Temperature Relays and MINIKA®   Mains Monitoring   Digital Panelmeters MINIPAN®   Switching Relays and Controls   Measuring Transducers   Grid- and Plant Protection

Operating Manual TR600

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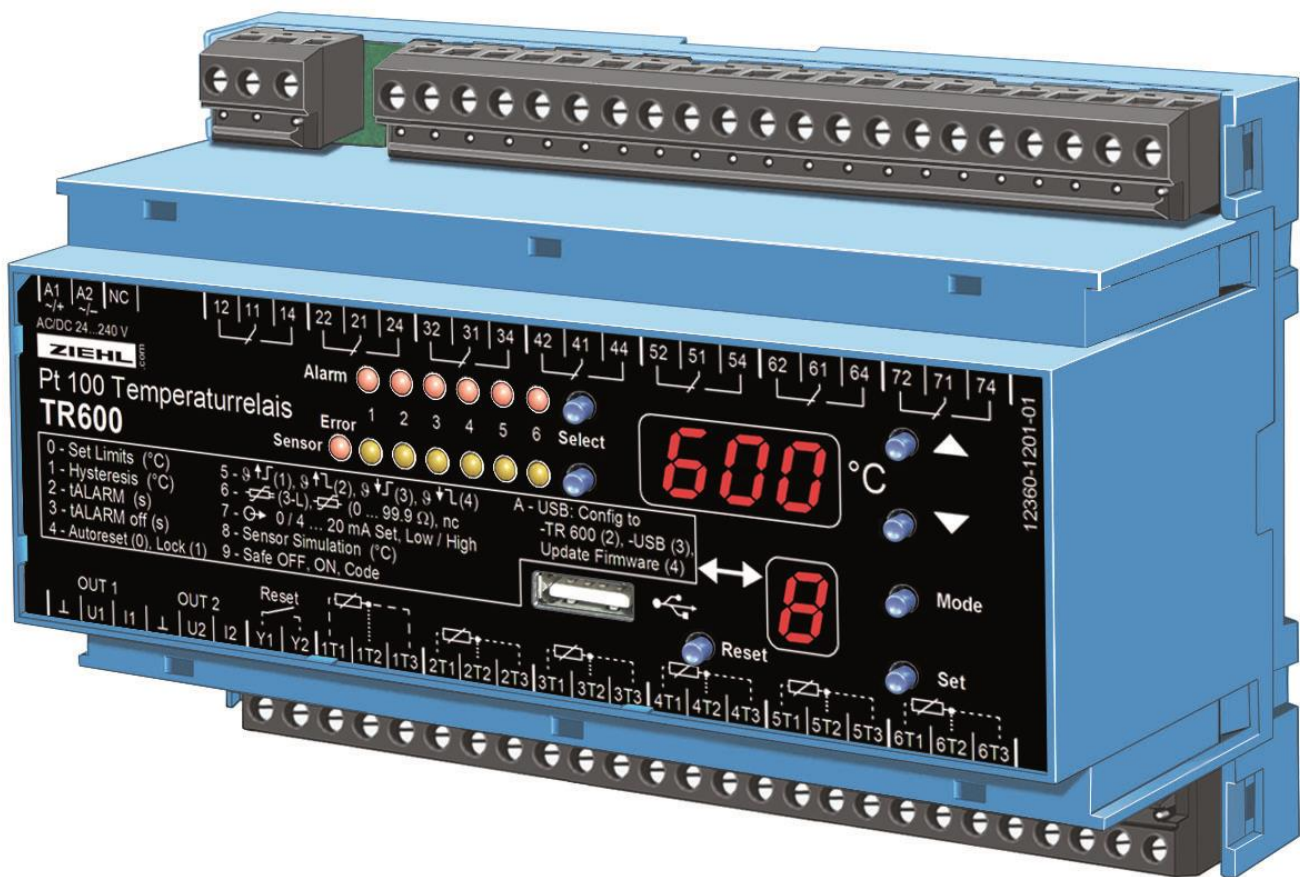
- Pt 100 temperature relay with 2 analog outputs

C E   c UL US

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1   Application and short description

The Pt 100 thermostat TR600 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 analog 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
UL E377414 Process Control Equipment, Electrical - Component

2   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.
- 2 analog outputs, 0/4...20 mA and 0/2...10 V, with individual scaling.
- Universal power supply. 2 ranges AC/DC 24-60V or AC/DC 90-240 V
- Universal power supply AC/DC 24-240 V
- Terminal for USB-Stick for up- and downloads of sets of parameters and for firmware-updates

3   Connection plan
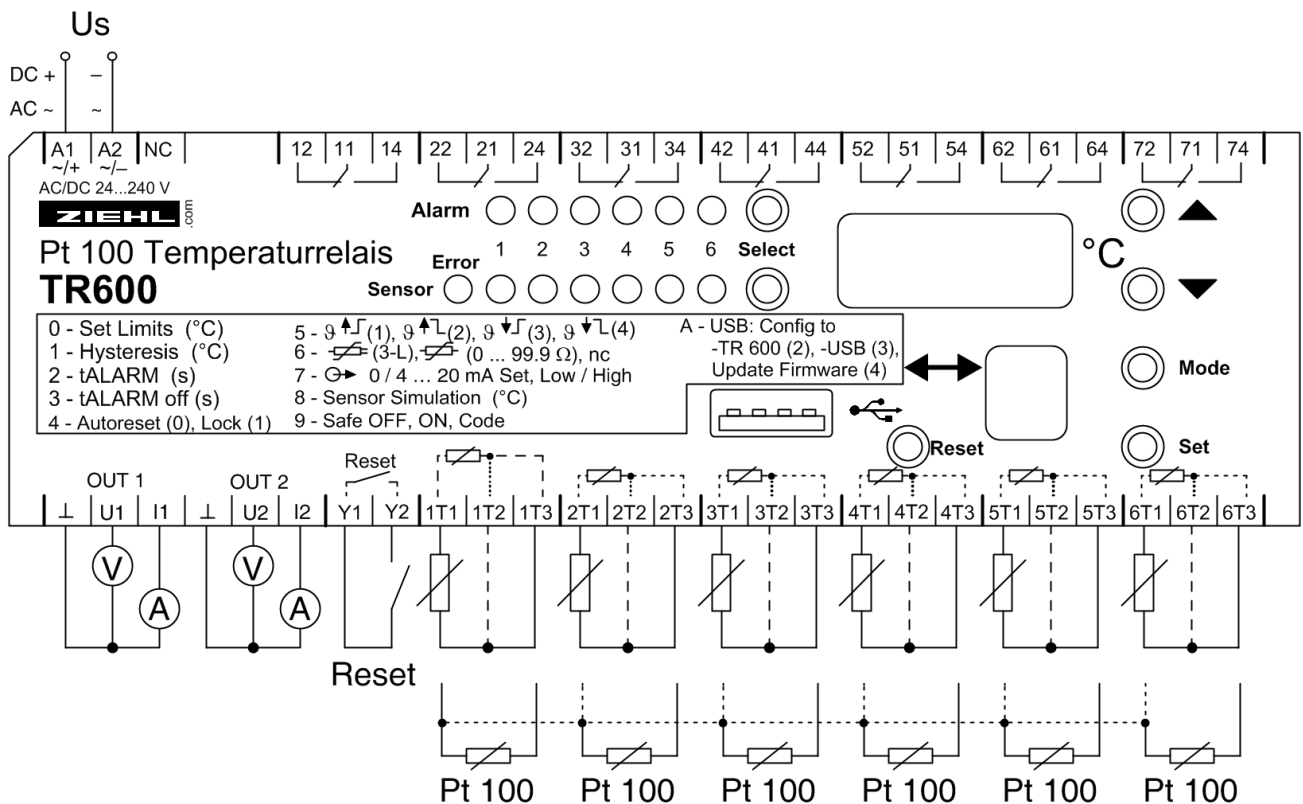
4   Display and operating elements
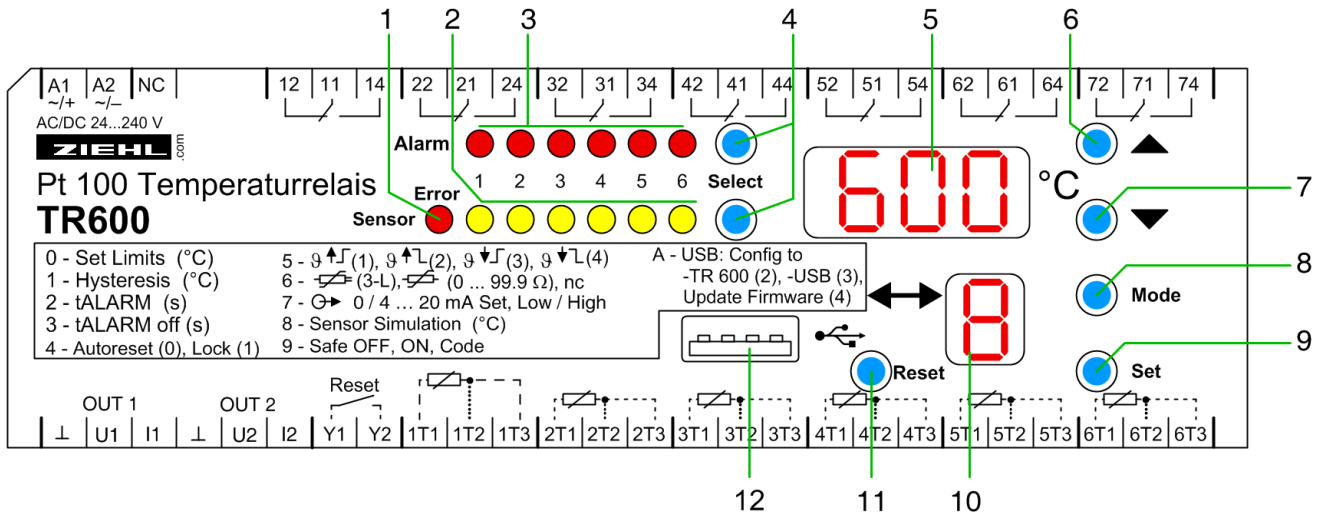
1	LED Sensor Error
2	6x LED Sensor
3	6x LED Alarm
4	Select buttons
5	Display, 3 digits
6	Up button
7	Down button
8	Mode button
9	Set button
10	Display, 1 digit (Mode)
11	Reset button
12	Terminal for USB-Stick

5   Function diagram

t_M : measuring time
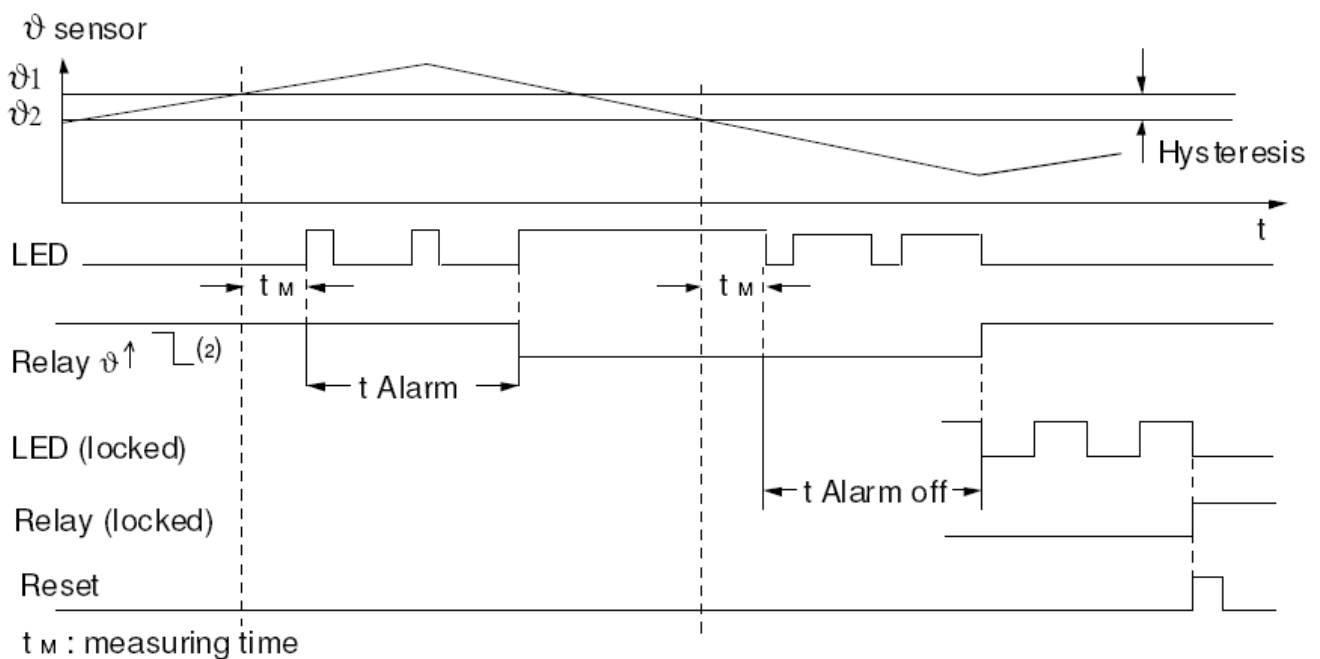
6 Important notes

> ⚠️ **Danger!**
> **Hazardous voltage. Will cause death or serious injury.**
> **Turn off and lock out all power supplying this device before working on this device.**

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/IEC and checked and leave the plant according to security in perfect condition. If, 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.

ATTENTION! Connecting temperature sensors Pt 100
Temperature sensors must be connected to the plug-in terminals 1T1, 1T2, 1T1 etc.
To ensure proper operation this plug-in terminals have gold-plated contacts. Do not use these plugs for other terminals.

> ⚠️ **The measuring-inputs 1T1 to 6T3 and RESET Y1, Y2 do not have an insulation to USB-Terminal and to analog output OUT 1 / OUT 2.**
> **The temperature-sensors need an appropriate insulation that complies with SELV (Safety Extra Low Voltage).**

> **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! Universal power supply
The unit is equipped with an universal power supply, that is suitable for DC- and AC voltages.
Before connecting the unit to the current, make sure that the allowed scope of
voltage of the control voltage Us, written on the lateral type plate, corresponds to the supply
voltage of the unit.

> ⚠️ **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 setting), also an interruption of the supply voltage and an instrument failure are reported. We recommend the evaluation of K7.**

7   Assembly

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

> ⚠️ **A circuit-breaker or switch must be situated within easy reach of the unit and fused. Installation excess current protection should be ≤ 10 A.**

8   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 resetted with reset-push-button or external contact closed Y1, Y2. A closed contact or short circuit at terminals Y1-Y2 means no autoreset function.

- **Functions of USB-Stick**

  With the 2 functions
  - „transfer configuration-file from TR600 to USB-Stick"
  - „transfer configuration-file from USB-Stick to TR600"

  settings of a readily configured TR600 can be easily read-out and transferred to other TR600.

  The USB-Stick is necessary for configuration and for firmware-updates only. It may not stay plugged during normal operation.

  Select Mode „A", then choose function with button „Alarm Select":
  ⇒ Alarm LED 2 = transfer configuration-file from USB-Stick to TR600
  ⇒ Alarm LED 3 = transfer configuration-file from TR600 to USB-Stick
  ⇒ Alarm LED 4 = update of firmware

  Attention: As long as TR600 is reading from or writing on the USB-Stick, all relays are released and no values are measured

  The file system on the USB-Stick has to FAT or FAT32. The files must be located in the main directory (highest level) of the USB-Stick. Info's and Download **www.ziehl.com**.
  File for configuration: „TR600.cfg" / file for firmware-update: „TR600.hex"

> **On www.ziehl.com / downloads a parameterizing web site is available.**
> **With this help the following activities can be done easily:**
>   **- create and change configuration-files**
>   **- check downloaded configurations-files**
>   **- documentation of configuration-files**
>
> **You will also find a update instruction and the latest firmware-version there.**

- **Relay locked active (Mode 4 = "1")**
  In this mode the relay can switch on when all the following parameters are full filled:
  - the temperature decreases below the switching back limit
  - the alarm relay delay-time t_{ALARM} off has overrun
  - a reset signal Y1,Y2 (resets push-button or external closed contact) is done or the mains (supply voltage) is switched off and 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) x RL/2 (RL = line resistance of two wires, n = number of sensors)

- **Sensor simulation**
  At this menu item a sensor (or sensor group) can be selected and with the buttons up/down a measured temperature can be simulated. All functions of the device act as if the temperature was measured in real.
  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 group *1) *2)	Measuring temperature of selected sensor or max. value of group of sensors
ϑ - MAX	▲	Highest measured temperature since last Reset
ϑ - MIN	▼	Lowest measured temperature since last Reset
ϑ - MIN - MAX- Reset	▲ or ▼ + Reset	Reset MIN-/MAX- memory to actual measured temperature
Relay locked Reset	Reset	
Switching points	Alarm select 1 …6	Adjusted limit and sensor or sensor group for the selected relay

*1) group: - Sensor 1+2+3, - Sensor 4+5, - Sensor 4+5+6, - Sensor 1+2, - Sensor 3+4,
        - Sensor 5+6, - Sensor 1+2+3+4+5+6

*2) Value of warmest sensor of group is displayed

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)	-199°…800°C	Store	100 °C Alarm 1 = Sensor 1 ... Alarm 6 = Sensor 6
1	Hysteresis (K)	Relay 1…6	-	1 …99 K	Store	3 K
2	t_{ALARM} (s)	Relay 1…6	-	0,1 … 20,0 s	Store	0,1 s
3	t_{ALARM} off (s)	Relay 1…6	-	0 … 999 s	Store	0 s
4	autoreset - locked	Relay 1…6	-	0 = autoreset 1 = locked	Store	0 = autoreset
5	Operating function Max-NO contact Max-NC contact Min-NO contact Min-NC contact	Relay 1…6 Sensor alarm (Relay K7)	-	$1 = \vartheta\uparrow$ ⌐ $2 = \vartheta\uparrow$ ⌐_ $3 = \vartheta\downarrow$ ⌐ $4 = \vartheta\downarrow$ ⌐_	Store	$2 = \vartheta\uparrow$ ⌐_
6	Sensor connection 3-wire not connected 2-wire (Ω)	-	sensor 1…6	3-.L n.c. *3 0…99,9	Store	3-.L
7	Analog out	Out 1 = 1 Out 2 = 2	sensor 1…6 group *1) *2)	0 = 0…20 mA 0 = 0…10 V 4 = 4…20 mA 4 = 2…10 V	Store	Out 1 = group 1+2+3 Out 2 = group 4+5+6
	Zero FullScale	- -	- -	-199°…800°C -199°…800°C	Store Store	0 °C = 0 mA 100 °C = 20 mA
8	Sensor Simulation	-	sensor 1…6 group *1)	-199°…800°C	-	
9	Code safe = off Code safe = on	-	-	off = 500 on = 504	 Store	500
A	USB	Config To TR = 2 Config To USB = 3 Firmware Update = 4	-		Start Start (+ button Reset) -> Start	

* return within 30 s without any button pushed

*1) group: - sensor 1+2+3, - sensor 4+5, - sensor 4+5+6, - sensor 1+2, - sensor 3+4,
      - sensor 5+6, - sensor 1+2+3+4+5+6

*2) When a group of sensors is selected, the warmest temperature makes the signal for the analog output.

*3) not connected (no sensor connected)

9 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 analog output.

- **Display**
  EEE   sensor interruption or over-range
  -EE   sensor short circuit or under -range

- **Analog output 0 mA/0 V**
  If sensor failure short circuit or sensor interruption is detected the output current is 0 mA and the output voltage 0 V.

- **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 unauthorized 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" or "E 2", 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.

- **Indication of firmware-version:** Push "Set" for 4s in Display Mode.

- **USB Stick – Error when writing configuration-file to USB-Stick**: The file „TR600.cfg" is being created or overwritten. In addition a file „TR600_xx.cfg" is being created. „xx" stands for a continuous index (00 … 99).

- **USB Stick – Error when reading configuration-file from USB-Stick**: The file „TR600.cfg" must be in the main directory. Parameters in this Text-file can be changed (text editor) and adapted to the required configuration.

- **USB Stick – Error when executing firmware-update**: The 2 yellow LEDs OUT 1 and OUT 2 display state of update.

LED OUT 1	LED OUT 2	Description
blinking	on	no firmware on TR600
on	off	new firmware is loaded to TR600
on	on	TR600 has called the update
blinking	off	no (no valid) firmware on USB- Stick (TR600.hex)
blinking	blinking	USB- Stick not identified

If a firmware-update fails (TR doesn't start as usual, display is dark) the update can be re-started as follows:
Switch off Us, keep buttons „Up" (▲) and „Set" pressed and switch on Us
 **-> Firmware-update starts.**

10 Technical data

Rated supply voltage Us	AC/DC 24 – 240V	
Tolerance	DC 20,4 - 297 V	AC 20 - 264 V 50/60 Hz
Power consumption	< 4 W	< 13 VA

Sensor connection (6 sensors)	Pt 100 (RTD) acc. to EN 60751 (2/3- wire)
Measuring range	-199°C .. 800°C, resolution = 1°C
Resistance of sensor + wire.	max. 500 Ohm
Sensor current	≤0,7 mA
Measuring cycle/ time sensor	≤ 1,5 s
Tolerance	±0,5 % of measured value ±1 digit
Temperature factor	<0,04°C/K

Analog outputs	OUT 1 and OUT 2
Voltage-output	DC 0/2 V – 10 V , max. DC 10 mA
Current output	DC 0/4 mA – 20 mA
Load	max. 500 Ω
No-load voltage	max. DC 16 V
Tolerance	1% of programmed span ±1 °C

Relay-output K1 … K7	7 x 1 change-over contacts (CO)	
Switching voltage	max. AC 415 V	
Switching current	max. 5 A	
Switching capacity	max. 1250 VA (resistive load)	
	max. 120 W at DC 24 V	
UL electrical ratings:	250 V ac, 5 A, resistive	
E214025	240 V ac, 1/2 hp	
	120 V ac, ¼ hp	
	B 300 – pilot duty, UL 508	
Nominal operational current Ie		
AC15	Ie = 3 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 NO	4 A time-lag or miniature circuit-breaker MCB B4	
Recommended fuse NC	3,15 A time-lag	
Expected contact life mechanical	3×10^7 operations	
Expected contact life electrical	1×10^5 operations at AC 250 V / 6 A	

Test conditions	EN 61010-1
Rated impulse voltage	4000 V
Overvoltage category	III
Contamination level	2
Rated insulation voltage Ui	300 V
On-time	100 %

EMC-tests	EN 61326-1
emitted interference	EN 61000-6-3
Burst	EN 61000-4-4 +/-4 kV
	Pulse 5/50 ns, f = 5 kHz, t = 15 ms, T = 300 ms
SURGE	IEC 61000-4-5 +/-4 kV
	Impulse 1,2/50 µs (8/20 µs)
discharge of static electricity	IEC 61000-4-2 +/-4 kV contact,
	+/- 8kV air

Environmental conditions	
Ambient temperature range	-20 °C ... +65 °C
Storage temperature range	-20 °C … +70 °C
Altitude	Up to 2000 m
Climatic conditions	5 – 85 % rel. humidity, no condensation
External wiring temperature range	-5 °C … +70 °C
Vibration resistance EN 60068-2-6	2…25 Hz ±1.6 mm
	25 ... 150 Hz 5 g

Galvanic insulation / Test-voltage	Us – Relays, sensors, USB, analog output,
	Reset input -> DC 3820 V
	Relays – sensors, USB, analog output,
	Reset input -> DC 3820 V
No galvanic insulation	sensors, USB, analog output, Reset input

Reset input Y1/Y2	app. DC 18 V / 3,5 mA

USB connector	Type A, for connecting a USB stick
	to configuration / to firmware update

Housing	Type V8
Dimensions (H x W x D)	140 x 90 x 58 mm
Mounting height / Width	55 mm / 8 TE
Line connection solid wire	je 1 x 1,5 mm^2
Stranded wire with isolated ferrules	je 1 x 1,0 mm^2
Torque	0,5 Nm (3,6 lb.in)
Protection class housing	IP 20
Protection class terminals	IP 20
Fitting position	any
Mounting	Snap mounting on 35 mm standard rail
	EN 60715 or M4 screws
Weight	app. 360 g

Subject to technical modifications

11 Form V8

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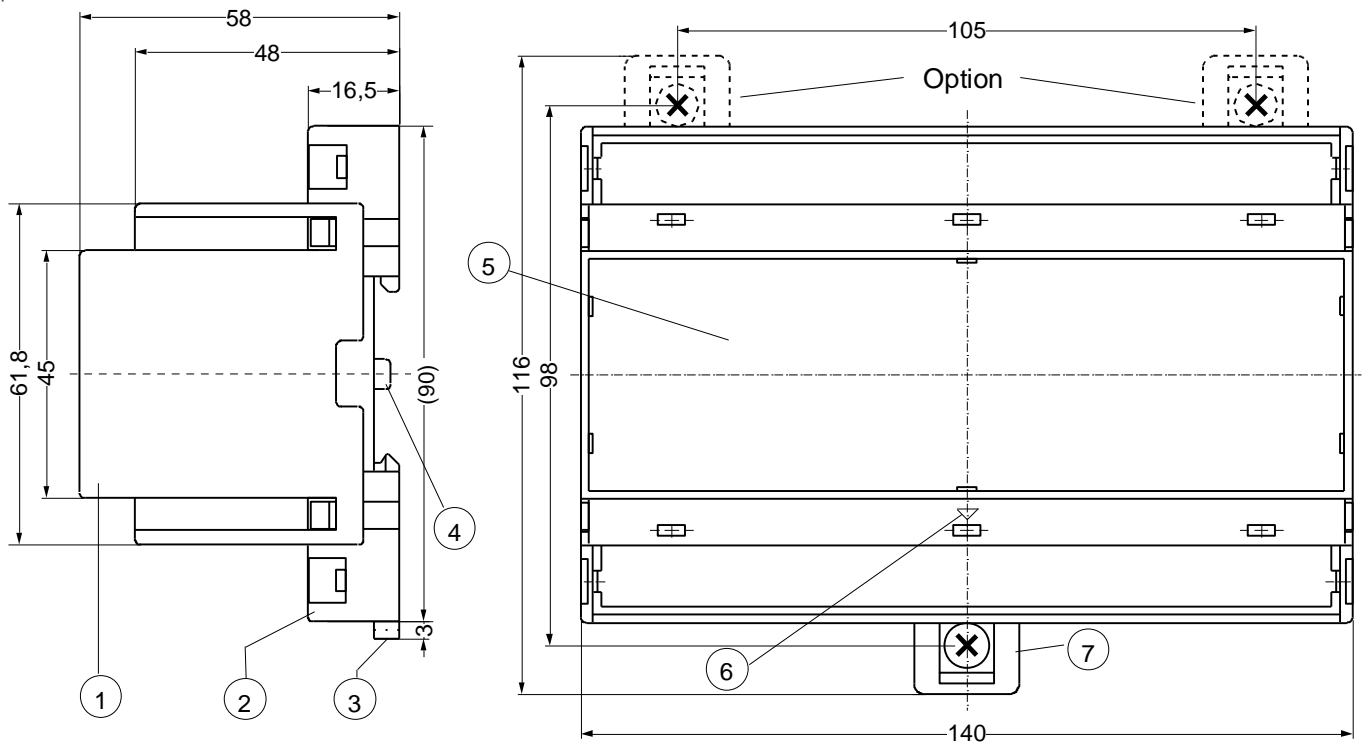
1   Oberteil / cover
2   Unterteil / base
3   Riegel / bar for snap mounting
4   Plombenlasche / latch for sealing
5   Frontplatteneinsatz / front panel
6   Kennzeichen für unten / position downward
7   Riegel bei Wandbefestigung mit Schrauben. Riegelbohrung Ø 4,2 mm
     / for fixing to wall with  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

Sie finden diese und weitere Betriebsanleitungen, soweit verfügbar auch in englisch, auf unserer Homepage **www.ziehl.de**.

You find this and other operating-manuals on our homepage **www.ziehl.de**, as far as available also in English.