TR 204 / TR 204-Ex

Field mounted Temperature transmitters, analog, Pt 100 (RTD), fixed measuring ranges

10/11-8.59 EN



- **Input**
  - Resistance thermometer (2- and 3-wire circuit)
  - optionally 4-wire circuit
- **Output**
  - 2-wire methode
  - 4...20 mA
- **Digital, low drift processing of measuring values**
- **Error signalization at sensor break and sensor short-circuit**
- **Approvals for explosion protection**
  - intrinsically safe Ⓔx II 2 G EEx ia IIC T6, mount in zone 1
    Ⓔx II 3 G EEx n A II T6, mount in zone 2
  - pressure-proof Ⓔx II 2 G EEx d IIC T6, mount in zone 1
- **EMC acc. to EN 50082-2**
- **5 years warranty**

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 cf. ordering information
min. span 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)

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

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

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

Sensor short-circuit monitoring, underranging $I_a < 3$ 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-wire methode)

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

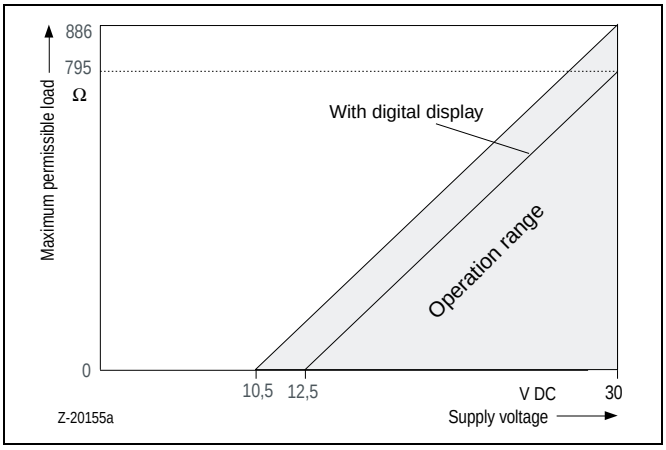
$$R(k\Omega) = \frac{(Usmax - Usmin)}{22}$$

Power demand of the indicator

(Power demands of transmitter and indicator have to be added)

Analog indicator U_{sd} = 0.2 V DC

Digital indicator U_{sd} = 2 V DC



Display (optionally)

Analog indicator

– Clearly arranged display 36 mm, 90° scale
– Available scalings: 0...100 % linear
(special scalings on request)

Digital indicator

– LCD display
3½ digits (± 1999), digit height 10 mm, 7 segments
– standard scaling 0...100 %
Linear scaling for measuring ranges and dimensions possible
Description of the physical unit (labels)

Display	Analog	Digital
Rise time	0.5 s	0.5 s
Measuring error	± 2 % fsd	± 0.1 %
Overvoltage	150 % of input range	
EMC	EN 50082-2	
Temperature	-20...+70 °C	
Humidity	0...100 %, condensation permissible	

Mind limits of application.



Technical data

General characteristics

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

Environment conditions

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

Mechanic design

Dimensions	cf. dimensional diagram
Weight	1.2 kg (without accessories)
Housing (material)	aluminium/stainless steel
Degree of protection	IP 67
Color (Epoxy)	light grey (RAL 9002)

Electrical connections

Thread	2 pcs. M20 x 1.5 2 pcs. 1/2“ NPT, 2 pcs. 3/4“ NPT
or with cable screw connections	2 pcs. M20 × 1,5 (metal)
Ground screw ext./int.	6 mm^2 M 5 / 2.5 mm^2 M4
Terminals	2.5 mm^2, screw terminals

Characteristics at rated conditions[1)]

(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)

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

Explosion protection

Intrinsically safety

Zone 1	⟨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 V	U_o = 6.8 V
Short-circuit current	I_i = 130 mA	I_o = 130 mA[3)]
Max. power	P_i = 0.8 W	P_o = 383 mW
Internal inductance	neglectable	L_o = 0.5 mH
Internal capacitance	neglectable	C_o = 235 nF

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

Zone 2	⟨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
Pressure-proof enclosure	⟨Ex⟩ II 2 G EEx d IIC T6
EC certificate	PTB 99 ATEX 1144 X
Temperature class T6/T5/T4	< 50°C/65 °C/85 °C

Canadian Standards Association and Factory Mutual

(in preparation)

Intrinsically Safe

FM/CSA	Class I, Div.1/Div.2, Group A, B, C, D T6 Class II, Div.1/Div.2, Group E, F, G T6 Class III T6
FM	Class I, Zone 0, AEx ia IIC T6
CSA	Class I, Zone 0, Ex ia IIC T6

Non-incendive

FM/CSA	Class I, Div.2, Group A, B, C, D, T6 Class II, Div.1/Div. 2, Group E, F, G, T6 Class III T6

Explosionsproof

FM/CSA	Class I, Div.1/Div.1, Group A, B, C, D, T6 Class II, Div.1/Div. 2, Group E, F, G, T6 Class III T6

Flameproof

FM	Class I, Zone 1, AEx d IIC T6
CSA	Class I, Zone 1, Ex d IIC T6

Electromagnetic compatibility (EMC)

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

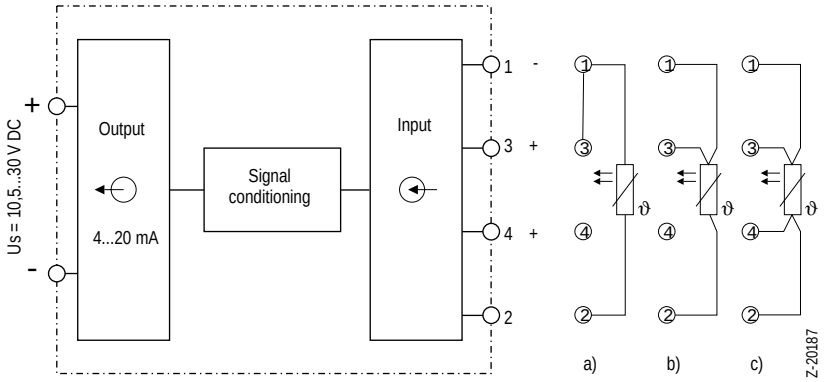
Type of test	Degree	Influence	IEC
burst to signal/ data lines	2 kV	< 0.5 %	1000-4-4
static discharge contact discharge to:			1000-4-2
contact plate	8 kV	< 1.0 %	
terminals for supply	6 kV	< 1.0 %	
terminals for sensors	6 kV	< 1.0 %	
radiated field 80 MHz...1 GHz	10 V/m	< 1.0 %	1000-4-3
coupling 150 kHz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

Ordering information

			Catalog No												
TR 204 / TR 204-Ex			**V11521-**												
TR 204	(without explosion protection)			1											
Type of protection: intrinsically safe															
TR 204-Ex	PTB / ATEX	II 2 G EEx ia IIC T6 (zone 1)		5											
TR 204-Ex	FM / CSA	Class I, Div. 1 / Div 2., Group A,B,C,D T6		7											
		Class II, Div. 1 / Div. 2, Group E,F,G T6													
		Class III T6													
		Class I, Zone 0, AEx ia IIC T6													
		Class I, Zone 0, Ex ia IIC T6													
TR 204-Ex N	PTB / ATEX	II 3 G EEx n A II T6 (zone2)		N											
	FM / CSA	Class I, Div. 2, Group A,B,C,D, T6 noninc.													
		Class II, Div. 2, Group E,F,G, T6													
		Class III T6													
Type of protection: pressure-proof enclosure / explosion-proof															
TR 204-Ex d	PTB / ATEX	II 2 G EEx d IIC T6		D											
TR 204-Ex d	FM / CSA	Class I, Div. 1 / Div. 2, Group A,B,C,D, T6		E											
		Class II, Div. 1/ Div. 2, Group E,F,G, T6													
		Class III T6													
Type of protection: flameproof															
TR 204-Ex d	FM	Class 1, Zone 1, AEx d IIC T6		F											
	CSA	Class 1, Zone 1, Ex d IIC T6													
Display / construction		AGLF housing without display			N										
		AGLFD housing with analog indicator			A										
		AGLFD housing with digital indicator			D										
Material	Aluminium					A									
	Stainless steel					E									
Connections	with cable-screw-connections	2 pieces: M 20 x 1,5[1]					M								
		2 pieces: pressure-proof[1]					D								
	Thread (without screw connection)	M 20 x 1,5					1								
		1/2" NPT					2								
		3/4" NPT					3								
		1/2" GK					4								
Mounting field housing		without						1							
		Wall mounting (STT37)						2							
		Wall mounting (stainless steel)						3							
		Pipe mounting (STT 37)						4							
		Pipe mounting (stainless steel)						5							
Measuring ranges	Standard measuring ranges	-30 °C…60 °c							0						
		-20 °C…40 °C							1						
		0 °C…40 °C							2						
		0 °C…60 °C							3						
		0 °C…100 °C							4						
		0 °C…120 °C							5						
		0 °C…150 °C							6						
		0 °C…200 °C							7						
		0 °C…250 °C							8						
		0 °C…300 °C							9						
		0 °C…400 °C							A						
		0 °C…600 °C							B						
	Standard meas. range	°F							F						
	Special meas. range	…°C bis …°C (span >40 K)							X						
		…°F bis …°F (span >72 °F)							Y						
Sensor circuit		2-wire								2					
		3-wire								3					
	optional:	4-wire								4					
Sensor break idendification:		at sensor braek overranging (> 22mA, standard version)									1				
		at sensor break underranging (< 3mA, optional)									Z				
Calibration certificates		without										0			
		Two-point calibration certificate										1			
		9-point calibration certificate										2			

[1] metal-screw-connection EEx e bzw. EEx d (cable-diameter 3,5 … 8,7 mm)

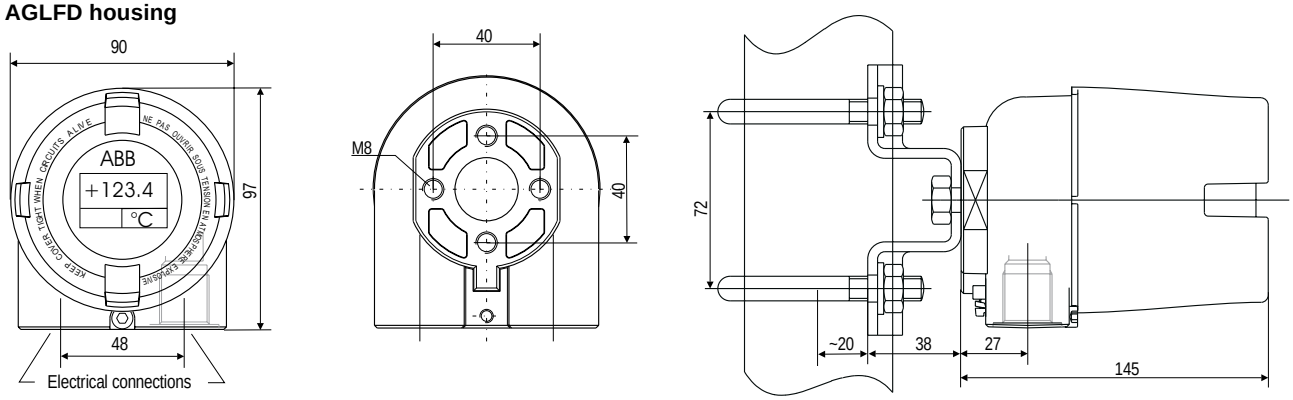
Connection diagram



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

Dimensional drawings (dimensions in mm)

AGLFD housing



AGLF housing

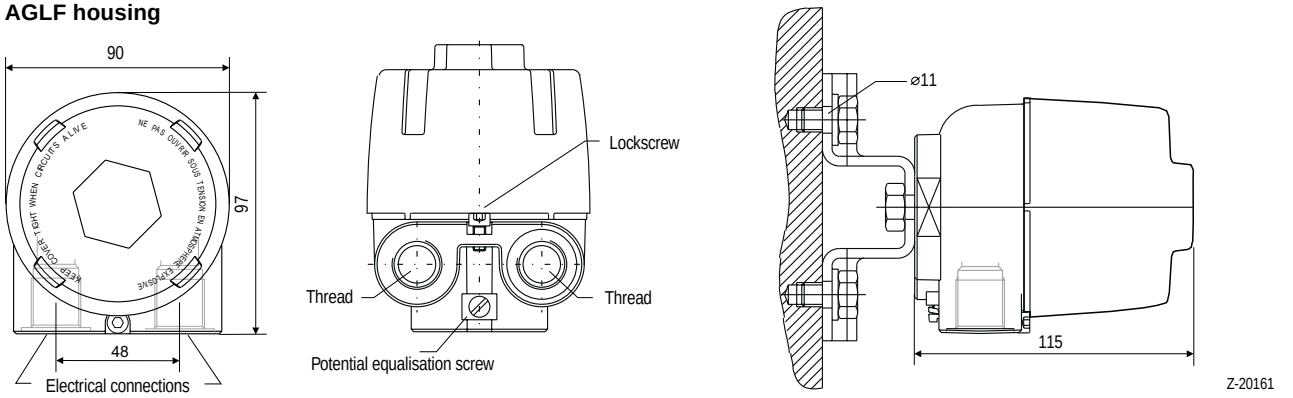




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