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Resistance Thermometers
Model TR227, Compact Design with Programmable Transmitter

Applications

- Machinery, plant and tank construction
- Power transmission engineering
- Air-conditioning and refrigeration systems

Special Features

- Application ranges from -50 °C to +250 °C
- Transmitter included (programmable via software)
- Compact design

Resistance Thermometer, Compact Design Model TR227 **Model TR227 with Neck**

Description

This series of resistance thermometers is designed for the measurement of liquid or gaseous media.
They are suitable for a max. pressure of 36 bar (depending on insertion length and diameter).
All electrical parts are protected against splash water and are vibration-proof.
Insertion length, process connection and sensor can be selected for the respective application from the order information text.

The resistance thermometer model TR227 is complete with a thermowell (welded construction) and a fixed process connection and is screwed directly into the process.
Standard DIN plug or circulator connector M12 x 1 is used for electrical connection.
An integrated programmable (via software) transmitter with output signal 4 ... 20 mA guarantees easy and reliable transmission of measured temperature values.

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Sensor

The sensor is located in the tip of the thermometer.

Sensor method of connection
- 3 wire

Sensor limiting error
- class A to DIN EN 60 751
- class B to DIN EN 60 751

Basic values and limiting errors
Basic values and limiting errors for the platinum measuring resistors are laid down in DIN EN 60 751.
The nominal value of Pt 100 sensors is 100 Ω at 0 °C. The temperature coefficient α can be stated simply to be between 0 °C and 100 °C with:

$$\alpha = 3.85 \cdot 10^{-3}\ °C^{-1}$$

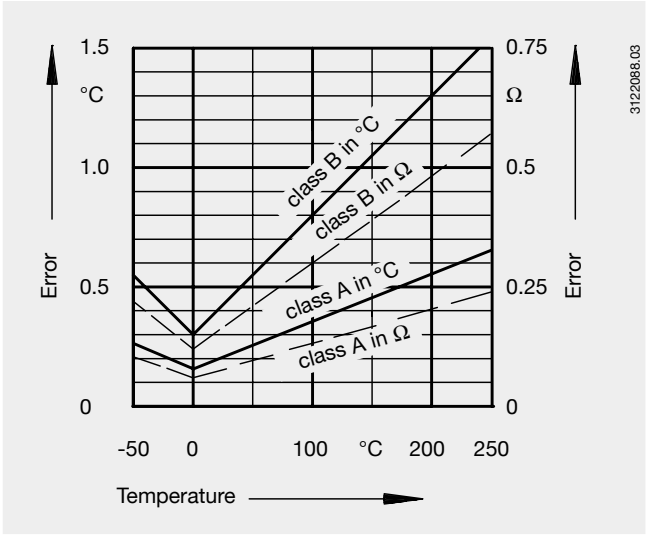
The relationship between the temperature and the electrical resistance is described by polynomes which are defined in DIN EN 60 751. Furthermore, this standard lays down the basic values in °C stages.

Class	Limiting error in °C
A	0.15 + 0.002 • | t | [1]
B	0.3 + 0.005 • | t |

1) | t | is the value of the temperature in °C without consideration of the sign

Basic values and limiting errors for the platinum measuring resistors per DIN EN 60 751

Temperature (ITS 90)	Basic value	Limiting error Class A		Class B	
°C	Ω	°C	Ω	°C	Ω
-50	80.31	± 0.25	± 0.09	± 0.55	± 0.21
0	100	± 0.15	± 0.06	± 0.3	± 0.12
50	119.40	± 0.25	± 0.09	± 0.55	± 0.21
100	138.51	± 0.35	± 0.13	± 0.8	± 0.30
150	157.33	± 0.45	± 0.17	± 1.05	± 0.39
200	175.86	± 0.55	± 0.2	± 1.3	± 0.48
250	194.1	± 0.65	± 0.24	± 1.55	± 0.56



Measuring insert

The measuring insert is not exchangeable.
Application range: -50 ... +250 °C

Process connection

- Male thread, material: stainless steel

Thermowell Ø in mm	Male thread G 1/4 B	G 3/8 B	G 1/2 B	1/4 NPT	1/2 NPT
3	x	x	x	x	x
6	x	x	x	x	x
6, tapered to 3 mm	x	x	x	x	x
8	-	x	x	-	x
8, tapered to 6 to 3 mm	-	x	x	-	x

Thermowell

- Material: stainless steel

Thermowell Ø in mm	Insertion length U_1 in mm 25	50	75	100	160	200	300	400	500
3	x	-	-	-	-	-	-	-	-
6	-	x	x	x	x	x	x	x	x
6, tapered to 3 mm	-	x	x	x	-	-	-	-	-
8	-	-	x	x	x	x	x	x	x
8, tapered to 6 to 3 mm	-	-	-	x	x	x	x	x	x

Neck

- Material: stainless steel, natural finish
- Length: 70 mm
- Diameter: 9 mm

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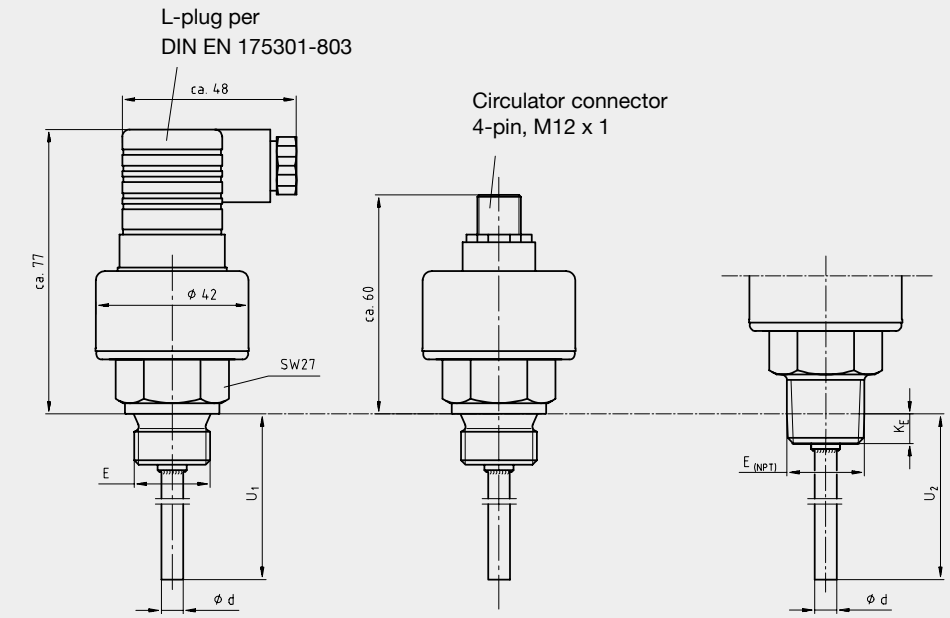
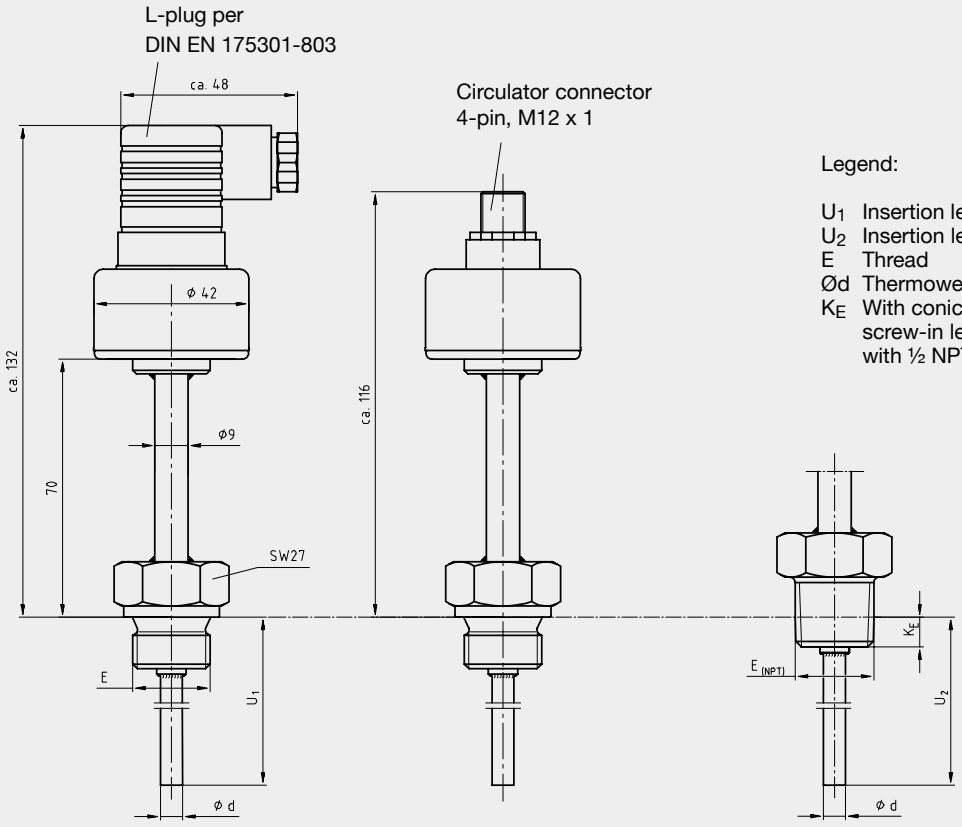
Dimensions in mm

DIN EN 175301-803

TR227



TR227, with neck



Legend:

U_1 Insertion length with cylindrical threads
U_2 Insertion length with conical threads
E Thread
Ød Thermowell Ø
K_E With conical threads:
screw-in length by hand,
with ½ NPT approx. 8.1 mm

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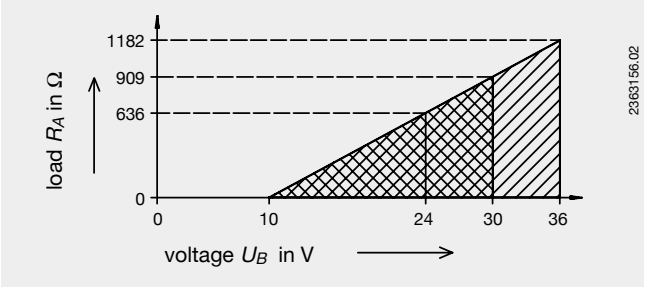
Specification	Model TR227
Measuring range maximum thermometer	-50 °C ... +250 °C
Adjustability range maximum transmitter	-150 °C ... +850 °C
Measuring span	Minimum 20 K
Initial value of measuring range, configurable	-150 °C ... +150 °C
End of measuring range, configurable	Dependent from initial value of measuring range, see diagram page 5
Basic configuration	3 wire 0 ... 150 °C
Sensor current	approx. 0.5 mA
Analogue output	4 … 20 mA 2 wire design
Measuring deviation per DIN EN 60770, 23 °C ± 5 K	± 0.2 % [1] (transmitter)
Linearization	Linear to temperature per DIN EN 60751
Linearity error	± 0.1 % [2]
Temperature coefficient T_K zero	± 0.1 % / 10 K$_{Ta}$ or [3] ± 0.15 K / 10 K$_{Ta}$
span	± 0.15 % / 10 K$_{Ta}$
Rising time t_{90}	< 1 ms
	< 10 ms
Signalling sensor burnout	Configurable: NAMUR downscale < 3.6 mA (typical 3 mA)
	NAMUR up scale > 21.0 mA (typical 23 mA)
sensor short circuit	Not configurable, in general NAMUR downscale < 3.6 mA (typical 3 mA)
Load R_A	$R_A \leq (U_B - 10\ V) / 0.022\ A$ with R_A in Ω and U_B in V
Load effect	± 0.05 % / 100 Ω
Power supply effect	± 0.025 % / V
Power supply	
from 4 ... 20 mA - loop	DC 10 … 36 V
Input power supply protection	Reverse polarity
Max. permissible ripple	10 % with 24 V / maximum load 300 Ω
Electromagnetic compatibility (EMC)	per EMC Directive 89/336/EWG DIN EN 61 326:2002
Ambient conditions	
Ambient and storage temperature	Standard range: -40 … +85 °C
Special features	
Temperature units	Configurable: °C, °F, K
Info data	TAG-No., Descriptor and Message via configuration storeable into transmitter
Configuration and calibration data	Permanently stored in EEPROM
Ingress protection	IP65 per EN 60 529 / IEC 529
Weight	Approx. 0.2 to 0.7 kg (depending on version)
Dimensions	See drawings

Specifications in % refer to the measuring span

1) For measuring span lower than 50 K additional: 0.1 K,
For measuring span higher than 550 K additional: 0.1 %
2) ± 0.2 % with measuring ranges with initial value lower than 0 °C or measuring span higher than 800 K
3) Whichever is greater

Load diagram

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



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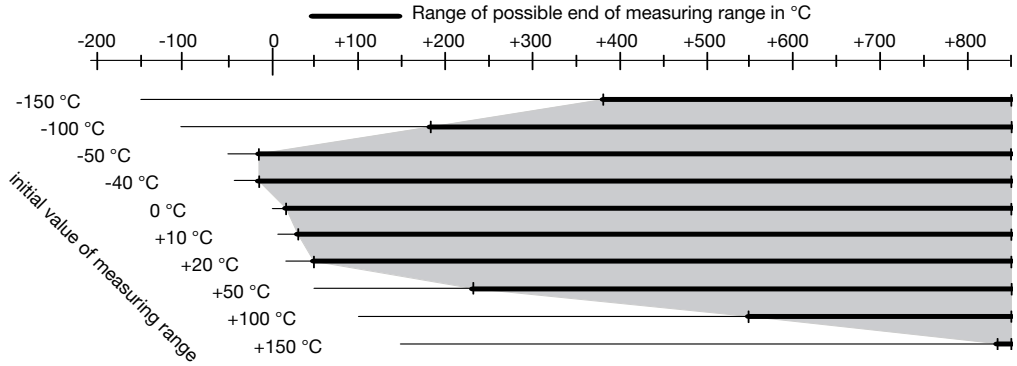
Possible combinations of initial value of measuring range / end of measuring range

The end of measuring range is dependent upon the respective initial value of measuring range. This is shown in the diagram below.

The configuration software checks the desired measuring range. Only permissible values are accepted.

Intermediate values are configurable, the smallest resolution is 0.1 °C.

Diagram for measuring ranges



Measuring range in °C

minimum	maximum
-150 ... +380	-150 ... +850
-100 ... +180	-100 ... +850
-50 ... -20	-50 ... +850
-40 ... -20	-40 ... +850
0 ... +20	0 ... +850
+10 ... +30	+10 ... +850
+20 ... +50	+20 ... +850
+50 ... +230	+50 ... +850
+100 ... +530	+100 ... +850
+150 ... +830	+150 ... +850

Note:
The measuring range of the thermometer is limited by the application range of the sensor, not by the adjustability range of the transmitter.

min.: -50 °C
max.: +150 °C (without neck)
max.: +250 °C (with neck)

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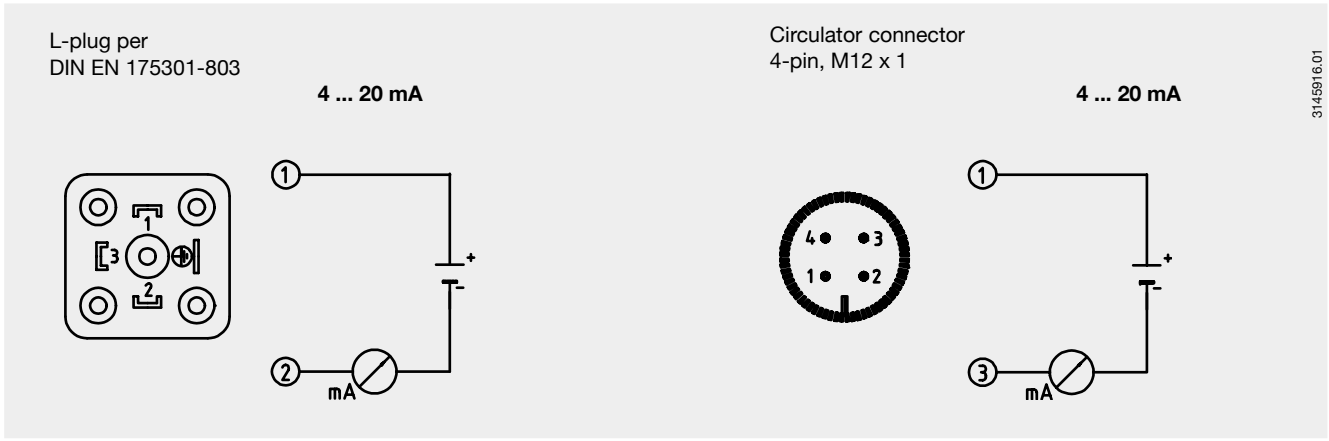
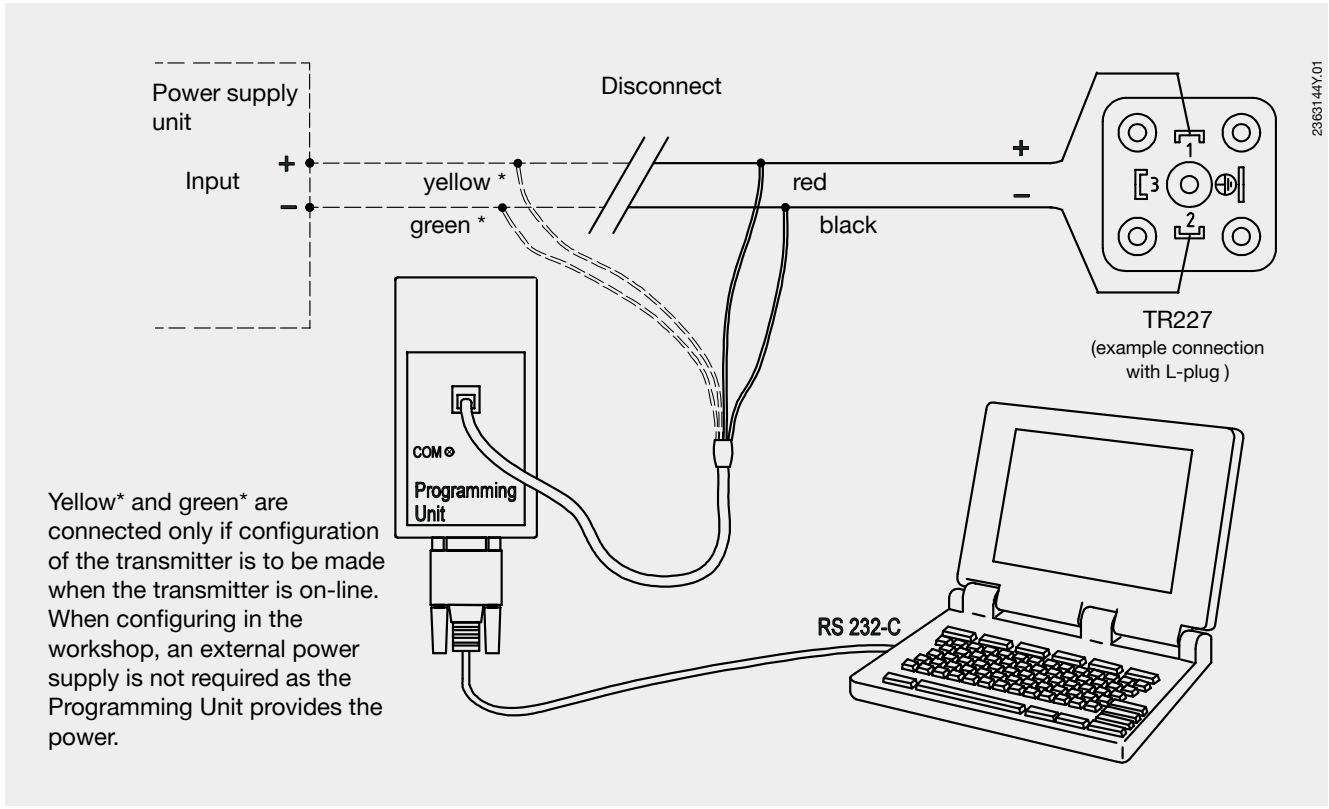
Electrical connection



Connection of Programming Unit



Yellow* and green* are connected only if configuration of the transmitter is to be made when the transmitter is on-line. When configuring in the workshop, an external power supply is not required as the Programming Unit provides the power.

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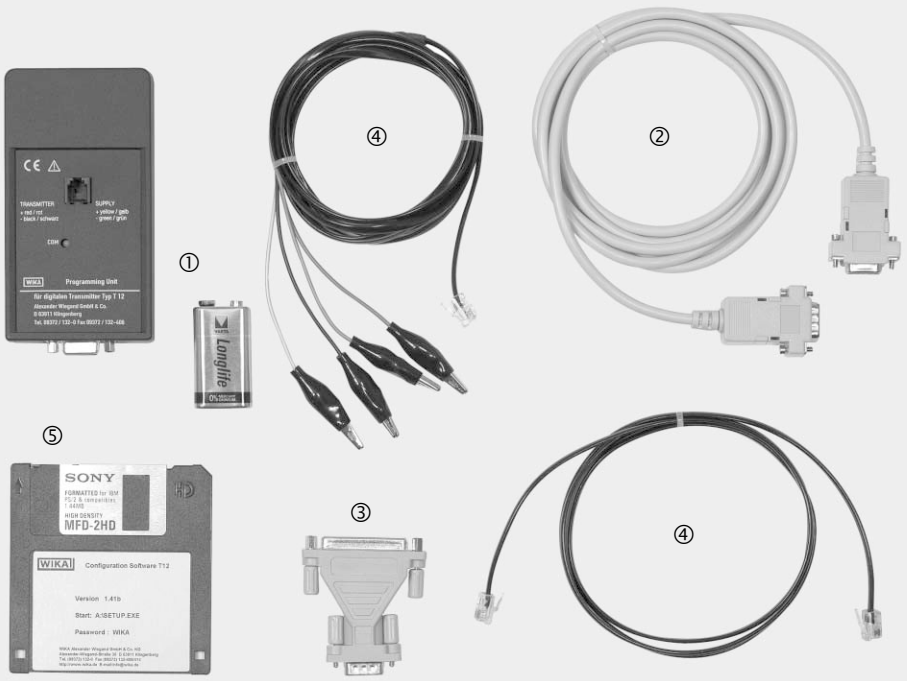
Accessory

Configuration-Set



① Programming Unit for the connection to a Windows PC, incl. 9 V battery
② Connection cable, RS 232-C (9 - pin sub - D - plug)
③ Plug adapter (9 - pin / 25 - pin plug)
④ Two connection cables Programming Unit ↔ Transmitter
⑤ Configuration Software (3.5 " disk, multi-lingual, Online Help)
(free of charge download from the WIKA Homepage **www.wika.de**)

Screenshot Configuration Software

Accessory *(please order separately)*	Order No.
Configuration-Set for T12, T24 and TR227	36 34842
Configuration Software TR227 on 3.5" disk 1)	23 75385

1) Free of charge download from the WIKA Homepage **www. wika.de**

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Ordering information

Field No.		Code	Features	
			Type and number of sensors	
		T	1 x Pt100 application range -50 °C ... +150 °C	
1		1	1 x Pt100 application range -50 °C ... +250 °C	
			Sensor limiting error	
		B	class B to DIN EN 60 751	
		A	class A to DIN EN 60 751	
2		?	other	*please state as additional text*
			Process connection	
		GD	G 1/2 B	
		GB	G 1/4 B	
		GC	G 3/8 B	
		ND	1/2 NPT	
3		NB	1/4 NPT	
			Thermowell outer diameter	
		L	3 mm	*only insertion length 25 mm*
		3	6 mm	*min. insertion length 50 mm*
		M	6 mm, tapered to 3 mm	*min. insertion length 50 mm*
		E	8 mm	*min. insertion length 75 mm*
4		S	8 mm, tapered to 6 mm, to 3 mm	*min. insertion length 100 mm*
			Insertion length	
		0025	25 mm	
		0050	50 mm	
		0075	75 mm	
		0100	100 mm	
		0160	160 mm	
		0200	200 mm	
		0250	250 mm	
		0300	300 mm	
		0400	400 mm	
5		0500	500 mm	
			Neck length	
		Z	without	
6		1	70 mm	
			Electrical connection	
		A	L-plug DIN EN 175301-803	
		C	Circulator connector, M12 x 1, 4-pin	
7		?	other	*please state as additional text*
			Connector	
		W	standard design	
8		?	other	*please state as additional text*
			Measuring range	
		EA	-50 °C ... +50 °C	
		EH	-50 °C ... +150 °C	
		1A	0 °C ... 50 °C	
		1B	0 °C ... 80 °C	
		1E	0 °C ... 100 °C	
		1F	0 °C ... 120 °C	
		1H	0 °C ... 150 °C	
		1L	0 °C ... 200 °C	*only version with neck*
		1M	0 °C ... 250 °C	*only version with neck*
9		??	Customers specification (please take account of the application range of the sensor)	

		Additional order info			
		YES	NO		
10		1	Z	quality certificates	
11		T	Z	additional text	*Please state as clearly understandable text!*

Order code:

	1	2		3		4	5	6	7	8	9		10	11
TR227 - Z -		3			- 1							-		

Additional text: _____

Specifications and dimensions given in this leaflet represent the state of engineering at the time of printing.
Modifications may take place and materials specified may be replaced by others without prior notice.

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