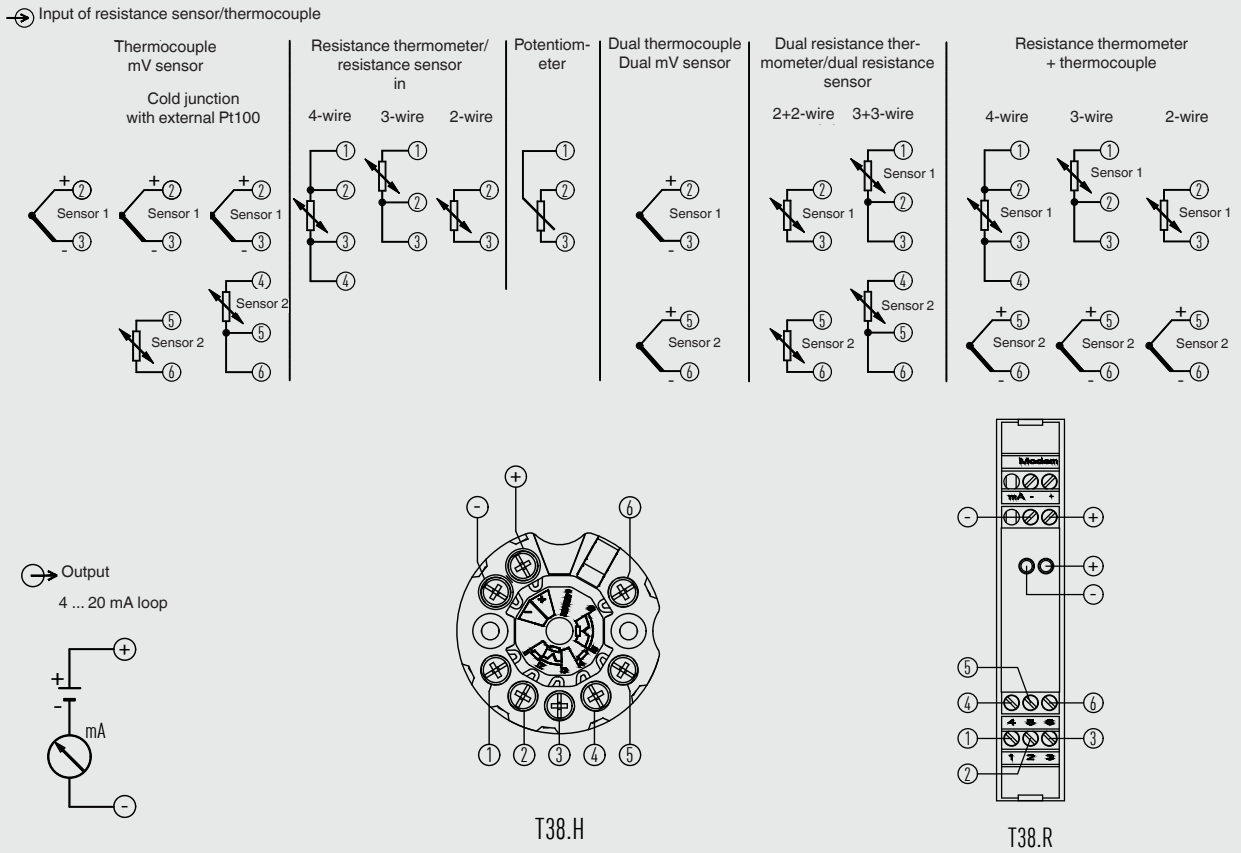
Output signal		
Monitoring functionality when 2 sensors have been connected (dual sensor)	Redundancy	In the case of a sensor error (sensor break, lead resistance too high or outside the measuring range of the sensor) of one of the two sensors, the process value will be only based on the error-free sensor. Once the error is rectified, the process value will again be based on the two sensors, or on sensor 1.
	Ageing control (sensor drift monitoring)	A status message via HART® occurs when the magnitude of the temperature difference between sensor 1 and sensor 2 exceeds a user-selectable value. This monitoring only generates a signal if two valid sensor values can be determined and the temperature difference is higher than the selected limit value. (Cannot be selected for the “Difference” sensor functionality, since the output signal already indicates the difference value).
	WIKA True Drift Detection	WIKA True Drift Detection technology is a specific sensor combination for the continuous monitoring of a resistance sensor. As soon as a drift is detected, this error will be signalled by the temperature transmitter via a HART® flag as a diagnostic status. A faulty measuring location is thus identified immediately and before the next recalibration. → For technical details, see special documentation SP 05.26
Voltage supply		
Auxiliary power U_B	DC 10.5 ... 42 V [2] Attention: Restricted auxiliary power ranges for explosion-protected versions (see “Safety-related characteristic values”) and extended SIL version.	
Time response		
Rise time t_{90}	Approx. 0.8 s	
Warm-up time	After approx. 5 minutes the instrument will function to the specifications (accuracies) given in the data sheet	
Switch-on time (time to get the first measured value)	Max. 10 s	
Typical measuring rate	Measured value update	■ Single sensor approx. 6/s ■ Dual sensor approx. 3/s

1) This operating mode is not allowed for the SIL option.

2) Auxiliary power input protected against reverse polarity; Load $R_A \leq (U_B - 10.5\ V) / 0.022\ A$ with R_A in Ω and U_B in V (without HART®)
On switching on, an increase in the auxiliary power of 4 V/s is needed; otherwise the temperature transmitter will remain in a safe state at 3.5 mA.

Electrical connections		
Wire cross-section		
T38.H head-mounted version	Solid wire	0.14 ... 2.5 mm² (24 ... 14 AWG)
	Stranded wire with end splice	0.14 ... 1.5 mm² (24 ... 16 AWG)
T38.R rail-mounted version	Solid wire	0.14 ... 2.5 mm² (24 ... 14 AWG)
	Stranded wire with end splice	0.14 ... 2.5 mm² (24 ... 14 AWG)
Lead resistance		
With resistance sensors	50 Ω each conductor, 3-/4-wire connection	
With thermocouples	5 kΩ each conductor	
Insulation voltage (input to analogue output)	AC 1,500 V, (50 Hz / 60 Hz); 60 s	

Assignment of connection terminals



Version with display TND

Operation/display:
The display shows a current measured value and additional information about which value it is (PV, S1-S2, etc.). The selection of the displayed value can be made via the configuration tool.

Should the transmitter detect an error in the measuring chain, this will be shown on the display with the channel number and the error code.

T38 with clip-on display (TND)

PIH-W with T38 and TND

When installing a head-mounted transmitter with a display in a case, it must be ensured that a case with a window in the cover is used. The WIKA PIH-W case, specifically developed for this application, is available for the combination of a T38 with a TND clip-on display (see figure “PIH-W with T38 and TND” and accessories).

Adjustment of sensors
Linearisation of the output is also required for resistance sensors (RTD). One method to improve the accuracy of the temperature measurement can be carried out by using Callendar–Van Dusen coefficients (Ptx resistance thermometer).
The Callendar–Van Dusen equation is described as:
$RT = R0[1+AT+BT^2+C(T-100)T^3]$

For best accuracy of the system, a platinum resistance thermometer (RTD) should be individually calibrated to generate the A, B, C coefficients.

→ For further information, see technical information IN 00.29

Materials	
Non-wetted parts	
T38.H head-mounted version	Plastic, PBT, glass-fibre reinforced
T38.R rail-mounted version	Plastic

Operating conditions	
Ambient temperature	
Standard	-40 ... +85 °C [-40 ... +185 °F]
Extended for high ambient temperatures [1]	-40 ... +105 °C [-40 ... +221 °F]
Extended for low ambient temperatures [1]	-50 ... +85 °C [-58 ... +185 °F]
Extended for SIL [2]	-40 ... +95 °C [-40 ... +203 °F]
Storage temperature	-40 ... +85 °C [-40 ... +185 °F]
Maximum allowable humidity	
T38.H head-mounted version	Test of max. temperature variation 65 °C [149 °F] and -10 °C [14 °F], 93 % ±3 % r. h.
T38.R rail-mounted version	Test of max. temperature 25 °C [77 °F] and 55 °C [131 °F], 95 % r. h.
Relative condensation	
T38.H head-mounted version	Permissible
T38.R rail-mounted version	Permissible in vertical mounting position
Climate class per IEC 60654-1: 1993	Cx (-40 ... +85 °C [-40 ... +185 °F], 5 ... 95 % r. h.)
Salt mist per IEC 60068-2-52: 2017	Severity grade 1
Vibration resistance in accordance with IEC 60068-2-6: 2008	Test Fc: 10 ... 2,000 Hz; 10 g, amplitude 0.75 mm [0.03 in]
Shock resistance per IEC 60068-2-27: 2008	Acceleration / shock width
T38.H head-mounted version	100 g / 6 ms
T38.R rail-mounted version	30 g / 11 ms
Free-fall test in line with IEC 60721-3-2: 2018	Height of fall 1.5 m [4.9 ft]
Ingress protection of the complete instrument (per IEC/EN 60529)	
T38.H head-mounted version	IP00 (electronics completely potted)
T38.R rail-mounted version	IP20
Electromagnetic compatibility (EMC) in accordance with DIN EN 55011:2010, DIN EN 61326-2-3:2013, NAMUR NE21:2012, GL 2012 VI Part 7	Emission (group 1, class B) and immunity (industrial application) [HF field, HF line, ESD, burst and surge]
Service life	Max. usable life of 20 years (in line with ISO 13849-1)

1) Special version, not for rail-mounted version, not for SIL version
2) Special version, not for rail-mounted version

Approvals

Logo	Description	Region
CE	**EU declaration of conformity**	European Union
	EMC directive EN 61326 emission (group 1, class B) and immunity (industrial environments)	
	RoHS directive	
UK CA	**UKCA**	United Kingdom
	Electromagnetic compatibility regulations	
	Restriction of hazardous substances (RoHS) regulations	
	Equipment and protective systems intended for use in potentially explosive atmospheres regulations	

Optional approvals

Logo	Description			Region
	EU declaration of conformity			European Union
	ATEX directive Hazardous areas			
	Ex i			
	- Head-mounted version	Zone 0 gas	II 1G Ex ia IIC T6 ... T4 Ga	
		Zone 20 dust	II 1D Ex ia IIC T135 °C Da	
		Zone 2 gas	II 3G Ex ic IIC T6 ... T4 Gc X	
	- Rail-mounted version	Zone 0, 1 gas	II (1G) 2G Ex ia [ia Ga] IIC T6 ... T4 Gb	
		Zone 20, 21 dust	II (1D) 2D Ex ia [ia Da] IIIC T135 °C Db	
	Ex e	Zone 2 gas	II 3G Ex ec IIC T6 ... T4 Gc X	
	IECEx (option) Hazardous areas			International
	- Head-mounted version	Zone 0 gas	Ex ia IIC T6 ... T4 Ga	
		Zone 20 dust	Ex ia IIC T135 °C Da	
		Zone 2 gas	Ex ic IIC T6 ... T4 Gc X	
	- Rail-mounted version	Zone 0, 1 gas	Ex ia [ia Ga] IIC T6 ... T4 Gb	
		Zone 20, 21 dust	Ex ia [ia Da] IIIC T135 °C Db	
	- Ex e	Zone 2 gas	Ex ec IIC T6 ... T4 Gc X	

Manufacturer's information and certificates

Logo	Description
	SIL 2 Functional safety
-	**China RoHS directive**
	NAMUR ■ EMC per NAMUR NE21 ■ Signalling per NAMUR NE43 ■ Sensor break monitoring per NAMUR NE89 ■ Self-monitoring and diagnostics of field instruments per NAMUR NE107

Certificates (option)

Certificates	
Certificates	■ 2.2 test report ■ 3.1 inspection certificate
Calibration	DAkkS calibration certificate

→ For approvals and certificates, see website

Safety-related characteristic values (Ex)

	Models T38.x-AI Gas hazardous application	T38.x-AC Gas hazardous application	Model T38.x-AI Dust hazardous application
Ex marking			
Head-mounted version	II 1G Ex ia IIC T6 ... T4 Ga	II 3G Ex ic IIC T6 ... T4 Gc	II 1D Ex ia IIC T135° Da
Rail-mounted version	II (1G) 2G Ex ia [ia Ga] IIIC T6 ... T4 Gb	II 3G Ex ic IIC T6 ... T4 Gc	II (1D) 2D Ex ia [ia Da] IIIC T135 °C Db
Connection values / Intrinsically safe supply and signal circuit (4 ... 20 mA current loop)			
Terminals	+ / -	+ / -	+ / -
Auxiliary power U_B [1)]	DC 10.5 ... 30 V	DC 10.5 ... 30 V	
Maximum voltage U_i	DC 30 V	DC 30 V	DC 30 V
Maximum current I_i	130 mA	130 mA	130 mA
Maximum power P_i	800/600 mW	800/600 mW	750 / 650 / 550 mW
Effective internal capacitance C_i	1.7 nF	1.7 nF	1.7 nF
Effective internal inductance L_i	negligible	negligible	negligible

Further specifications on: Safety-related characteristic values (Ex)

	Model T38.x-AI Ex ia IIC/IIB/IIA Ex ia IIIC	Model T38.x-AC Ex ic IIC/IIB/IIA
Connection values of sensor circuit		
Terminals	1 - 6	1 - 6
Maximum voltage U_0	DC 6.32 V	DC 6.32 V
Maximum current I_0	25 mA	25 mA
Maximum power P_0	39 mW	39 mW
Maximum external capacitance C_0	24 µF	325 µF
Maximum external inductance L_0	50 mH	120 mH
Maximum inductance/resistance ratio L_0/R_0	0.8 mH/Ω	1.55 mH/Ω
Characteristic curve	Linear	

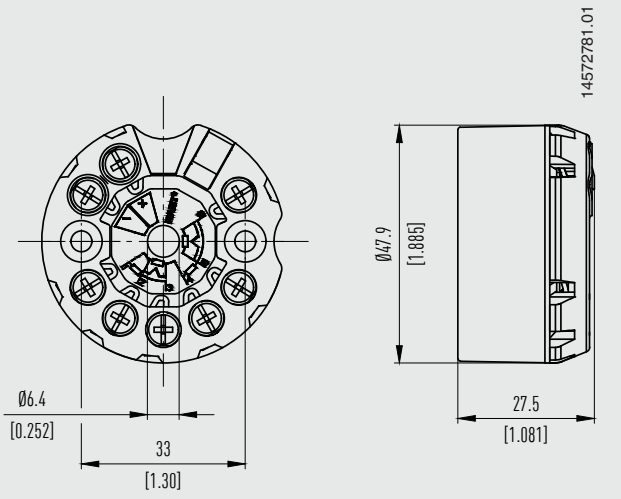
	Model T38.X-AE Gas hazardous application
Ex marking	II 3G Ex ec IIC T6 ... T4 Gc
Connection values / Intrinsically safe supply and signal circuit (4 ... 20 mA current loop)	
Terminals	+ / -
Voltage U_n	DC 40 V
Current I_n	22.5 mA

	Model T38.X-AE
Connection values of sensor circuit	
Terminals	1-6
Voltage U_n	DC 3 V
Current I_n	0.66 mA
Power P_n	2 mW

Application	Ambient temperature range	Temperature class	Power P_i
Group II Gas	-50 ... +105 °C [-58 ... 221 °F]	T4	600 mW
	-50 ... +85 °C [-58 ... 185 °F]	T4	800 mW
	-50 ... +75 °C [-58 ... 167 °F]	T5	800 mW
	-50 ... +60 °C [-58 ... 140 °F]	T6	600 mW
	-50 ... +50 °C [-58 ... 122 °F]	T6	800 mW
Group III Dust	-50 ... +40 °C [-58 ... 104 °F]	T135 °C	750 mW
	-50 ... +70 °C [-58 ... 158 °F]	N / A	650 mW
	-50 ... +100 °C [-58 ... 212 °F]	N / A	550 mW

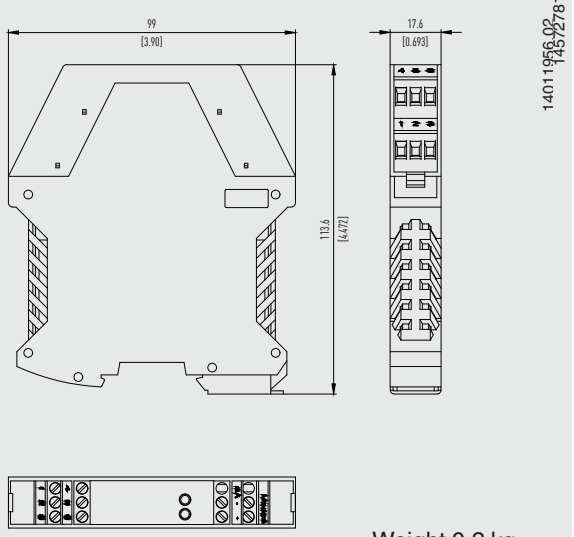
Dimensions in mm [in]

Head-mounted version



Weight: 0.07 kg

Rail-mounted version



Weight 0.2 kg

Communication

HART® protocol rev. 7.6

Interoperability (i.e. compatibility between components from different manufacturers) is a strict requirement of HART® instruments. The T38 transmitter is compatible with almost every open software and hardware tool; including:

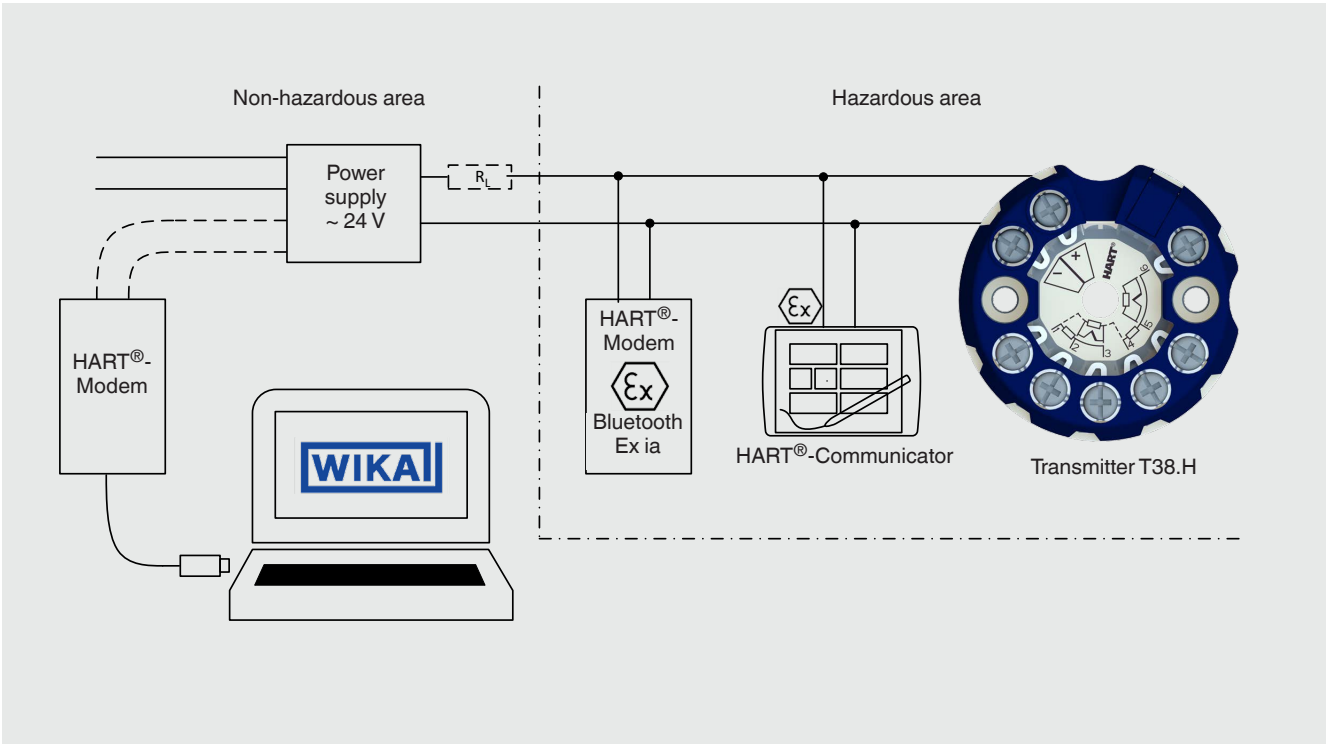
1. User-friendly WIKAsoft-TT WIKA configuration software, free-of-charge download from www.wika.com
2. HART® communicator (e.g. AMS Trex):
   T38 device description (device object file) is integrated
3. Asset management systems
   - 3.1 Complete, EDDL/FDI-compliant Device Description (DD) with FDI device package: e.g. for Emerson AMS, Simatic PDM
   - 3.2 Device Type Manager (DTM): e.g. for PACTware, FieldMate

Attention:

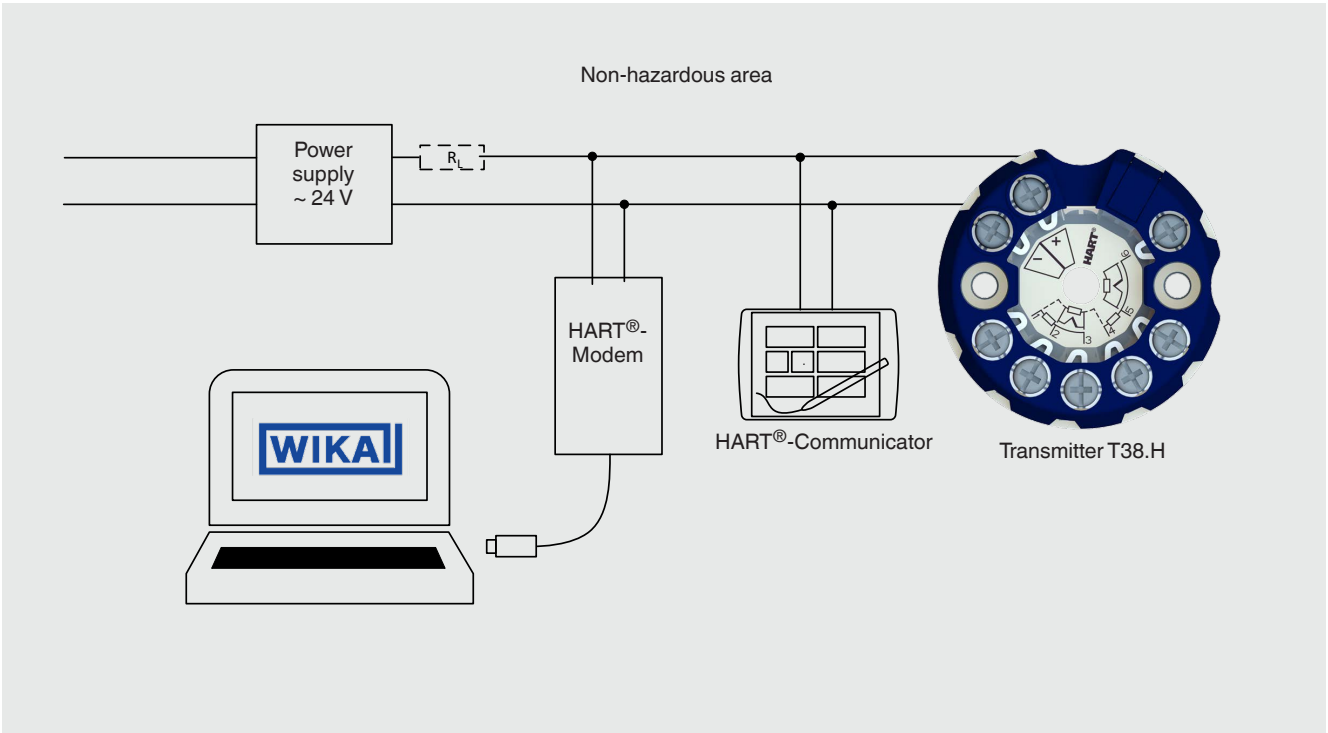
For direct communication via the serial interface of a PC/notebook, a HART® modem is needed (see “Accessories”). As a general rule, parameters which are defined in the scope of the universal HART® commands can, in principle, be edited with all HART® configuration tools.

Configuration

Typical connection in hazardous area



Typical connection in non-hazardous area



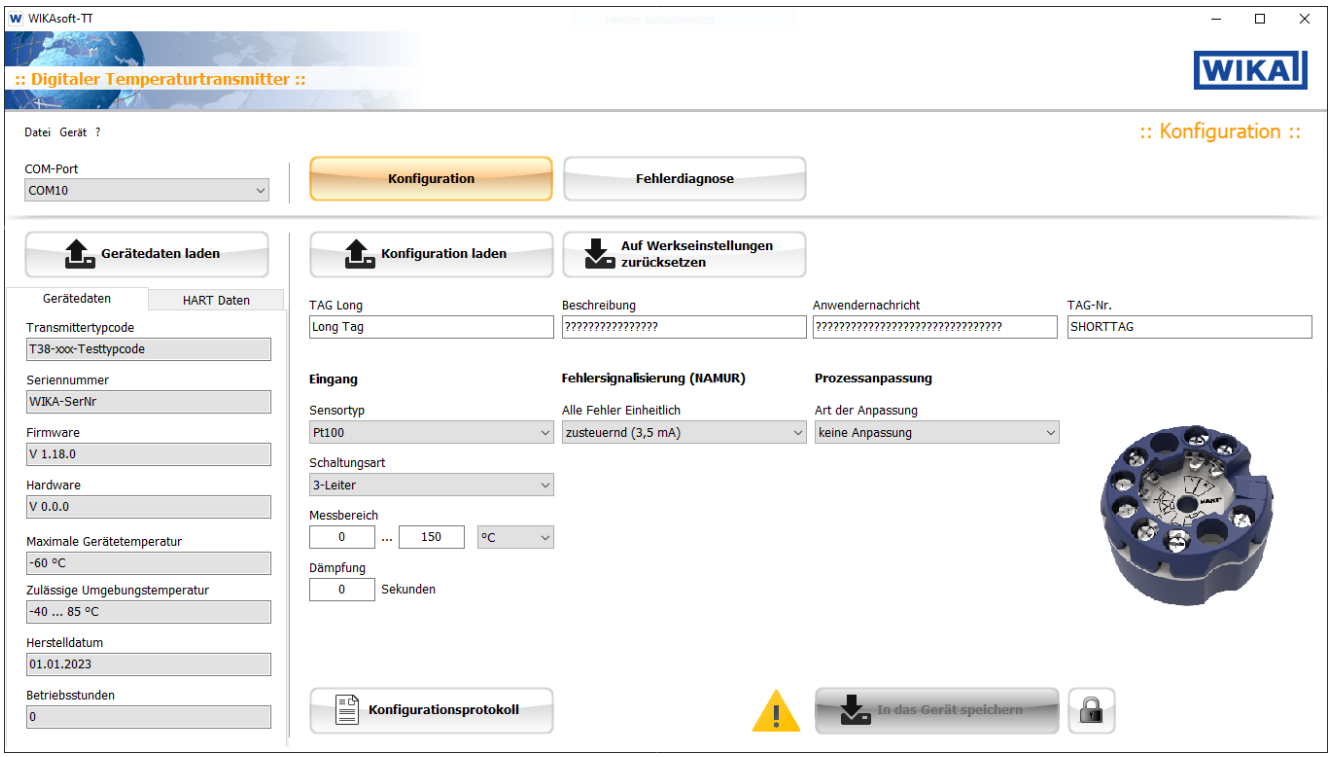
RL = Load resistance for HART® communication
RL min. 230 Ω, max. 1,100 Ω

If RL is < 230 Ω in the respective circuit, RL must be increased to at least 230 Ω by connecting external resistors.

Connecting the PU-548 programming unit

Attention:
For direct communication via the serial interface of a PC/notebook, a model PU-548 programming unit is needed (see “Accessories” on page 16).

Configuration software WIKAsoft-TT



Accessories

WIKA configuration software: Free download from www.wika.com

Model		Description	Order number
	**DIH50, DIH52 with field case**	DIH50 display module without separate auxiliary power supply, automatically rescales on a change in measuring range and units via monitoring of the HART® communication, 5-digit LC display, 20-segment bar graph display, display rotatable in 10° steps, with II 1G EEx ia IIC explosion protection; see data sheet AC 80.10 Material: Aluminium / stainless steel Dimensions: 150 x 127 x 138 mm	On request
	**PIH-X Connection head**	Modular connection heads, can be combined with T38 transmitter as a complete instrument; Available with window -> installation of the TND possible Impressive stability in accordance with C5-M (without mounting parts) With explosion protection Material: Aluminium; for further specifications, see data sheet AC 80.12	On request
	**TND – Temperature Numerical Display**	Indication module TND, 5-digit LC display, 20-segment bar graph display	33025404
	**Programming unit model PU-548**	Programming unit for USB interface for use with the WIKAsoft-TT configuration software Easy to use LED status indication Compact design No further voltage supply needed, neither for the programming unit nor for the transmitter Incl. 1 model magWIK magnetic quick connector	14231581
	**Adapter**	Suitable for TS 35 per DIN EN 60715 (DIN EN 50022) or TS 32 per DIN EN 50035 Material: Plastic / stainless steel Dimensions: 60 x 20 x 41.6 mm	On request
	**Adapter**	Suitable for TS 35 per DIN EN 60715 (DIN EN 50022) Material: Steel, tin-plated Dimensions: 49 x 8 x 14 mm	On request
	**Magnetic quick connector, model magWIK**	Replacement for crocodile clips and HART® terminals Fast, safe and tight electrical connection For all configuration and calibration processes	14026893

Ordering information

Model / Explosion protection / SIL specifications / Configuration / Permissible ambient temperature / Certificates / Options