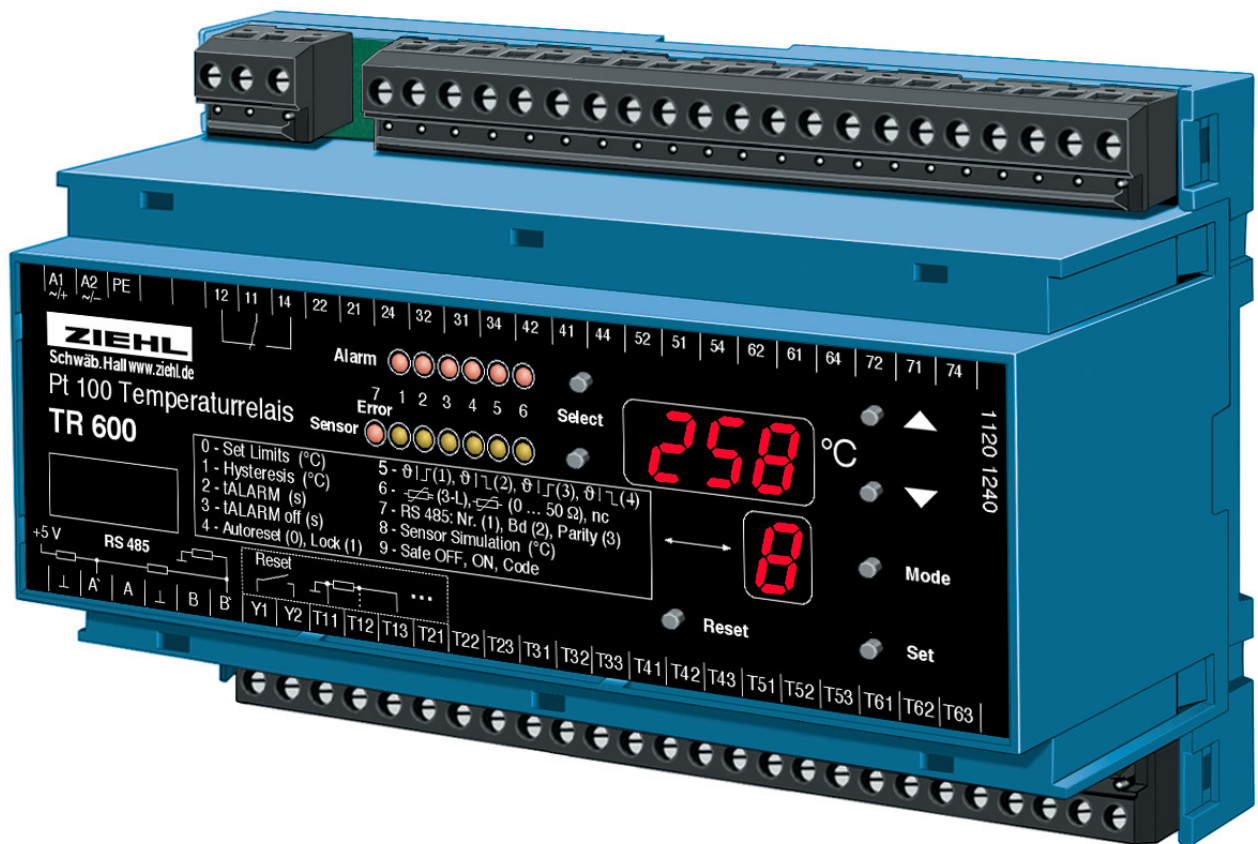


Operating manual - Archive document -

Pt 100 thermostat TR 600 with interface RS 485



Application and short description	3
Overview of functions	3
Connection plan	3
Display and operating elements	4
Function diagram	4
Important notes	5
Assembly	6
Putting into operation	6
Remarks	6
Table of function	8
Setup	8
Trouble shooting	9
Technical data	10
Form	12
Appendix	13
Data structure for serial transmission	13
Example	14

Application and short description

The Pt 100 thermostat TR 600 is a temperature controller and monitors up to six Pt 100 sensors at the same time. Six switching points and six relays permit almost any combination of switching action. It also can select the highest temperature of a group of three or six sensors. The temperatures of two sensors or groups of sensors can be issued to 2 analogue outputs i.e. for remote displays or further evaluation. Programming is very variable and simple.

Due to the fact that 6 type Pt 100 sensors can be connected, the unit is especially suitable for temperature monitoring wherever up to 6 different measuring points must be monitored simultaneously:

- motors and generators with simultaneous monitoring of bearings and coolant.
- transformers with additional monitoring of the core temperature also.
- power machines and plants

Approval

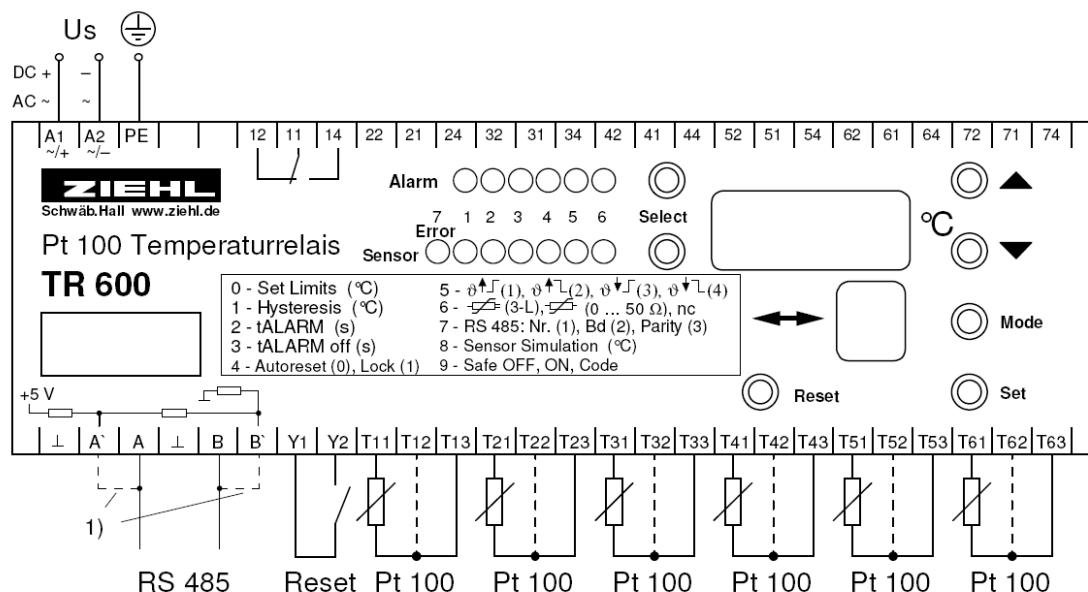


USL, CNL Industrial Control Equipment 82VN

Overview of functions

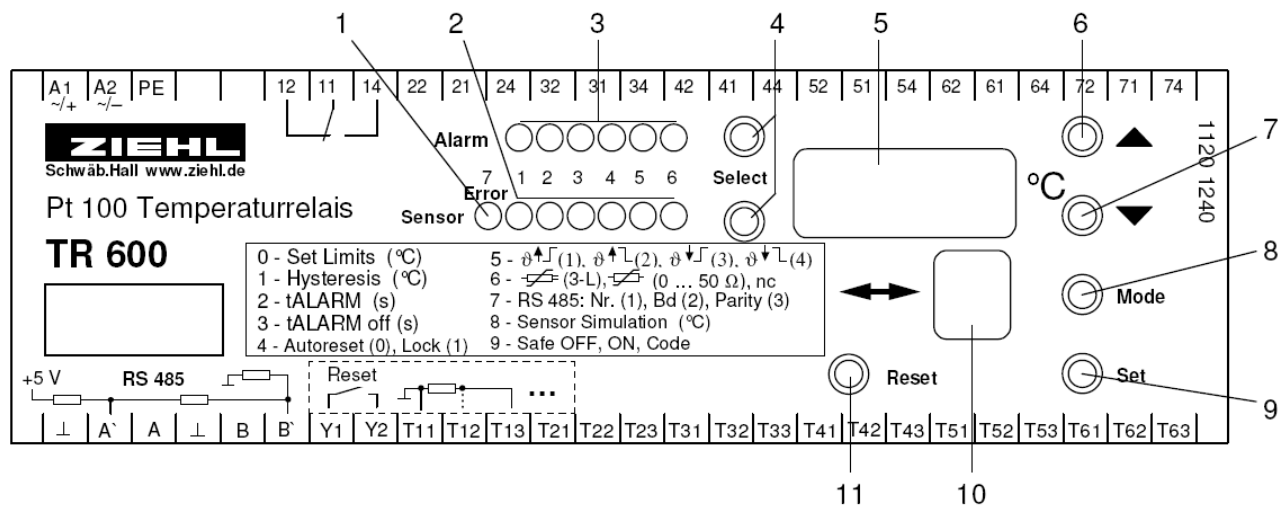
- Measuring and monitoring range -199 ... +800 °C
- 6 sensor inputs with 2- or 3-wire connection
- 7 relay outputs with change-over contact
- Alarm 1 ... 6 relay K1 (11/12/14) ... K6 (61/62/64)
- Sensor Error Relay K7 (71/72/74) monitors sensor break or sensor short circuit.
- RS 485 interface
- Universal power supply. 2 ranges AC/DC 24-60V or AC/DC 90-240 V

Connection plan:



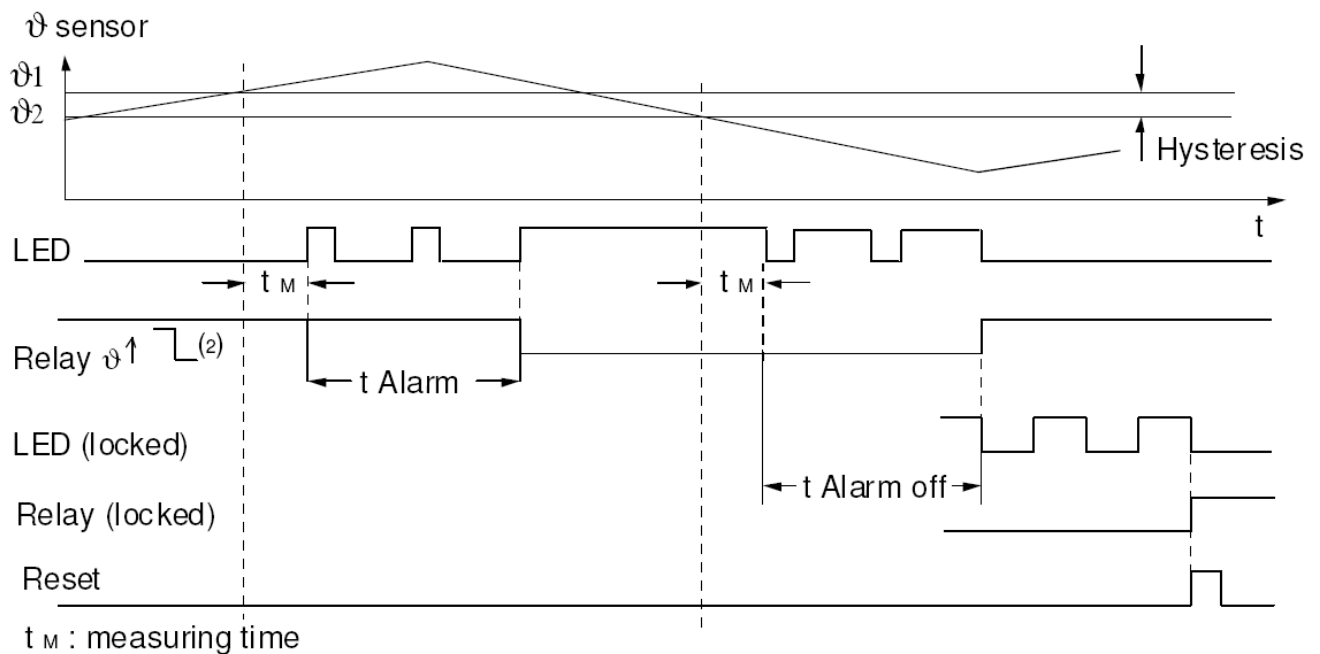
1) Bridge for terminating resistor

Display and operating elements

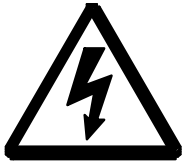


- 1 LED Sensor Error
- 2 6 x LED Sensor
- 3 6 x LED Alarm
- 4 Select buttons
- 5 Display, 3 digits
- 6 Up button
- 7 Down button
- 8 Mode button
- 9 Set button
- 10 Display, 1 digit (Mode)
- 11 Reset button

Function diagram



Important notes



ATTENTION

Dangerous electrical voltage!

May lead to electrical shock and burn.

Before beginning of work switch unit and equipment free of voltage.

To use the equipment flawless and safe, transport and store properly, install and start professionally and operate as directed.

Only let persons work with the equipment who are familiar with installation, start and use and who have appropriate qualification corresponding to their function. They must observe the contents of the instructions manual, the information which are written on the equipment and the relevant security instructions for the setting up and the use of electrical units.

The equipments are built according to DIN / EN and checked and leave the plant according to security in perfect condition. f, in any case the information in the instructions manual is not sufficient, please contact our company or the responsible representative.

Instead of the industrial norms and regulations written in this instructions manual valid for Europe, you must observe out of their geographical scope the valid and relevant regulations of the corresponding country.

Observe the maximum temperature permissible when installing in switching cabinet. Make sure sufficient space to other equipment or heat sources. If the cooling becomes more difficult e.g. through close proximity of apparatus with elevated surface temperature or hindrance of the cooling air, the tolerable environmental temperature is diminishing.

ATTENTION!

Connect temperature sensors Pt 100

Temperature sensors must be connected to the plug-in terminals T11, T12, T13 etc.

To ensure proper operation this plug-in terminals have gold-plated contacts. Do not use these plugs for other terminals.

Universal power supply

The universal power supply works within the ranges AC/DC 24-60 V or AC/DC 90-240 V. Before switching on make sure, that the operational voltage U_s of the type- plate and the mains voltage are the same.

Attention:

Sensor-Inputs and Interface RS 485 are the same potential. Please regard.

RS 485 interface:

Large cable lengths may shift the potential ground and the transmission can be disturbed. Corrective measures can be galvanic separation or an additional ground wire.

**Attention!**

The sensor-alarm-relay K7 signals an error in a sensor. The relays for the alarms 1-6 do not switch with a disturbance in a sensor. When relay K7 is programmed in closed-circuit current mode (= release at alarm = factory settings), also an interruption of the supply voltage and an instrument failure are reported. We recommend the evaluation of K7.

Assembly:

- on 35 mm mounting rail according to EN 60715
- wall-mounting with 3 x screws M4
- to prevent miss-operation and malfunction connect wires refer to the connection plan.

Putting into operation**Remarks****• LEDs Alarm**

off:	temperature below switching point
on:	temperature beyond switching point
blinking 1x on 4x off:	alarm-relay delay time t_{ALARM} is running
blinking 4x on 1x off:	alarm-relay delay time t_{ALARM} off is running
blinking 1x on 1x off:	relay locked, ready for reset

Alarm-relay can be reseted with reset-push-button or external contact closed Y1, Y2. A closed contact or short circuit at terminals Y1-Y2 means no auto reset function.

• Operating delay time – measuring time t_M

The operating delay time of the relay depends on the number of connected sensors and the measuring function. With continuous change of temperature the measuring time t_M is about 1,5 s. With abrupt change of temperature the measuring time t_M is about 3 ... 4 s (for example by simulation of temperature changes in mode 8). With sensor short circuit or sensor interruption the measuring time t_M increases to 6...8 s.

• Relay locked active (Mode 4 = "1")

In this mode the relay can switch on when all the following parameters are fulfilled:

- the temperature decreases below the switching back limit
- the alarm relay delay-time t_{ALARM} off has overrun
- a reset signal Y1,Y2 (reset push-button or external closed contact) is done or the mains (supply voltage) is switched off an on.

In the ready for reset status the alarm-LED will be blinking 1x on 1x off .

- **2-wire technique line resistance compensation**

To compensate the line resistance short-circuit the wires nearby the sensor and measure the line resistance. Setting see mode 6.

We recommend to use 2 or better 3 wires for each sensor. With 2-wire connection and a common line for all signals, all sensor measuring currents will be added on the common line. Thus the value of the compensation line resistance RK must be calculated as follows: $RK = (n+1) \times RL/2$ (RL = line resistance of two wires, n = number of sensors)

- **Sensor simulation**

If no button is pushed within 15 minutes the relay automatically returns in the normal function mode.

Table of function

Function	Key	Display
Sensor temperature	Sensor select 1 ...6	Measuring temperature of selected sensor
ϑ - MAX	Δ	Highest measured temperature
ϑ - MIN	▽	Lowest measured temperature
ϑ - MIN - MAX- Reset	Δ or ▽ + Reset	Measured temperature
Relay locked Reset	Reset	
Switching points	Alarm select 1 ...6	Adjusted limit and sensor or sensor group

Setup *

Mode	Function	Alarm select (Alarm=Relay)	Sensor select	Display	SET	Factory Adjust
0	Switching Point (°C)	Relay 1...6	Sensor 1...6 group 1+2+3 group 4+5 group 4+5+6 group 1...6	-199°...800 °C	Store	100 °C Alarm 1 = Sensor 1 ... Alarm 6 = Sensor 6
1	Hysteresis (K)	Relay 1...6	-	1 ...20 K	Store	3 K
2	tALARM (s)	Relay 1...6	-	0,1 ... 20,0 s	Store	0,1 s
3	tALARM off (s)	Relay 1...6	-	0 ... 999 s	Store	0 s
4	auto reset - locked	Relay 1...6	-	0 = auto reset 1 = locked	Store	0 = auto reset
5	Operating function Max-NO contact Max-NC contact Min-NO contact Min-NC contact	Relay 1...6 Sensor alarm (Relay K7)	-	1 = ϑ↑  2 = ϑ↑  3 = ϑ↓  4 = ϑ↓ 	Store	2 = ϑ↑ 
6	Sensor connection 3-wire not connected 2-wire (Ω)	-	sensor 1...6	3-.L n.c. 0...50,6		3-.L
7	RS 485 interface	Address of unit (= 1)	-	0...99	Store	0
		Baud rate (= 2)	-	4800,9600,19200	Store	96
		Parity bit (= 3)	-	N,O,E	Store	E
8	Sensor Simulation	-	sensor 1...6	-199°...800 °C	-	
9	Code safe = off Code safe = on	-	-	off = 500 on = 504	Store	500

* return within 30 s without any button pushed

Trouble shooting

- **LED sensor error**

The LED sensor error indicates a failure at a sensor and the sensor-LED blinks. The sensor alarm relay K7 has switched. Refer to operation mode 5. Also see analogue output.

- **Display**

EEE sensor interruption or over-range

-EE sensor short circuit or under -range

- **Reset to factory adjust**

When pushing the buttons "Reset" and "Set" simultaneously > 5 s all programmed parameters will be set back to factory adjust. Code save must be off. If code save is on, see mode 9.

- **No parameter setup possible - code save on**

Code save protects the relay against not allowed manipulations. With code save on no programmed parameters can be changed. The factory code is 504 and cannot be changed by the user. See setup mode 9.

- **Failure display "E 0", sensor error relay K7 switching**

Operation failure. Switch off the supply voltage and restart. When the failure is still going on, the relay should be replaced and send to the factory.

- **Failure display "E 1" or "E 2", sensor error relay K7 switching**

EEPROM parameter failure. Check all programmed parameters and setup new when necessary. Switch off the supply voltage and restart again. When the failure is still going on, the relay should be replaced and send to the factory.

- **Sensor alarm relay K7**

Sensor alarm relay K7 with operating function 2 = NC-contact releases at any failure and signals an interruption of power-supply.

ATTENTION! . There is a short alarm-signal of K7 when switching-on the supply-voltage.

Sensor alarm relay K7 with operating function 1 = NO-contact picks up at any failure.

ATTENTION: There is no alarm-signal of K7 if interruption of power supply occurs.

See setup mode 5.

In case of any other malfunctions, replace device and send it in together with a description of the occurred malfunction.

- **Indication of the software version:** Push „Set“ 4 s in the display mode.

Technical data

<u>Rated supply voltage Us:</u>	AC/DC 24 – 60 V (see lateral type plate)
Tolerance DC-supply	DC 20 - 81 V (0,85 x 24V...1,35 x 60V)
Tolerance AC-supply	AC 20 - 66 V (0,85 x 24V...1,1 x 60V)
<u>Rated supply voltage Us:</u>	AC/DC 90 – 240 V (see lateral type plate)
Tolerance DC-supply	DC 81 - 297 V (0,9 x 90V...1,35 x 220V)
Tolerance AC-supply	AC 76 - 264 V (0,85 x 90V...1,1 x 240V)
Power consumption	< 8 VA
Frequency	0 / 50 / 60 Hz
<u>Relay output:</u>	1 change-over (CO) contact
Switching voltage	max. AC 415 V
Switching current	max. 5 A
Switching power cos φ =1	max. 1250 VA (ohmic load) max.48 W at DC 24 V
Derating factor cos φ =0,7	0,5
UL electrical ratings:	3 A Resistive, 240 VAC D300 1A 240 VAC
Rated operational current Ie:	
AC15	Ie = 1 A Ue = 400 V Ie = 2 A Ue = 250 V
DC13	Ie = 2 A Ue = 24 V Ie = 0,2 A Ue = 125 V Ie = 0,1 A Ue = 250 V
Recommended fuse for contacts	T 3,15 A (gL)
Expected life mechanical	1 x 10 ⁷ operations
Expected life electrical	1 x 10 ⁵ operations with AC 250 V / 5 A 2 x 10 ⁵ operations with AC 250 V / 3 A 6 x 10 ⁵ operations with AC 250 V / 1 A
<u>Test conditions:</u>	EN 60947, EN 50178
<u>Insulation</u>	EN 60664
Rated impulse voltage	4000 V
Over voltage category	III
Contamination level	3 2
Rated insulation voltage Ui	250 V 415 V
<u>Sensor connection :</u>	6 x Pt 100 acc. to DIN EN 60751
Measuring accuracy	±0,5 % of value ±1 Digit
Sensor current	≤ 2 mA
3-wire sensor	Pt 100 + R _L = max. 490 Ω
2-wire sensor	R _L = 0 ...50,6 Ω adjustable
Measuring delay time t _M	<1,5 s (normal operation, depends on number of connected sensors)
<u>Switch points:</u>	6 , digital adjustable
Relay operating function	standard = closed circuit current principle (NC) option = operating current (NO)
<u>Temperature alarm:</u>	
Temperature range θ1...θ6	-199 ... +800 °C
Hysteresis	1 ... 20 K
(Release) delay time t _{ALARM}	0,1 ... 20,0 s
(Pick-up) delay time t _{ALARM off}	0 ... 999 s

RS 485 interface:

Address of unit	0. 99
Baud rate	4800, 9600, 19200 Baud
Parity	N, O, E (no, uneven, even)
	Cable length max. 1000 m with 19200 Baud

Max. Ambient Temperature:

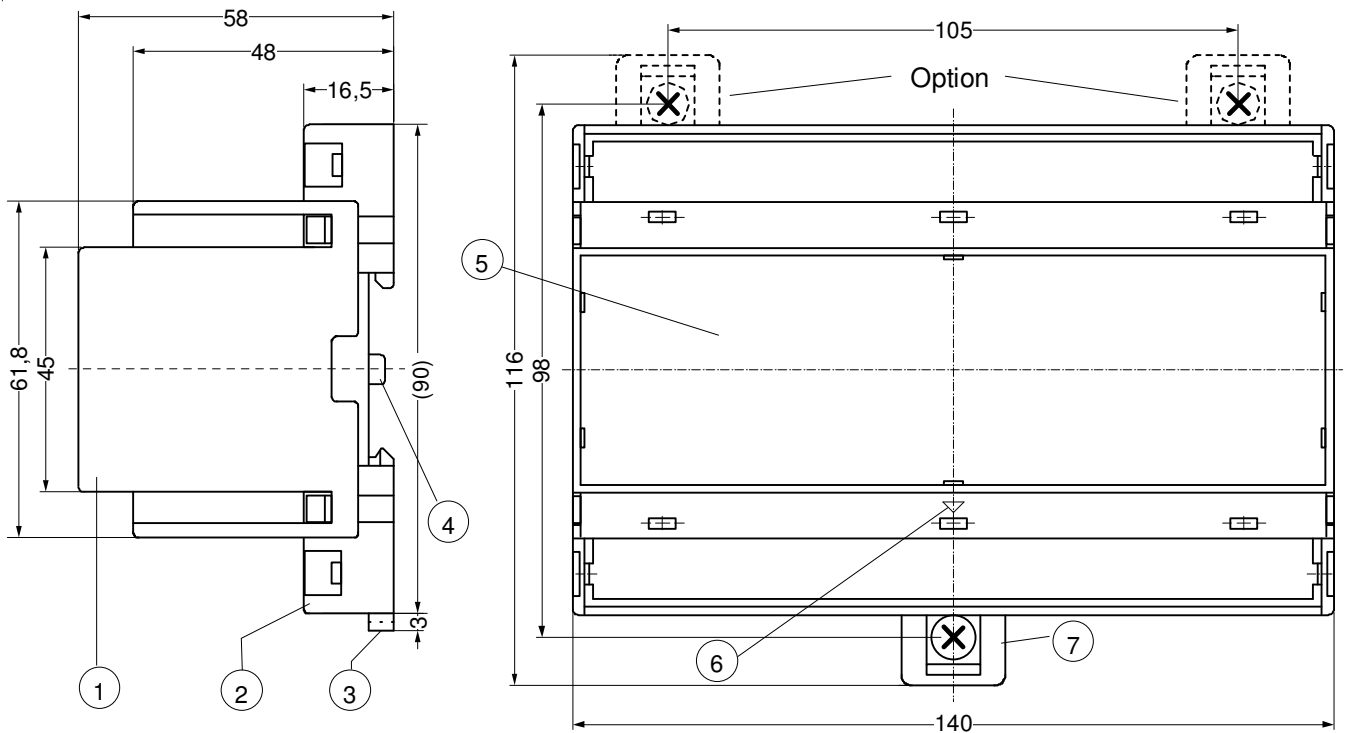
Operating Temperature	-20 °C ... +65 °C
Storage Temperature	-20 °C ... +70 °C
no condensation permitted	

Housing:

Housing	Type V8
Dimensions (H x W x D)	140 x 90 x 58 mm
Mounting height / Width	55 mm / 4 TE
Line connection solid wire	1 x 1,5 mm ²
Stranded wire with insulated ferrules	1 x 1,0 mm ²
Torque	0,5 Nm (3,6 lb.in)
Protection class housing	IP 31
Protection class terminals	IP 20
Fitting position	any
Mounting	Snap mounting on 35 mm standard rail EN 60715 or M4 screws
Weight	app. 350g

Subject to technical modifications

Form V8: dimensions in mm



- 1 Oberteil / cover
- 2 Unterteil / base
- 3 Riegel / bar for snap mounting
- 4 Plombenlasche / latch for sealing
- 5 Frontplatteneinsatz / front panel
- 6 Kennzeichen für unten / position downward
- 7 Riegel bei Wandbefestigung mit Schrauben. Riegelbohrung Ø 4,2 mm / for fixing to wall with screws, Ø 4,2 mm.

Appendix

Data structure for serial transmission of data with interface RS 485

Transmission format:	ASCII	
Baud rate:	9600 (default)	4800, 9600, 19200
Data:	8 bit	
Stop bit:	1	
Parity:	even (default)	even, odd, no

1. Master requests data from TR 600

Master sends <start><address of unit><read-command><mode><BCC><CR><LF>:

Start-of message	s (ASCII)	
	S (ASCII)	
	STX (0x2)	1 Byte
Address of unit	01 .. 99 (ASCII)	2 Byte
Read-command	r (ASCII)	
	R (ASCII)	1 Byte
Data Mode	0 .. 9 (ASCII)	1 Byte
Block check	exor of all transmitted bytes	3 Byte
Carriage Return	CR (0xd)	1 Byte
Line Feed	LF (0xa)	1 Byte

10 Byte

2. TR 600 sends the requested data

TR sends <start><type of unit><address of unit><mode><data><BCC><CR><LF>:

Start of message	s (ASCII)	(Start-sign same as start sign at data request)	
	S (ASCII)		
	STX (0x2)		1 Byte
Data:			
Type of unit	TR600 (ASCII)		5 Byte (+ separated by ";")
Address of unit	00 .. 99 (ASCII)		2 Byte (+ separated by ";")
Mode of data	0 .. 9 (ASCII)		1 Byte (+ separated by ";")
Temperature sensor 1	-199 .. +800 (ASCII)	*1	4 Byte (+ separated by ";")
Temperature sensor 2	-199 .. +800 (ASCII)	*1	4 Byte (+ separated by ";")
Temperature sensor 3	-199 .. +800 (ASCII)	*1	4 Byte (+ separated by ";")
Temperature sensor 4	-199 .. +800 (ASCII)	*1	4 Byte (+ separated by ";")
Temperature sensor 5	-199 .. +800 (ASCII)	*1	4 Byte (+ separated by ";")
Temperature sensor 6	-199 .. +800 (ASCII)	*1	4 Byte (+ separated by ";")
Alarm 1	0 .. 1 (ASCII)		1 Byte (+ separated by ";")
Alarm 2	0 .. 1 (ASCII)		1 Byte (+ separated by ";")
Alarm 3	0 .. 1 (ASCII)		1 Byte (+ separated by ";")
Alarm 4	0 .. 1 (ASCII)		1 Byte (+ separated by ";")
Alarm 5	0 .. 1 (ASCII)		1 Byte (+ separated by ";")
Alarm 6	0 .. 1 (ASCII)		1 Byte (+ separated by ";")
Alarm 7	0 .. 1 (ASCII)		1 Byte (+ separated by ";")
Internal error	00 .. 99 (ASCII)		2 Byte (+ separated by ";")
Block check	exor of all transmitted bytes		3 Byte
Carriage Return	CR (0xd)		1 Byte
Line Feed	LF (0xa)		1 Byte

64 Byte

With default-address of unit "0", the TR 600 transmits a complete set of data every 3s (start-sign <STX>).

*1 Sensor not connected, data "+980"

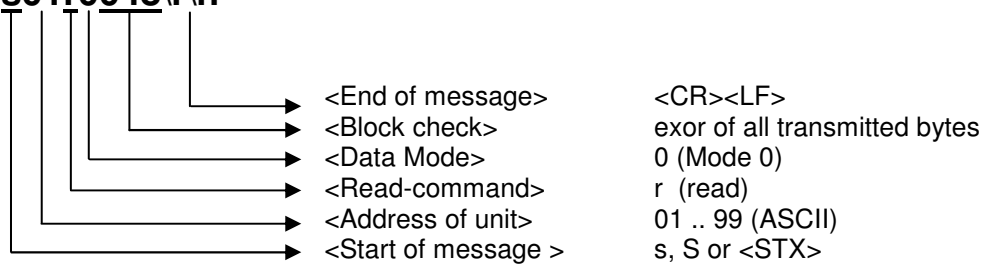
Sensor short circuit, data "-999"

Sensor interruption, data "+999"

Example:

Data requested from TR 600

s01r0048\r\n



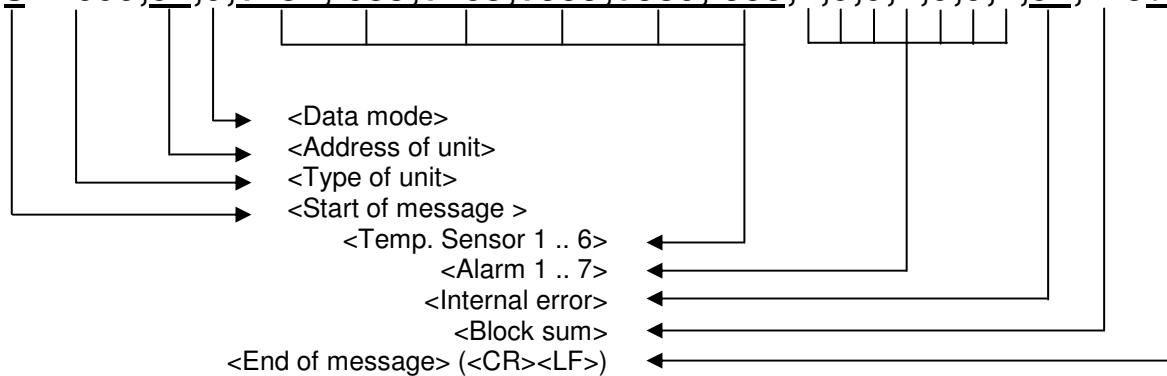
Block sum: s (115) exor 0 (48) exor 1 (49) exor r (114) exor 0 (48)

= 048

The values in brackets correspond with the ASCII-code of the sign.

TR 600 answers

sTR600;01;0;+154;-055;+268;+999;+980;-999;1;0;0;1;0;0;1;02;119\r\n



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