

# TR 104 / TR 104-Ex

Rail mounted  
temperature transmitters,  
analog, Pt 100 (RTD),  
fixed measuring ranges

10/11-8.48 EN



## ■ Input

- Resistance thermometer (2- and 3-wire circuit)
- optionally 4-wire circuit

## ■ Output

- 2-wire technique
- 4...20 mA

## ■ 1 or 2 independent channels

## ■ Digital, low drift processing of measuring values

## ■ Error signalization at sensor break and sensor short-circuit

## ■ Approvals for explosion protection

- intrinsically safe  $\text{Ex}$  II 2 G EEx ia IIC T6, mount in zone 1
- $\text{Ex}$  II 3 G EEx n A II T6, mount in zone 2

## ■ EMC acc. to EN 5082-2

**ABB**

**Technical data**

**Output** 

Output signal (temperature linear)	4...20 mA
Output current, max.	28 mA
Underranging	2.5...< 3mA
Overranging	22 < ...26 mA

**Input** 

**Resistance**

Resistance thermometer	Pt 100 (IEC 751) -200 °C...850 °C
Measuring ranges min. span	cf. ordering information 40 K
Sensor lead resistance (max.)	100 Ω (3-wire, 4-wire)
Sensor lead influence > 100 Ω	< 0.1 %/10 Ω (3-wire, 4-wire)
Sensor lead influence	additionally to Pt 100 (2-wire)
Pt 100-measuring current	0.8 mA

Sensor break monitoring  
 Overranging,  $I_a \geq 22$  mA (standard)

$$R_{Break} > ME(\Omega) + MS(\Omega)/8$$

Underranging,  $I_a \leq 3$  mA (optionally)

$$R_{Break} < 2 \text{ k}\Omega$$

Sensor short-circuit monitoring, underranging  $I_a \leq 3$  mA

$$R_{short-circuit} \leq MA(\Omega) - MS(\Omega)/16$$

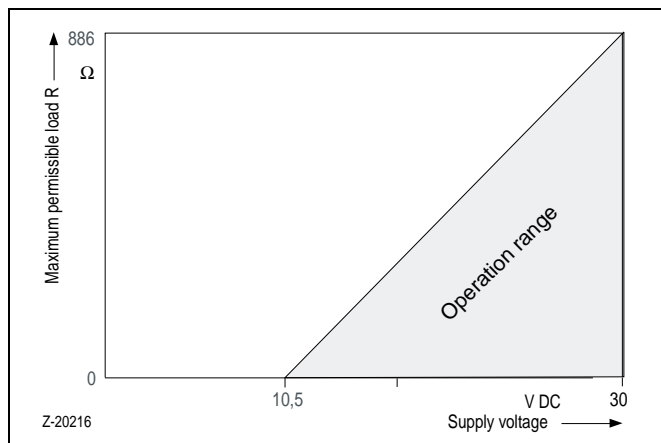
MA = Lower range value  
 ME = Upper range value  
 MS = Measuring span  
 Percentage related to span MS

**Power supply (2-wires method)**

Supply voltage (protected against wrong polarity)	$U_s = 10.5...30$ V DC
for explosion protection application, max.	$U_i = ...29.4$ V DC
Influence of supply voltage	< 0.05 %/10 V
max. residual ripple	< 1 % (peak-to-peak)

**Maximum Load**

$$R(k\Omega) = \frac{(U_{smax} - U_{smin})}{22}$$



**General characteristics**

Response time	2, 3-wire	< 1.5 s
	4-wire	< 10 ms
Vibration resistance	Vibration in operation	
	2g acc. to DIN IEC 68 part. 2-6	
Long-term stability	< 0.1 %/year	

**Environment conditions**

Ambient temperature range	-(40)20...85 °C
Transport- and storage temperature	-40...100 °C
Relative humidity	< 100 % (100 % humidity with isolated terminals only)
Condensation	permissible

**Mechanic design**

Dimensions	cf. dimensional diagram
Weight	200 g
Housing (material)	Polyamid
Degree of protection	IP 20 (DIN 40050)
Class of protection	2 (IEC 348)
Degree of fire protection	V0 acc. to UL 94
Overvoltages category	II
Color (Epoxy)	light grey (RAL 9002)

**Electrical connections**

Terminals, pluggable	2.5 mm <sup>2</sup> , screw terminals
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**Characteristics at rated conditions<sup>1)</sup>**

(acc. to IEC 770 (related to 25 °C))

Measuring error incl. characteristic deviation	Pt 100/resistance measurement .....	
Balancing error		
Spans > 100 °C	< 0.1 %	
Spans < 100 °C	< 0.15 K	
Linearity error	< 0.10 %	

**Influences**

Ambient temperature influences	< 0.1 % / 10 K or < 0.1 K / 10 K (whichever value is greater)
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Example:

MA = -50 °C, ME = 150 °, MS = 200 °C	
Balancing error	0.2 K (0.1 %)

1) Percentage related to measuring span MS = ME - MA  
 MA = lower range value, ME = upper range value

Ordering information										
			Catalog No							
TR 104 / TR 104-Ex			V11515-		1st chan.		2nd chan.			
<b>Without explosion protection</b>	<b>TR 104</b>	1 channel	1							
		2 channels	3							
<b>With explosion protection</b>	<b>TR 104-Ex</b>									
<b>Zone 1</b>										
ATEX: II 2 G EEx ia IIC T6		1 channel	5							
ATEX: II 2 G EEx ia IIC T6		2 channels	A							
<b>With explosion protection</b>	<b>TR 104-Ex N</b>									
<b>Zone 2 / Type N</b>										
ATEX: II 3 G EEx n A II T6		1 channel	N							
ATEX: II 3 G EEx n A II T6		2 channels	M							
<b>Measuring Ranges<sup>1</sup></b>										
Standard										
	-30... 60 °C		0			0				
	-20... 40 °C		1			1				
	0... 40 °C		2			2				
	0... 60 °C		3			3				
	0...100 °C		4			4				
	0...120 °C		5			5				
	0...150 °C		6			6				
	0...200 °C		7			7				
	0...250 °C		8			8				
	0...300 °C		9			9				
	0...400 °C		A			A				
	0...600 °C		B			B				
	Standard meas. range °F		F			F				
Special measuring ranges °C : ..... to ..... (span > 40 °K)		1st channel	C							
		2nd channel				C				
Special measuring ranges °F: ..... to ..... (span > 72 °F)		1st channel	Y							
		2nd channel				Y				
<b>Sensor circuit</b>										
2-wire			2			2				
3-wire			3			3				
optional:	4-wire circuit	1st channel	4							
	4-wire circuit	2nd channel				4				
<b>Sensor break identification</b>										
overranging $\geq 22$ mA <sup>1)</sup> (ex stock version)					A			A		
underranging $\leq 3$ mA <sup>1)</sup>		1st channel	Z							
underranging $\leq 3$ mA <sup>1)</sup>		2nd channel				Z				
<b>Calibration certificate</b>										
without		1-channel				0	0	0	0	
without		2-channel							0	
Two-point		1-channel				0	0	0	1	
Two-point		2-channel							A	
9-point		1-channel				0	0	0	2	
9-point		2-channel							B	

<sup>1)</sup> later can not be modified

**Technical data**

**Explosion protection**

**Intrinsically safety  
 Zone 1**

$\text{Ex}$  II 2G EEx ia IIC T6

EC certificate

PTB 99 ATEX 2053 X

Temperature class T6/T5/T4

< 50 °C/65 °C/85 °C

Supply circuit	Output ia	Input ia
Max. voltage	$U_i = 29.4 \text{ V}$	$U_o = 6.8 \text{ V}$
Short-circuit current	$I_i = 130 \text{ mA}$	$I_o = 130 \text{ mA}^3)$
Max. power	$P_i = 0.8 \text{ W}$	$P_o = 383 \text{ mW}$
Internal inductance	neglectable	$L_o = 0.5 \text{ mH}$
Internal capacitance	neglectable	$C_o = 235 \text{ nF}$

3) Load current for connected intrinsically safe primary element < 1.5 mA

**Zone 2**

$\text{Ex}$  II 3 G EEx n A II T6

Conformity declaration

PTB 99 ATEX 2215 X

Temperature class T6/T5/T4

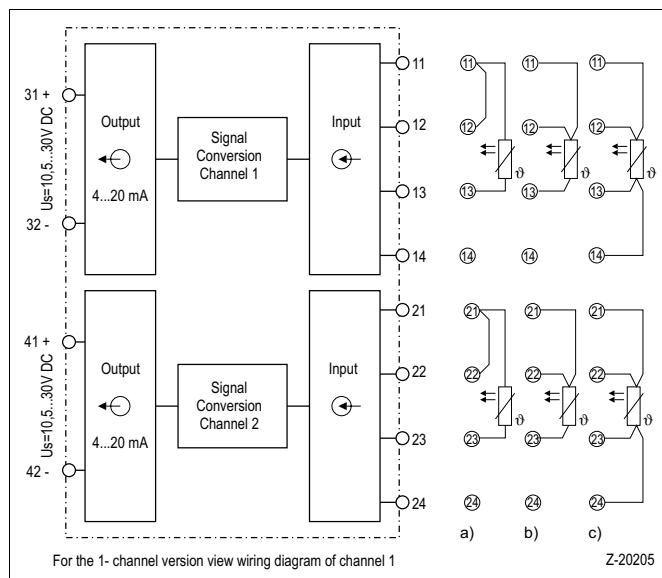
< 50 °C/65 °C/85 °C

**Electromagnetic compatibility (EMC)**

Pt 100: measuring range 0...100 °C, span 100 K, 3-wire  
 acc. to NAMUR NE 21 recommendation

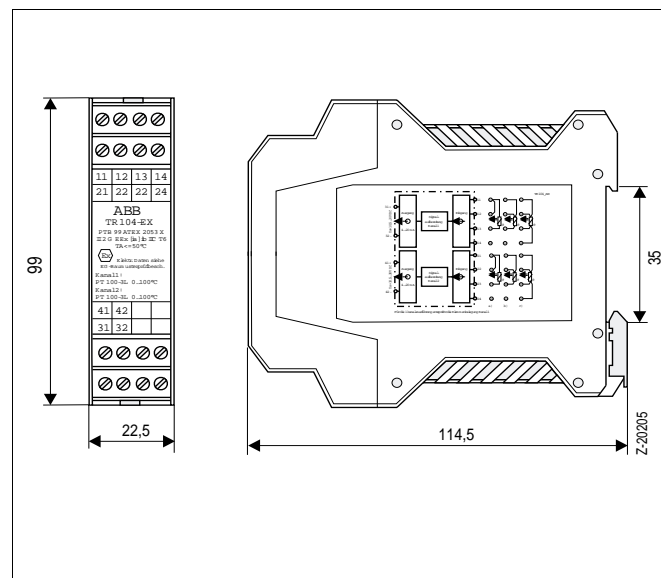
Type of test	Degree	Influence	IEC
burst to signal/ data lines	2 kV	< 0.5 %	1000-4-4
static discharge contact discharge to: contact plate	8 kV	< 1.0 %	1000-4-2
terminals for supply	6 kV	< 1.0 %	
terminals for sensors	6 kV	< 1.0 %	
radiated field 80 MHz...1 GHz	10 V/m	< 1.0 %	1000-4-3
coupling 150 kHz - 80 MHz	10 V	< 1.0 %	1000-4-6

**Connection diagrams**



- a) Resistance thermometer, 2-wire circuit
- b) Resistance thermometer, 3-wire circuit
- c) Resistance thermometer, 4-wire circuit (optionally)

**Dimensional drawings (dimensions in mm)**



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