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Digital Temperature Transmitters with HART® Protocol
Model T32.10, Head Mounting
Model T32.30, Rail Mounting

Applications

- Process industry
- Machinery and plant construction

Special Features

- User-friendly WIKA Configuration Software available free-of-charge
- Configurable with almost all HART® Soft- and Hardware tools
- Universal for the connection of
  - Resistance thermometer / -sensor
  - Thermocouple / mV-Sensor
- Signalling in acc. with NAMUR NE 43, NE 89
- Functional safety (SIL 2)

Fig. left: Digital Temperature Transmitter Model T32.10
Fig. right: Digital Temperature Transmitter Model T32.30

Description

These temperature transmitters are designed for universal use in the process industry. They offer a high accuracy, galvanic isolation and an excellent EMI protection.
Via the HART® protocol, the transmitters are configurable (interoperable) with a variety of open configuration tools. Apart from the different sensor types, e.g. sensors in accordance with DIN EN 60751, JIS C1606, DIN 43760, DIN EN 60584 or DIN 43710, customer specific sensor-curves, through the input of value pairs (user-defined linearisation), can also be defined.

The T32 transmitter convinces, in addition, with further sophisticated supervisory functionality such as monitoring of the sensor wire resistance and sensor-break detection in accordance with NAMUR NE 89.

Moreover, the transmitters execute an initial test (self test) on connection of the power supply.

The dimensions of the head-mounted transmitter match the Form-B DIN connecting heads with extended mounting space, e.g. WIKA Model BSS. The rail-mounted transmitters can be used for all standard rack systems in accordance with IEC 60715. The transmitters are delivered with either a basic configuration or configured according to customers' specifications.

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Specifications of Model T32.10 head mounting and Typ T32.30 rail mounting

Temperature Transmitter input; configurable

Resistance sensor	Configurable measuring range[1]	Standard	α values	Minimum measuring span	Typical accuracy at 23 °C ±5 K in the permissible ambient temperature range	
					Basic accuracy	Temperature coefficient
Pt100	-200 ... +850 °C [2]	**IEC 60751**: 1996	**α = 0.00385**	10 K or 3,8 Ω whichever is greater	**≤ ± 0.21 °C [4]**	**≤ ± 0.007 °C / °C [5]**
Pt(x) [3] 10 ... 1000	-200 ... +850 °C	IEC 60751: 1996	α = 0.00385		≤ ± 0.21 °C [4]	≤ ± 0.007 °C / °C [5]
JPt100	-200 ... +500 °C	JIS C1606: 1989	α = 0.003916		≤ ± 0.21 °C [4]	≤ ± 0.007 °C / °C [5]
Ni100	-60 ... +250 °C	DIN 43760: 1987	α = 0.00618		≤ ± 0.21 °C [4]	≤ ± 0.007 °C / °C [5]
Resistance sensor	0 ... 700 Ω / 0 ... 5 kΩ			4 ... 32 Ω	≤ ± 0.15 Ω [6]	≤ ± 0.011 Ω / °C [6]

Sensor current	max. 0.2 mA (Pt100)
Connection type	**1 sensor** 2- /4- /**3-wire** (for further information, please refer to Designation of Terminal Connection)
Max. wire resistance	30 Ω each wire, 3-wire symmetrically

Thermocouple	Configurable measuring range [1]	Standard	Minimum measuring span	Typical accuracy at 23 °C ±5 K in the permissible ambient temperature range	
				Basic accuracy	Temperature coefficient
type J (Fe-CuNi)	-210 ... +1200 °C	IEC 584: 1998-06	50 K or 2 mV whichever is greater	≤ ± 0.52 °C [7]	≤ ± 0.024 °C / °C [7]
type K (NiCr-Ni)	-270 ... +1372 °C	IEC 584: 1998-06		≤ ± 0.52 °C [7]	≤ ± 0.024 °C / °C [7]
type L (Fe-CuNi)	-200 ... +900 °C	DIN 43760: 1985-12		≤ ± 0.31 °C [7]	≤ ± 0.018 °C / °C [7]
type E (NiCr-Cu)	-270 ... +1000 °C	IEC 584: 1998-06		≤ ± 0.52 °C [7]	≤ ± 0.024 °C / °C [7]
type N (NiCrSi-NiSi)	-270 ... +1300 °C	IEC 584: 1998-06		≤ ± 0.52 °C [7]	≤ ± 0.024 °C / °C [7]
type T (Cu-CuNi)	-270 ... +400 °C	IEC 584: 1998-06		≤ ± 0.31 °C [7]	≤ ± 0.018 °C / °C [7]
type U (Cu-CuNi)	-200 ... +600 °C	DIN 43710: 1985-12		≤ ± 0.31 °C [7]	≤ ± 0.018 °C / °C [7]
type R (PtRh-Pt)	-50 ... +1768 °C	IEC 584: 1998-06	150 K	≤ ± 1.6 °C [7]	≤ ± 0.04 °C / °C [7]
type S (PtRh-Pt)	-50 ... +1768 °C	IEC 584: 1998-06	150 K	≤ ± 1.6 °C [7]	≤ ± 0.04 °C / °C [7]
type B (PtRh-Pt)	0 ... +1820 °C	IEC 584: 1998-06	200 K	≤ ± 1.3 °C [8]	≤ ± 0.06 °C / °C [8]
mV-Sensor	-400 ... +1200 mV		4 ... 32 mV	≤ ± 0.13 mV [9]	≤ ± 0.012 mV / °C [9]

Connection type	1 sensor (for further information, please refer to Designation of Terminal Connections)
Max. wire resistance	250 Ω each wire
Cold junction compensation, configurable	compensation; internal or external with Pt100 or with thermostat or off

1) Other units e.g. °F and K on request
2) Extended up to 1000 °C
3) x configurable between 10 … 1000
4) Based on 3-wire Pt100, Ni100, 150 °C MV incl. additionally measuring deviation at 3-wire connection from 50 mΩ (≙ 0.13 K at Pt100) with adjusted supply lead resistance.
5) Based on 150 °C MV
6) Based on R_{total} 1 kΩ (3-wire)
7) Based on 400 °C MV, without cold junction compensation error
8) Based on 1000 °C MV, without cold junction compensation error
9) Based on 400 mV MV

bold: basic configuration

MV Measuring value

User linerisation

Via software, customer-specific sensor curves can be stored in the transmitter, so that further sensor types can be used.
Number of data points: min. 2; max. 30

Analogue output / Output limits / Signalling / Isolation resistance

Analogue output, configurable	**linear to temperature per IEC 60751** / JIS C1606 / DIN 43760 (for resistance sensors) or linear to temperature per IEC 584 / DIN 43710 (for thermocouples) **4 ... 20 mA** or 20 ... 4 mA, 2-wire design	
Output limits, configurable	lower limit	upper limit
to NAMUR NE 43	**3.8 mA**	**20.5 mA**
not active	3.6 mA	21.5 mA
customer specific, adjustable	from 3.6 mA up to 4.0 mA	from 20.0 mA up to 21.5 mA
Current value for Signalling, configurable	**down scale**	up scale
to NAMUR NE 43	**< 3.6 mA (3.5 mA)**	> 21.0 mA (21.5 mA)
default value	from 3.5 mA up to 12 mA	from 12 mA up to 22.5 mA
In simulation mode, independent from input signal, simulation value configurable form 3.5 mA up to 22.5 mA		
Load R_A	$R_A \leq (U_B - 12\ V) / 0.0225\ A$ with R_A in Ω and U_B in V	
Isolation voltage (input to analogue output)	1500 V AC, (50 Hz / 60 Hz); 60 s	
Power consumption with U_B = 24 V	max. 540 mW	

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Rise time / Damping / Measuring rate

Rise time t_{90}	approx. 1.5 s
Damping, configurable	**off**; configurable between 1 s and 60 s
Turn on time (time to get the first measured value)	5 s
Measuring rate	Measured value update appprox. 3/s

bold: basic configuration

Measuring deviation / Temperature coefficient

Load effect	not measurable
Power supply effect	not measurable
Warm-up time	after ca. 5 minutes the instrument will function to the specified technical data (accuracy)

Input	Measuring deviation[1] per DIN EN 60770, 23 °C ±5 K	Temperature coefficient [2] -40 ... +85 °C	Connection lead effects
Resistance thermometer (Pt100)	MV ≤ 200 °C: 0.08 K [3] MV > 200 °C: 0.08 K + 0.01 % |MV - 200 K| [3]	±(0.05 K + 0.015 % MV) / 10 K	4-wire: no effect (0 to 30 Ω each wire) 3-wire: ± 0.02 Ω / 10 Ω (0 to 30 Ω each wire) 2-wire: connection lead effects
Resistance sensor	±0.03 or 0.01 % MV [3]	±(0.01 Ω + 0.01 % MV) / 10 K	
Thermocouples type T, L, U	-150 °C < MV < 0 °C: ±(0.25 K + 0.15 % MV) MV ≥ 0 °C: ±(0.25 K + 0.015 % MV)	MV > -150 °C: T32.10: ±(0.1 K + 0.02 % MV) / 10 K	0.1 µV / 10 Ω [5]
type E, J, K, N	-150 °C < MV < 0 °C: ±(0.4 K + 0.2 % MV) MV ≥ 0 °C: ±(0.4 K + 0.03 % MV)	MV > -150 °C: T32.10: ±(0.1 K + 0.035 % MV) / 10 K	
type R, S	50 °C < MV 400 °C: ±(1.2 K + 0.1 % |MV - 400 K|) 400 °C < MV 1600 °C: ±(1.2 K + 0.015 % |MV - 400 K|)	50 °C < MV ≤ ≤1600 °C: T32.10: ±(0.3 K + 0.025 % |MV - 400 K|) / 10 K	
type B	400 °C < MV < 1000 °C: ±(1.3 K + 0.25 % |MV - 1000 K|) MV ≥ 1000 °C: ±1.3 K	400 °C < MV ≤ 1000 °C: T32.10: ±(0.4 K + 0.02 % |MV - 400 K|) / 10 K MV ≥ 1000 °C: T32.10: ±(0.4 K + 0.02 % |MV - 1000 K|) / 10 K	
mV-sensor	±(10 µV + 0.03 % MV)	T32.10: ±(2 µV + 0.03 % MV) / 10 K	
Cold Junction Compensation (CJC) [4]	±0.8 K	±0.1 K / 10 K	

Output	±0.04 % of span	±0.1 % of span / 10 K	

Total measuring deviation: sum of input + output per DIN EN 60 770, 23 °C ± 5 K

MV Measuring value
(temperature measuring values in °C)

1) The higher value applies
2) T32.10: With the extended ambient temperature range (-50 … +85 °C) the value is doubled
3) additionally measuring deviation at 3-wire connection: 50 mΩ (approx. 0.13 K at Pt100) with adjusted supply lead resistances.
4) Only at thermocouples
5) Within a range of 0 … 500 Ω wire resistance

Monitoring

Test current for sensor monitoring [6]	nom. 1 µA during test cycle, otherwise 0 µA
Monitoring NAMUR NE 89 (monitoring of input lead resistance)	
■ Resistance thermometer (Pt100, 4-wire)	$R_{L2} + R_{L3} > 128\ \Omega \pm 0.1\ \Omega$ with hysteresis 12 Ω ± 0.1 Ω $R_{L1} + R_{L4} + R_{PT100} > 14.5\ k\Omega \pm 30$ % with hysteresis 750 Ω ± 20 %
■ Thermocouple	$R_{L1} + R_{L4} + R_{thermocouple} > 14.5\ k\Omega \pm 30$ % with hysteresis 750 Ω ± 20 %
Sensor burnout monitoring	Activated
Self monitoring	Automatic performance of a initial test after connecting the power supply
Monitoring of input lead resistance (3-wire)	Monitoring for resistance difference between lead 3 and 4; an error will be set, if there is a difference (> 0.5 Ω) between leads 3 and 4

6) Valid for thermocouple only.

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Explosion protection / power supply

Model	Approvals	Permissible ambient or storage temperature	Safety-related maximum vales for Sensor (connections 1 up to 4)	Current loop (connections ±)	Power supply U_B [1]
T32.10.000/ T32.30.000	without	{-50} -40 ... +85 °C -20 ... +70 °C	-	-	12 ... 42 V
T32.10.002/ T32.30.002	**EC type examination certificate:** **DMT98 ATEX E 007 X** **Zone 0, 1**: II 1G EEx ia IIC T4/T5/T6 intrinsically safe per directive 94/9/EG (ATEX)	{-50} -40 ... +85 °C (T4) {-50} -40 ... +75 °C (T5) {-50} -40 ... +60 °C (T6) -20 ... +70 °C (T4) -20 ... +70 °C (T5) -20 ... +60 °C (T6)	U_o = DC 11.5 V I_o = 12.3 mA P_o = 35.2 mW IIB: C_o = 11 µF L_o = 1 mH IIC: C_o = 1.6 µF L_o = 1 mH	U_i = DC 30 V I_i = 130 mA P_i = 800 mW C_i = 7,8 nF L_i = 100 µH	12 ... 30 V
T32.10.006/ T32.30.006	**CSA File No. 1248412 (old: LR 105000-6)** **Intrinsically safe:** Cl. I / Div. 1, Group A,B,C,D **Non-Incendive:** Cl. I / Div. 2, Group A,B,C,D	{-50} -40 ... +85 °C (T4) {-50} -40 ... +75 °C (T5) {-50} -40 ... +60 °C (T6) -20 ... +70 °C (T4) -20 ... +70 °C (T5) -20 ... +60 °C (T6)	V_{oc} = DC 11.5 V I_{sc} = 12.3 mA P_{max} = 35.2 mW C_a = 1.6 µF L_a = 1 mH	V_{max} = DC 30 V I_{max} = 130 mA P_{max} = 800 mW C_i = 7.8 nF L_i = 100 µH	12 ... 30 V
T32.10.008/ T32.30.008	**Installation Drawing No. 3181945** **Intrinsically safe:** Cl. I / Div. 1, Group A,B,C,D **Non-Incendive:** Cl. I / Div. 2, Group A,B,C,D	{-50} -40 ... +85 °C (T4) {-50} -40 ... +75 °C (T5) {-50} -40 ... +60 °C (T6) -20 ... +70 °C (T4) -20 ... +70 °C (T5) -20 ... +60 °C (T6)	V_{oc} = DC 11.5 V I_{sc} = 12.3 mA P_{max} = 35.2 mW C_a = 1.6 µF L_a = 1 mH	V_{max} = DC 30 V I_{max} = 130 mA P_{max} = 800 mW C_i = 7.8 nF L_i = 100 µH	12 ... 30 V
T32.10.009/ T32.30.009	II 3G Ex nL IIC T4/T5/T6 X energy-limited equipment II 3G Ex nA IIC T4/T5/T6 X non-functioning system II 3G Ex ic IIC T4/T5/T6 X intrinsically safe equipment	{-50} -40 ... +85 °C (T4) {-50} -40 ... +75 °C (T5) {-50} -40 ... +60 °C (T6) -20 ... +70 °C (T4) -20 ... +70 °C (T5) -20 ... +60 °C (T6)	U_o = DC 5.5 V I_o = 0.21 mA C_o = 1000 µF L_o = 1 mH	U_i = DC 40 V C_i = 7.8 nF L_i = 100 µH	12 ... 40 V

1) Power supply input protected against reverse polarity; Load $R_A \leq (U_B - 12\ V) / 0.0225\ A$ with R_A in Ω and U_B in V
{ } Items in curved brackets are optional extras for additional price, not for rail mounting T32.30

Ambient conditions

Climate class DIN EN 60654-1	T32.10: Cx (-40 … +85 °C, 5 % up to 95 % relative air humidity) T32.30: Bx (-20 ... +70 °C, 5 % up to 95 % relative air humidity)
Maximum permissible humidity	T32.10: 100 % relative humidity (unlimited with isolated sensor connection wires) moisture condensation permissible DIN IEC 68-2-30 Var. 2 T32.30: 90 % relative humidity (DIN IEC 68-2-30 Var. 2)
Vibration	10 ... 2000 Hz 5 g DIN IEC 68-2-6
Shock	DIN IEC 68-2-27 gN = 30
Salt mist	DIN IEC 68-2-11
EMC directive	2004/108/EC, DIN EN 61326 Emission (Group 1, Class B) and immunity (industrial application), as well as per NAMUR NE21

Case

Transmitter model	Material	Weight	Ingress protection [2] Case (terminal connections)	Terminal connections (screws captive)
T32.10 head mounting	Plastic PBT, glass fibre reinforced	0.07 kg	IP 66 / IP 67 (IP 00)	wire cross-section max. 1.5 mm²
T32.30 rail mounting	Plastic	0.2 kg	IP 40 (IP 20)	wire cross-section max. 2.5 mm²

2) Ingress protection per IEC 60529 / EN 60529

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HART® Communication Protocol Rev. 5 including burst mode, Multidrop

Interoperability (i.e. compatibility between components from different manufacturers) is imperative with HART®-Devices.
The T32 can be compatible with almost every open software and hardware tool; among other things with:

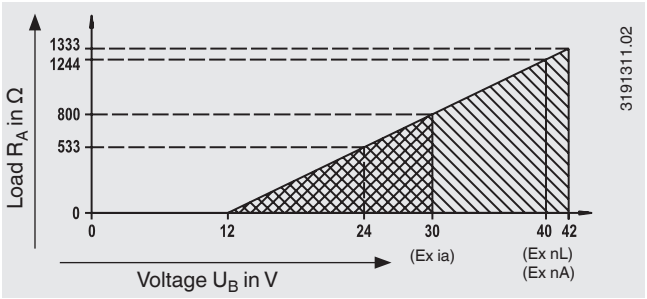
1. User-friendly WIKA Configuration Software, free-of-charge download via www.wika.de
2. HART® Communicator HC275 / FC375: T32 Device Description is integrated and upgradable with old versions
3. Asset Management Systems
   - 3.1 AMS: T32_DD completely integrated and upgradable with old versions
   - 3.2 Simatic PDM: T32_EDD completely integrated from version 5.1, upgradable with version 5.0.2
   - 3.3 Smart Vision: DTM upgradable per FDT 1.2 standard from SV version 4
   - 3.4 PACTware (see accessories): DTM completely integrated and upgradable as well as all supporting applications with FDT 1.2 interface
   - 3.5 Fieldmate: DTM upgradable

Note:

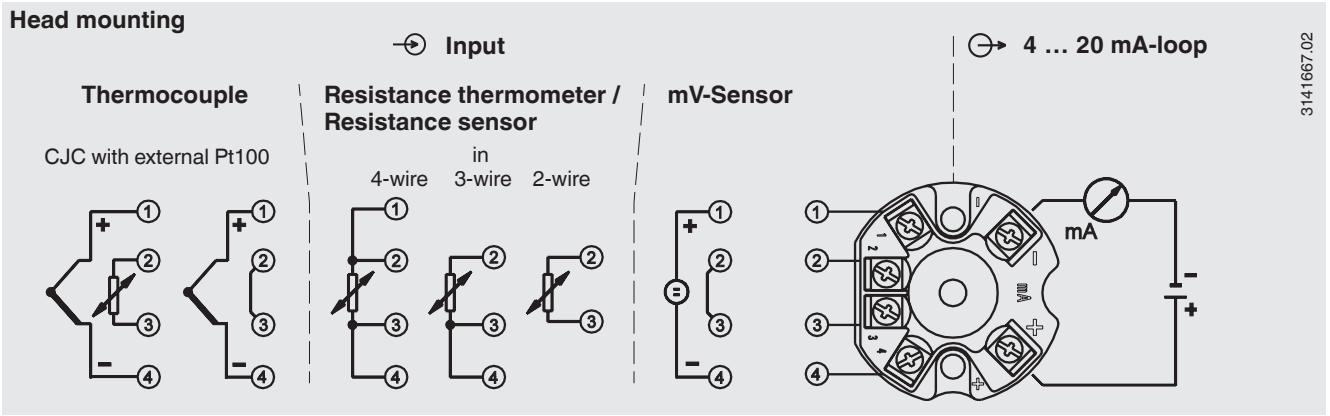
For direct communication via the serial interface of a PC/Notebook, a HART® modem is needed (see Accessories).
Parameters, which are defined in the scope of the universal HART® commands (e.g. the measuring range) can, in principle, be edited with all HART® configuration tools.

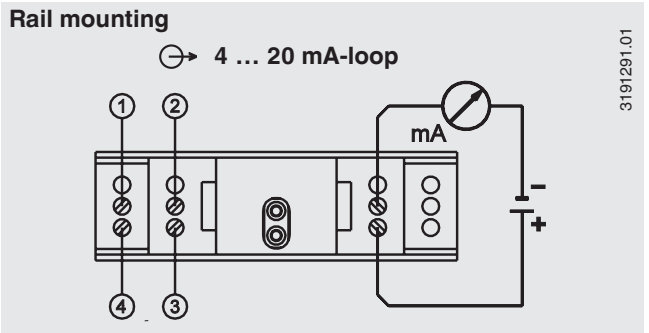
Load diagram

The permissible load is dependent upon the loop power supply voltage.



Designation of Terminal Connections





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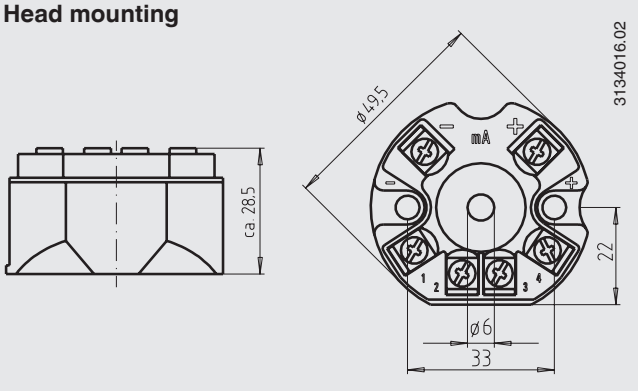
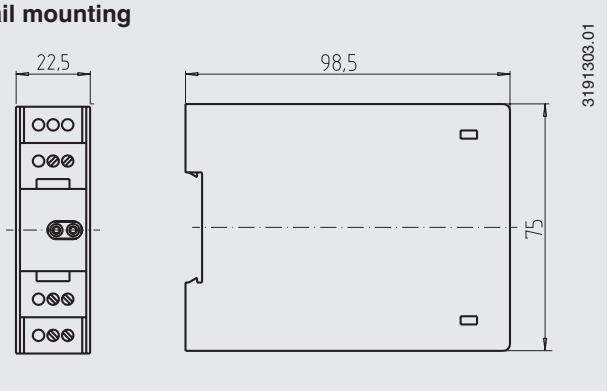
Dimensions in mm

Head mounting



Rail mounting



Accessories

WIKA Configuration Software: free-of-charge download via www.wika.de

DIH50-F with field housing, adapter

Model	Design	Special features	Dimensions	Order No.
DIH50-F with field housing 	Aluminium	The DIH50 digital indicator needs no separate auxiliary power supply / Automatically rescales to the new measuring range and its units via supervision of the HART®-Communication / 5-digit LC-Display / 20-Segment Bargraph / Display rotatable in 10° steps / with explosion protection II 1G EEx ia IIC	150 x 127 x 138 mm	on request
Adapter 	Plastic / stainless steel	suitable for TS 35 per DIN EN 60715 (DIN EN 50022) or TS 32 per DIN EN 50035	60 x 20 x 41.6 mm	3593789
Adapter 	Steel tin galvanized	suitable for TS 35 per DIN EN 60715 (DIN EN 50022)	49 x 8 x 14 mm	3619851

HART® Modem

Model	Description	Order No.
Model 010031 	USB interface, particularly for use with modern notebooks	11025166
Model 010001	RS232 interface	7957522
Model 010041	Bluetooth interface [EEx ia] IIC	11364254

HART® Communicator

Model	Description	Order No.
FC375HR1EKL9 	HART® protocol, NIMH rechargeable battery, power supply AC 90 ... 240 V, without EASY UPGRADE, ATEX II 2G (1GD) EEx ia IIC T4	2297486
FC375HR1EKLU	HART® protocol, NIMH rechargeable battery, power supply AC 90 ... 240 V, with EASY UPGRADE, ATEX II 2G (1GD) EEx ia IIC T4	11107316
MFC4150 	HART® protocol, universal power supply, cable set incl. 250 Ω resistance, with DOF-Upgrade, with explosion protection	11405333

DTM Collection, incl. PACTware

Model	Description	Order No.
DTM Collection	incl. PACTware, includes DTMs for WIKA field instruments	12513636

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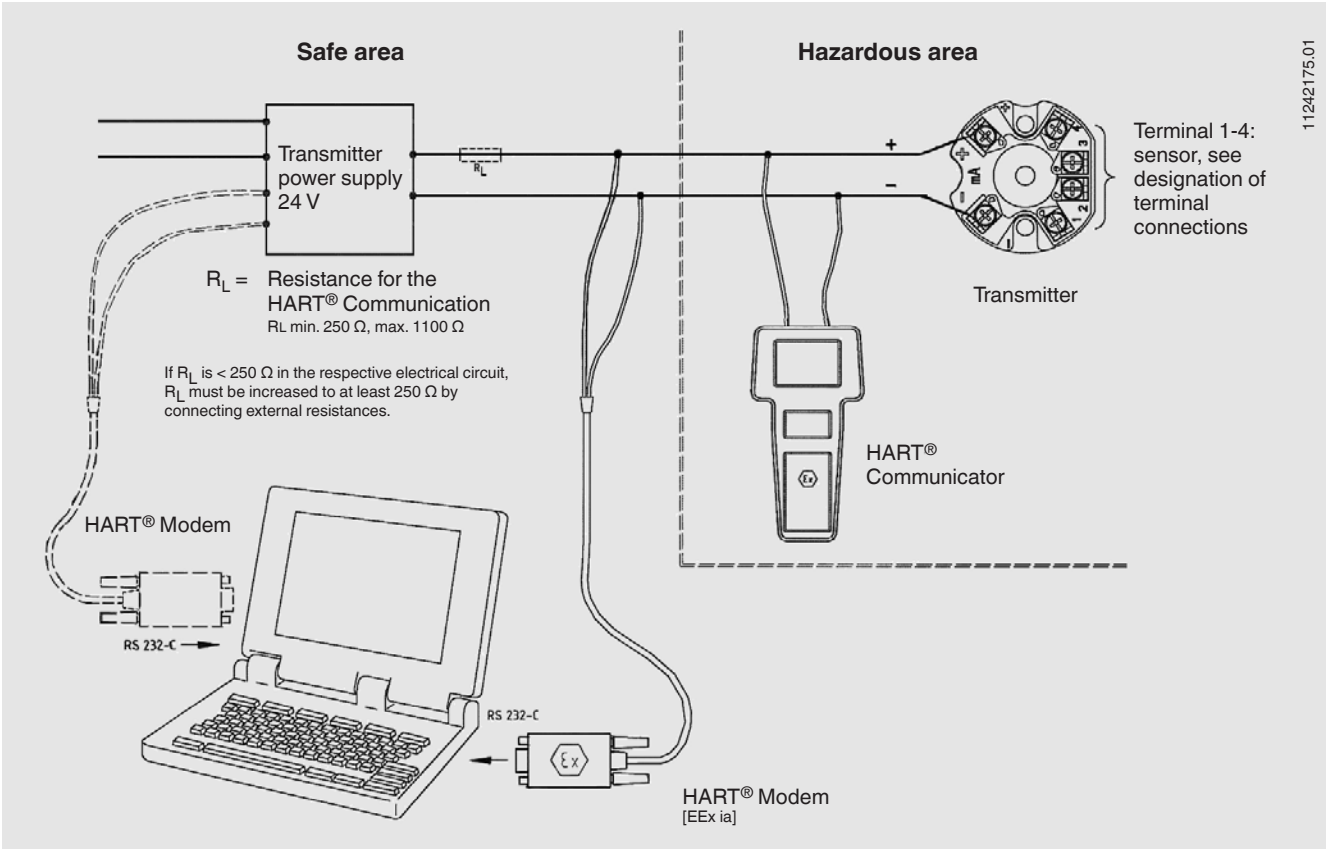
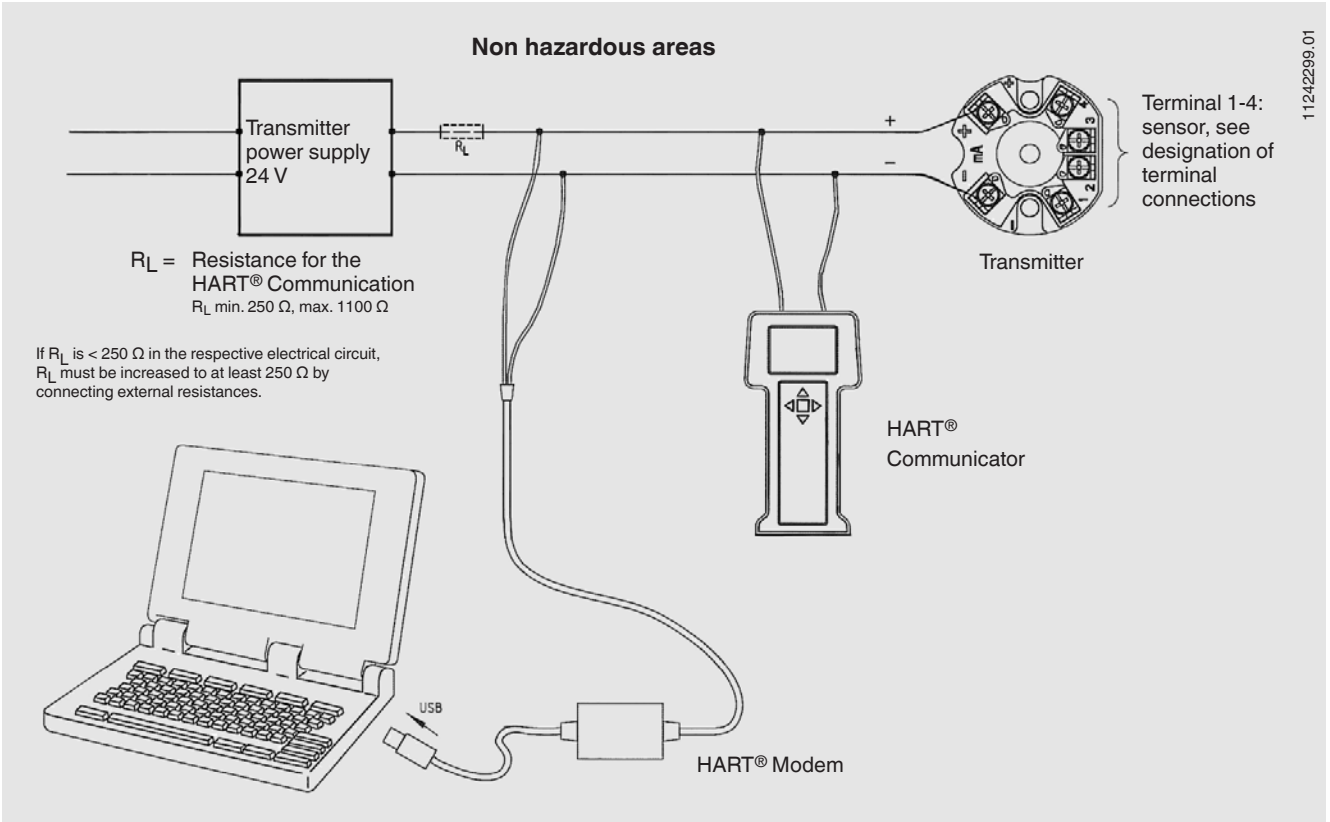
Typical connection for hazardous areas



Typical connection for non-hazardous areas



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WIKA Alexander Wiegand SE & Co. KG
Alexander-Wiegand-Straße 30
63911 Klingenberg/Germany
Tel. (+49) 9372/132-0
Fax (+49) 9372/132-406
E-mail info@wika.de
www.wika.de

05/2010 GB