

## Operating manual

# TR 1200

Pt 100 thermostat with 12 sensor ports and Interface RS485



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# 1. Application and brief description

The Pt 100 thermostat TR 1200 is especially suitable for temperature monitoring wherever up to 12 different measuring points must be monitored simultaneously:

- Motors and generators,
- Simultaneous monitoring of bearings and coolant
- Transformers with additional monitoring of the core temperature
- power machines and plants

The Pt 100 thermostat TR 1200 measure the temperature of up to 12 Pt 100 thermometers. With the RS485 Interface measured temperature values can be issued i.e. for remote control or further evaluation.

One error relay monitors sensor failures und signals general malfunctions.

# 2. Overview of functions

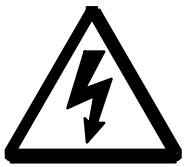
- 3-digit temperature display
- 12 inputs for temperature sensors, 1...12 sensors can be connected
- Pt 100 thermostats with 2- or 3- wire connection
- 1 Error relay (potential-free change-over contact)
- RS485 Interface (ZIEHL standard protocol and Modbus RTU protocol)
- LED signal the measuring channel, Error state, relay function and RS485 activity
- Code lock prevents parameter manipulation
- TR 600 compatible (to replace one TR 600 with 6 sensors connected)
- Universal power-supply AC/DC 24-240 V
- Snap mounting on 35 mm standard rail EN 60715



## 4. Description of terminals

Terminal	Function
A1 and A2	Supply Voltage Us, see Operating Instructions Point 12
11, 12, 14	Error relay change-over contacts
1T1...12T3	Sensor connection (xT2 = Sense line of three wire technique)
A	RS485 receiving wire
A´	RS485 load resistor, jumper to terminal A required
B	RS485 transmitting wire
B´	RS485 load resistor, jumper to terminal B required
⊥ (Gnd)	Ground wire of RS485 interface, potential equalisation between multiple units

## 5. 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. To keep this condition, observe the security instructions with the headline „Attention“ written in the instructions manual. Ignoring of the security instructions may lead to death, physical injury or damage of the equipment itself and of other apparatus and equipment.

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!**

When all relays are programmed in operation current mode (= pick up at alarm), a loss of the supply voltage or an instrument failure can remain unidentified. When the relay is applied as control instrument, the operator must ensure, that this error is recognized by regular examinations. We recommend to program and accordingly evaluate at least one relay in the closed-circuit current mode.

### **Caution! Temperature sensor terminals**

The pin connections of Sensors 1...6 (below) are not compatible with Sensors 7...12 (above). If a 3-wire-technique sensor connected below is to be connected above, both external connections must be swapped.

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.

### **Caution!**

The sensor inputs and the RS485 interface are applied to the same electrical potential but are galvanically isolated (2kV) for the auxiliary voltage. Take this into consideration during configuration.

### **RS485 connection:**

Use RS485 Interface only with shielded wires.

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.

Max. allowed cable length is 1000m.

## **6. Installation**

The device can be mounted:

- Distribution board or switchgear cabinet on 35 mm rails according to EN 60715
- wall-mounting with 3 x screws M4

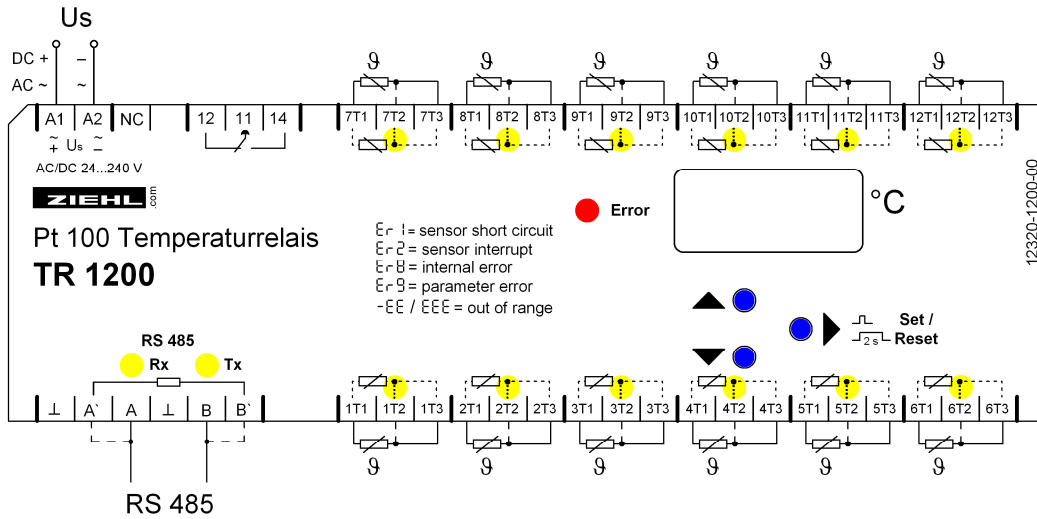
**Observe the maximum temperature permissible when installing in switching cabinet. Make sure sufficient space to other equipment or heat sources. If the cooling becomes more difficult e.g. through close proximity of apparatus with elevated surface temperature or hindrance of the cooling air, the tolerable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



### **Attention! Universal power supply**

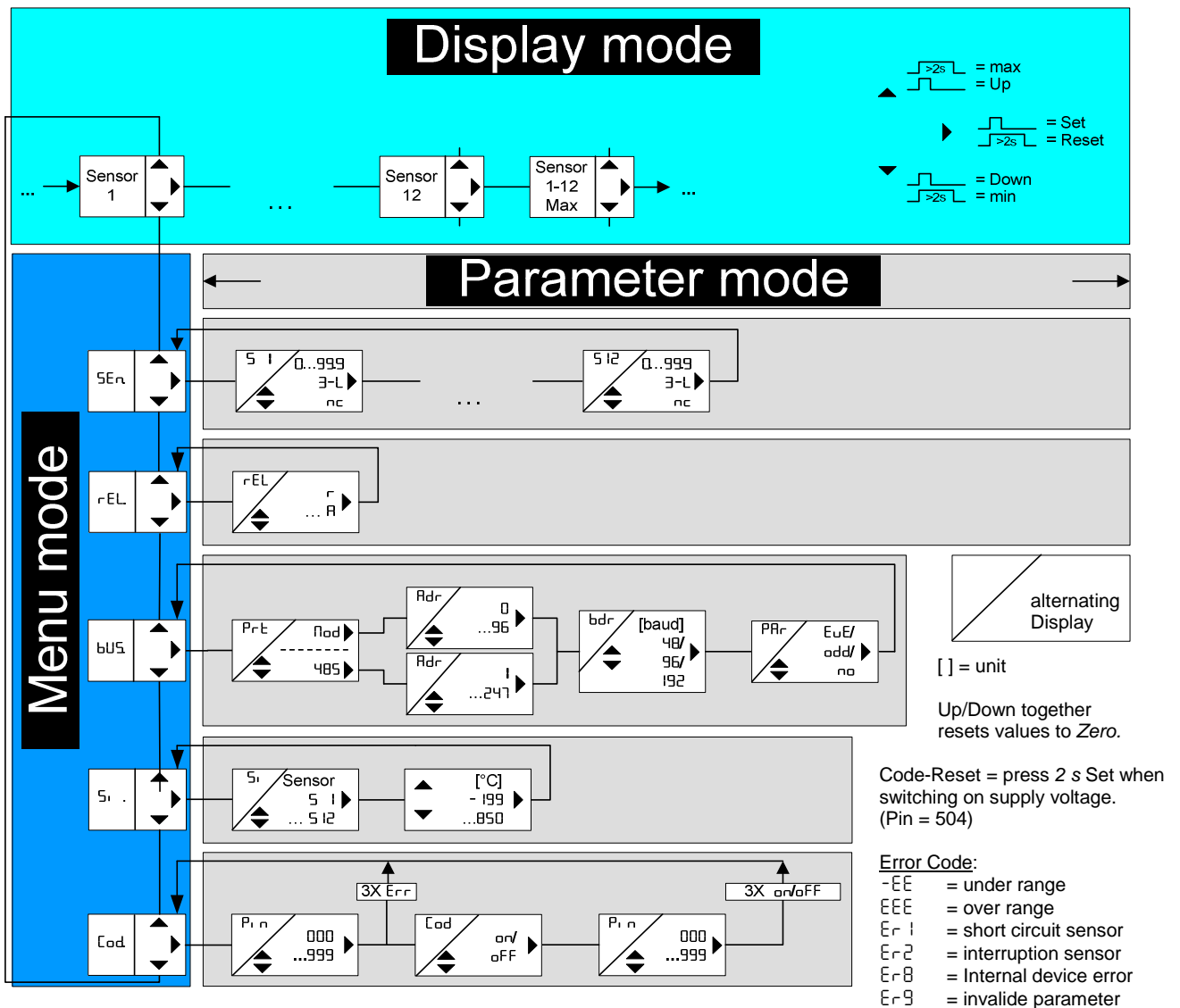
The unit is equipped with a universal power supply that is suitable for DC- and AC-voltages. Before connecting the unit to the current, make sure that the allowed scope of voltage of the control voltage  $U_s$ , written on the lateral type plate, corresponds to the supply voltage of the unit.

# 7. Connection diagram



# 8. Commissioning

## 8.1 Control chart



## 8.2 Description of the parameters

Parameters	Display	Explanation	Adjustment range
Sensors	SEn	Menu item for sensor configuration	S 1 ... S 12
Sensor	S 1 S 2 ...	Sensor configuration (line compensation) S1...S12	0.00 , 3-L , nc
Relay function	rEL	Zero signal current / operating current	r , R
Bus	bUS	Menu item for configuring the RS485 interface	485 , Mod
Protocol	PrE	Set ZIEHL / Modbus protocol	0 ... 96 1 ... 247
Address	Adr	Set the device address	0 ... 96 1 ... 247
Baud rate	bdr	Set the baud rate	48 = 4800 96 = 9600 192 = 19200
Parity	PAR	Set the parity bit	EuE = even odd = odd no = none

## 8.3 Display mode (last decimal point off)

In the display mode, the TR 1200 is in its normal state; here the temperature of the selected sensor is displayed. In addition, the error codes (e.g. Er 1) are also displayed.

Function key Set / Reset	<u>Press briefly:</u> Switches the sensor over
	<u>Press for &gt; 10 s:</u> Displays the software version (e.g. 000)
Function key Up / Down	<u>Press briefly:</u> Changes into the menu mode
	<u>Press for ≥ 2 s:</u> Displays MAX and MIN measurements, additionally pressing the Set key for ≥ 2s deletes the saved values

## 8.4 Menu mode (last decimal point on)

The menu mode is used to select the menu items. If no key is pressed for 30s, one automatically returns to the display mode.

Function key Set / Reset	<u>Press briefly:</u> Changes into the configuration mode
	<u>Press for ≥ 2 s:</u> Returns to the display mode (the most recently set values are then taken over)
Function key Up / Down	<u>Press briefly:</u> Select menu item; switches to the display mode



## 8.5 Configuration mode (last decimal point flashes)

The value of a parameter can be set in the configuration mode. The display continually alternates between the parameter name and the currently set value until the Up/Down key is pressed, which changes the value of the parameter. If no key is pressed for 2s, the display starts alternating.

If no key is pressed for 30s (simulation mode 15min), one automatically returns to the display mode (the most recently set value is taken over)

Function key Set / Reset	<u>Press briefly</u> : The settings are taken over; continue to next parameter. After the last parameter, change into menu mode
	<u>Press for <math>\geq 2</math> s</u> : Returns to display mode (except simulation mode), the most recently set values are taken over during this
Function key Up / Down	<u>Press short/long</u> : Changes the parameter value (fast/slow)

**Hint:** Pressing the Up and Down keys simultaneously sets the adjustable value to zero. If you keep the Up or Down key pressed while setting a value, the speed of the change in the display is accelerated.

## 8.6 2-wire technique line resistance compensation

Connect the sensor at terminals xT1 and xT3, xT2 has to be open.

To compensate the line resistance short-circuit the wires nearby the sensor and measure the line resistance.

We recommend using 2 or bettering 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)

## 8.7 Configuring sensors

Adjustment process:

<ul style="list-style-type: none"> <li>Select the menu item with the Up/Down key until ...</li> </ul>
⇒ Display 5E <sub>n</sub>
<ul style="list-style-type: none"> <li>Press the Set key</li> </ul>
⇒ Display 5 1 / 3-L (Sensor 1 / Connection type) flash alternately
<ul style="list-style-type: none"> <li>Use the Up and Down keys to set the connection type or line resistance.  <u>Sensor not connected</u>: Select nC  <u>3-conductor connection</u>: Select 3-L  <u>2-conductor connection</u>: 0.00 Perform a line compensation and adjust the line resistance</li> </ul>
<ul style="list-style-type: none"> <li>Press the Set key</li> </ul>
⇒ Display 5 2 / 3-L (Sensor 2 / Connection type) flash alternately
<ul style="list-style-type: none"> <li>Configure all 12 sensors in this manner.</li> </ul>

## 8.8 Configuring the relay

Adjustment process:

• Select the menu item with the Up/Down key until ...
⇒ Display <b>rEL.</b> (Relay function)
• Press the Set key
⇒ Display <b>rEL</b> / <b>r</b> (Relay function / Zero signal current) flash
• Use the Up and Down keys to select the relay function
• Press the Set key (exits the configuration mode)
⇒ Display <b>rEL.</b> (Relay function)

## 8.9 Configuring the RS485 interface

Adjustment process:

• Select the menu item with the Up/Down key until ...
⇒ Display <b>bU5.</b> (Bus)
• Press the Set key
⇒ Display <b>PrE</b> / <b>485</b> (Protocol / 485) flash alternately
• Set the desired protocol using the Up and Down keys
• Press the Set key
⇒ Display <b>Adr</b> / <b>0</b> (Device address / Value) flash alternately
• Set the desired device address using the Up and Down keys
• Press the Set key
⇒ Display <b>bDr</b> / <b>96</b> (Baud rate / Value) flash alternately
• Set the desired baud rate using the Up and Down keys
• Press the Set key
⇒ Display <b>PRr</b> / <b>EUE</b> (Parity / Value) flash alternately
• Set the desired parity bit using the Up and Down keys
• Press the Set key (exits the configuration mode)
⇒ Display <b>bU5.</b> (Bus)

**Note:** The set device address always applies for the transmission of Sensors 1...6.  
If at least one of the sensors 7...12 as is configured as 2- or 3-conductor  
(not „nc“), they will be transmitted with the set device address+1.

More information about Modbus configuration and programming can be found in  
Appendix 1 (Download from [www.ziehl.com](http://www.ziehl.com))

## 8.10 Simulation

A sensor can be selected and a temperature simulated here. All device functions operate as if this value is actually being measured. Error messages are only indicated with the LED and not in the display.

If no key is pressed for 15 minutes, the device automatically switches back to the display mode.

Adjustment process:

• Select the menu item with the Up/Down key until ...
⇒ Display <b>S.</b> (Simulation)
• Press the Set key
⇒ Display <b>S.</b> / <b>S I</b> (Simulation / Sensor) flash alternately
• Use the Up and Down keys to select the sensor function
• Press the Set key
⇒ Display <b>0</b> (Temperature)
• Simulate the desired temperature using the Up and Down keys
• Press the Set key (exits the simulation mode)
⇒ Display <b>S.</b> (Simulation)

## 8.11 Code lock

Here, the set parameters can be protected by activating a code lock. The device acknowledges an incorrect entry with **Err** (flashes three times).

Adjustment process:

• Select the menu item with the Up/Down key until ...
⇒ Display <b>Code</b> (Code lock)
• Press the Set key
⇒ Display <b>Pin</b> / <b>0</b> (Pin / Pin code) flash alternately
• Use the Up and Down keys to set the <b>saved</b> pin code ( <b>factory setting is 504</b> )
• Press the Set key
• Set the desired code block using the Up and Down keys: <ul style="list-style-type: none"><li>○ <b>off.</b> off, all parameters can be changed</li><li>○ <b>on</b> on, no parameters can be changed</li></ul>
• Press the Set key
⇒ Display <b>Pin</b> / <b>504</b> (Pin / Pin code) flash alternately
• Set the desired new pin code with the Up and Down keys (caution: write down the pin code)
• Press the Set key (exits code locking)
⇒ Code lock on, display <b>on</b> flashes three times
⇒ Code lock off, display <b>off</b> flashes three times
⇒ Display <b>Code</b> (Code lock)

## 8.12 Possible indications in display

### Display mode

Er 1 ... Er 9	Error messages (see 11. Error messages and measures)
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### Menu mode / Configuration mode

SEn.	Menu item sensor configuration
S 1 ... S 12	Sensors 1...12
3-L	3-conductor connection
nc	No sensor connected
rEL	Relay function
bUS.	Menu item for configuring the RS485 interface
Prt.	Protocol RS485 interface
485	RS485 protocol
Mod	Modbus protocol
Adr	Device address RS485 interface
bdr	Baud rate RS485 interface
PAR	Parity bit RS485 interface
Si	Simulation
Cod	Code lock
Pin	Pin code (factory setting 504)

## 9. Factory settings and software version

Press button "SET" for 10 s when switching on supply voltage for factory settings.

Menu mode	Parameter	Factory settings	My configurations
SEn.	S 1 (Sensor 1)	3-L	
	S 2 (Sensor 2)	3-L	
	S 3 (Sensor 3)	3-L	
	S 4 (Sensor 4)	3-L	
	S 5 (Sensor 5)	3-L	
	S 6 (Sensor 6)	3-L	
	S 7 (Sensor 7)	nc	
	S 8 (Sensor 8)	nc	
	S 9 (Sensor 9)	nc	
	S 10 (Sensor 10)	nc	
	S 11 (Sensor 11)	nc	
	S 12 (Sensor 12)	nc	
rEL.	rEL (Relay function)	r	
bUS.	Prb (Protocol)	485	
	Adr (Unit address)	0	
	bdr (Baud rate)	96	
	PAR (Parity bit)	EoE	
S <sub>i</sub>	S 1 (Sensor 1)	850	
	...		
	S 12 (Sensor 12)	850	
CodE	on / off	off	
	Pi n (PIN code)	504	

**Display of Software-Version:** Press "SET" for 10 s in display mode.

## 10. Maintenance and repair

The devices are maintenance-free. Only the manufacturer may accomplish repairs. We recommend an examination within the regular maintenance periods of the plant, in which the equipment is installed.

## 11. Trouble shooting

Error code	Cause	Remedy
-EE	Under range $15 \Omega < R < 18,39 \Omega$	check sensor and line resistance compensation
EEE	Over range $390,26 \Omega < R < 400 \Omega$	check sensor and line resistance compensation
Er1	Sensor or line short circuit LED error illuminates, LED of the corresponding sensor flashes	check sensors/wires/terminals
Er2	Sensor or line interruption LED error illuminates, LED of the corresponding sensor flashes	check sensors/wires/terminals
Er8	Internal device error Malfunction of the device	Switch unit off and back on. If the error continues to appear, the unit must be returned to the factory for repair.
Er9	Invalid parameter	Press button "SET" for 10 s when switching on supply voltage for factory settings.
Wrong temperature values	Sensors with 3-wire technique interchanged	Check sensors with 3-wire technique. Terminals of sensor 1...6 are not compatible to terminals sensor 7...12
Parameter configuration not allowed	Code lock active	<p>The Code-lock can be activated as a protection against manipulation of the settings. The user can change the PIN-Code.</p> <p><u>You have forgotten the PIN? -&gt; Make a code-reset:</u></p> <ul style="list-style-type: none"> <li>▪ press button "SET" for 2 s when switching on supply voltage</li> </ul> <p>⇒ display changes  <span style="border: 1px solid black; padding: 2px;">888</span> - <span style="border: 1px solid black; padding: 2px;">Cod</span> - <span style="border: 1px solid black; padding: 2px;">oFF</span> - <span style="border: 1px solid black; padding: 2px;">888</span></p> <p>⇒ Release button „SET“            Code = OFF, PIN = 504</p>

## 12. Technical Data

### Auxiliary supply Us:

Rated supply voltage

AC/DC 24-240 V, 0/45...65 Hz, < 5VA

DC: 20,4...297 V, AC: 20,4...264 V

### Relay output:

Switching voltage

1 Wechsler (CO)

max. AC 415 V

Switching current

max. 5 A

Switching capacity

max. 2000 VA (ohmic load)

max.120 W at DC 24 V

Reduction factor for  $\cos \varphi$  0,7  
 UL electrical ratings:  
 0,5  
 250 V ac, 3 A, general use  
 240 V ac, 1/4 hp, 2.9 FLA  
 120 V ac, 1/10 hp, 3.0 FLA  
 C 300  
 D300 1 A 240 VAC

Nominal operational current  $I_e$ :  
 AC15  
 DC13  
 $I_e = 1 \text{ A}$   $U_e = 400 \text{ V}$   
 $I_e = 2 \text{ A}$   $U_e = 250 \text{ V}$   
 $I_e = 2 \text{ A}$   $U_e = 24 \text{ V}$   
 $I_e = 0,2 \text{ A}$   $U_e = 125 \text{ V}$   
 $I_e = 0,1 \text{ A}$   $U_e = 250 \text{ V}$

Recommended fuses for contact  
 Expected contact life mechanical  
 Expected contact life electrical  
 T 3,15 A (gL)  
 $1 \times 10^7$  operations  
 $1 \times 10^5$  operations at AC 250 V / 5 A  
 $2 \times 10^5$  operations at AC 250 V / 3 A  
 $6 \times 10^5$  operations at AC 250 V / 1 A

Temperature measurement:

Measuring time sensor resistance 0,25...3s (depending on number of sensors)  
 Measuring time line resistance 0,25...30s (each cycle of a sensor)  
 Measuring range -199°...850°C  
 Resolution 1°C

Sensor connection:

12 x Pt 100 according EN 60751

Sensor	temperature range °C		Short circuit (Ohm)	Interruption (Ohm)	Pt 100 + R <sub>L</sub> (Ohm)
	min	max	<	>	max
Pt 100	-199	860	15	400	500

Measuring accuracy  $\pm 0,5 \%$  of measuring value  $\pm 1 \text{ K}$   
 Sensor current  $\leq 0,8 \text{ mA}$   
 Temperature drift  $< 0,04 \text{ °C/K}$

RS485 interface

Address of unit 0...96  
 Baud rate 4800, 9600, 19200 Baud  
 Parity N, O, E (no, uneven, even)  
 Cable length 1000m with 19200 Baud  
 Time end request – start answer 6...10ms (ZIEHL RS485 protocol)

Test conditions

EN 61010  
 Rated impulse voltage 4000 V  
 Overvoltage category III  
 Contamination level 2  
 Rated insulation voltage  $U_i$  300 V  
 on-period 100 %  
 Ambient temperature operational -20 °C ... +65 °C  
 EN 60 068-2-2 dry heat  
 Galvanic isolation between auxiliary voltages – Sensor ports DC 3820 V  
 No galvanic isolation between RS485 interface – Sensor ports  
 EMC test conditions EN 61326-1  
 EMC emission EN 61000-4-3

EMC immunity  
Electrical fast transient (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 +/-1 kV

pulse 1,2/50  $\mu$ s (8/20  $\mu$ s)

Electrostatic discharge

IEC 61000-4-2 +/-4 kV contact, +/- 8kV air

### Housing

Dimensions (W x H x D)

Design V8, distribution cabinet mounting

140 x 90 x 58 mm

Mounting height/width

55 mm / 8 TE

Wire connection, single wire

each 1 x 1.5 mm<sup>2</sup>

Stranded wire with insulated ferrules

each 1 x 1,0 mm<sup>2</sup>

Torque of screw

0,5 Nm (3,6 lb.in)

Protection class housing / terminals

IP 30 / IP 20

Fitting position

any

Installation

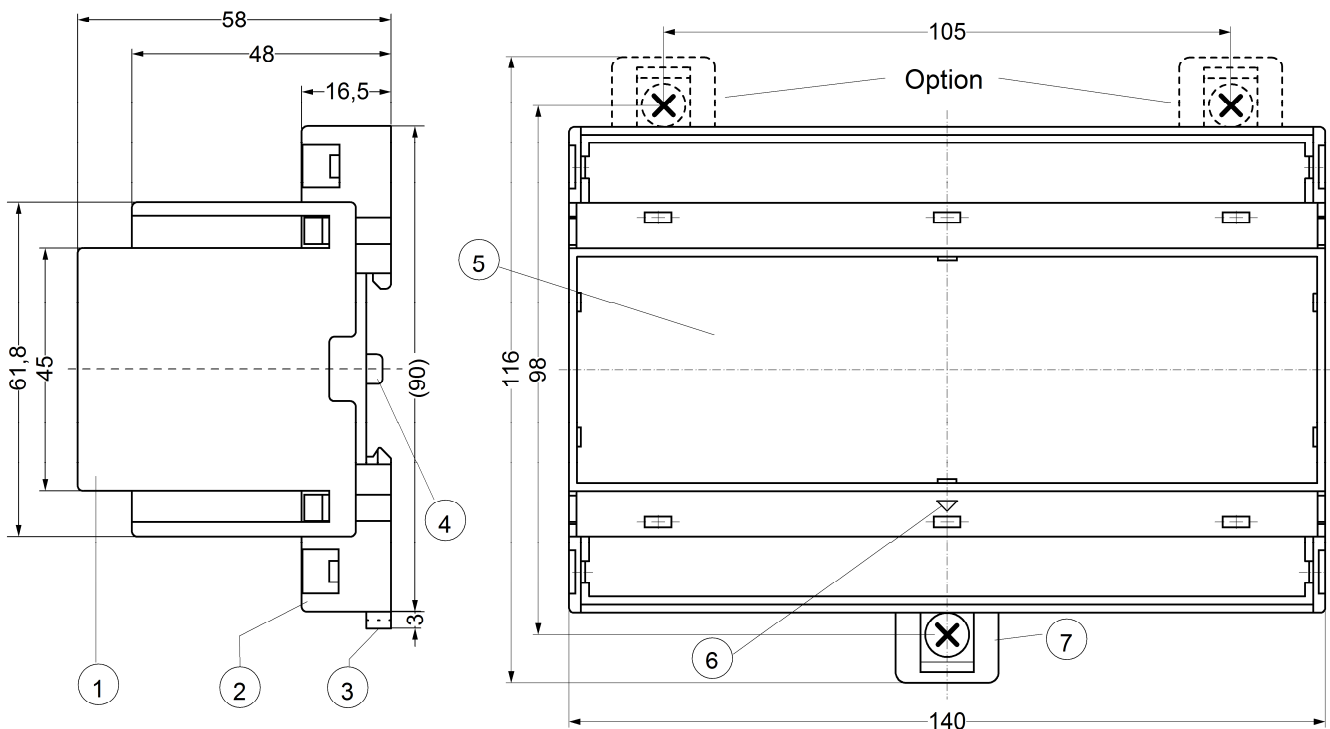
Snap mounting on mounting rail 35 mm according to EN 60 715 or with screws M 4 (additional bar in scope of delivery

Weight

app. 350 g

Subject to technical changes

### 13. Housing design 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  $\varnothing$  4,2 mm / for fixing to wall with screws,  $\varnothing$  4,2 mm.



## 14. RS485 interface - Protocols

The TR 1200 optionally supports the Modbus or the ZIEHL RS485 protocol. Device data and measurements can be read out with both protocols; in addition, the TR 1200 can be configured using the Modbus protocol.

The protocol is selected in the menu item `bus`.  
(see [8.9 Configuring RS485 interface](#))

### 14.1 Modbus protocol

You can find documentation on the Modbus protocol in the Internet at [www.ziehl.com](http://www.ziehl.com) TR 1200 – Modbus Appendix

## 14.2 RS485 Protocol

Depending on the configured data mode the TR 1200 transmits data with ZIEHL TR600 protocol in data mode 0 or with TR 1200 protocol in data mode 4.

Transmission format:	ASCII
Compatibility:	TR 600 RS485 (Modus 0)
Baud rate:	9600 (default), 4800, 19200
Data bits:	8
Stop bit:	1
Parity:	even (default), odd, no
Separated by:	";" (ASCII)

### Master requests data from TR1200:

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

Start of message:	s (ASCII) or S (ASCII) or STX (0x02)	1 Byte
Address of unit	0...99 (ASCII)	2 Byte
Read command:	r (ASCII) or R (ASCII)	1 Byte
Data mode:	0...9 (ASCII)	1 Byte
Block check (BCC):	EXOR of all transmitted bytes	3 Byte
Carriage Return (CR):	0x0D	1 Byte
Line Feed (LF):	0x0A	1 Byte
		<b>10 Byte</b>

### TR 1200 sends the requested data:

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

Start of message:	s (ASCII) or S (ASCII) or STX (0x02) (same as request)	1 Byte
Type of unit:	TR600 (ASCII) or TR120 (ASCII)	5 Byte + ";"
Address of unit::	0...99 (ASCII)	2 Byte + ";"
Data mode:	0...9 (ASCII)	1 Byte + ";"
Value sensor 1 (7):	-199...+850 (ASCII) *	4 Byte + ";"
Value sensor 2 (8):	-199...+850 (ASCII) *	4 Byte + ";"
Value sensor 3 (9):	-199...+850 (ASCII) *	4 Byte + ";"
Value sensor 4 (10):	-199...+850 (ASCII) *	4 Byte + ";"
Value sensor 5 (11):	-199...+850 (ASCII) *	4 Byte + ";"
Value sensor 6 (12):	-199...+850 (ASCII) *	4 Byte + ";"
Alarm 1:	0 (ASCII)	1 Byte + ";"
Alarm 2:	0 (ASCII)	1 Byte + ";"
Alarm 3:	0 (ASCII)	1 Byte + ";"
Alarm 4:	0 (ASCII)	1 Byte + ";"
Alarm 5:	0 (ASCII)	1 Byte + ";"
Alarm 6:	0 (ASCII)	1 Byte + ";"
Alarm 7:	0..1 (ASCII)	1 Byte + ";"
Internal error:	0...99 (ASCII) *2	2 Byte + ";"
Block check (BCC):	EXOR of all transmitted bytes	3 Byte
Carriage Return (CR):	0x0D	1 Byte
Line Feed (LF):	0x0A	1 Byte
		<b>64 Byte</b>

\* Sensor not connected, data "+980"

Sensor short circuit, data "-999"

Sensor interruption, data "+999"

\*2 01=EEPROM error, 02=parameter error, 03=ADC error

Parameter		Answer of TR unit																										
Address of unit	Data mode	Request/Transmission	Start of message	Type of unit	Unit number	Data mode												Alarm							Internal error	Block check	CR	LF
						Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7	Sensor 8	Sensor 9	Sensor 10	Sensor 11	Sensor 12	Alarm 1	Alarm 2	Alarm 3	Alarm 4	Alarm 5	Alarm 6	Alarm 7				
0	0	3s	x	TR600	x	x	x	x	x	x	x	x						0	0	0	0	0	0	x	x	x	x	x
1	0	x	x	TR600	x	x	x	x	x	x	x	x						0	0	0	0	0	0	x	x	x	x	x
	4	x	x	TR120	x	x	x	x	x	x	x	x	x	x	x	x	x							x	x	x	x	x
2	0	x	x	TR600	x	x							x	x	x	x	x	0	0	0	0	0	0	x	x	x	x	x
	4	x	x	TR120	x	x	x	x	x	x	x	x	x	x	x	x	x							x	x	x	x	x
3	0	x	x	TR600	x	x	x	x	x	x	x	x						0	0	0	0	0	0	x	x	x	x	x
	4	x	x	TR120	x	x	x	x	x	x	x	x	x	x	x	x	x							x	x	x	x	x
.																												
.																												
.																												
94	x	3s	x	TR600	x	x	x	x	x	x	x	x						0	0	0	0	0	0	x	x	x	x	x
95*	x	3s	x	TR600	x	x							x	x	x	x	x	0	0	0	0	0	0	x	x	x	x	x
96	x	3s	x	TR120	x	x	x	x	x	x	x	x	x	x	x	x	x							x	x	x	x	x

\*when unit address 94 is configured, data of sensor 1...6 will be send in 3s under unit address 94 and 3s later data of sensor 7...12 will be send under unit address 95 (independent of sensor configuration „nc“).

**Hints:**

The configured unit address is permanent for transmitting data of sensor 1...6.  
 If one of the sensors 7...12 is configured, data of these sensors will be transmitted with configured unit address+1.  
 In the case of unit address 0, 94 und 96 no request must be send.  
 Type of unit TR600 = 64 Byte, Type of unit TR120 = 82 Byte

**Example:**

Request: `s01r0048\r\n` Master sends data request

<code>&lt;End of message&gt;</code>	<code>&lt;CR&gt; &lt;LF&gt;</code>
<code>&lt;Block check&gt;</code>	EXOR of all transmitted bytes
<code>&lt;data mode&gt;</code>	0 (Modus 0)
<code>&lt;Read command&gt;</code>	r (read)
<code>&lt;Address of unit&gt;</code>	01...99 (ASCII)
<code>&lt;start of message&gt;</code>	s, S or <STX>

Block sum:  $s(115) \text{ EXOR } 0(48) \text{ EXOR } 1(49) \text{ EXOR } r(114) \text{ EXOR } 0(48) = 048$   
 The values in brackets correspond with the ASCII-code of the sign.

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

<code>&lt;Data mode&gt;</code>	0
<code>&lt;Address of unit&gt;</code>	01
<code>&lt; Type of unit &gt;</code>	TR600
<code>&lt; Start of message &gt;</code>	s
<code>&lt;Temp. Sensors&gt;</code>	0154
<code>&lt;Alarm 1...7&gt;</code>	055
<code>&lt; Internal error &gt;</code>	268
<code>&lt; Block sum &gt;</code>	999
<code>&lt;End of message&gt;</code>	980

## 15. Appendix SIPROTEC configuration

The sensor connections and the configuration of the TR 1200 for evaluation on a Siemens SIPROTEC are described below. While doing so, the Thermo box connection type is differentiated.

### 6 RTD Simplex (1x TR 1200 works like 1x TR 600) = Factory setting

- ⇒ Connect Sensors 1...6
- ⇒ Configure Sensors 1...6 in menu item **SEn** depending on the connection (configure sensors that are not connected as "nc")
- ⇒ Configure Sensors 7...12 in menu item **SEn** as "nc"
- ⇒ Set device address in menu item **bUS** → **Adr** to 0

The TR 1200 transmits the data from Sensors 1...6 cyclically every 3s under device address 0.

### 6 RTD Semiduplex (1x TR 1200 works like 1x TR 600)

- ⇒ Connect Sensors 1...6
- ⇒ Configure Sensors 1...6 in menu item **SEn** depending on the connection (configure sensors that are not connected as "nc")
- ⇒ Configure Sensors 7...12 in menu item **SEn** as "nc"
- ⇒ Set device address in menu item **bUS** → **Adr** to 1

The TR 1200 transmits the data from Sensor 1...6 on request (see example above) with device address 1 or 2. The TR 1200 works like 1x TR 600.

### 12 RTD Semiduplex (1x TR 1200 works like 2x TR 600)

- ⇒ Connect Sensors 1...12
- ⇒ Configure Sensors 1...12 in menu item **SEn** depending on the connection
- ⇒ Set device address in menu item **bUS** → **Adr** to 1

The TR 1200 transmits the data from Sensors 1...6 on request (see example above) with device address 1 and the data from Sensors 7...12 on request with device address 2.