

# Temperature-Relays

PTC Resistor-Relays Type MS	6
Temperature-Range 60...180°C Fixed switching point Particularly suitable for monitoring of Electromotors, Transformers and Bearings	
PTC-Resistor Temperature Sensors (Thermistors) MINIKA®	24
Temperature-Relays for Pt 100-Sensors (RTD) Type TR	29
Temperature-Range -200...850°C Adjustable switching point For use in the manufacture of chemical apparatus, plastic machinery, for motor protection in high-power generators and high-voltage motors	
Safety Temperature Limiter	55
Pt 100-Sensors (RTD)	57
Temperature-Relays for Thermocouples Type TR	61
Temperature-Range -170...+1820°C Adjustable switching point for high-temperature monitoring functions	
Measuring-Transducers and Measuring-Point change-over see products groups 4 and 5	

# PTC-Resistor-Relays

## General

ZIEHL PTC resistor relays and ZIEHL PTC resistors according to DIN 44 081 and DIN 44 082 are a reliable protection from thermal overloading. Together they result in a fast and effective protective system for i.e. engines and transformers. ZIEHL PTC relays offer the following advantages:

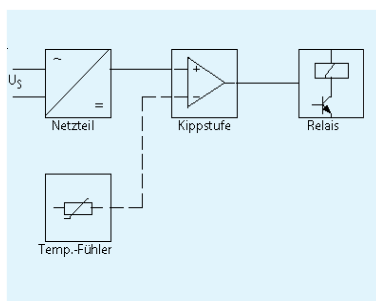
- Sensors and relays can be used in many combination

- fixed response temperatures of the sensors of 60... 180 °C
- reliable monitoring of sensor line sensors
- 1 - 6 PTC resistor connectable
- monitoring of normally closed contacts possible
- housings for the fast assembly standard rail or with screws M4
- protection against accidental contact according to VBG 4, VDE 106 part of 100

ZIEHL PTC resistor relays are routine tested and meet the following standards for PTC resistor relays: VDE 0660, VDE 0160, IEC 337-1, CENELEC hp 420 i

Type	housing	connectable PTC-resistors	potential-free relay contacts	reclosing-lock	approvals/remarks
MS220K	K	1...6	1 CO, 2 CO	-	Low-Cost-Version
MSR220K	K	1...6	1 CO, 2 CO	x	Low-Cost-Version
MS220KA	K	1...6	1 CO, 2 CO	-	Short-circuit monitoring, ATEX-Approval
MSR220KA	K	1...6	1 CO, 2 CO	x	Short-circuit monitoring, ATEX-Approval
MS220VA	V2	1...6	1 CO	-	Short-circuit monitoring, ATEX-Approval
MSR220VA	V2	1...6	1 CO	x	Short-circuit monitoring, ATEX-Approval
MS220Vi	V4	1...6	2 CO	-	intrinsic safe sensor-circuit, Ex II (1) GD (Ex ia) II C (Ex ia D)
MSR220Vi	V4	1...6	2 CO	x	intrinsic safe sensor-circuit, Ex II (1) GD (Ex ia) II C (Ex ia D)
MS220C	C	1...6	1 CO	-	compact device, GL-Zulassung
MS220K2	K	2 x 1...6	2 x 1 CO	-	2 separate channels
MSR220K2	K	2 x 1...6	2 x 1CO	x	2 separate channels, reclosing-lock
MSR220K6	K	6 x 1...6	1 CO	x	6 channels, common output
MSR820V	V4	8 x 1...6	2 CO	x	8 channels, common output, LED-display for responding sensor-circuit
MS40ZT	S12	1...6	1 CO	-	pulse input for monitoring movement of elevators
MSF220K	K	2 x 1...6	1 CO, 1 NO	-	2 separate channels, test-button, monitoring of dry transformers
MSF220SE	S12	2 x 1...6	2x1 CO	-	2 separate channels, timing-relay, monitoring of dry transformers
MSF220V	V4	3 x 1...6	2x1 CO, 1 NO	-	3 separate channels, fan-control, monitoring of dry transformers
MSF220VL	V4	4 x 1...6	4 x 1CO	-	4 separate channels, fan-control, core monitoring of dry transformers
TS1000	V8	3 x 1...6	3x1 CO, 6x1 NO	-	protection of dry transformers with integrated monitoring of fan-motors
MS-Tester	K	-	-	-	device for testing PTC-relays

## Function



The electronics monitors the sensor circuit with a continuous current. In the cold state the resistance is  $<250 \Omega$  per sensor and the relay signals o.k. The resistance of the sensors rise rapidly when reaching nominal response temperature (NRT). The relay switches at values

between  $1650 \Omega$ ...  $4000 \Omega$ . The relay switches back at values  $\leq 1650 \Omega$ .

PTC relays type MS switch back automatically. PTC relays type MSR store the switching until a RESET (integrated reset-button, external reset with contact at terminal or switch-off of power-supply). PTC-relays type MSM have a power-fail proof reclosing lock.

## Application

PTC relays in combination with PTC resistors also effectively monitor the temperatures of

- bearings in equipment and machinery
- coolants, i.e. in transformers
- airflows and gases
- oil and other liquid media

PTC resistor sensors are suitable for the installation into windings of electrical machines. They protect against to high temperatures in case of: blocking rotors, hard start, countercurrent operation, undervoltage and phase failure, with increased ambient temperature and hindered cooling.

# PTC-Resistor-Relay Type MS(R)220K

## Single PTC-Circuit

### MS220K



The MS220K is a particularly economical standard design in a 22,5 mm wide housing with vertically arranged terminals. Each terminal remains accessible even if all others are already occupied.

- 1 PTC resistor set 1... 6 PTC resistors
- output relay with 1 or 2 change-over (co) contacts
- 2 LEDs for ON and ALARM
- K-type housing, vertically arranged terminals, 22,5 mm wide

- assembly on 35 mm DIN rail or with 2 screws M4 (option)
- UL Recognized Component
- Option:

#### Part numbers:

1 CO	2 CO	
<b>T221745</b>	<b>T221765</b>	AC 220-240 V
<b>T221741</b>	<b>T221761</b>	AC/DC 24 V
1 CO / 1 NO		
<b>T221749</b>		AC/DC 24-240 V

### MSR220K

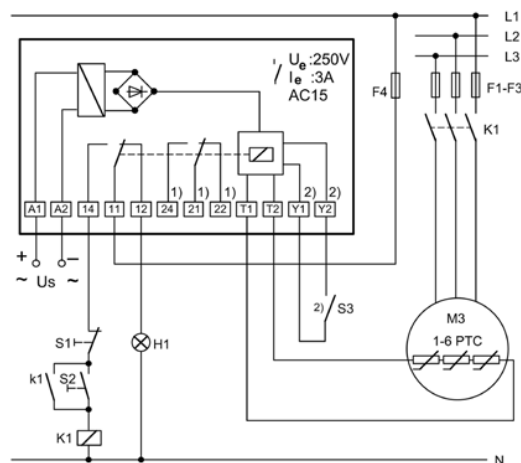


Same execution as MS220K, additionally with electronic reclosing lock. A switching is stored until a RESET.

- electronic reclosing lock (disconnectable)
- integrated RESET-button
- link for external RESET
- automatic RESET at voltage recovery
- LEDs for power ON (green) and alarm (red) in reset-button
- UL Recognized Component
- Option: other supply-voltages

#### Part numbers:

2 CO	
<b>T221775</b>	AC 220-240 V
<b>T221771</b>	AC/DC 24 V



Us = supply voltage  
S1 = pushbutton OFF  
S2 = pushbutton ON  
S3 = external reset  
H1 = trip alarm

F1 - F4 = fuses  
K1 = contactor  
1) only versions with 2xCO  
2) only MSR

### Technical Data

Rated supply voltage  $U_s$

AC 220 - 240 V,  $\pm 10\%$ , 50/60 Hz,  $\leq 2$  VA  
AC/DC 24 V, AC  $\pm 10\%$  DC 21-30 V  $< 2$  VA, without potential separation  
AC/DC 24-240 V, AC 14-264 V, DC 20-297 V  $< 2$  VA  
1... 6 PTC according to DIN 44 081 or 44 082  $< 4000 \Omega$   
1 or 2 change-over contacts (co)  
type 2 see "general technical information"  
see "general technical information"  
-20...+55 °C

connectable PTC resistors  
switching point  
output relay  
type of contact  
test conditions  
rated ambient temperature range  
dimensions (h x w x d) attachment

protection housing / terminals  
weight

design K: 75 x 22.5 x 110 [ mm ]  
on 35 mm DIN rail according to DIN EN 50 022  
or with screws M4 (option)  
IP 30 / IP 20  
approx. 150 g

# PTC-Resistor-Relay Type MS(R)220KA

## Single PTC-Circuit, ATEX-Approval according to Directive 2014/34/EU

### MS220KA



PTC-relay for the application as a protection device against inadmissible heating up at electrical equipment in areas with explosive gases (zones 1 and 2) and areas with combustible dust (21 and 22), e.g. for direct temperature-monitoring of explosion-proof motors EEx e and EEx d.

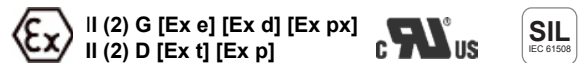
Vertically arranged terminals. Each terminal remains accessible even if all others are already occupied.

- ATEX-approval according to directive 2014/34/EU
- SIL 1 according to IEC 61508
- PL c according to ISO 13849

- 1 PTC-resistor (thermistor) set, each 1...6 PTC-sensors
- short-circuit monitoring of sensor-circuit
- output-relay with 1 or 2 change-over contacts (co)
- 2 LEDs for ON and ALARM
- K-housing, vertically arranged terminals housing 22.5 mm wide
- assembly on DIN-rail or with 2 screws M4 (option)
- UL Recognized Component
- Option:
  - other supply-voltages

#### Part numbers:

1 change-over	2 change-over	
<b>T222445</b>	<b>T222455</b>	AC 220-240 V
	<b>T222451</b>	AC/DC 24 V



### MSR220KA

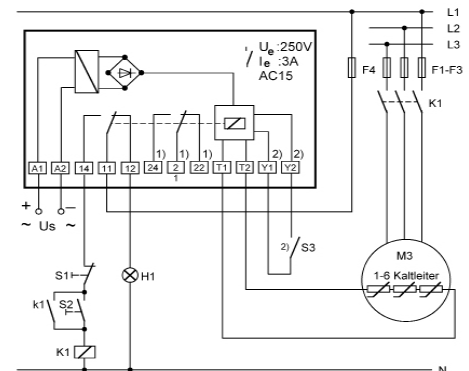
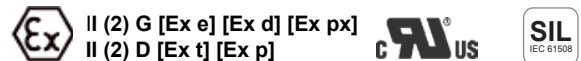


Same execution as MS220KA, additionally with electronic reclosing lock. An alarm is stored until a reset is made.

- ATEX-approval according to directive 2014/34/EU
- SIL 1 according to IEC 61508
- PL c according to ISO 13849
- electronic reclosing lock (disconnectable)
- integrated RESET-button
- link for external reset
- automatic reset at voltage recovery
- LEDs for power-on (green) and alarm (red) in reset-button
- UL Recognized Component
- Option:
  - other supply-voltages

#### Part numbers:

	2 change-over	
	<b>T222475</b>	AC 220-240 V
	<b>T222471</b>	AC/DC 24 V
	<b>T222473</b>	AC 110-120 V
(without cURus)	<b>T222476</b>	AC 380-415 V



Us = supply voltage  
S1 = pushbutton OFF  
S2 = pushbutton ON  
S3 = external reset  
H1 = trip alarm

F1 - F4 = fuses  
K1 = contactor  
1) only version with 2xCO  
2) only MSR

### Technical Data

Rated supply-voltage  $U_s$

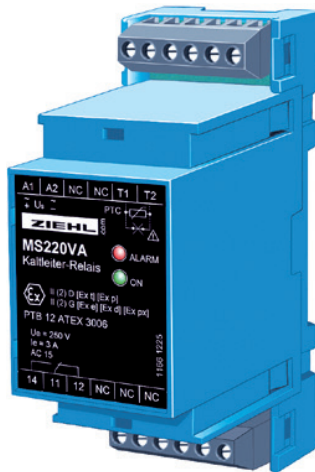
connectable PTC-resistors  
switching point  
output relay  
type of contact  
test conditions  
rated ambient temperature  
dimensions (h x w x d)  
attachment  
protection housing/terminals  
weight

AC 220 - 240 V  $\pm 10\%$  50/60 Hz  $\leq 2$  VA  
AC/DC 24 V, AC  $\pm 10\%$  DC 21- 30 V  $< 2$  VA, without potential separation  
1...6 in series according to DIN 44081 or 44082  
 $< 4000 \Omega$   
1 or 2 change-over contacts (co)  
type 2 see "general technical information"  
see "general technical information"  
-20...+55 °C  
design K: 75 x 22,5 x 110 [mm]  
on 35 mm DIN-rail or with 2 screws M4 (option)  
IP 30 / IP 20  
app. 150 g

# PTC-Resistor-Relay Type MS(R)220VA

Single PTC-Circuit, ATEX-Approval according to Directive 2014/34/EU

## MS220VA



PTC-relay for the application as a protection device against inadmissible heating up at electrical equipment in areas with explosive gases (zones 1 and 2) and areas with combustible dust (21 and 22), e.g. for direct temperature-monitoring of explosion-proof motors EEx e and EEx d.

This compact version is especially suitable for mounting in fuse-boxes or power-distribution panels.

- ATEX-approval according to directive 2014/34/EU
- SIL 1 nach IEC 61508
- PL c nach ISO 13849

- 1 PTC-resistor (thermistor) set, each 1...6 PTC-sensors
- short-circuit monitoring of sensor-circuit
- output-relay with 1 change-over contact (co)
- 2 LEDs for ON and ALARM
- housing for mounting in fuse-boxes
- mounting height 55 mm, 35 mm wide
- assembly on DIN-rail or with 2 screws M4
- UL Recognized Component
- Option:
- - other supply-voltages



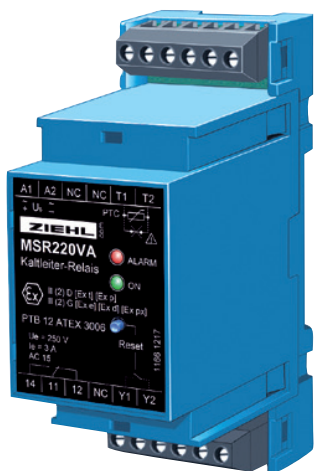
II (2) G [Ex e] [Ex d] [Ex px]  
II (2) D [Ex t] [Ex p]



**Part number:**  
**T222415**

AC 220-240 V

## MSR220VA



Same execution as MS220VA, additionally with electronic reclosing lock. An alarm is stored until a reset is made.

- ATEX-approval according to directive 2014/34/EU
- SIL 1 nach IEC 61508
- PL c nach ISO 13849
- electronic reclosing lock (disconnectable)
- integrated RESET-button
- link for external reset
- automatic reset at voltage recovery
- UL Recognized Component
- Option:
- - other supply-voltages

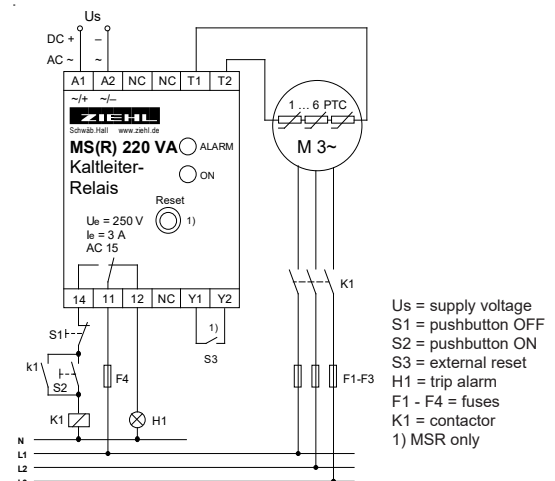


II (2) G [Ex e] [Ex d] [Ex px]  
II (2) D [Ex t] [Ex p]



**Part numbers:**  
**T222435**  
**T222431**

AC 220-240 V  
AC/DC 24 V



## Technical Data

Rated supply-voltage  $U_s$

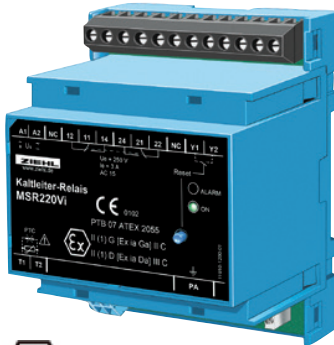
connectable PTC-resistors  
switching point  
output relay  
type of contact  
test conditions  
rated ambient temperature  
dimensions (h x w x d)  
attachment  
protection housing/terminals  
weight

AC 220 - 240 V  $\pm 10\%$  50/60 Hz  $\leq 2$  VA  
AC/DC 24 V, AC  $\pm 10\%$  DC 21- 30 V  $< 2$  VA, without potential separation  
1...6 in series according to DIN 44081 or 44082  
 $< 4000 \Omega$   
1 change-over contact (co)  
type 2 see "general technical information"  
see "general technical information"  
-20...+55 °C  
design V2: 90 x 35 x 58 [mm]  
on 35 mm DIN-rail or with 2 screws M4  
IP 30 / IP 20  
app. 120 g

# PTC-Resistor-Relay Type MSR220Vi

Atex-Approval according to Directive 2014/34/EU, intrinsic safe input

## MSR220Vi



II(1)GD [Ex ia] IIC [Ex iaD]

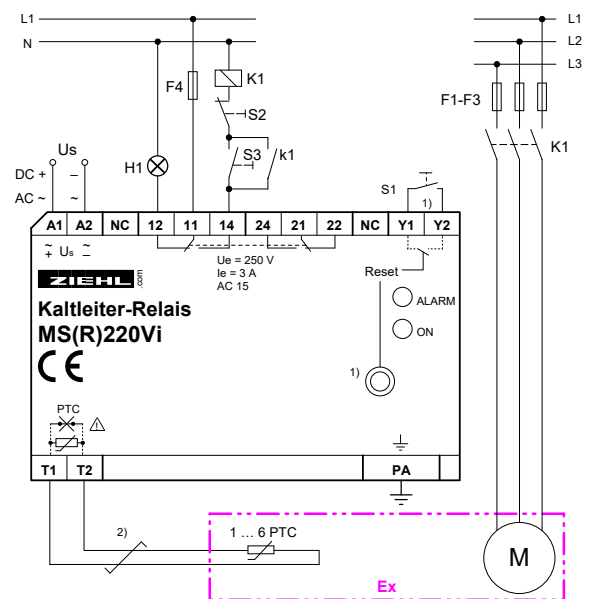
### Part numbers:

**T222195** AC 220-240 V  
**T222191** AC/DC 24 V

PTC-relay for the application as a protection device against inadmissible heating up at electrical equipment in areas with explosive gases (zones 0, 1 and 2) and in areas with combustible dust (zones 20, 21 and 22), e.g. for direct monitoring in explosion-protected areas where intrinsic safety class "i" is afforded.

PTC-Sensors (Thermistors) of intrinsic safety class "i" can be connected directly. The sensors may be placed in the potentially explosive atmosphere, e.g. for mechanical explosion-protection at bearings. The relay itself may not be installed in the potentially explosive atmospheres.

- Connection for temperature sensor with intrinsic safety ignition protection type Ex ia IIC and Ex iaD
- ATEX-approval according to directive 2014/34/EU
- Safety Integrity Level SIL 1
- 1 PTC-resistor set (thermistors), each 1...6 PTC
- Short-circuit monitoring of sensor-circuit
- Electronic reclosing lock (disconnectable)
- Integrated RESET-button
- Link for external reset
- Automatic reset at voltage recovery
- Output-relay with 2 change-over contacts
- LEDs for ON and ALARM
- Housing for mounting in switchgear-cabinet, 70 mm wide, mounting height 55 mm
- Assembly on DIN-rail 35 mm or screws M4



Ex = area of potentially explosive atmosphere  
 PTC = Thermistor sensor  
 Us = supply voltage  
 S1 = external reset  
 S2 = pushbutton OFF  
 S3 = pushbutton ON  
 H1 = Trip alarm

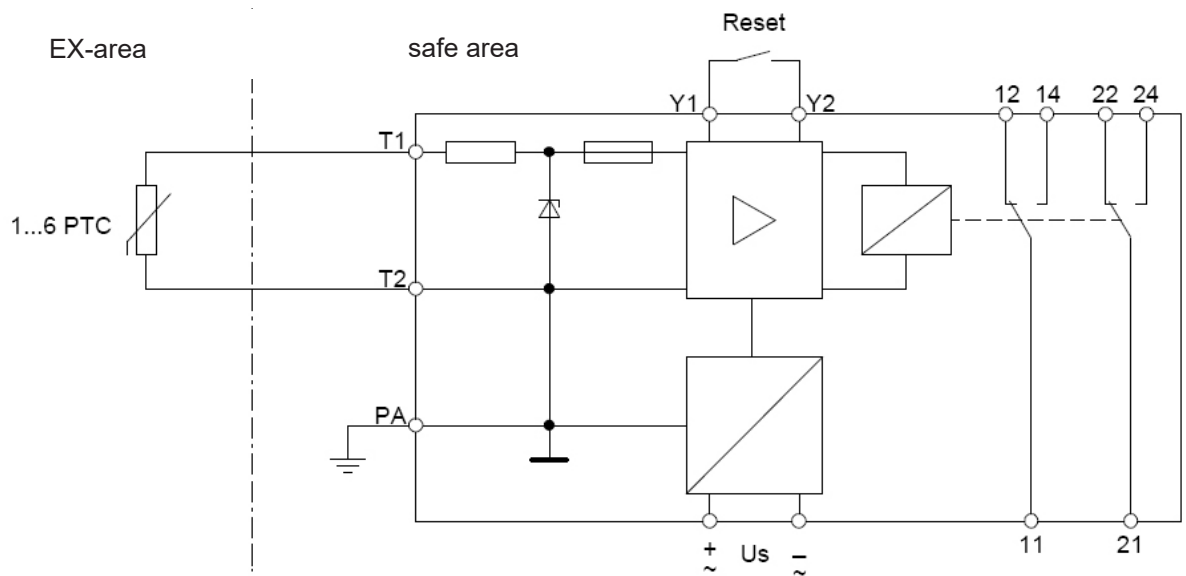
F1-F4 = fuses  
 K1 = contactor  
 1) only MSR  
 2) twisted lines



Technical Data

Rated supply-voltage $U_s$	AC 220 - 240 V $\pm$ 10 % 50/60 Hz $\leq$ 2 VA AC/DC 24 V, AC $\pm$ 10 % DC 21- 30 V $<$ 2 VA, without potential separation
Connectable PTC-resistors Switching point	1...6 in series according to DIN 44081 or 44082 $<$ 4000 $\Omega$
Output relay Type of contact	2 change-over contacts (co) type 2, see "general technical information"
Test conditions Rated ambient temp. range	see "general technical information" -20...+60 °C
Dimensions (H x W x D) Attachment Protection housing/terminals Weight	Design V4: 90 x 70 x 58 mm, mounting height 55 mm on 35 mm rail according to EN 60 715 or screws M4 IP 30 / IP 20 app. 180 g

1



# PTC-Resistor-Relay Type MS220C

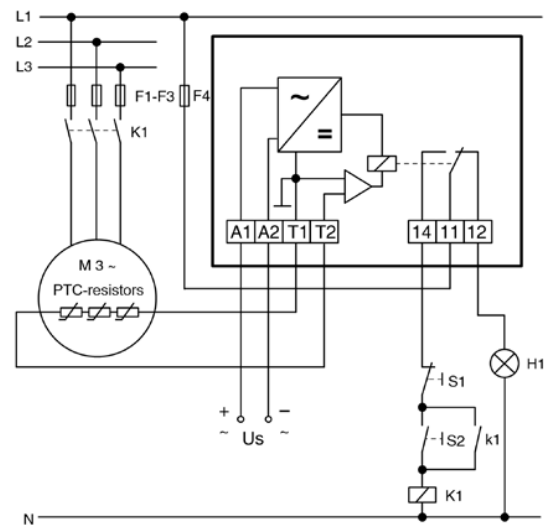
## Single PTC-Circuit

### MS220C



This compact device is the smallest version of all our PTC-resistor relays:

- terminals outside
- protection terminals IP 20
- Relays 1 change-over contact (co)
- AC 220 - 240 V



Us = Anschlussspannung  
S1 = Aus-Taster  
S2 = Ein-Taster  
H1 = Meldelampe Störung  
F1-F4 = Sicherungen  
K1 = Motorschutz

Us = supply voltage  
S1 = pushbutton OFF  
S2 = pushbutton ON  
H1 = trip alarm  
F1-F4 = fuse  
K1 = contactor

### Part numbers:

**T221804** AC 220-240 V  
**T221830** AC/DC 24 V

### Technical Data

Rated supply voltage  $U_s$

AC 220-240 V  $\pm 10\%$ , 50/60 Hz, 2 VA  
AC/DC 24 V, AC  $+10/-15\%$ , DC  $+25/-20\%$ ,  
< 1 W, < 2 VA, without potential separation

connectable PTC resistors  
switching point

1... 6 PTC according to DIN 44 081 or 44 082  
<4000  $\Omega$

output relay  
type of contact

1 change-over contact (co)  
type 2 see "general technical information"

test conditions  
rated ambient temperature  
range

see "general technical information"  
-20...+55  $^{\circ}\text{C}$

dimensions (h x w x d) attach-  
ment

design C: 72 x 33 x 60 [ mm ]  
on 35 mm of DIN rail according to EN 60 715  
or with screws M4

protection housing / terminals  
weight

IP 30 / IP 20  
approx. 120 g



# PTC-Resistor-Relay Type MS220C

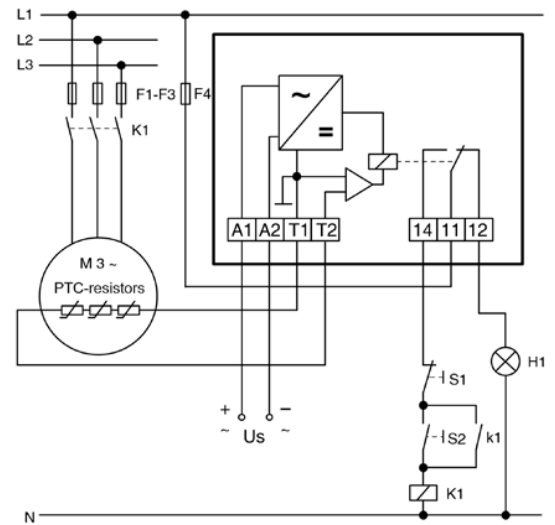
Single PTC-Circuit, Supply Voltage AC/DC 24 - 240 V

MS220C



This compact device is the smallest version of all our PTC-resistor relays:

- terminals outside
- protection terminals IP 20
- Relays 1 change-over contact (co)



Us = Anschlussspannung  
S1 = Aus-Taster  
S2 = Ein-Taster  
H1 = Meldelampe Störung  
F1-F4 = Sicherungen  
K1 = Motorschütz

Us = supply voltage  
S1 = pushbutton OFF  
S2 = pushbutton ON  
H1 = trip alarm  
F1-F4 = fuse  
K1 = contactor

Part number:

**T221821** AC/DC 24-240 V

## Technical Data

Rated supply voltage  $U_s$

AC/DC 24-240 V, AC 20-264 V, DC 20-297 V,  
< 1 W, < 4 VA

connectable PTC resistors  
switching point

1... 6 PTC according to DIN 44 081 or 44 082  
<4000  $\Omega$

output relay  
type of contact

1 change-over contact (co)  
type 2 see "general technical information"

test conditions  
rated ambient temperature  
range

see "general technical information"  
-20...+70 °C

dimensions (h x w x d) attach-  
ment

design C: 72 x 33 x 60 [ mm ]  
on 35 mm of DIN rail according to EN 60 715  
or with screws M4

protection housing / terminals  
weight

IP 30 / IP 20  
approx. 120 g

# PTC-Resistor-Relay Type MS(R)220K2

## 2 PTC-Circuits

### MS220K2



The MS220K2 monitors 2 PTC-resistor sets at the same time. If a temperature rise occurs in one set, the appropriate output relay releases.

With this relay, 2 PTC-sets can be independently monitored on only 22.5 mm space

- 2 PTC-resistor sets, each 1... 6 PTC resistors
- output relays 2 x 1 change-over contact (co)
- LEDs for operation and alarm

### Part numbers:

**T221925**

**T221923**

AC 230 V

AC/DC 24 V

### MSR220K2



Same execution as MS220K 2, additionally with electronic reclosing lock:

- electronic reclosing lock
- (disconnectible)
- integrated RESET-button
- link for external RESET
- automatic RESET at voltage
- recovery

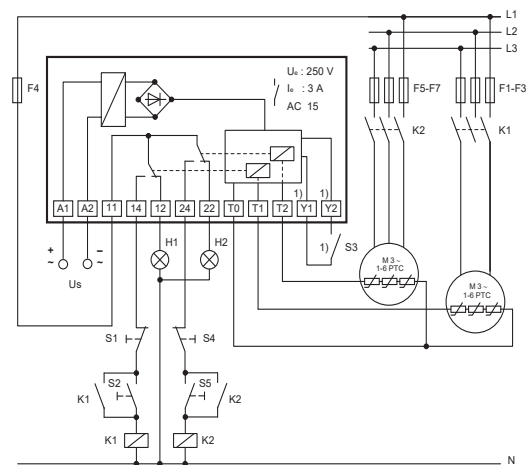
### Part numbers:

**T221945**

**T221943**

AC 230 V

AC/DC 24 V



U<sub>i</sub> = Anschlussspannung  
S2, S5 = Ein - Taster  
H1, H2 = Störmeldung  
K1, K2 = Motorschutz

S1, S4 = Aus- Taster  
S3 = Externer Reset  
F1 - F8 = Sicherung  
1) nur MSR

### Technical Data

Rated supply voltage U<sub>s</sub>

AC 230 V, ± 10 %, 50/60 Hz, ≤ 2 VA  
AC/DC 24 V, AC ± 10 %, DC 21-30 V, < 2 VA,  
without potential separation

connectable PTC resistors  
switching point  
output relays  
type of contact  
test conditions  
rated ambient temperature  
range

2 x 1... 6 PTC according to DIN 44 081 or 44 082  
< 4000 Ω  
2 x 1 change-over contact (co)  
type 2 (see "general technical informations")  
see "general technical informations"  
-20...+55 °C

dimensions (h x w x d) attach-  
ment

design K: 75 x 22.5 x 110 [ mm ]  
on 35 mm DIN rail according to DIN EN 50 022  
or with screws M4 (option)

protection housing / terminals  
weight

IP 30 / IP 20  
approx. 145 g

# PTC-Resistor-Relay Type MSR220K6

## 6 PTC-Circuits

### MSR220K6



**Part number:**  
**T221958** AC/DC 24-240 V

The MSR220K6 monitors up to 6 PTC-resistor sets with up to 6 PTCs each at the same time. If a temperature rise occurs in one set, the output relay releases and LEDs show the overheated sensor.

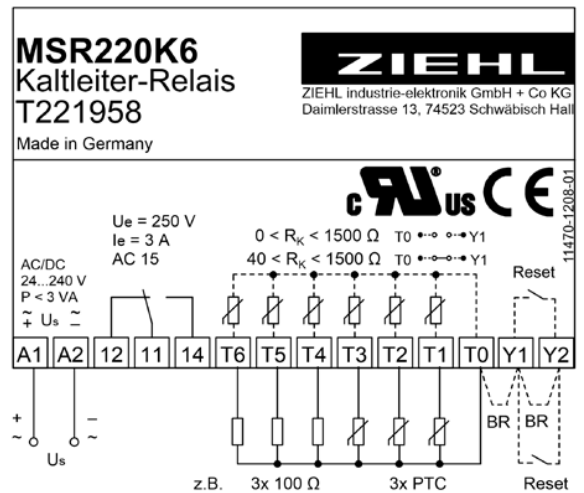
Switching-off is stored until a Reset. Thus enables to find the overheated sensor even when it has cooled down.

With the MSR220K6 only 4 mm space is needed per monitored PTC-circuit.

It is especially suitable for monitoring drives with multiple motors, like cranes or robots.

Instead of the PTC-sensors also contacts (normally closed) can be connected.

- 6 PTC-resistor sets, each 1...6 PTC
- Monitoring of short-circuit of sensor
- Output relay 1 x change-over contact
- Electronic reclosing lock (disconnectable with bridge)
- Input for external RESET
- Automatic RESET at voltage recovery
- LED for power on (green)
- 6 LEDs for display of overheated sensor
- Universal supply voltage AC/DC 24-240 V
- UL Recognized Component



### Technical Data

Rated supply voltage $U_s$	AC/DC 24-240 V, AC 19-264 V, DC 20-297 V, <2 VA
connectable PTC resistors switching point	6 x 1... 6 PTC according to DIN 44081 or 44082 <4000Ω
output relay Type of contact	change-over contact (co) type 2 see "general technical informations"
test conditions rated ambient temperature-range	see "general technical informations" -20... +55 °C
dimensions (h x w x d) attachment	design K: 75 x 22,5 x 110 [ mm ] on 35 mm DIN rail according to DIN EN 50 022 or with screws M4
protection housing / terminals weight	IP 30 / IP 20 approx. 145 g

# PTC-Resistor-Relay Type MSR820V

## 8 PTC-Circuits

### MSR820V



#### Part numbers:

**T221709** AC/DC 24-240 V

**T224384** ER4



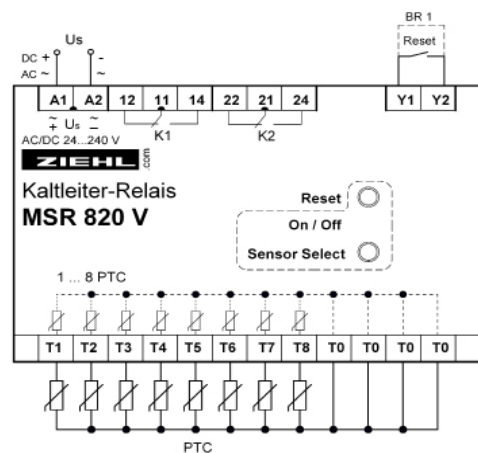
The MSR820V monitors up to 8 PTC-resistor-circuits at the same time. A common relay signals an alarm or an error in a sensor-circuit.

The inputs can be enabled or disabled during operation.

The MSR820V can also be used as a fault annunciator for collective reports

- 1-8 PTC-circuits, each 1...6 PTC in series (max. cold-resistance 1500Ω/circuit)
- Easy activating/deactivating of PTC-circuits (display with LEDs)
- 2 potential-free relay-outputs, display of switching state with LEDs
- Display of state of PTC-circuits with 2 LEDs per circuit
- Electronic reclosing-lock (disconnectible with bridge Y1-Y2)
- monitoring of contacts for collective fault-reports

- Programmable functions:
  - Monitoring of short-circuit of PTCs (off / on)
  - External Reset as normally closed (nc) or open (no) contact (Y1, Y2)
  - Power-fail-safe reclosing lock (off / on)
  - Function of relay
    - K1 and K2 closed-current mode
    - K1 and K2 operating-current mode
    - K1 closed- and K2 operating-current-mode
- Universal supply-voltage AC/DC 24 – 240 V
- Mounting on DIN-rail 35mm EN 60715 or wall-mount (Option)
- Mounting height 55 mm
- Accessory: [Installation frame ER4 for panel mount](#)



BR 1: reclosing lock off

### Technical Data

Rated supply-voltage $U_s$	AC/DC 24-240 V 0/50/60 Hz + 25/-20 %, <1W,<3VA DC 20,4 - 297 V AC 20 - 264 V
Connectable PTC-resistors Switching Point	8 x 1...6 pieces according to DIN 44081/82 3,3 kΩ...4 kΩ typical 3,65 kΩ
Output Relay Type of contact	2 x 1 change-over contact (CO) AgSnO <sub>2</sub>
Testing Conditions Rated ambient Temperature range	see "general technical informations" -20...+55 °C
Housing / Installation Frame Dimensions H x W x D Attachment	Design V4 / Front mounting kit type ER4 90 x 70 x 58 [ mm ] mounting height 55 mm on rail NS 35 mm according to EN 60 715 or with screws M4 (option)
Protection Housing / Terminals Weight	IP 30 / IP 20 app. 180 g

# PTC-Resistor-Relay Type MS40ZT

## for Elevators

### MS40ZT

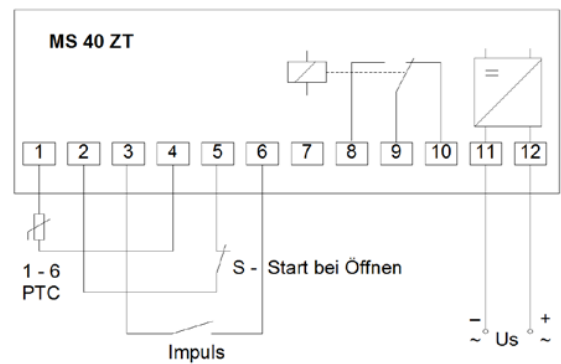


**Part number:**  
**T221120** AC 220-240 V

The PTC-resistor relay MS40ZT monitors particularly engines at elevator cars and lifts. A pulse input monitors the movement of the elevator car as long as the motor is switched on.

- watchdog timing adjustable 5 - 50 s.
- temperature monitoring with PTC-resistor
- integrated RESET-button
- LED for temperatur alarm
- LED for watchdog alarm

At elevator systems the temperature of the motor and the travelling motion have to be monitored. With the car at rest and contact between terminals 2 and 5 closed, the integrated relay picks up (terminals 8, 9 connected). The time monitoring starts with the opening of the contact between terminals 2 and 5. Then the pulse input between terminals 3 and 6 must continuously open and close during travelling motion. When the pulse stops or



### Technical Data

Rated supply voltage  $U_s$   
connectable PTC resistors  
switching point  
output relay  
type of contact  
test conditions  
rated ambient temperature  
range  
dimensions (h x w x d) attach-  
ment

protection housing / terminals  
weight

AC 220 - 240 V  $\pm 10\%$ , 50/60 Hz, 3VA  
1... 6 PTC according to DIN 44 081 or 44 082  
< 4000  $\Omega$   
1 change-over contact (co)  
type 2 (see "general technical informations")  
see "general technical informations"  
-20... +55  $^{\circ}\text{C}$

design S 12: 82 x 42 x 121 [ mm ]  
on 35 mm DIN rail according to DIN EN 50 022  
or with screws M4  
IP 30 / IP 20  
approx. 280 g

# PTC-resistor relay type MSF220K

## for Dry-Transformers, 2 PTC-Circuits

### MSF220K

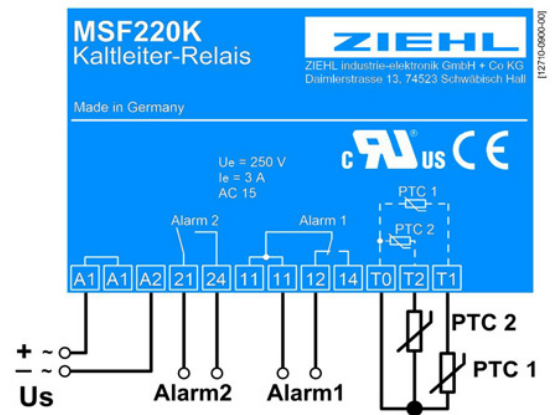


PTC-relay for the monitoring of dry transformers.  
Alarm 1 with relay in closed-circuit current mode for preliminary warning, releases at over-temperature at PTC-set 1 and serves at the same time as functional monitoring.  
Alarm 2 in operating current mode. Thus no wiping signal occurs when switching on the supply voltage on.  
Additional terminals enable comfortable wiring from supply voltage to relays K1 and/or K2.

- 2-PTC resistor sets
- 2 output relays 1 change-over contact (co) / 1 normally open contact (no)
- monitoring of sensors for short-circuit and break activatable
- Test-button (delayed)
- LEDs for ON, alarm 1 and 2
- K-type housing, vertically arranged terminals, 22,5 mm wide
- for attachment on DIN rail 35 mm or with 2 screws M4

#### Part numbers:

**T221718** AC 220-240 V  
**T221717** AC/DC 24-240 V



### Technical Data

#### Rated supply voltage $U_s$

AC 220 - 240 V  $\pm 10\%$ , 50/60 Hz,  $\leq 2$  VA  
AC/DC 24-240 V, AC 19 - 264 V, DC 20 - 297 V  $< 3$ VA

connectable PTC resistors  
switching point  
output relays

2 x 1... 6 PTC according to DIN 44081 or 44082  
 $< 4000 \Omega$   
1 change-over contact (co), 1 normally-open contact (no)  
type 2 see "general technical information"  
see "general technical information"  
-20... +55 °C

type of contact  
test conditions  
rated ambient temperature  
range  
dimensions (h x w x d)  
attachment

design K: 75 x 22.5 x 110 [ mm ]  
on 35 mm DIN rail according to DIN EN 50 022  
or with screws M4  
IP 30 / IP 20  
approx. 110 g

protection housing / terminals  
weight



# PTC-Resistor-Relay Type MSF220SE

## for Dry-Transformers, 2 PTC-Circuits

### MSF220SE



#### Part numbers:

**T221697** AC 90-240 V  
**T221696** AC/DC 24-240 V

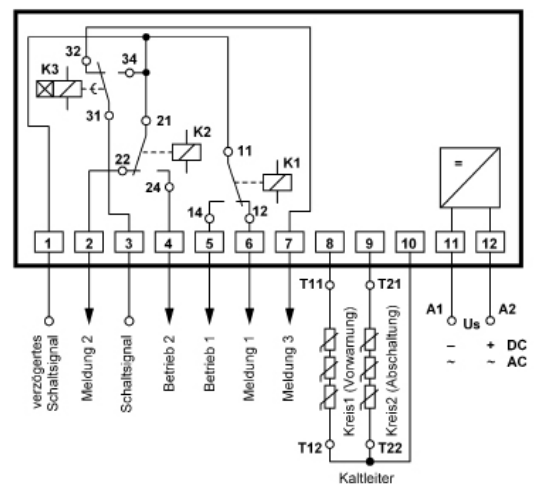
The MSF220SE is a 2-channel PTC resistorrelay. It is used favourably wherever an alarm has to be suppressed for a short period when applying the supply voltage.

- 2 PTC resistor sets
- 2 output-relays with change-over contacts (co)
- integrated timing-relay K3 to suppress an alarm-impulse when switching on supply voltage
- ALARM 1, i.e. for preliminary alarm
- ALARM 2, i.e. for switching off power on green LED
- ALARM 1 yellow LED
- ALARM 2 red LED
- Test-button for testing of relays K1/K2
- time-delayed signal (2-4s) of K3 available at terminal 1 for external use

Thanks to the delayed switching-on of relay K3, the MSF 220 SE is especially suitable in applications, where an auxiliary voltage is not available and the secondary voltage of the monitored transfor-

mer is being used as supply voltage.

As a consequence of this feature, there will be no alarm case of failure of supply voltage. We recommend therefore the monitoring of the function of K3 at terminals 1 or 7.



### Technical Data

Rated supply voltage  $U_s$

connectable PTC resistors  
switching point

output relays  
type of contact  
test conditions  
rated ambient temperature range

dimensions (h x w x d) attachment

protection housing / terminals weight

AC/DC 90-240 V, AC 80-264 V, DC 80-297 V, < 2 VA  
 AC/DC 24-240 V, AC 20-264 V, DC 21-297 V, < 2 VA  
 2 x 1... 6 PTC according to DIN 44 081 or 44 082  
 < 4000  $\Omega$

2 x 1 change-over contacts (co)  
 type 2 see "general technical information"  
 see "general technical information"  
 -20... +55 °C

design S 12: 82 x 42 x 121 [ mm ]  
 on 35 mm DIN rail according to DIN EN 50 022  
 or with screws M4  
 IP 40 / IP 20  
 approx. 290 g



# PTC-Resistor-Relay Type MSF220V/VU

## for Dry-Transformers, 3 PTC-Circuits

### MSF220V/ MSF220VU



UL US

#### Part numbers:

MSF220V	
<b>T221738</b>	AC 230/240 V
MSF220VU	
<b>T221737</b>	AC/DC 24-240 V

ER4  
**T224384**



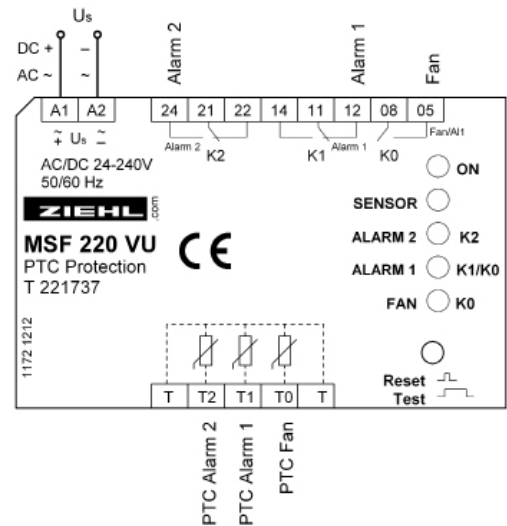
The MSF220V is particularly suitable for the temperature monitoring at dry transformers.

3 PTC-circuits with different nominal response temperatures (NRT) can be connected to this unit, one for controlling an fan (forced cooling) and two for alarms.

Each PTC-circuit is monitored for break and short circuit. This reduces the probability of false alarms.

- 3 PTC-circuits
- MSF220VU for universal supply voltage AC/DC 24-240 V
- intelligent control of fan (relay K0, 1 normally-open contact)
- ALARM 1 in closed-circuit current mode (relay K1, 1 change-over contact) for pre-alarm. Signals also error in any sensor and interruption of supply voltage.
- ALARM 2 in operation current mode (relay K2, 1 change-over contact). No signal when switching on and off the supply voltage.
- all output relays potentially separated from each other.
- monitoring of sensor lines
- TEST-button (stop possible before ALARM 2)
- simple testing with disconnectable monitoring of break and

- short-circuit (for 10 minutes)
- LEDs for ON, sensor error, Fan, ALARM 1 and ALARM 2
- UL Recognized Component
- plug-in terminals
- housing for mounting on DIN-rail or wall-mount mounting height 55 mm
- Accessory: [Installation frame ER4 for panel mount](#)



### Technical Data

Rated supply voltage  $U_s$

AC 220 - 240 V  $\pm$  10 %, 50/60 Hz,  $\leq$ 3 VA

Connectable PTC resistors

AC/DC 24 - 240 V  $\pm$  15 %, < 3 VA

Switching point

3 x 1... 6 PTC according to DIN 44 081 or 44 082 < 4000  $\Omega$

Output relays

2 x 1 change-over contacts, 1 normally-open contact

Type of contact

Type 2 see "general technical information"

Test conditions

see "general technical information"

Rated ambient temperature range

-20... +55  $^{\circ}$ C

Housing / Installation Frame

Design V4 / Front mounting kit type ER4

Dimensions (h x w x d)

90 x 70 x 58 [ mm ]

Attachment

on 35 mm DIN rail according to DIN EN 50 022

or with screws M4

Protection housing / terminals

IP 30 / IP 20

Weight

approx. 320 g

# PTC-Resistor-Relay Type MSF220VL

## for Dry-Transformers, Fan, Warning, Trip Winding and Trip Core

### MSF220VL



CE US

#### Part numbers:

**T221674** AC/DC24-240 V

**T224384** ER4

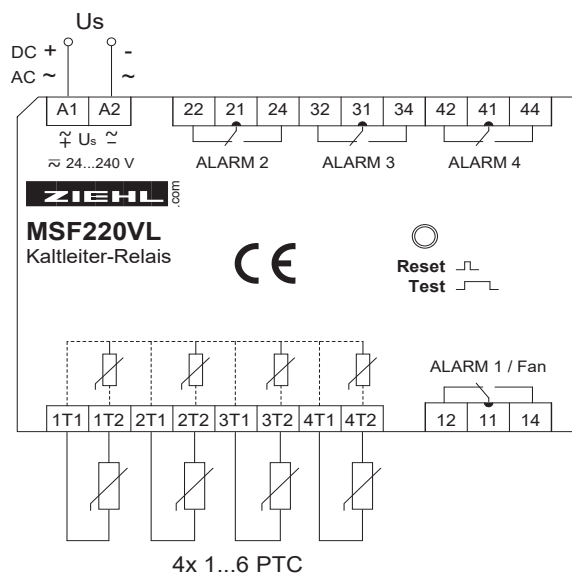


The MSF220VL is particularly suitable for monitoring of temperatures at dry transformers, when also the temperature of the core shall be measured. Monitoring of core temperature is especially required in rectifier transformers because of harmonics causing heat in the core. An intelligent control prolongs automatically the runtime of a cooling-fan, depending on the load of the transformer. Each PTC-circuit is monitored for break and short circuit. This reduces probability of false alarms. Relays in operating-current mode prevent from a trip-signal when switching on supply voltage.

The device can be adapted to different applications with 4 programs:

- 1.) Fan-control - alarm - trip (winding) - trip (core)
- 2.) Alarm - trip (winding) - trip (core) - alarm (fault)
- 3.) Fan-control - alarm - trip (winding) - alarm (fault)
- 4.) Fan-control with hysteresis T1/T2 - alarm - trip (winding) - time relay

- 4 inputs for PTC Intelligent control of fan
- Automatic fan-test 1x / week
- electronic reclosing lock for alarms (trip) connectable
- Monitoring of sensors
- Test-button
- Simple testing with disconnectable monitoring of break and short circuit (for 10 minutes)
- LEDs for alarms, states of relays and sensors
- Housing for mounting on DIN-Rail or wall-mount (option)
- Mounting height 55 mm
- Universal supply voltage AC/DC 24-240 V
- DEWA-standard for Dubai
- Accessory: [Installation frame ER4 for panel mount](#)



### Technical Data

Rated supply voltage  $U_s$

AC/DC 24 - 240 V  $\pm$  15 %, < 3 VA

Connectable PTC resistors

4 x 1... 6 PTC according to DIN 44 081 or 44 082 < 4000  $\Omega$

Switching point

4 x 1 change-over contacts

Output relays

Type 2 see "general technical information"

Type of contact

see "general technical information"

Test conditions

-20... +60  $^{\circ}$ C

Rated ambient temperature range

Housing / Installation Frame

Design V4 / Front mounting kit type ER4

Dimensions (h x w x d)

90 x 70 x 58 [ mm ]

Attachment

on 35 mm DIN rail according to DIN EN 50 022 or with screws M4

Protection housing / terminals

IP 30 / IP 20

Weight

approx. 185 g

# Transformer-Protection Trafosafe TS1000

## with integrated monitoring of Fans

### Trafosafe TS1000



**Part number:**  
**T221660** AC/DC24-240 V

The Trafosafe TS1000 is applied at transformers with forced cooling. It monitors the temperature of the transformer with 3 sensor-circuits (PTC-thermistors), controls the forced cooling depending on the load of the transformer, reports exceeding of alarm-temperature and switches off the transformer (trip) when increasing of the temperature continues.

Up to 6 fans can be controlled and monitored directly with the TS1000. Contactors and motor protection switches are not necessary any more.

At Pt 100-monitored transformers the TS1000 can be used to control only the fans.

#### Temperature-Monitoring:

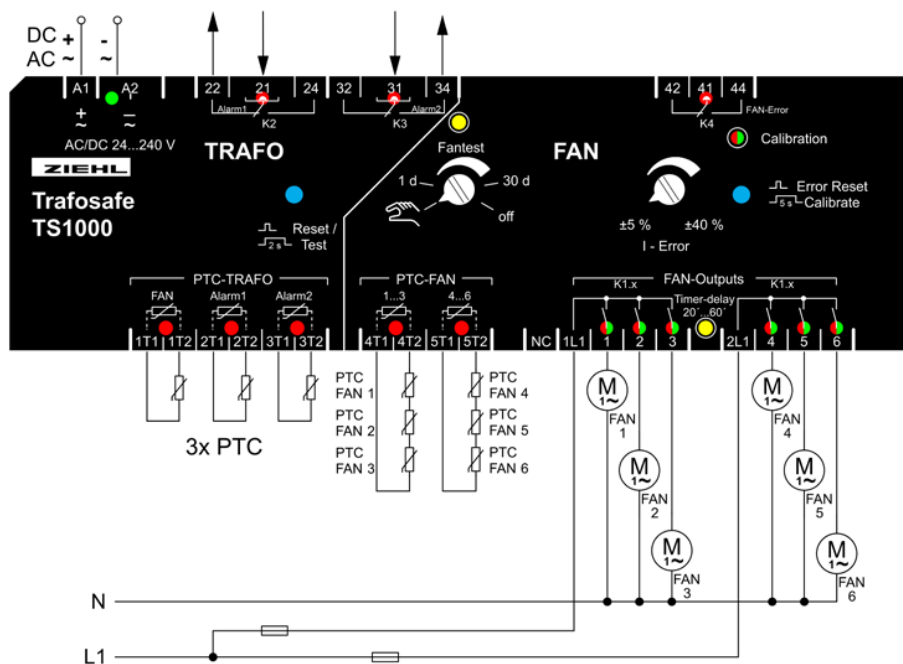
- 1 PTC-circuit for controlling the cooling (1T1/1T2) = input for starting fan when using as fan-control only.
- 2 x 1 PTC-circuit for alarm 1 (2T1/2T2) and alarm 2/trip (3T1/3T2), monitored for short-circuit and interruption Alarm 1 (K2) in closed-circuit current mode = monitoring of function
- Alarm 2/trip (K3) in open-circuit current mode = no signal/tripping when switching on the device
- Test-/Reset-button for testing the function

#### Fan-Control and Monitoring of Fan:

- direct connection of up to 6 fans 0,07...4,0 A
- automatic exceeding of the on-time of the fans at high load of the transformer
- Monitoring of failure fan (over-/undercurrent)
- Self-calibration of the monitored values of the currents to the fans
- Switching-point for current-failure adjustable  $\pm 5-40\%$
- automatic test of fans 1-30 days, disconnectable
- Relay for reporting fan-failure
- Clear displays with LEDs

#### General:

- Universal-power-supply AC/DC 24-240 V
- compact housing for cabinet-mount, 140 mm wide, mounting height 55 mm
- Attachment on 35 mm rail or with 3 screws M4



### Technical Data

Supply voltage  $U_s$   
Tolerance

AC/DC 24 - 240 V, 0/45-120 Hz, < 2 W, < 4 VA  
DC 20,4 - 297 V, AC 20 - 264 V

Connectable PTC-circuits  
Switching point

5 x 1...6 pcs according to DIN 44081 or 44082  
< 4000  $\Omega$

Output relays K2, K3, K4  
Type of contact

3 x 1 change-over contact (co)  
type 3 (see "general technical informations")

Output relays 1-6  
Rated current of fans

6 x 1 normally-open contact (no)  
0,07...4,0 A

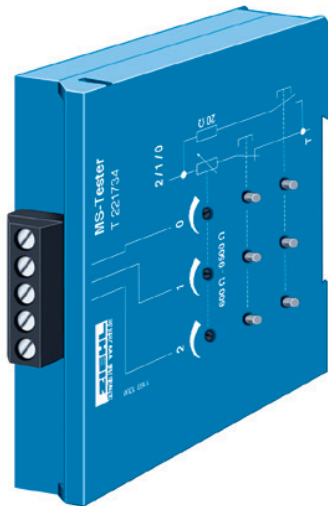
Test conditions  
Rated ambient temp. range  
Dimensions (h x w x d)  
Attachment  
Protection housing / terminals  
Weight

see "general technical informations"  
-20...+55 °C  
housing V8: 90x140x8 [mm], mounting height 55 mm  
on DIN-rail 35 mm or 3 screws M4  
IP 30 / IP 20  
app. 400 g

# MS-Tester

## for PTC-Relays Type MS

### MS-Tester



Part number: **T221734**

Simple PTC-relays can be easily tested by interrupting the sensor-line.

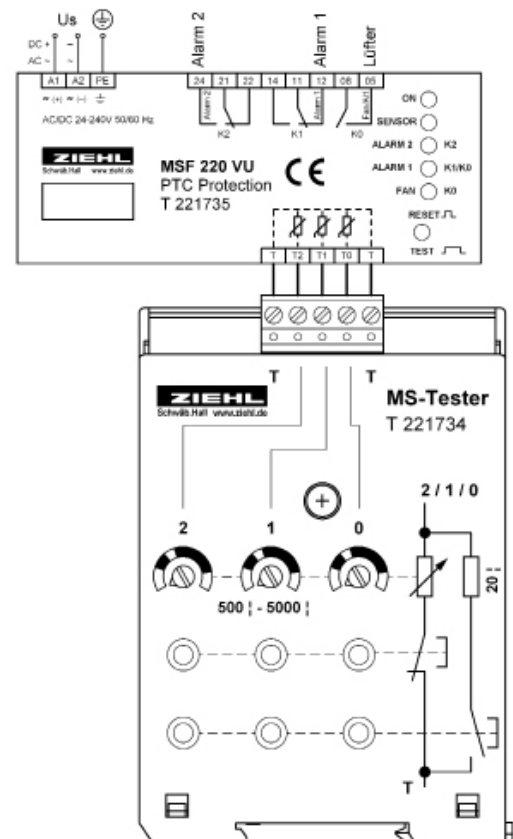
At PTC-relays with monitoring the sensor for short-circuit and break this is not possible.

With the ZIEHL MS-Tester these relays can also be tested easily for correct function.

#### Test:

- Turn off supply-voltage of the tested relay
- disconnect output-side if necessary
- connect MS-Tester (T/0, T/1 and/or T/2) to the sensor-inputs
- switch on PTC-relay
- increase resistance slowly by turning the potentiometer until the according alarm switches
- reduce resistance until the relay in the MS switches back or the LED signals ready for switching back
- If necessary, the accurate switching-points can be evaluated by measuring the resistances between the terminals T/0, T/1 and T/2 after disconnecting the MS. The values are typically 3000  $\Omega$  to 4000  $\Omega$  for tripping and >1500  $\Omega$  for switching back.
- Test break of sensor with button (only relays with monitoring of sensor-break)
- Test short-circuit of sensor with button (only relays with monitoring of sensor-short-circuit))
- **ATTENTION:** At MSF 220 V(U) short-circuit or break of any sensor or fast rising of resistance will lead to a report of an error = alarm 1.
- **TIP:** Cold PTC have a resistance of 20 ... 250  $\Omega$ , typically 50 ... 120  $\Omega$  per sensor.

The connection-cable (included) is cabled for the connection to a ZIEHL MSF220V(U), but other PTC-relays can be tested with the MS-Tester also.



# PTC-Resistor Temperature-Sensors MINIKA®

to DIN 44 081 and DIN 44 082

## General

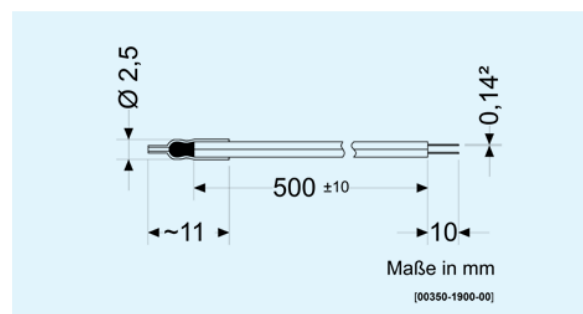
PTC-resistor temperature sensors (also called PTC-resistors or thermistors) are temperature dependent semiconductor resistors whose main function is to alter their electrical resistance drastically when their body temperature reaches the nominal trip temperature NAT (TNF)

PTC-resistors are used principally to protect windings in electromotors or transformers against excess temperature. They also find application in machines, tooling machines especially machine bearings and controlling the temperature of power semiconductors.

PTC-resistor temperature sensors are particularly suited to this purpose due to their precise response range combined with small dimensions and minimal thermal inertia at low cost.

## Single PTC-resistor type MINIKA® K

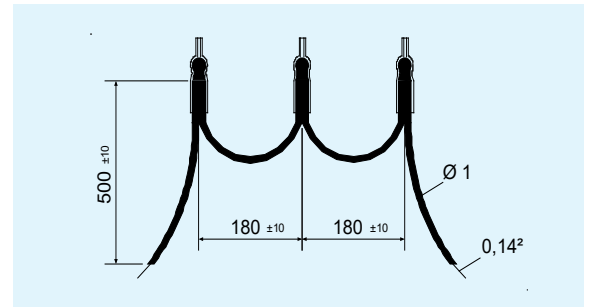
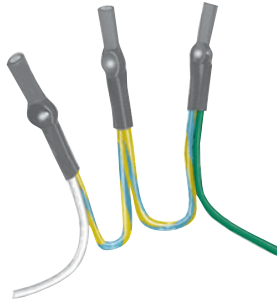
PTFE-insulated strand  
Cu, silver-plated  
Lead length:  $500 \pm 10$  mm  
Stripping of lead-ends 10 mm  
standard cross-section:  
 $0,14 \text{ mm}^2$  (AWG 26)  
weight: approx. 2,6 g



Type	NAT°C	Standard ID colour (DIN 44 081)	Part numbers: MINIKA®
K60	60 ± 5	white - grey	<b>K401000</b>
K70	70 ± 5	white - brown	<b>K401010</b>
K 80	80 ± 5	white - white	<b>K401005</b>
K 90	90 ± 5	green - green	<b>K401015</b>
K100	100 ± 5	red - red	<b>K401025</b>
K110	110 ± 5	brown - brown	<b>K401035</b>
K120	120 ± 5	grey - grey	<b>K401045</b>
K130	130 ± 5	blue - blue	<b>K401055</b>
K140	140 ± 5	white - blue	<b>K401065</b>
K150	150 ± 5	black - black	<b>K401075</b>
K160	160 ± 5	blue - red	<b>K401085</b>
K170	170 ± 5	white - green	<b>K401095</b>
K 180	180 ± 5	white - red	<b>K401090</b>

## Triple PTC-resistor type MINIKA® KD

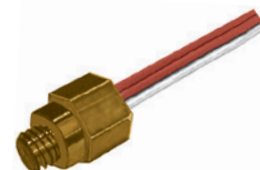
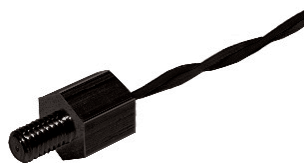
PTFE-insulated strand  
 Cu, silver-plated  
 Lead length:  
 500-180-180-500 ± 10 mm  
 Stripping of lead ends 10 mm  
 standard cross-section:  
 0.14 mm<sup>2</sup> (AWG 26)  
 weight: approx. 3,6 g



Type	NAT°C	Standard ID colour (DIN 44 082)	Part numbers MINIKA®
KD60	60 ± 5	white - yellow - yellow - grey	<b>K401300</b>
KD70	70 ± 5	white - yellow - yellow - brown	<b>K401310</b>
KD80	80 ± 5	white - yellow - yellow - white	<b>K401305</b>
KD90	90 ± 5	green - yellow - yellow - green	<b>K401315</b>
KD100	100 ± 5	red - yellow - yellow - red	<b>K401325</b>
KD110	110 ± 5	brown - yellow - yellow - brown	<b>K401335</b>
KD120	120 ± 5	grey - yellow - yellow - grey	<b>K401345</b>
KD130	130 ± 5	blue - yellow - yellow - blue	<b>K401355</b>
KD140	140 ± 5	white - yellow - yellow - blue	<b>K401365</b>
KD150	150 ± 5	black - yellow - yellow - black	<b>K401375</b>
KD160	160 ± 5	blue - yellow - yellow - red	<b>K401385</b>
KD170	170 ± 5	white - yellow - yellow - green	<b>K401395</b>
KD180	180 ± 5	white - yellow - yellow - red	<b>K401390</b>

## Screw-in sensors in housing G2 (M4) and G3 (M6) MINIKA® KS

PTFE-insulated strand  
 Cu, silver-plated  
 Lead length:  
 500 ± 10 mm  
 Stripping of lead ends 10 mm  
 standard cross-section:  
 0.14 mm<sup>2</sup> (AWG 26)  
 weight: G2: approx. 5 g  
 G3: approx. 14 g



Type	NAT°C	Standard ID colour DIN (44 081)	Part numbers	
			G2 (M4)	G3 (M6)
KS80	80 ± 5	white - white	<b>K302005</b>	<b>K302109</b>
KS90	90 ± 5	green - green	<b>K302015</b>	<b>K302119</b>
KS100	100 ± 5	red - red	<b>K302025</b>	<b>K302129</b>
KS110	110 ± 5	brown - brown	<b>K302035</b>	<b>K302139</b>
KS120	120 ± 5	grey - grey	<b>K302045</b>	<b>K302149</b>

## Technical Data

Design	K	KD	KS
Max. operational voltage	25 V DC	25 V DC	25 V DC
Measuring voltage at NAT+15K -20...NAT+5K	≤ 7,5 V DC ≤ 2,5 V DC	≤ 7,5 V DC ≤ 2,5 V DC	≤ 7,5 V DC ≤ 2,5 V DC
Nominal response temperature NAT (TNF)	60...180°C	60...180°C	80...120°C
Tolerance NAT	± 5 K	± 5 K	± 5 K
Nominal resistance R at -20...NAT-20K VPTC ≤ 2,5 V	≤ 250 Ω	≤ 750 Ω	≤ 250 Ω
Rated ambient temperature range	-20°C...NAT+20°C		
Thermal response-time $t_a$	≤ 5 s	≤ 5 s	-
Storage temperature	-25°C...+65°C		
Rated insulation voltage $U_{eff}$	690 V	690 V	690 V
Test voltage $U_{eff}$	2500 V AC	2500 V AC	2500 V AC



## Resistors

The resistance of each individual sensor (according to standard) must, for temperatures related to the Nominal Response Temperature (NAT), have the following values:

- ≤ 250 Ohms at temperatures of -20°C to NAT -20 degrees. Measurement voltage up to max. 2.5 V
- ≤ 550 Ohms at a temperature of NAT -5 degrees. Measurement voltage max. 2.5 V
- ≥ 1330 Ohms at a temperature of NAT +5 degrees. Measurement voltage max. 2.5 V
- ≥ 4000 Ohms at a temperature of NAT +15 degrees. Measurement voltage max. 7.5 V

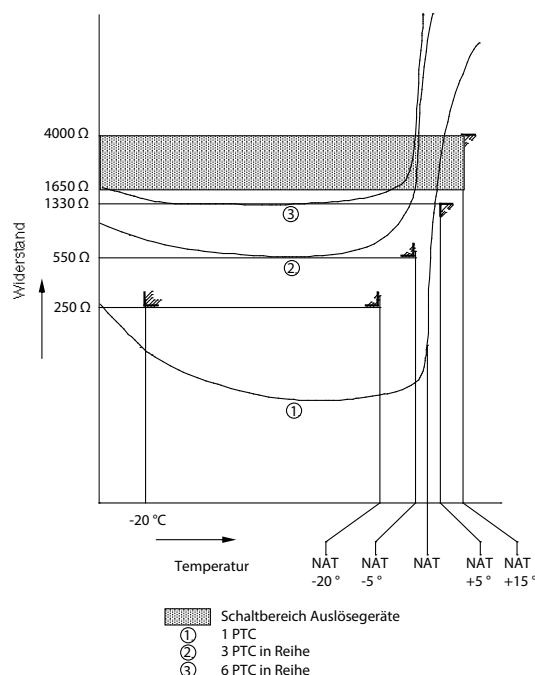
The exact values of the resistance values in the temperature ranges are not relevant. Flawless sensors should have a cold resistance of between 20 and at most 250 Ohms. Typical values (ambient temperature) lie between 50 - 150 Ohms.

When the cold resistance is within these limits, short-circuit and interruption can be excluded. For checking the nominal response temperature, the sensors have to be heated up to this temperature.

In accordance with standards, trip devices switch between 1650 Ohms and 4000 Ohms.

If a varying number of temperature sensors connected in series to a trip device are subjected to uniform heat, this results in the following cut-off point:

- 1 PTC switches at latest at NAT +15 degrees, at earliest at NAT +5 degrees.
- 3 PTC (typical instance) switch at latest at NAT +5 degrees, at earliest at NAT -5 degrees.
- 6 PTC switch at latest at NAT, at earliest at NAT -20 degrees. (Absolutely uniform heating of all sensors virtually never occurs in this instance).



## Insulation classes

For built-in PTC-resistors, we recommend the following nominal cut-off temperature values for machines which are used to full capacity within permissible heating limits in keeping with their insulation class (VDE 0530).

These values can then be correspondingly reduced for machines at less than full capacity. In some instances it might prove necessary to work out nominal response temperature values which deviate somewhat from

the values recommended in the table, on the basis of trial and error. When it is intended as a preliminary warning, the value recommended as nominal response temperature is 20°C below the break temperature.

Insulation material class			
120 (E)	130 (B)	155 (F)	180 (H)
120°C	130°C	150°C	

## Fitting PTC-resistor temperature sensors

PTC-resistors can only be fitted before a winding has been impregnated by the motor manufacturer. It is not possible to insert them at a later stage.

Each winding has a sensor of its own. This means fitting 3 in single-speed motors and 6 in pole changing motors, with these sensors arranged in series and taken to separate terminals in the terminal box.

Measuring circuit must be provided with a separate power supply. The use of motor supply lines or other main current lines is unacceptable. Shielded supply lines must be used in case inductive or capacitive interference is produced by nearby high-voltage lines.

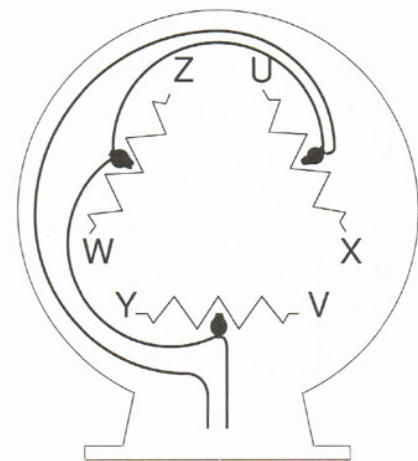
The maximum line length for a cable diameter of 0.5 mm<sup>2</sup> is approx. 500 m. For greater diameter cable, correspondingly more.

Fitting should, where possible, be carried out at the warmest winding head in the exhausted-air-side of the electrical machine. Care should be taken to ensure good heat contact between the sensors and the winding when being fitted. The more intimate the connection between a PTC-resistor and its winding, the better the winding temperature is registered, especially when temperatures rise sharply. For this reason, Temperature sensors should be implanted in the middle of the end winding-heads so as to be surrounded on all sides by the winding copper.

To fit the temperature sensors, the ready-shaped winding heads are spread apart in the centre using a piece of winding wood. The temperature sensors should be inserted parallel to the winding wires, care being taken that the winding wires are actually touching the temperature sensors. Cavities and air-occlusions impair heat contact and can be minimized by exerting pressure by hand to close the gap between winding wires and sensors. At the spot where the sensors are to be fitted, the winding wires on the end winding should be tightly bandaged. If the wire is more than 1 mm<sup>2</sup> thick, intervening spaces should be filled in with resin thickened with quartz powder.

If the motor manufacturer uses special saturants or impregnating resins whose chemical behaviour is anything but neutral, or if he uses some special working method, he will have to test the temperature sensors' resistivity himself in the operating conditions he will use.

To prevent peaks in interference voltage due to the formation of loops, we recommend that the connecting strand be fed back on the same side as the lead.



Assembly Tip: Do not shorten leads which are too long, roll them up and fasten them in position.

## Testing fitted PTC-resistors

A maximum DC-voltage of 2.5 V can be passed through PTC-resistor temperature sensors when testing. Buzzers (voltage peaks) and similar testers should, therefore, not be used, but only meters or bridges.

For all measurement voltage values up to DC 2.5 V, resistance

values ranging from -20°C to NAT -20 degrees should not exceed 250 Ohms. Exact resistance values within this temperature range are unimportant. For flawless sensors, the lowest resistance value is generally above 20 Ohms.

When measurement values are being determined, care must be taken that the measurement results are not influenced by the selfwarming of the sensors. In the course of the manufacturing process, we test all sensors for NAT and disruptive strength.

# Pt 100 Temperature Relays Type TR

## General

Temperature relays type TR monitor temperatures in connection with temperature sensors Pt 100 according to DIN 43 760 / IEC 751. They signal or switch, if a preset limit is exceeded.

They operate according to standard with relays in closed-circuit current mode. Break of sensor is recognized. In some models also short-circuit of sensor line is monitored.

The temperature relays type TR have the following features:

type	connectable sensors Pt 100	connection		adjustable limits	output relays	analog output	housing	remarks
		2-wire	3-wire technique					
TR111V	1	-	x	1	1 co	-	V2	hysteresis and switching delay adjustable
TR122D	1	x	x	2	2 co	-	S12	digital display programmable, plug-in housing
TR122DA	1	x	x	2	2 co	0 / 4-20 mA	S12	digital display programmable, plug-in housing
TR210	2	x	x	2/4	2 co	0 / 4-20 mA 0 - 10 V	V4	digital display programmable, Pt 1000, Thermocouples
TR250	3	x	x	3	3 co	-	V4	digital display programmable, connection of PTC
TR400	4	x	x	4	4 + 1 co	2 x 0/4 - 20 mA 2 x 0 - 10 V	V8	digital display programmable, plug-in terminals
TR440	4	x	x	4	3 + 1 co	-	96x96 mm	interface RS485 MODBUS
TR600	6	x	x	6	6 + 1 co	2 x 0/4 - 20 mA 2 x 0 - 10 V	V8	digital display programmable, plug-in terminals, option: interface RS 485
TR800 WebControl	8	x	x	4 x 8	4 co	-	V8	interface for Ethernet, TCP/IP udp, MODBUS TCP/IP inputs Thermocouples 0/4 - 20 mA, 0 - 10 V
TR1200	12	x	x	-	1 U	-	V8	RS485 MODBUS
TR1200IP	12	x	x	-	1 U	-	V8	Ethernet-Interface TCP/IP udp modbus TCP/IP interface RS 485 (MODBUS)

## Application

Temperature relays type TR and temperature sensors Pt 100 are a reliable monitoring system. Possible damage by excess temperature in machines and plants are positively avoided.

Typical for all devices is exact recording of temperatures and constant switching points.

For the monitoring of engines or transformers devices with 3 to 6 inputs are especially suitable. They can monitor a sensor in the coil of each phase.

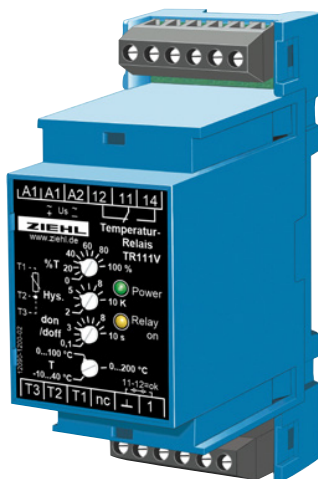
If the measuring temperature is to be displayed additionally or be evaluated by a superior computer system, devices with analogue output or interface RS 485 are recommended.

We supply temperature sensors Pt 100 in many various executions, according to customer's request and with isolation for high voltages.

# Pt 100-Temperature-Relay Type TR111V

## 1 Sensor

**TR111V**  
3-Leiter



### Part numbers:

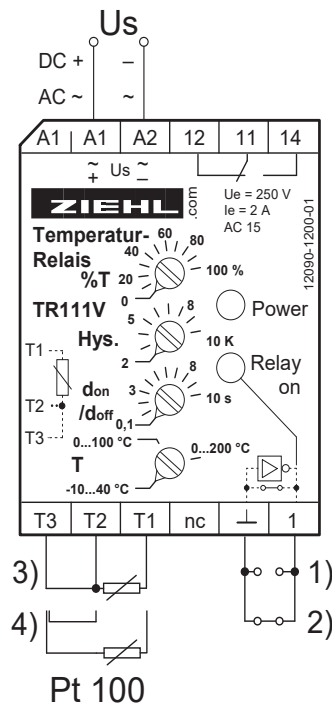
**T224107** -10...+200 °C  
**T224108** 0...+400 °C

Temperature-Relays TR111V can be used as limit-switches or 2-point controllers with high repeat accuracy. 3 measuring-ranges, adjustable hysteresis and switching delay and the choice between operating- and closed-current principle of the relay make it a very universal device.

- Measuring input 1x Pt 100 (RTD) / 3-wire
- measuring-ranges selectable:
  - -10...+40/0...100/0...200 °C
  - 0...100/100...200/200...300/300...400 °C
- 1 limit adjustable 0...100 % switching delay adjustable 0,1...10 s
- Output-relay 1 changeover-contact (co)
- Operating- or closed-current-mode selectable with bridge
- Switching off at sensor-short-circuit or break
- LEDs for display state of operation
- Universal supply-voltage AC/DC 24-240 V
- Housing for mounting in switchgear cabinets or fuse-boxes, 35 mm wide  
Mounting height 55 mm

### Application:

Protection from over-temperature in processes, plants and machines. Monitoring of temperatures in bearings.  
Controlling of temperatures in processes and plants.



- 1) Ruhestrom / closed current mode
- 2) Arbeitsstrom / operating current mode
- 3) 3-Leiter / 3-wire
- 4) 2-Leiter / 2-wire  
Brücke zwischen T2-T3 / Bridge from T2-T3

## Technical Data

Supply voltage $U_s$	AC/DC 24-240 V, 0/50/60 Hz, < 2W, < 3VA (DC 20,4 - 297, AC 20-264 V)
Pt 100 -Sensor (RTD)	EN 60751 / IEC 60751
Measuring ranges	ranges selectable
Error of setting	$\pm 5$ K
Repeat error	app. 0,5 K
Temperature-dependence	$\leq 0,05$ %/K
Hysteresis	adjustable 2...10 K
Switching delay don/doff	adjustable 0,1...10 s
Relay output	1 change-over contact (co)
Type of contact	<b>type 3</b> see "general technical informations"
Test conditions	siehe "general technical informations"
Rated ambient temperature range	-20°C...+55°C
Dimensions (H x W x D)	design V4: 90x70x58 [mm], mounting height 55 mm
Attachment	on 35 mm DIN-rail according to EN 60 715 or with screws M4
Protection housing/terminals	IP 30 / IP 20
Weight	app. 100 g

# Pt 100-Temperature-Relay Type TR122DA

1 Sensor, 2 Limits, Digital display, Analog-output

## TR122DA



### Part numbers:

TR122DA

**T224126** with analog output

TR122D

**T224127** no analog output

The TR122DA is a temperature relay with 2 independent switching points and with analog output.

### Applications:

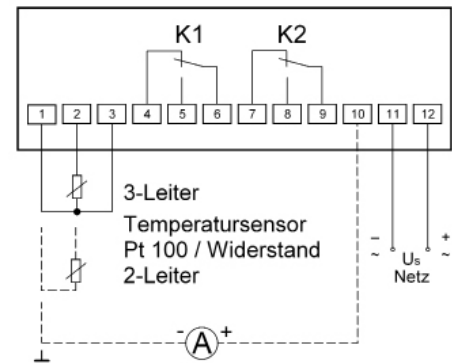
- Monitoring of temperature with pre-alarm and alarm

- 1 sensor Pt 100 (RTD) 2- or 3-wire-connection
- Range -199...+850 °C
- Resistance 0...850 Ω
- 2 alarms/relays (co-contacts)
- Digital display, 3 digits
- Monitoring of sensor (break/short-circuit)
- Display of MIN- and MAX-values
- scalable analog output 0/4...20 mA (TR 122 DA only)
- Universal supply voltage AC/DC 24-240 V
- Plug-in housing for easy mounting and service

- Monitoring of under- and over-temperature
- 2-point-controller, e.g. for heating (the second switching point can be used for monitoring the function and release an alarm at over- or undertemperature)
- 3-point-controller for heating/keeping temperature
- Monitoring of resistance 0...850 Ohm
- Transducer for Resistance

The following parameters can be programmed:

- Switching points (alarms)
- Hysteresis (+ or - = MIN or MAX-function)
- Relay in closed- or operating current mode
- automatic reset or electronic reclosing lock
- switching- and switch-back-delay
- Analog output
- **EasyLimit** for simplified setting of alarms
- Code-lock against manipulation of settings



## Technical Data

rated supply voltage  $U_s$

AC/DC 24-240 V, <3W, <5VA  
(AC 20-264 V, DC 20,4-297 V)

sensor Pt 100 (RTD)  
connection

Pt 100 according to EN 60 751/IEC 60 751,  
Resistance 0...850 Ohm  
line-resistance max. 3 x 22 Ω / 2 x 10 Ω

measuring accuracy  
measuring current  
connection of sensor

< 0,3 % of value ± 0,5 K (Ω)  
≤ 0,8 mA  
2-/3-wire, line-resistance max. 2 x 50 Ω / 3 x 50 Ω

analog output  
measuring range  
resolution  
hysteresis  
switching delays  
relay-contact

0/4-20 mA, max. 500 Ω, error <0,3% of fullscale  
-199 ... +850 °C / 0 ... 850 Ω  
1 K (Ω), -19,9 ... 99,9: 0,1 K (Ω)  
±200 K  
0...999 s  
**type 2** (see "general technical informations")

test conditions  
rated ambient temp. range  
dimensions (h x w x d)  
attachment

see "general technical informations"  
-20°C...+55°C  
design S12: 82 x 42 x 121 [mm]  
on 35 mm DIN rail according to DIN EN 50 022 or with screws M4  
P 30 / IP 20  
app. 300 g

# Temperature Relay Type TR210

for 2 Temperature-Sensors or 0/4-20 mA, 0-10 V, 2 Limits, Analog-output

## TR210



C<sub>RU</sub> US

### Part numbers:

**T224071** AC/DC 24-240 V

Accessory: [Installation frame ER4 for panel mount](#)

**T224384** ER4



The control unit TR210 monitors up to 2 measuring inputs for Pt100 (RTD), Pt1000, thermocouples, or standard-signals 0/4-20 mA, 0-10 V.

The signals are monitored for up to 4 limits. The value of one or of both inputs can be read out at an analog output.

### Application:

The TR210 is very versatile and can thus be used in many applications. Nevertheless multiple preset programs allow an easy setting.

It can be used as a limit switch or as a controller for 2 limits (with day/night shift up to 4 limits).

As a measuring transducer it can convert signals from the temperature-sensors to standard-signals or change the scaling of standard-signals. The user can also select, if minimum or maximum of 2 signals or the difference of 2 signals is connected to the analog output.

For more applications see basic programs.

- Measuring and monitoring range -270...+1820 °C
- resolution 0,1°C (to 999.9 °C)
- Analog output (scaleable) for 1 input, min./max. of 2 inputs or difference of 2 sensors (no isolation between inputs and output)
- 2 relay outputs
- Shifting of day/night (selectable with contact at terminals Y1/Y2)
- Universal power supply AC/DC 24-240 V
- Easy setting with 3 buttons and preset programs
- Storing of min- and max-values of inputs
- Code-lock against manipulation of settings
- Terminals pluggable

### 2 Measuring-Inputs:

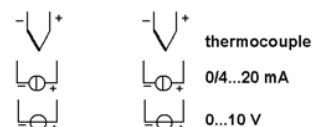
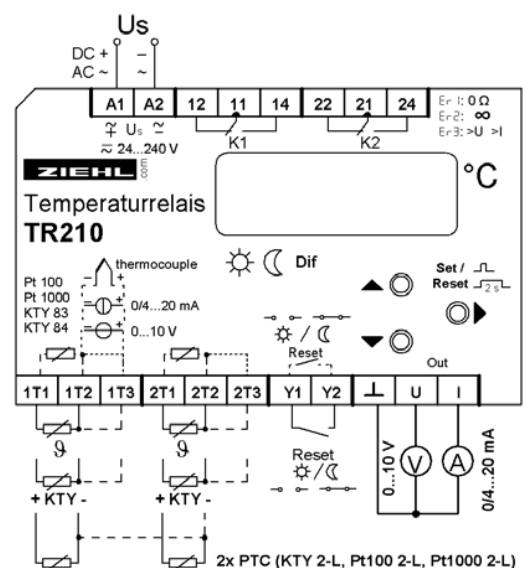
- Resistance-sensors Pt100 (RTD), Pt1000, KTY83/84 in 2- or 3-wire-connection
- Thermocouples types B, E, J, K, L, N, R, S or T
- different sensors at both inputs possible
- Standard-signals 0/4-20 mA, 0-10 V (scaleable)

### Displays:

- 4-digit for measuring value
- 2 LEDs for state of relays
- 3 LEDs sensor/difference
- 2 LEDs day/night

### Switching-Functions:

- 2 relays (co-contacts)
- 2-4 limits
- Warmest/coldest sensor switches relay
- Programmable for every relay:
  - hysteresis (+ or - = MIN- or MAX-function) -199.9...999.9 s
  - autoreset or electronic reclosing lock
  - delay-time for switching and switching back 0...9999 s
  - operating- or closed current-mode
  - cyclic check of function
- Monitoring of difference in temperature
- Preset basic programs





## Basic Programs

## Program 1:

**1 Temperature-sensor, 2 Limits**

Application: Monitoring of a temperature for 2 limits, e.g. over-temperature with warning and switching off or monitoring of a temperature-range (min/max).

## Program 2:

**2 Temperature-Sensors, 1 Limit for each Sensor**

Application: Monitoring of 2 temperatures for 1 limit each, e.g. over-temperature or as double electronic controller.

## Program 3:

**1 Temperature-Sensor, 2 Limits each day/night**

Application: Controlling of a temperature with first limit, different for day and night.

Monitoring of the same temperature with second limit, different for day and night.

## Program 4:

**2 Temperature-Sensors, each 1 Limit for day/night**

Application: Monitoring or controlling of 2 temperatures for 2 limits, depending on operation mode, e.g. controlling of 2 circulation pumps (day/night) or of processes (active/stand-by).

## Program 5:

**2 Temperature-Sensors for monitoring of differences in temperature, 2 Limits**

Application: Regulation or monitoring of the difference of 2 measuring-points for 2 limits, e.g. circulation pumps in solar systems.

## Program 6:

**1 Standard-Signal 0/4-20 mA or 0-10 V, 2 Limits**

Display can be scaled, e.g. measuring input 4-20 mA = display 0...1200 l/h.

Application: Monitoring of signals from a measuring transducer for 2 limits, e.g. over- or under-exceeding of limits with pre-alarm and alarm or monitoring of a signal-range (min/max) and/or as measuring-transducer.

In combination with any measuring-transducers, signals like pressure, volume-flow, pH-value, ... can be monitored.

## Program 7:

**2 Standard-Signals 0/4-20 mA or 0-10 V, 1 Limit each**

Display can be scaled, e.g. measuring input 4-20 mA = display 0...1200 l/h.

Application: Monitoring of signals from 2 measuring transducers, each for 1 limit, e.g. over- or under-exceeding of a limit as double electronic controller.

## Program 8:

**2 Standard-Signals 0/4-20 mA or 0-10 V for monitoring of differences of signals**

Application: Regulation or monitoring of the difference of 2 analog signals for 2 limits, e.g. levels of liquids.

## Program 9:

**2 Temperature-Sensors, 2 shared Limits**

Application: Coldest (MIN) or warmest (MAX) sensor switches relay. Monitoring of 2 bearings for pre-alarm and alarm.

Application as Measuring-Transducer:

At programs **with 1 measuring-input** the output can be scaled for this input, e.g. 0...200.0 = 4-20 mA.

At programs **with 2 measuring-inputs** the output can be scaled for 1 input or min- or max- value of both inputs.

At programs **for measuring of differences** output can be scaled for 1 signal or for the difference input 2 minus input or for min- or max- value of both inputs.

Thus the TR 210 can be used as limit value switch and/or measuring-transducer simultaneously. The measured values can be forwarded to e.g. a remote display or a superior control.

## Technical Data

Rated supply voltage	Us	AC/DC 24-240V, <3W, <7VA (AC 20-264 V, DC 20,4-297 V)
2 Measuring inputs		Pt 100, Pt 1000 according to EN 60 751 Thermocouples types B, E, J, K, L, N, R, S, according to EN 60 584, DIN 43 710 0/4-20 mA (22Ω), 0-10 V (13 kΩ)
Measuring-time		<2,5 s to 5 s, depending on speed of change of signal
Analog output		0/4-20 mA, max. 500 Ω. 0-10 V, max. 10 mA (without isolation to inputs)
Relay output		type 3, see "general technical informations" 2 x 1 co- (change-over) contact
Test conditions		see "general technical informations"
Rated ambient temp.range		-20...+65°C
Housing / Installation Frame		Design V4 / Front mounting kit Type ER4
Dimensions h x w x d		90x70x58 [mm], mounting height 55 mm
Protection housing / terminals		IP 30 / IP 20 (terminals pluggable)
Weight		app. 200 g
Attachment		on 35 mm DIN-rail or with screws M 4



# Pt100-Temperature-Relay Type TR250

3 Sensors Pt 100 (RTD), Pt 1000, PTC or KTY, 3 Limits

**NEW: Alarm counter and preset programs for use with PTC thermistors only**

## TR250



### Part number:

**T224190** AC/DC 24-240 V

Accessory: [Installation frame ER4](#)  
[for panel mount](#)

### T224384

ER4



- Measuring and monitoring range - 199...+850°C
- resolution 0.1 °C selectable within range -19.9...99.9 °C
- 3 relay outputs K1 to K3 with change-over contacts
- Universal power supply AC/DC 24-240 V
- Easy setting
- Storing of values of MIN- and MAX- temperature
- **Alarm counter for 3x99 alarms with display of sensor and elapsed time.**
- Code-lock against manipulation of settings

The Pt100 thermostat TR250 monitors up to 3 sensors Pt100 (RTD), Pt1000, KTY83, KTY84 or thermistors (PTC) at the same time. Different types of sensors, e.g. Pt 100 and PTC can be monitored simultaneously. The unit is especially suitable for monitoring motors, generators and transformers.

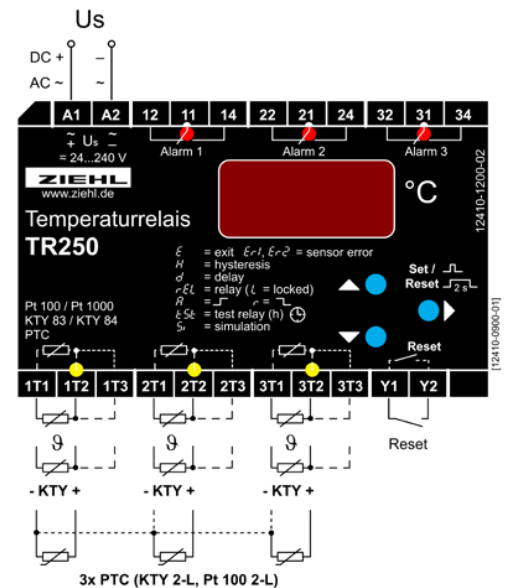
An other application is the use as a 2- or 3-step-controller with additional monitoring of over- or under-temperature. monitoring of differences in temperatures of 2 sensors or temperature controller for heat pumps.

### 3 Sensor-Inputs:

- Pt100/1000, 2- or 3-wire connection, KTY83, KTY84
- Thermistors (PTC) each 1...6 in series
- Monitoring of short-circuit and break

### Displays:

- 3 digit 7-segment-display for temperature and programming
- 3 LEDs for sensors, for alarms/ relays
- display °C or °F selectable, resolution 0.1 °C



### Switching-Functions

- 3 relays
- warmest/coldest sensor switches relay
- programmable for every relay:
  - hysteresis
  - autoreset or electronic reclosing lock
  - delay-time for switching and switching back
  - operating- or closed current-mode
  - cyclic check of function
- monitoring of difference in temperature

### 6 preset programs:

- motor / generator with 3x Pt 100
- transformer with 3x Pt 100
- **transformer with 2x PTC / 3x PTC**
- transformer with 2x PTC and 1x Pt 100
- 3 x 1 alarm per sensor

## Technical Data

Rated supply voltage  $U_s$

AC/DC 24-240 V (AC 20-264 V, DC 20-297 V)

Sensor connection

3 x Pt100 (DIN 43 760/IEC 751) (RTD)  
3 x Pt1000, KTY83, KTY84  
3 x 1...6 PTC (DIN 44080/44081)

Measuring accuracy

< 0,5 % of value  $\pm 1$  K

Sensor-current

< 1 mA

Connection

3-wire, 2-wire, line-resistance max. 2 x 50  $\Omega$

Measuring range

-199...+850 °C

Hysteresis

-99...+99 °C

Switching delay on/off

0...99 s / 0...999 s

Type of contact

**type 2** (see "general technical information")

Test conditions

see "general technical information"

Rated ambient temp. range

-20°C...+65°C

Housing / Installation Frame

Design V4 / Front mounting kit type ER4

Dimensions (h x w x d)

90 x 70 x 58 [mm], mounting height 55 mm

Protection housing / terminals

P 30 / IP 20

Weight

app. 200 g

Attachment

on 35 mm DIN rail or with screws M4

# Pt100-Temperature Relays type TR400

Digital, 4 Sensors, 4 Limits

## TR400



### Part numbers:

TR400 T224380



ER8 T224388

The Pt100 thermostat TR400 is a temperature controller and monitors up to four Pt100 (RTD) sensors at the same time. Four switching points and four relays permit almost any combination of switching action. It also can select the highest temperature of a group of three or four 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 4 type Pt100 sensors can be connected, the unit is especially suitable for temperature monitoring wherever up to 4 different measuring points must be monitored simultaneously:

- machines, bearings, plants
- motors and generators with simultaneous monitoring of bearing or coolant
- transformers with additional monitoring of the core temperature also

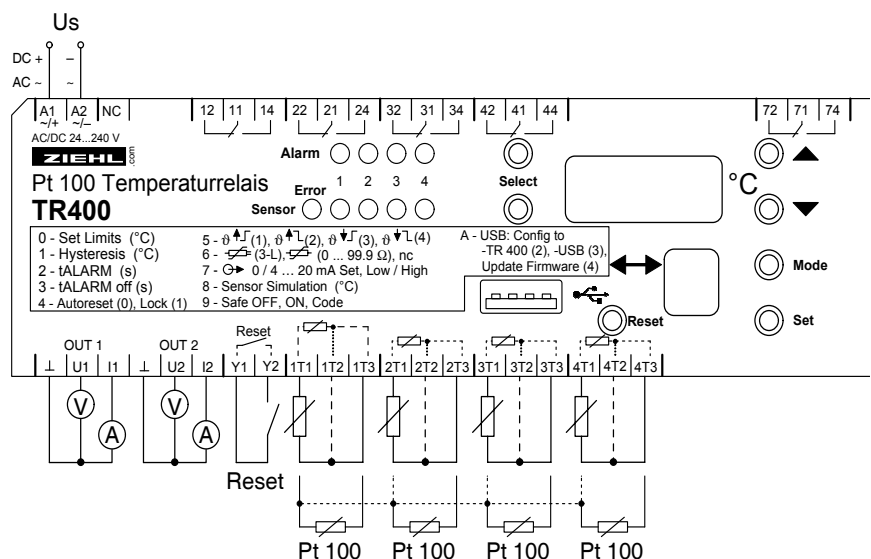
Accessory: [Installation frame ER8 for panel mount](#)

### Function overview

- Measuring and monitoring range -199 ... +800 °C
- 4 sensor inputs with 2- or 3-wire connection
- 4 relay outputs K1 to K4 with change-over contact
- Sensor Error Relay K7 monitors sensor break or sensor short circuit as well as an interruption of the powersupply.
- 2 analog outputs, 0/4...20 mA and 0/2...10 V, with individual scaling.
- Universal power supply. 2 ranges AC/DC 24-240 V
- USB-Stick-Terminal for up- and download of sets of parameters and for firmware-updates

### Displays

- built-in 3 digit temperature display and 1 digit programm-mode display
- LED Alarm showing state of the alarm relays
- LED Sensor Error blinking at sensor short circuit or sensor interruption.
- Stored Values of MIN- and MAX- temperature can be displayed
- „Sensor select“ showing temperatures of the different sensors „Alarm select“ showing switching points .



## Technical Data TR400

Rated supply voltage $U_s$	tolerance DC-supply	AC/DC 24 – 240 V
	tolerance AC-supply	DC 20,4...297 V AC 20...264 V
Relay outputs	power consumption	< 4 W, < 13 VA
	frequency	0 / 50 / 60 Hz
Relay outputs	switching voltage	5 change-over contacts (co) max. AC 415 V
	switching current	max. 5 A
	switching power	max. 1250 VA (ohmic load) max. 120 W at DC 30 V
	Nominal operational current $I_e$ AC15 DC13	$I_e = 3 \text{ A}$ $U_e = 250 \text{ V}$ $I_e = 0,1 \text{ A}$ $U_e = 250 \text{ V}$ $I_e = 2 \text{ A}$ $U_e = 24 \text{ V}$
	recommended fuse NO recommended fuse NC expected life mechanical expected life electrical	4 A time-lag or miniature circuit-breaker MCB B4 3.15 A time-lag 3 x 10 <sup>7</sup> operations 1 x 10 <sup>5</sup> operations with AC 250 V / 5 A, cos $\varphi = 1$
Testing conditions	ambient temperature range	EN 60 010-1 - 20 ... + 65 °C
	galvanic separation	Us-Relay, Sensors, USB, Analog output Reset input -> DC 3820 V Relay - Sensors, USB, Analog output Reset input -> DC 3820 V
	No galvanic separation	Sensors, USB, Analog output, Reset input
Sensor connection	measuring accuracy	4 x Pt 100 acc. to EN 60751 / IEC 60751, 2-/3-wire $\pm 0,5 \%$ of value $\pm 1$ Digit
	sensor current	$\leq 0,7 \text{ mA}$
	measuring delay time $t_M$	<1,5 s
Temperature alarm	switch points	-199 ... +800 °C
	hysteresis	1 ... 99 K
	delay time tALARM	0,1 ... 99,9 s
	delay time tALARM off	0 ... 999 s
Analog output OUT 1/2	voltage outputs	DC 0/2 V – 10 V , max. DC 10 mA
	current outputs	DC 0/4 mA – 20 mA
	output resistance current	max. 500 $\Omega$
	no-load voltage	max. DC 16 V
	accuracy	1% of span $\pm 1 \text{ K}$
Housing	design / Installation Frame	V8 / Front mounting kit ER8, 8 TE
	dimensions (h x w x d)	90 x 140 x 58 [mm] mounting height 55 mm
	line connection solid wire	1 x 1,5 mm <sup>2</sup> (1,0 mm <sup>2</sup> with end sleeves for strands)
	protection housing / terminals	IP 30 / IP 20
	attachment	on 35 mm DIN rail according to DIN EN 60 715 or M4 screw
	weight	app. 360 g

# Pt100-Temperature-Relay Type TR440

## 4 Sensors Pt100 (RTD), Monitoring of Core, Panel-Mount

### TR440



#### Part numbers:

T224184

T224185 RS485

#### Function:

#### Temperature-Relay for the protection of transformers from over-temperature and for controlling a fan.

Monitoring of the temperatures in the windings is made with 3 sensors. The input for the 4th sensor can be used for monitoring the temperature in the core or for a sensor for ambient temperature.

The 4 alarms/relay-outputs control the fan and release signals for alarm and trip if limits are exceeded. Different programs allow to adapt the required alarms to the application. Depending on the program e.g. extra alarms for sensor-error or for tripping because of over-temperature in the core are available.

#### Other applications:

The fourth sensor can be used to monitor the room, in which the transformer is set up and the alarm can control a forced cooling of the room.

The TR440 can also be used for the monitoring of temperatures e.g. at motors.

#### Features:

- 4 sensor-inputs Pt 100 (RTD) and Pt 1000
- Sensor-connection in 2- or 3-wire
- Monitoring range -199...+850°C / -199...+999°F
- 4 alarms / relays
- Supply-voltage AC/DC 24-240 V
- Clearly arranged displays and easy programming
- Storing of values of MIN- and MAX-temperature
- Code-lock against unintended / unauthorized manipulations of settings

#### Displays:

- 3 digit 7-segment-display
- 4 LEDs for sensor-inputs, LED for sensor-error
- 4 LEDs for alarms
- 4 LEDs for state of relays
- Display in °C or °F

#### Switching functions:

- 4 relay-outputs, change-over (co) contacts
- Relay for Fan max. 10 A
- Adjustable (depending of function)
  - Hysteresis 1...99 K
  - Switch- and switch-back-delay 0...999 s
  - Operating- or closed-current mode
  - Autoreset or electronic reclosing lock
  - Cyclic start of fan (K1 only)

#### Option:

- Interface RS485 (Modbus RTU)

#### Monitoring Programs:

##### 3 sensors in windings:

Alarms/outputs for:

- Fan (with cyclic test)
- Alarm
- Trip
- Sensor-Error

##### 3 sensors in windings and 1 sensor in core:

Alarms/outputs for:

- Fan (with cyclic test)
- Alarm (winding and core)
- Trip (winding and core)
- Sensor-Error

For core and winding different limits can be programmed.

##### 3 sensors in windings and 1 sensor in core:

Alarms/outputs for:

- Fan (with cyclic test)
- Alarm (winding) / sensor-error (combined)
- Trip (winding)
- Trip (core)

Alarm 2 reports sensor-error and alarm

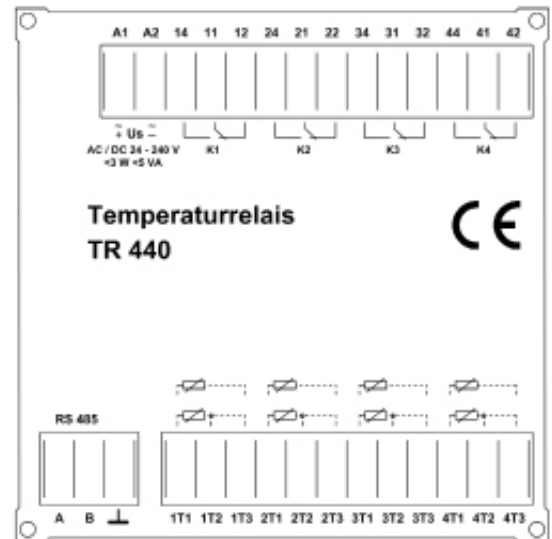
##### 3 sensors in windings and 1 sensor in core:

Alarms/outputs for:

- Trip (core)
- Alarm (winding)
- Trip (winding)
- Sensor-Error

The relay for error (short-circuit or break of sensor-lines) is preset in closed-current mode (alarm also at loss of supply-voltage or failure in the device = monitoring of function of the device). All other relays are in operating-current mode (pick up at an alarm = no alarm when switching on and off supply-voltage). The mode of the relays can be changed by the user.

Connection plan:



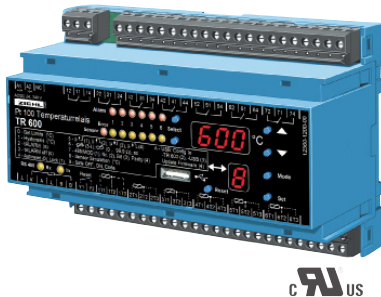
## Technical Data

Rated supply voltage $U_s$	AC/DC 24-240V, AC 20-264 V, DC 20-297 V,
Power consumption	<math>3 W</math>, <math>5 VA</math>
Sensor-connection	4 x Pt100 (RTD) acc. to EN 60 751/ IEC 60 751
Measuring accuracy	<math>< 1\%</math> of value $\pm 1$ digit
Sensor-current	$\leq 1$ mA
Connection	2- wire or 3-wire, with line-resistance max. 2 x 50 $\Omega$
Measuring range	-199...850 $^{\circ}C$ (-199...+999 $^{\circ}F$ )
Hysteresis	1...99 $^{\circ}C$ ( $^{\circ}F$ )
Switching-delay on/off	0...999 s
Relay-output	Alarm 1 (Fan): 10 A Alarms 2-4: type 3, see "general technical informations"
Test conditions	see "general technical informations"
Rated ambient temperature range	-40...+65 $^{\circ}C$
Housing	panel-mount 96 x 96 mm
Dimensions (H x B x T)	96 x 96 x 85 mm
Terminals	2 x 13-pole
Line connection solid wire	1 x 0,5 mm <sup>2</sup>
Stranded with insulated ferrules	1 x 0,14...1,5 mm <sup>2</sup>
Attachment	Panel-mount, cutout 92 <sup>+0,8</sup> x92 <sup>+0,8</sup> mm
Protection housing	IP 20
Protection front	IP 54
Protection terminals	IP 20
Weight	app. 290 g

# Pt100-Temperature-Relay Type TR600

## Digital, 6 Sensors, 6 Limits, 2 analog outputs

**TR600**  
with analog output



**Part numbers:**

TR600 analog **T224360**

ER8 **T224388**



**Temperature Relay for 6 Sensors Pt100**

The Pt100-temperature relay TR600 monitors up to six sensors Pt100 (RTD) 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 groups of 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 Pt100 sensors can be connected, the unit is especially suitable for temperature monitoring wherever up to 6 different measuring points must be monitored simultaneously:

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

Accessory: [Installation frame ER8 for panel mount](#)

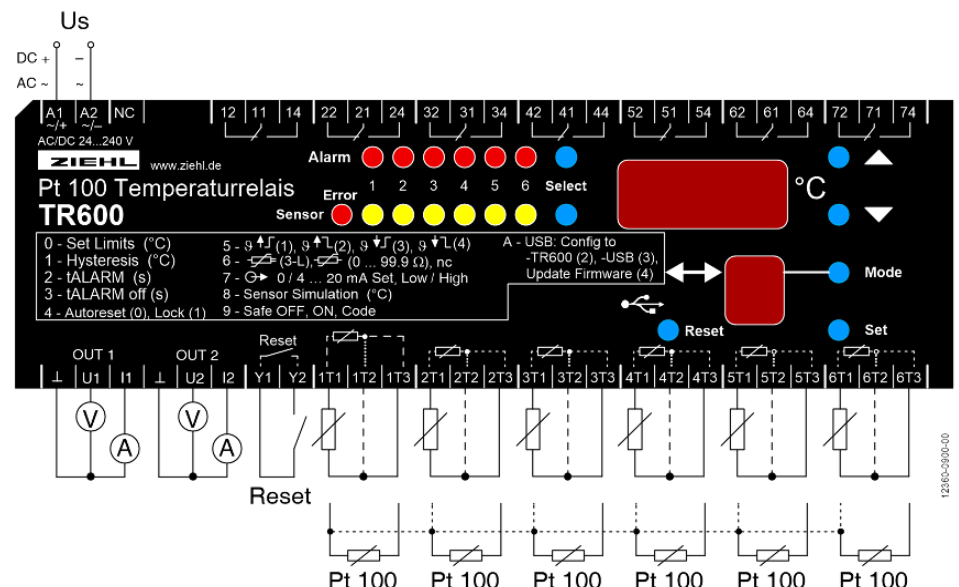
- measuring and monitoring range -199 ... +800 °C
- 6 sensor inputs with 2- or 3-wire connection
- 6 relay outputs K1 to K6 with change-over contacts
- switching points for single sensor or group of 2, 3 or 6 sensors
- sensor error relay K7 monitors sensor break or sensor short circuit as well as an interruption of the power-supply.
- 2 analog outputs, 0/4...20 mA and 0/2...10 V, with individual scaling.
- universal power supply in 2 ranges AC/DC 24 - 240 V
- USB-Stick-Terminal for up- and download of sets of parameters and for firmware-updates

**Displays**

- built-in 3 digit temperature display and 1 digit program-mode display
- LED Alarm showing state of the alarm relays
- LED Sensor Error blinking at sensor short circuit or sensor interruption.
- Stored Values of MIN- and MAX- temperature can be displayed
- „Sensor select“ showing temperatures of the different sensors
- „Alarm select“ showing switching points .

**Programmable for each relay extra:**

- hysteresis
- electronic reclosing lock or autoreset
- switch-on delay and switch-off delay
- MIN or MAX- function of relay
- relay releases or picks up when exceeding the setpoint





## Technical Data TR600

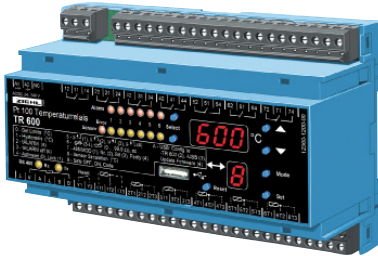
Rated supply voltage $U_s$	tolerance DC-supply	AC/DC 24 – 240 V
	tolerance AC-supply	DC 20,4...297 V AC 20...264 V
Relay outputs	power consumption	< 4 W, < 13 VA
	frequency	0 / 50 / 60 Hz
Relay outputs	switching voltage	7 change-over contacts (co) max. AC 415 V
	switching current	max. 5 A
	switching power	max. 1250 VA (ohmic load) max. 120 W at DC 30 V
	Nominal operational current $I_e$	
AC 15	$I_e = 3 \text{ A}$ $U_e = 250 \text{ V}$	
DC 13	$I_e = 2 \text{ A}$ $U_e = 24 \text{ V}$ $I_e = 0,1 \text{ A}$ $U_e = 250 \text{ V}$	
Testing conditions	recommended fuse NO	4 A time-lag or miniature circuit-breaker MCB B4
	recommended fuse NC	3.15 A time-lag
	expected life mechanical	$3 \times 10^7$ operations
	expected life electrical	$1 \times 10^5$ operations with AC 250 V / 5 A, $\cos \varphi = 1$
Testing conditions	ambient temperature range	EN 60 010-1 - 20 ... + 65 °C
	galvanic separation	Us-Relay, Sensors, USB, Analog output Reset input -> DC 3820 V Relay - Sensors, USB, Analog output Reset input -> DC 3820 V
	No galvanic separation	Sensors, USB, Analog output, Reset input
Sensor connection	measuring accuracy	6 x Pt 100 acc. to EN 60751 / IEC 60751, 2- / 3-wire $\pm 0,5 \%$ of value $\pm 1$ Digit
	sensor current	$\leq 0,7 \text{ mA}$
	measuring delay time $t_M$	<1,5 s
Temperature alarm	switch points	-199 ... +800 °C
	hysteresis	1 ... 99 K
	delay time tALARM	0,1 ... 99,9 s
	delay time tALARM off	0 ... 999 s
Analog output OUT 1/2	voltage outputs	DC 0/2 V – 10 V , max. DC 10 mA
	current outputs	DC 0/4 mA – 20 mA
	output resistance current	max. 500 $\Omega$
	no-load voltage	max. DC 16 V
	accuracy	1% of span $\pm 1 \text{ K}$
Housing	Design / Installation Frame	V8 / Front mounting kit ER8, 8 TE
	Simensions (h x w x d)	90 x 140 x 58 [mm] mounting height 55 mm
	Line connection solid wire	1 x 1,5 mm <sup>2</sup> (1,0 mm <sup>2</sup> with end sleeves for strands)
	Protection housing / terminals	IP 30 / IP 20
	Attachment	on 35 mm DIN rail according to EN 60715 or M4 screw
	Weight	app. 360 g



# Pt100-Temperature-Relay Type TR600

Digital, 6 Sensors, 6 Limits, RS485

## TR600 Interface RS485



### Part numbers:

TR600 RS485 **T224361**  
(no analog output)

ER8 **T224388**



### Temperature Relay for 6 Sensors Pt100

The Pt100-temperature relay TR600 monitors up to six sensors Pt100 (RTD) at the same time. 6 switching points and 6 relays permit almost any combination of switching action. It also can select the highest temperature of groups of sensors. Programming is very variable and simple.

Due to the fact that 6 type Pt100 sensors can be connected, the unit is especially suitable for temperature monitoring wherever up to 6 different measuring points must be monitored simultaneously:

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

Accessory: [Installation frame ER8 for panel mount](#)

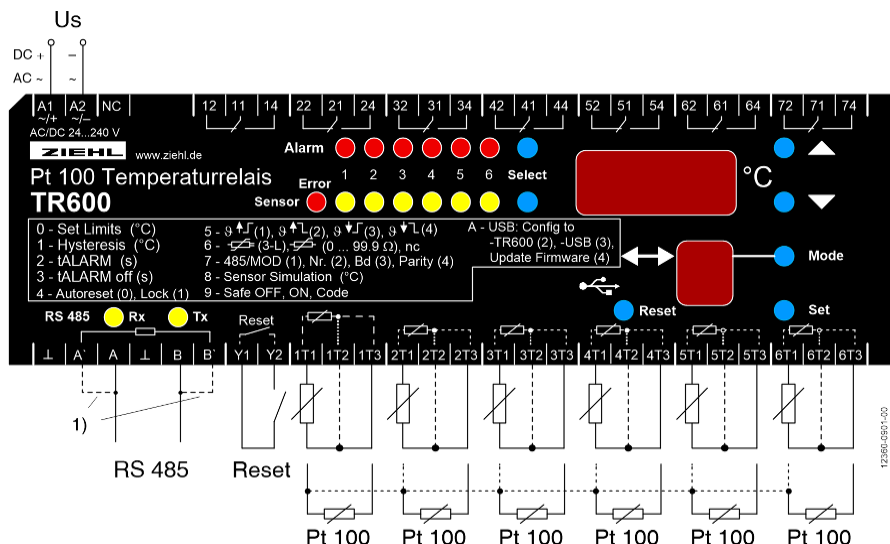
- measuring and monitoring range -199 ... +800 °C
- 6 sensor inputs with 2- or 3-wire connection
- 6 relay outputs K1 to K6 with change-over contacts
- switching points for single sensor or group of 2, 3 or 6 sensors
- sensor error relay K7 monitors sensor break or sensor short circuit as well as an interruption of the power-supply.
- interface RS485 protocols ZIEHL and modbus RTU
- universal power supply in 2 ranges AC/DC 24 - 240 V
- USB-Stick-Terminal for up- and download of sets of parameters and for firmware-updates

### Displays

- built-in 3 digit temperature display and 1 digit program-mode display
- LED Alarm showing state of the alarm relays
- LED Sensor Error blinking at sensor short circuit or sensor interruption.
- Stored Values of MIN- and MAX- temperature can be displayed
- „Sensor select“ showing temperatures of the different sensors
- „Alarm select“ showing switching points .

### Programmable for each relay extra:

- hysteresis
- electronic reclosing lock or autoreset
- switch-on delay and switch-off delay
- MIN or MAX- function of relay
- relay releases or picks up when exceeding the setpoint



## Technical Data TR600

Rated supply voltage $U_s$	tolerance DC-supply	AC/DC 24 – 240 V
	tolerance AC-supply	DC 20,4...297 V AC 20...264 V
Relay outputs	power consumption	< 4 W, < 13 VA
	frequency	0 / 50 / 60 Hz
Relay outputs	switching voltage	7 change-over contacts (co) max. AC 415 V
	switching current	max. 5 A
	switching power	max. 1250 VA (ohmic load) max. 120 W at DC 30 V
	Nominal operational current $I_e$	
AC 15	$I_e = 3 A$ $U_e = 250 V$	
DC 13	$I_e = 2 A$ $U_e = 24 V$ $I_e = 0,1 A$ $U_e = 250 V$	
Testing conditions	recommended fuse NO	4 A time-lag or miniature circuit-breaker MCB B4
	recommended fuse NC	3.15 A time-lag
	expected life mechanical	$3 \times 10^7$ operations
	expected life electrical	$1 \times 10^5$ operations with AC 250 V / 5 A, $\cos \varphi = 1$
Testing conditions	ambient temperature range	EN 60 010-1 - 20 ... + 65 °C
	galvanic separation	Us-Relay, Sensors, USB, Analog output Reset input -> DC 3820 V Relay - Sensors, USB, Analog output Reset input -> DC 3820 V
	No galvanic separation	Sensors, USB, Analog output, Reset input
Sensor connection	measuring accuracy	6 x Pt 100 acc. to EN 60751 / IEC 60751, 2- / 3-wire $\pm 0,5$ % of value $\pm 1$ Digit
	sensor current	$\leq 0,7$ mA
	measuring delay time $t_M$	<1,5 s
Temperature alarm	switch points	-199 ... +800 °C
	hysteresis	1 ... 99 K
	delay time tALARM	0,1 ... 99,9 s
	delay time tALARM off	0 ... 999 s
Interface RS485	address/busnumber	Modbus RTU/ZIEHL RS485 protocol 1-247 (Modbus)/0-99 (ZIEHL RS485 protocol)
	baudrate	4800/9600/19200/57600
	parity bit	no, odd, even
	stopbit	1 (at modbus and parity no, stopbit = 2)
	Response time ZIEHL RS485 protocol	7-9 ms after reception of last sign
	Housing	Design / Installation Frame
Dimensions (h x w x d)		90 x 140 x 58 [mm] mounting height 55 mm
Line connection solid wire		$1 \times 1,5 \text{ mm}^2$ (1,0 $\text{mm}^2$ with end sleeves for strands)
Protection housing / terminals		IP 30 / IP 20
Attachment		on 35 mm DIN rail according to EN 60715 or M4 screw
Weight		app. 360 g

# Temperature relay TR640IP

Sensors 6 x Pt 100, Pt 1000 or PTC, 4 limits, IP interface, operation with browser via TCP/IP

## TR640IP



CE US

Part numbers:  
TR640IP

T224390

ER6



T224386

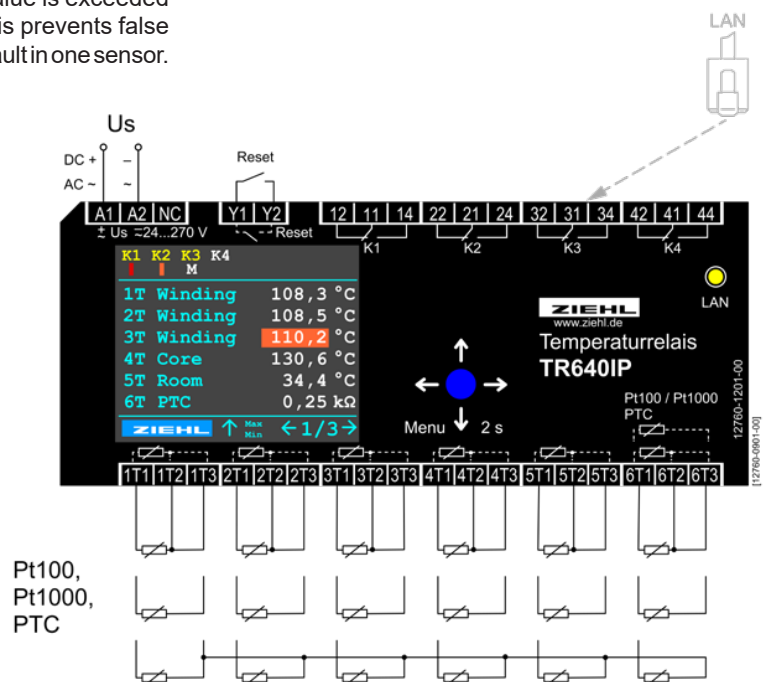
Temperature Relays TR640IP monitor up to 6 sensors for up to 4 limits. Different sensors can be connected at the same time, e.g. Pt 100 (RTD) and PTC-thermistors. Typical applications are monitoring of motors, generators or transformers. An other application is the use as a 2- or more step-controller with additional monitoring of over- or undertemperature or monitoring of differences in temperatures of 2 sensors.

Preset programs allow easy setting e.g. monitoring of transformers with/without monitoring of temperature of core or with/without controlling a ventilator. If the evaluation "2 out of x" is activated with several connected sensors, an alarm is only triggered when the limit value is exceeded in 2 sensors. This prevents false alarms due to a fault in one sensor.

Operation can be made at the device or with a standard browser via ethernet.

- 6 inputs for sensors Pt 100, Pt 1000 and PTC, mixed sensors possible
- 4 alarms / output relays
- alarm 2 of x = alarm only when limit is exceeded in min. 2 sensors
- monitoring of difference of temperatures
- monitoring of rate of change of temperature
- logging of temperatures and history
- preset programs for protection of motors, transformers and more
- interface ethernet TCP/IP, values available via modbus TCP
- programming with browser via TCP/IP or with joystick at device
- coloured LCD display for clear display of temperatures and states of alarms
- universal power supply AC/DC 24-270 V

Accessory: [Installation frame ER6 for panel mount](#)



## Technical data

Rated supply voltage  $U_s$   
Sensor connection  
Type of connection  
Monitoring range  
Switching delay on/off  
Relay output  
Test conditions  
Rated ambient temperature range

AC/DC 24 - 270 V, 0/50/60 Hz  
6 x Pt 100, Pt 1000, PTC  
3-wire, 2-wire (line resistance 0,0...99,9 Ohm)  
-199,9...+800 °C  
00:00...59:59 mm:ss  
4 x changeover contact  
EN 61010, EN 61326  
-20°C...+65°C

Housing / Installation Frame  
Dimensions (w x h x d)  
Protection housing/terminals  
Mounting  
Weight

Design V6 / Front mounting kit type ER6, 6 TE  
105 x 90 x 58 mm, mounting height 55 mm  
IP 30 / IP 20  
snap mount on 35 mm DIN rail or screws M4  
app. 250 g

# Temperature relay TR660IP

Sensors 6 x Pt 100, Pt 1000 or PTC, 7 limits, analog outputs or interface RS485, IP interface, operation with browser via TCP/IP

## TR660IP



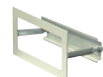
CE US

### Part numbers:

TR660IP analog  
TR660IP RS485

T224370  
T224371

ER8



T224388

Temperature Relays TR660IP monitor up to 6 sensors for up to 7 limits. Different sensors can be connected at the same time, e.g. Pt 100 (RTD) and PTC-thermistors. Typical applications are monitoring of motors, generators or transformers. An other application is the use as a 2- or more step-controller with additional monitoring of over- or undertemperature or monitoring of differences in temperatures of 2 sensors.

Preset programs allow easy setting e.g. monitoring of transformers with/without monitoring of temperature of core or with/without controlling a ventilator. If evaluation "2 out of x" is activated with several connected sensors, an alarm is only triggered when the limit value is exceeded in 2 sensors. This prevents false alarms due to a fault in one sensor.

Operation can be made at the device or with a standard browser via ethernet.

- 6 inputs for sensors Pt 100, Pt 1000 and PTC, mixed sensors possible
- 7 alarms / output relays
- alarm 2 of x = alarm only when limit is exceeded in min. 2 sensors
- monitoring of difference of temperatures
- monitoring of rate of change of temperature
- logging of temperatures and history
- preset programs for protection of motors, transformers and more
- interface ethernet TCP/IP, values available via modbus TCP
- programming with browser via TCP/IP or with joystick at device
- coloured LCD display for clear display of temperatures and states of alarms
- universal power supply AC/DC 24-270 V

TR660IP RS485:

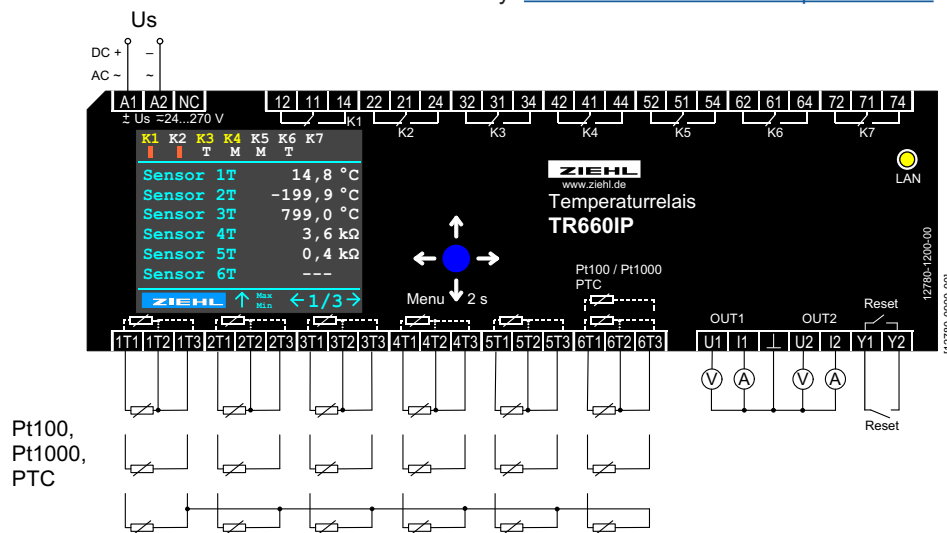
Interface RS 485 (modbus RTU)

TR660IP analog:

4 analog outputs 2x 0/4-20 mA and 2x 0/2-10V,

isolated from sensor inputs, individually programmable

Accessory: [Installation frame ER8 for panel mount](#)



## Technical data

Rated supply voltage $U_s$	AC/DC 24 - 270 V, 0/50/60 Hz
Sensor connection	6 x Pt 100, Pt 1000, PTC
Type of connection	3-wire, 2-wire (line resistance 0,0...99,9 Ohm)
Monitoring range	-199,9...+800 °C
Switching delay on/off	00:00...59:59 mm:ss
Relay output	7 x changeover contact
Test conditions	EN 61010, EN 61326
Rated ambient temperature range	-20°C...+65°C

Housing / Installation Frame	Design V8 / Front mounting kit ER8, 8 TE
Dimensions (w x h x d)	140 x 90 x 58 mm, mounting height 55 mm
Protection housing/terminals	IP 30 / IP 20
Mounting	snap mount on 35 mm DIN rail or screws M4
Weight	app. 400 g

# Universal-Relay Type TR800Web

8 Inputs, Operation with Browser via TCP/IP

## TR800Web



**Part numbers:**  
TR800Web

**T224164**

ER8



**T224388**

### Web-IO Universal Relay with 8 Inputs for Temperature-Sensors and other analog Signals.

The TR800Web can be connected to the internet or an intranet and operated via TCP/IP from a normal PC with a suitable browser. No special software and no special instruction is necessary.

The Universal-Relay TR800Web monitors and logs signals from up to 8 inputs. Up to 8 limits (one per input) can be programmed for each of the 4 output-relays. Thus e.g. alarm 1 can be activated when the temperature at a sensor (e.g. Pt100) at input 1 exceeds a limit or when the signal

of a transmitter for pressure (e.g. 4-20 mA) at input 5 falls below a limit.

It can also send an email when a limit is exceeded and/or when the signals falls short of the limit again. A day/night switchover allows to vary limits depending on daytime.

In addition the device has an interface RS485 with the protocols Modbus and ZIEHL-standard.

### Applications:

The TR800Web is used where one or more of the following features are required:

- measuring of up to 8 analog signals and transmit the data via TCP/IP
- reading of measured values and teleservice via internet/intranet
- signalling of alarms via email when limits are exceeded
- monitoring of filling levels (water, oil) with ZIEHL [filling level probe NS6123-6](#)
- logging of measured values and remote inquiry e.g. for monitoring temperatures at engines and in plants

## Features

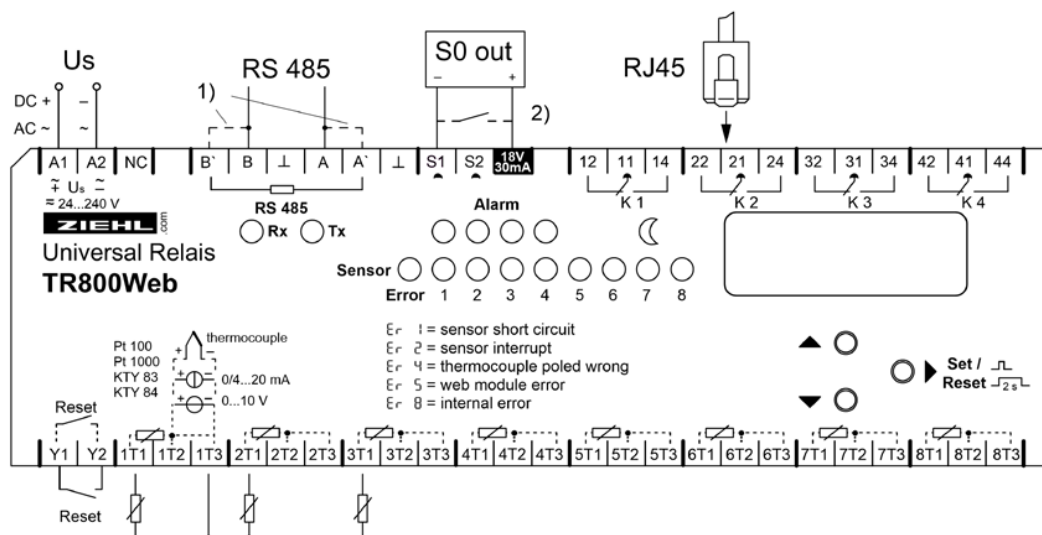
### 8 Measuring Inputs (each programmable):

- Pt100 (RTD), Pt1000 in 2- or 3-wire
- KTY83 or KTY84
- thermocouples types B, E, J, K, L, N, R, S, T
- DC 0-10 V, DC 0/4-20 mA, display can be scaled
- resistance 0-500 Ohm, 0-30 kOhm
- Difference of 2 signals

### 4 Alarms

- 4 relays, potential-free change-over contacts
- Remote switching of relays via Ethernet
- for every alarm separately programmable
  - one limit per input (limit and switching-back-value)
  - second set of values switchable day/night
  - switching-delay and switching-back delay
  - remote operation of relays (on/off) with browser
  - interlocked switching
  - email at alarm

Accessory: [Installation frame ER8 for panel mount](#)



0/4...20 mA	xT2 xT3	
0...10 V	xT2 xT3	
thermocouple	xT2 xT3	
KTY83 KTY84 Pt100 Pt1000 R (Ohm)	xT1 xT3	
Pt100 Pt1000 3-wire	xT1 xT2 xT3	



Programmable via internet in web-browser

- display of measured values, min- and max-values with date/time-stamp
- simulation of measured values state of alarms
- configuration of inputs (name, compensation, scaling and measuring-unit)
- configuration of alarms (limits, function of relays, ...)
- time-depending day/night changing of limits
- logging of up to 150.000 values per input, alarms with date/time-stamp
- logging-interval adjustable 2 seconds to 24 hours

- configuration of network
- settings of system
- administration of users and code-protection
- real-time clock with synchronizing with time-server, reserve 7 days

Interfaces:

Ethernet interface (http, https, UDP and Modbus)

- http (port can be selected and switched off) and https
- ftp-upload for automatic (interval adjustable)
- storage of logged data on ftp-server

- UDP- and Modbus protocol to read data (port can be selected)

- AJAX for data-readout in html
- SNMP

RS485 interface to readout data with modbus (RTU) and ZIEHL-protocol



Displays and Operating elements:

- 8 LEDs for inputs
- 4 LEDs for alarms, 4 LEDs for state of relays
- 4 digit display for measuring values
- 3 buttons for reading measured values at the device and for setting of IP-address
- switch IP 10.10.10 / user
- reset-button
- LEDs for activity of interfaces





## Operating and Programming with Web-Browser:

 **TR800\_Temperatur**
2016-Oct-04 10:17:26 [Help](#) TR800Web 

Cancel
Save

Sensor Configuration

No.	Sensor-Name	current value	Sensor Type	Wire Compensation	Scaling				Unit
					on	zero point	fullscale	Dec. point	
1.	Aussentemperatur/Outside	30.0 °C	Pt 100	10.4 Ω	<input type="checkbox"/>	0	5000	xxxx	°C
2.	Raumtemperatur/Room	27.8 °C	Thermo K	3-wire	<input type="checkbox"/>	0	5000	xxxx	°C
3.	Temperatur Wicklung/Bearing L1	99.0 °C	Pt 100	3-wire	<input type="checkbox"/>	0	5000	xxx . x	°C
4.	Temperatur Wicklung/Bearing L2	98.7 °C	Pt 100	3-wire	<input type="checkbox"/>	0	5000	xxx . x	°C
5.	Temperatur Wicklung/Bearing L3	95.3 °C	Pt 100	3-wire	<input type="checkbox"/>	0	5000	xxx . x	°C
6.	Temperatur Kern/Core	78.4 °C	Pt 100	3-wire	<input type="checkbox"/>	0	5000	xxx . x	°C
7.	Feuchte/Humidity	38 %	4..20 mA	3-wire	<input checked="" type="checkbox"/>	0	100	xxxx	%
8.	Sensor 8	21.5 °C	KTY 84	3-wire	<input type="checkbox"/>	0	5000	xxxx	°C

Alarm Configuration

Day    Night   now active: day

alarm name	Alarm 1 / Relay K1			Alarm 2 / Relay K2			Alarm 3 / Relay K3			Alarm 4 / Relay K4						
	delay [s]	Relay	alarm on error	alarm locked	sensor no.	active	Alarm ON	Alarm OFF	active	Alarm ON	Alarm OFF	active	Alarm ON	Alarm OFF		
Vorwarnung/Alarm	on 0 off 0	off at alarm	on <input checked="" type="radio"/> off <input type="radio"/>	on <input type="radio"/> off <input checked="" type="radio"/>	1.	<input type="checkbox"/>	0.0	<input type="radio"/> 5.0	1.	<input type="checkbox"/>	25.0	<input type="radio"/> 23.0	1.	<input type="checkbox"/>	3.0	<input type="radio"/> 5.0
Abschaltung/Trip	on 0 off 0	on at alarm	on <input type="radio"/> off <input checked="" type="radio"/>	on <input checked="" type="radio"/> off <input type="radio"/>	2.	<input type="checkbox"/>	100.0	<input type="radio"/> 97.0	2.	<input type="checkbox"/>	100.0	<input type="radio"/> 97.0	2.	<input type="checkbox"/>	100.0	<input type="radio"/> 97.0
Ventilator	on 0 off 999	manual on	on <input type="radio"/> off <input checked="" type="radio"/>	on <input type="radio"/> off <input checked="" type="radio"/>	3.	<input checked="" type="checkbox"/>	140.0	<input type="radio"/> 135.0	3.	<input checked="" type="checkbox"/>	150.0	<input type="radio"/> 145.0	3.	<input type="checkbox"/>	100.0	<input type="radio"/> 97.0
Abschaltung/Trip Kern/Core	on 0 off 0	on at alarm	on <input type="radio"/> off <input checked="" type="radio"/>	on <input checked="" type="radio"/> off <input type="radio"/>	4.	<input checked="" type="checkbox"/>	140.0	<input type="radio"/> 135.0	4.	<input checked="" type="checkbox"/>	150.0	<input type="radio"/> 145.0	4.	<input type="checkbox"/>	100.0	<input type="radio"/> 97.0
			on <input type="radio"/> off <input checked="" type="radio"/>	on <input type="radio"/> off <input checked="" type="radio"/>	5.	<input checked="" type="checkbox"/>	140.0	<input type="radio"/> 135.0	5.	<input checked="" type="checkbox"/>	150.0	<input type="radio"/> 145.0	5.	<input type="checkbox"/>	100.0	<input type="radio"/> 97.0
			on <input type="radio"/> off <input checked="" type="radio"/>	on <input type="radio"/> off <input checked="" type="radio"/>	6.	<input type="checkbox"/>	0.0	<input type="radio"/> 969.0	6.	<input type="checkbox"/>	0.0	<input type="radio"/> 969.0	6.	<input checked="" type="checkbox"/>	200.0	<input type="radio"/> 190.0
			on <input type="radio"/> off <input checked="" type="radio"/>	on <input type="radio"/> off <input checked="" type="radio"/>	7.	<input type="checkbox"/>	1000	<input type="radio"/> 969	7.	<input type="checkbox"/>	1000	<input type="radio"/> 969	7.	<input type="checkbox"/>	200	<input type="radio"/> 190
			on <input type="radio"/> off <input checked="" type="radio"/>	on <input type="radio"/> off <input checked="" type="radio"/>	8.	<input type="checkbox"/>	100.0	<input type="radio"/> 97.0	8.	<input type="checkbox"/>	100.0	<input type="radio"/> 97.0	8.	<input type="checkbox"/>	100.0	<input type="radio"/> 97.0

NoAlarm    Delay Alarm On    Alarm    Delay Alarm Off    Locked Alarm

Alarm- E-Mail

Alarm 1 / Relay K1 Vorwarnung/Alarm

eMail on "Alarm ON"	<input checked="" type="checkbox"/>	Recipient: maier@maier.de Subject: Vorwarnung/Alarm Trafo 1 Text: Vorwarntemperatur 140 °C überschritten Alarm temperature 140 °C exceeded	<input type="button" value="Add"/>
eMail on "Alarm OFF"	<input checked="" type="checkbox"/>	Recipient: maier@maier.de Subject: Vorwarnung/Alarm Trafo 1 beendet/finished Text: Vorwarntemperatur unterschritten Alarm temperature deceeded	<input type="button" value="Add"/>

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## Technical Data TR800Web

Rated supply voltage  $U_s$  Tolerance AC/DC 24-240 V, 0/50/60 Hz < 4 W < 13 VA  
DC 20,4...297 V, AC 20...264 V

Relay output Type of contact 4 x 1 change-over contact (CO)Typ 2  
type 2 (see "general technical informations")

Testing conditions see "general technical informations"

Network-connection 10/100 MBit Auto-MDIX

Inputs Measuring cycle/measuring time < 3 s

Pt100, Pt1000 according to EN 60 751

Sensor	Measuring range °C		Short-circuit Ohm	Interruption Ohm	Resistance sensor + resistance line Ohm
	min	max	<	>	max
Pt100	-199	860	15	400	500
Pt1000	-199	860	150	4000	4100
KTY83	-55	175	150	4000	4100
KTY84	-40	150	150	4000	4100

Accuracy < ± 0,5 % of measured value ± 0,5 K (KTY ±5K)  
Sensor-current ≤ ± 0,6 mA  
Thermal drift < 0,04 °C/K

Thermocouples according to EN 60 584, DIN 43710

Typ	Measuring range °C		Accuracy	
	Min	Max		
B	0	1820	≤ ± 2 °C T > 300 °C	
E	-270	1000	≤ ± 1 °C	
J	-210	1200	≤ ± 1 °C	
K	-200	1372	≤ ± 2 °C	
L	-200	900	≤ ± 1 °C	
N	-270	1300	≤ ± 2 °C	
R	-50	1770	≤ ± 2 °C	
S	-50	1770	≤ ± 2 °C	
T	-270	400	≤ ± 1 °C	

Thermal drift < 0,01 % /K  
Measuring-error of sensor-line + 0,25 µV / Ω  
Accuracy of summing point < ± 5 °C

Inputs for voltage and current

	Resistance of input	max. Inputsignal	Accuracy from Full Scale
0 - 10 V	12 k Ω	27 V	< 0,1 %
0/4...20 mA	18 Ω	100 mA	< 0,5 %

Thermal drift < 0,02 % / K

Measuring of resistance:

Accuracy 0,0...500,0 Ω < 0,2 % of measured value ± 0,5 Ω  
Accuracy 0...30,00 kΩ < 0,5 % measured value ± 2 Ω  
Measuring current ≤ 0,6 mA

Housing Dimensions (w x h x d) Design V8 / Front mounting kit ER8, 8 TE  
Protection housing/terminals 140 x 90 x 58 mm, mounting height 55 mm  
Attachment IP 30/ IP 20  
DIN-rail 35 mm according to EN 60715 oder screws M4  
(with 2 extra bars)  
Weight app. 370 g

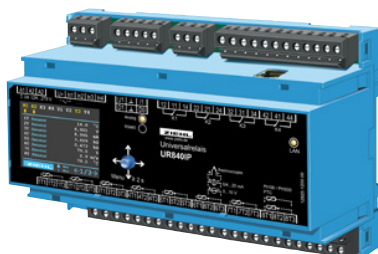
# Universal-Relay Type UR840IP

Monitoring Relay for Temperatures and analog Signals

4 Limits, IP-interface, built-in Webserver

Available 4<sup>th</sup> quarter of 2022

## UR840IP



### Part numbers:

UR840IP **T224353**

ER8 **T224388**

**Web-IO universal limit value relay with Ethernet interface, built-in web server and 8 inputs for temperature sensors or other analog signals.**

The UR840IP can be connected to the internet or an intranet and operated via TCP/IP from a normal PC with a suitable browser. The device can simultaneously evaluate and monitor up to 8 different input signals. Each of the 4 output relays can be assigned up to 8 limit values, one per input. If a limit value is reached, an alarm is triggered and a relay switches.

Example: Alarm 1 is activated when a temperature is exceeded at sensor input 3 (e.g. Pt 100) or the signal from a pressure transmitter (e.g. 4-20 mA) at input 5 falls below a limit value. The device also has an RS485 interface (Modbus RTU) and analogue outputs 0/2-10 V or 0/4-20 mA.

### Applications:

- The UR840IP is used to advantage wherever the following features are required
- monitor up to 8 different analogue measured values and transfer them to the Internet
- Measured value query and remote maintenance via intranet/internet

### Displays and controls:

- LCD display and joystick for querying measured values and operation

### 8 Measuring inputs (every input individually programmable):

- Pt 100 (RTD), Pt 1000 in 2- or 3-wire connection
- PTC-sensors (thermistors)
- Thermocouples type B, E, J, K, L, N, R, S, T
- DC 0-10 V, DC 0/4-20 mA
- Resistance 500 Ohm, resistance 30 kOhm
- Virtual sensors: linking of measured values (difference, MIN/MAX)
- 4 digital inputs with programmable functions

### 4 Alarms/Output Relays

- 4 relays (potential-free changeover contacts)
- Remote switching command for relays via Ethernet
- individually programmable for each alarm:
  - one limit value per measurement input/virtual sensor (switching and reset value)
  - switching and switch-back delay
  - Remote control of the relays (on/off) via browser
  - 2 out of x, alarm only if limit value is reached in 2 sensors

### Interfaces:

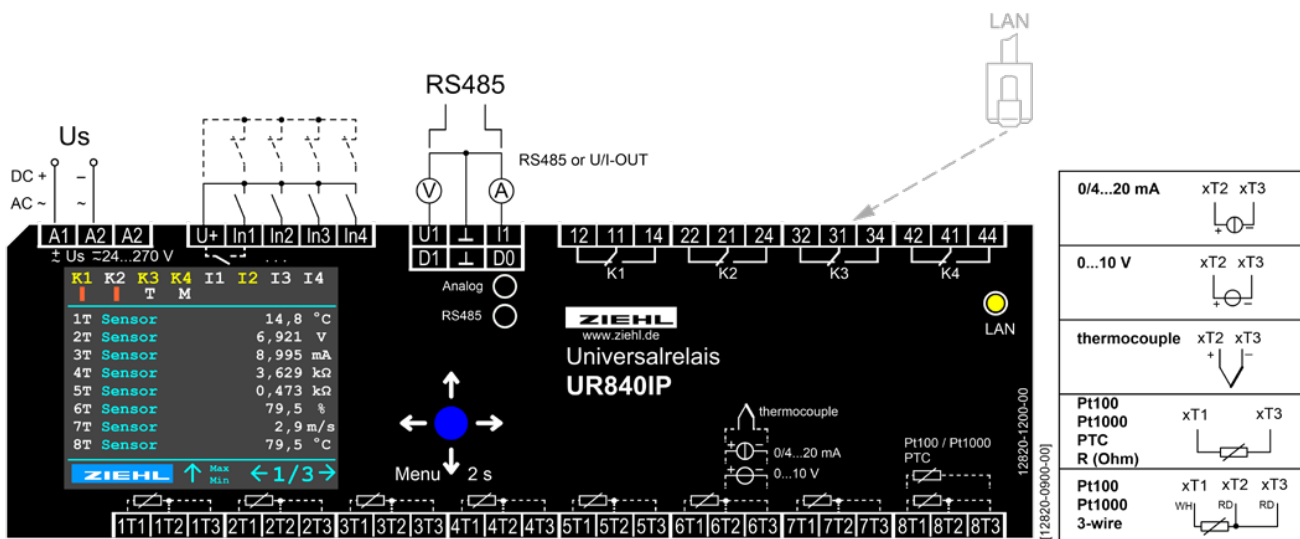
- Ethernet interface (http and modbus)
- Modbus TCP protocol for reading data (port adjustable)

- RS485 interface for reading data with Modbus (RTU)
- 2 analogue outputs 0/2-10 V / 0/4-20 mA, configurable (optionally instead of RS485)

### Connected to internet via web browser

- Measured values, min/max values with date/time stamp
- Simulation of measured values
- status of the alarms
- Configuration of the inputs (name, type, compensation, scaling and unit)
- Configuration of alarms (limit values, relay function, ...)
- Data logging of measured values for each input, with time stamp
- Logging interval adjustable from 10 seconds to 30 minutes.
- alarm logging
- network configuration and system settings
- User management and password protection
- Real-time clock with time server synchronization, power reserve 7 days

Accessory: [Installation frame ER8 for panel mount](#)



## Technical Data UR840IP

Rated supply voltage Us	Tolerance	AC/DC 24-240 V, 0/50/60 Hz < 4 W < 12VA DC 20,4...297 V AC 20...264 V
Relay outputs	Switching voltage Type of contact	4 x 1 change over contact (CO) max. AC 300 V, DC 300 V Typ 2 (see "general technical information")
Digital inputs		approx. DC 18 V / 3,5 mA

### Sensor inputs

#### Pt 100, Pt 1000 according to EN 60 751:

Sensor	Measuring range °C		short-circuit Ohm	Interruption Ohm	Resistance sensor + resistance line Ohm
	min	max	<	>	max
Pt 100	-199,9	800,0	15	400	500
Pt 1000	-199,9	800,0	150	4000	4100
PTC		20	20000		

Accuracy  $\pm 0,5\%$  of measured value  $\pm 1$  K  
 Sensor current  $\leq 1$  mA  
 Measuring cycle /  
 measuring time / tM < 1 s depending on number and type of connected sensors

#### Thermocouples according to EN 60 584, DIN 43 710

Type Sensor	Measuring range °C		Accuracy
	Min	Max	
B	0,0	1820,0	$\leq \pm 2$ °C T > 300 °C
E	-270,0	1000,0	$\leq \pm 1$ °C
J	-210,0	1200,0	$\leq \pm 1$ °C
K	-200,0	1372,0	$\leq \pm 2$ °C
L	-200,0	900,0	$\leq \pm 1$ °C
N	-270,0	1300,0	$\leq \pm 2$ °C
R	-50,0	1770,0	$\leq \pm 2$ °C
S	-50,0	1770,0	$\leq \pm 2$ °C
T	-270,0	400,0	$\leq \pm 1$ °C

Thermal drift < 0,01 % /K  
 Measuring error of sensor line + 0,25  $\mu$ V /  $\Omega$   
 Accuracy of summing point <  $\pm 5$  °C

#### Inputs for voltage and current

	Resistance Input Ohm	Input signal max.	Accuracy from Full Scale
0 - 10 V	12 k $\Omega$ 27 V	< 0,1 %	
0/4...20 mA	18 $\Omega$ 100 mA	< 0,5 %	

Thermal drift < 0,02 % / K

#### Measuring of resistance PTC. 500 $\Omega$ . 30 k $\Omega$ :

Accuracy 0,0...500,0  $\Omega$  < 0,2 % of measured value  $\pm 0,5$   $\Omega$   
 Accuracy 0,000...30,000 k $\Omega$  < 0,5 % of measured value  $\pm 2$   $\Omega$   
 Measuring current  $\leq 0,6$  mA

### Housing

Housing / Installation Frame	Design V8 / Front mounting kit ER8, 8 TE
Dimensions (w x h x d)	140 x 90 x 58 mm, mounting height 55 mm
Protection housing/terminals	IP 30/ IP 20
Attachment	DIN-rail 35 mm according to EN 60715 or screws M4 (with 2 extra bars)
Weight	approx. 370 g

# Pt100-Temperature-Relay TR1200

12 Sensors, Interface RS485

## TR1200



**Part number:**  
**T224095** AC/DC 24-240 V

### 12-channel Temperature-Relay for Sensors Pt100 (RTD)

Temperature-relays TR1200 measure the temperature of up to 12 sensors within 199...+850 °C and provide the data at an interface RS485 for external evaluation. With its universal power-supply AC/DC 24-240 V it can be connected to all common supply-voltages.

The TR1200 provides the data as Modbus-RTU-protocol or according to the ZIEHL-standard.

With protocol ZIEHL-standard it can replace two ZIEHL TR600.

The TR1200 is used where temperatures of many sensors Pt100 shall be evaluated by a device with input RS485. TR1200 itself does not monitor temperatures for limits. For direct monitoring of temperatures our devices with alarms and output relays are recommended.

Applications are e.g. monitoring of

- motors and generators (windings, bearings, coolant, ambient temperature)
- transformers (windings, core, ambient temperature)
- machines, plants and equipment

## Features

### Sensors and Displays:

- 12 inputs for sensors Pt100 (RTD)
- Connection 2- or 3-wire unneeded inputs can be switched off
- Monitoring of sensors for short-circuit and interrupt
- 3-digit-display for temperature
- LEDs for assigning the measured value, error, state of relay and interface

- selectable Protocols see operating-manual on [www.ziehl.de](http://www.ziehl.de)
- Relay for Error (1 co-contact) for sensor-error and operational failure

### More Features:

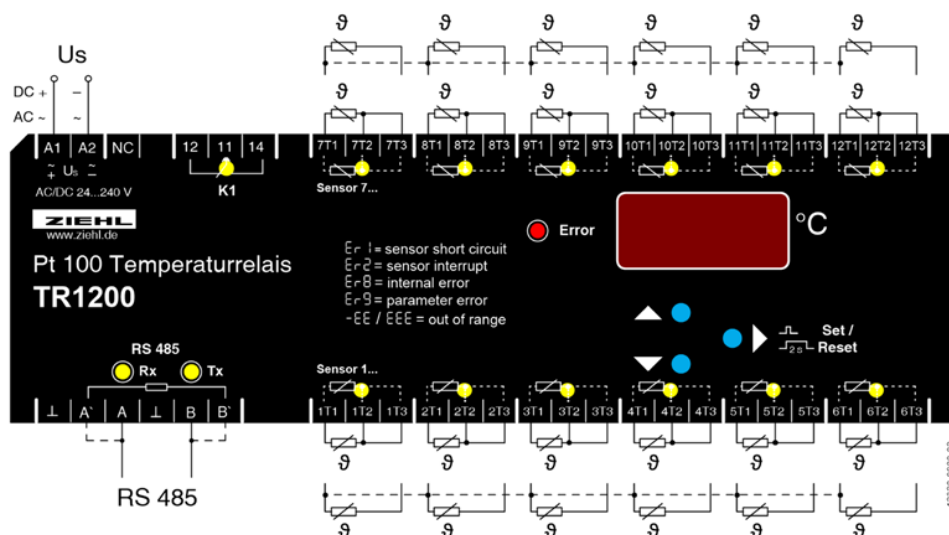
- easy operation and selection of temperatures at the device
- Sensor-simulation
- Code-protection against manipulation of settings
- Universal supply-voltage AC/DC 24...240 V
- Housing for switchgear-mount, 140 mm wide, mounting-height 55 mm
- Mounting on DIN-rail 35mm or with screws M4 (option)

### Interface:

- Interface RS485 (protocols ZIEHL-standard and Modbus-RTU)
- Baud rate (4800/9600/19200) and Parity-Bit

### Software for operation (download from [www.ziehl.de](http://www.ziehl.de))

- Software (Modbus) for programming the inputs
- Logging-function (with connected PC only)
- Hardware for every TR1200: PC with USB or RS232 interface + RS485-RS232 converter (depending on the interface)
- Software: Win7/Win10 and Excel 2010-2016



## Technical Data TR1200

Rated Supply Voltage Us	AC/DC 24-240 V, 0/45...65 Hz, < 5 VA DC: 20,4...297 V, AC: 20,4...264 V
Relay output	1 change-over contact (CO) type 2, see "general technical informations"
Measuring inputs	12 x Pt100 (RTD) acc. to EN 60 751 / IEC 60 751
Measuring time sensor	0,25...3s (depending on number of sensors)
Measuring range	-199°...850°C
Resolution	1°C
Tolerance	± 0,5% of value ± 1 K
Sensor-current	≤ 0,8 mA
RS485 interface	
Adress of device	0...96
Baud rate	4800, 9600, 19200 baud
Parity	N, O, E (non, odd, even)
cable-length	max. 1000 m at 19200 baud
Testing conditions	see "general technical informations"
Rated ambient temperature range	-20°C...+65°C
Housing	Design V8
Dimensions (W x H x D)	140 x 90 x 58 mm, mounting height 55 mm
Protection housing/terminals	IP 30 / IP 20
Attachment	DIN-rail 35 mm acc. to EN 60715 or screws M4 (option)
Weight	app. 350 g



# Pt100-Temperature-Relay TR1200IP

12 Sensors, Interface TCP/IP, IEC 61850 (GOOSE)

## TR1200IP



**Part number:**  
**T224078** AC/DC 24-240 V

### 12-channel Temperature-Relay for Sensors Pt 100 (RTD)

Temperature-relays TR1200IP measure the temperature of up to 12 sensors within 199...+850 °C and provide the data at an ethernet interface for external evaluation. With its universal power-supply AC/DC 24-240 V it can be connected to all common supply-voltages.

Actual measured values and stored min- and max-values can be displayed in a normal browser.

At the ethernet interface the following protocols are available:

- Modbus TCP
- ZIEHL RTD
- IEC 61850 (GOOSE)

The TR1200IP is used where temperatures of many sensors Pt100 shall be measured and transmitted via Ethernet. TR1200 itself does not monitor temperatures for limits. For direct monitoring of temperatures our devices with alarms and output relays are recommended.

Applications are e.g. monitoring of

- motors and generators (windings, bearings, coolant, ambient temperature)
- transformers (windings, core, ambient temperature)
- machines, plants and equipment

## Features

### Sensors and Displays:

- 12 inputs for sensors Pt100 (RTD)
- Connection 2- or 3-wire unneeded inputs can be switched off
- Monitoring of sensors for short-circuit and interrupt
- 3-digit-display for temperature
- LEDs for assigning the measured value, error, state of relay and interface

- Protocol details see [www.ziehl.de](http://www.ziehl.de) - operating manuals

### More Features:

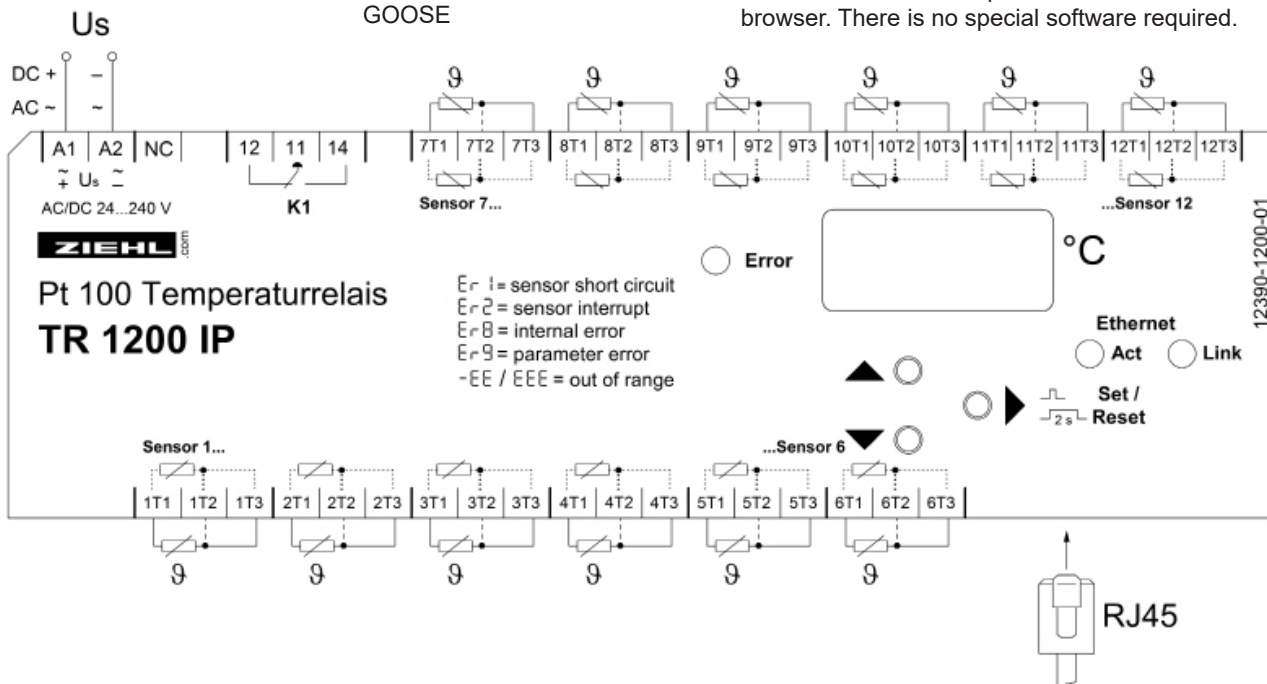
- easy operation and selection of temperatures at the device
- Sensor-simulation
- Code-protection against manipulation of settings
- Relay for Error (1 co-contact) for sensor-error and operational failure
- Universal supply-voltage AC/DC 24...240 V
- Housing for switchgear-mount, 140 mm wide, mounting-height 55 mm
- Mounting on DIN-rail 35mm or with screws M4 (option)

### Interface:

- Interface TCP/IP
- 10 MBit/s Ethernet
- supports IEC 61850 GOOSE

### Software

- The TR1200IP can be operated with a normal web-browser. There is no special software required.



## TR1200IP

GOOSE settings  
and configuration:

Status Simulation Sensor Config IP Config TCP/UDP Config **GOOSE** Firmware Update Help

**Achtung:** VLAN ID / Priorität wird nicht unterstützt!  
**Warning:** VLAN ID / Priority is not supported!

<b>IEC 61850:</b>	<input checked="" type="radio"/> On <input type="radio"/> Off
<b>Goose MAC:</b>	01:0C:CD:01:10:00
<b>IEC 61850 Name:</b>	TR1200IP 504
<b>Go ID:</b>	ZIEHL_TR1200IP
<b>App ID:</b>	0x 0504
<b>Monitoring time min:</b>	10 ms
<b>Monitoring time max:</b>	2000 ms
<b>Deadband:</b>	99 .0 °C
<b>Config revision:</b>	1
<input type="button" value="Save Config"/>	

[Download IEC 61850 IED Capability Description \(ICD\) file](#)

Sensor state of single sensor	Internal error / device error 0 = no error	temperature value	Quality of the temperature value
Valid temperature	0	-199..859 °C	0
Sensor = not connected	0	980 °C	0x0042
Sensor interruption	0	999 °C	0x0042
Sensor short-circuit	0	-999 °C	0x0042
any	> 0	-199..859, -999, 980,999 °C	0x0042

QUALITY 0x0042 = INVALID + FAILURE

Technical Data TR1200IP	Rated Supply Voltage Us	AC/DC 24-240 V, 0/45...65 Hz, < 5 VA DC: 20,4...297 V, AC: 20,4...264 V
	Relay output	1 change-over contact (CO) type 2, see "general technical informations"
	Measuring inputs	12 x Pt 100 (RTD) acc. to EN 60 751 / IEC 60 751
	Measuring time sensor	0,25...3s (depending on number of sensors)
	Measuring range	-199°...850°C
	Resolution	1°C
	Tolerance	± 0,5% of value ± 1 K
	Sensor-current	≤ 0,8 mA
	Ethernet interface	
	IP-adress	selectable
	Subnet mask	selectable
	UDP Port	selectable 0...65535
	Max. cable-length	max. 20 m with CAT 5 patch-cable
	Max. response time	200 ms
	Testing conditions	see "general technical informations"
	Rated ambient temperature range	-20°C...+65°C
	Housing	Design V8
	Dimensions (W x H x D)	140 x 90 x 58 mm, mounting height 55 mm
	Protection housing/terminals	IP 30 / IP 20
	Attachment	DIN-rail 35 mm acc. to EN 60715 or screws M4 (option)
	Weight	app. 350 g

# Safety Temperature-Limiting-Device STR100 for Pt100

## STR100



### Part numbers:

<b>T224148</b>	0...200 °C	AC 230 V
<b>T224142</b>	100...300 °C	AC 230 V
<b>T224144</b>	200...500 °C	AC 230 V
<b>T224058</b>	0...200 °C	DC 24 V
<b>T224059</b>	100...300 °C	DC 24 V
<b>T224062</b>	200...500 °C	DC 24 V

Other measuring ranges upon request

The electrical safety temperature limiting device type STR100, in connection with Pt100 sensors, monitors temperatures in applications for which monitoring with increased safety is required. Functioning corresponds to type 2BDK as per VDE 0631.

The limit temperature T can be set at the front by means of a scaled potentiometer. An unauthorized or unintended manipulation of the limit is prevented by a transparent plastic-plate which can be sealed. A potential free relay contact is switched off when exceeding the limit value.

Safety temperature limiting devices are used in plants when temperature monitoring has to meet high requirements:

- Industrial furnace plants
- Dyeing machines
- Thermal oil plants

The device can be used in combination with sensors Pt100 (RTD). The suitability must be proved in combination with the used sensors. Regular checks are stipulated for enhanced safety requirements.

The safe STR100 can be used in applications, in which an increased safety level up to SIL 2, PL c is required. It meets the requirements of safety category 3 (Safety of machines according to DIN EN 954-1, for models with supply-voltage DC 24 V and AC 230 V tested and approved by TÜV Rheinland with reports T24/00, 19.6.2000, T103/2007, 25.1.2007 and Z103/2007 E2, 12.9.07. Reports see homepage [www.ziehl.de](http://www.ziehl.de)).

## Description

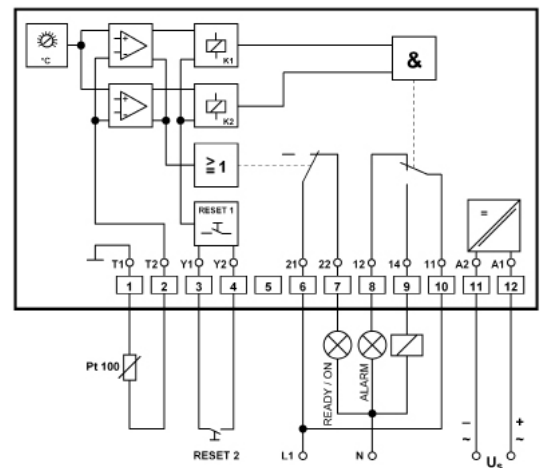
The safety temperature limiting device STR100 detects the resistance of a Pt100-sensor connected to the input. This is linearized and evaluated in 2 separated channels. If the measured temperature is smaller than the limit value adjusted, both output relays are picked up. To do this, a reset has to be made after switching on the supply voltage (close contact between terminals 3+4). The relays are wired in such a way to have the function of a change-over switch to the outside. The load circuit is only closed when both relays are picked up. If a malfunction occurs or if the limit value is exceeded, both relays are released and the load circuit is separated. The released relays K1 and K2 are indicated by the lighting up of the red LEDs. When the limit value is exceeded, a third relay picks up which is used for error indication. Interruption of the sensor or short-circuit are signaled by a red LED each and also lead to disconnection of both channels.

Only when the temperature has fallen below the response value by the switching hysteresis of about 10°C and no malfunction occurs, it is possible for the STR 100 to close

the load circuit after actuating the reset key.

Readiness for switching on is displayed by the third relay and a LED. An incorporated safety fuse avoids welding of the relay contacts.

- Safety temperature limiting device meets safety category 3 (SK 3) as per DIN EN 954-1
- SIL2 according to IEC61508
- Connection for Pt 100 sensors as per EN 60751/IEC 60751 can be delivered with
- measuring-range between -200 and +700 °C
- 2-channel evaluation
- Sensor monitoring for interruption and short-circuit
- LED-displays for relay position, error messages and readiness for switching on
- Relay for message readiness for switching on
- Setting of limit value to be sealed
- Incorporated reset key
- Connection for external reset key
- Assembly-friendly plug-in base housing S 12



## Technische Daten STR100

Power supply	Rated supply-voltage $U_s$	AC 230 V	DC 24 V
	Adm. tolerance $U_s$	-10...+10%	-15...+25%
	Power consumption	< 2 VA	< 3W
	Frequency	50/60 Hz	
Sensor-Input		2-wire Pt 100 acc. to EN 60751/IEC 751, $\alpha = 0,00385$	
	Max. current	< 3,15 mA (< 10 mA bei -200...+0°C)	
	Max. voltage	< 2 V, open terminals < 15 V	
	Line resistance	Standard = 0,5 $\Omega$ , Option: max. 30 $\Omega$	
Switching points	Switching off	Over-temperature, sensor break, sensor short circuit and malfunction	
	Limit value T	adjustable	
	Switching hysteresis	10°C ( $\pm 25\%$ )	
	Reset	with reset key at the front or an external key	
Relay outputs		1 change-over contact (CO)	
	Switching voltage	max. AC 400 V	max. DC 300 V
	Switching current	max. 6 A	
	Switching power	max. 2000 VA (ohmic load)	
		max. 48 W at DC 24 V	
	nominal continuous current $I_{th}$	6 A	
	nominal operating current $I_e$	2 A AC 15 400V	2 A DC 13 24 V
		4 A AC 11/AC 15 230V	
	recommended fuse for contacts	3,15 A slow blow, 4 A flink	
	expected life mechanical	3 x 10 <sup>7</sup> operations	
expected life electrical	1 x 10 <sup>5</sup> operations with 240 V/6 A		
derating factor $\cos \varphi$	0,3		
Testing conditions		EN 50178, EN 61010-1, EN 60947-5	
	Rated insulation voltage	AC 250 V	
	Contamination level	2 (normal)	
	Rated impulse withstand voltage	4000 V	
	Overvoltage category	III	
	Transformer	EN 61558-2-6 (VDE 0551)	
	Interference resistance industry	EN 61000-6-2, EN 61326-1	
	Interference transmission	Class B EN 50081-1	
	"on"-period	100 %	
	Rated ambient temperature range	0...50°C EN 60068-2-1 dry heat	
Housing	Dimensions H x B x T	Design S 12 (plugable): 82 x 42 x 121 [mm]	
	wire-connection	12-pole, each 2 x 1,5 mm <sup>2</sup>	
	Protection housing	IP 40	
	Protection terminals	IP 20	
	Fitting position	any	
	Fastening	Snap mounting on 35 mm standard rail conforms to DIN EN 50 022 or M4 screws	
	Vibration resistance	1 mm deflection 25 Hz/ 10 g 25-100 Hz	
	Shock resistance	10 g 20 ms	
		20 g 4 ms	
	Weight	approx. 300 g	

# Pt100 Temperature Sensors Type TF101

## General

TF101 temperature sensors use EN 60751/IEC 60751 platinum resistance temperature detectors (RTD). For precise temperature measurement the Platinum Re-

sistance Thermometer offers the best overall advantages in repeatability and stability over a long period. High accuracy allows replacement of a sensor without any need for re-adjust of the connected measuring devices or thermostats.

## Types / Description

### TF101N

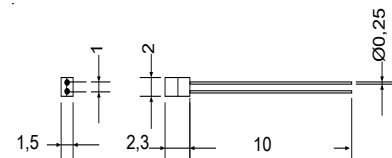
-70°C...+500°C



Platinum resistance temperature sensor on ceramic substrate intended for installation into any housing depending to user's requirements. Very small and quick sensor, only suitable for further treatment. Notice: do not cut the sensor leads. Thermal response time refer to manufacturer data:

$T_{0,9}$  in the air 10 s, in water <1 s.

**Part number: 019061**



### TF101K

-50°C...+170°C



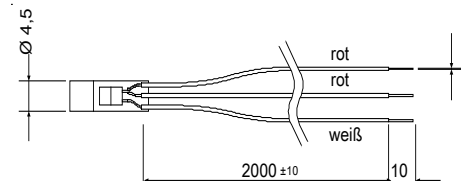
Platinum resistance temperature sensor on ceramic substrate protected by a heat-shrinkable sleeve and with PTFE isolated stranded wire. The TF101K version can be installed in motor or transformer windings. When build-in into windings do not pressure the sensor element. Precautions should be taken to protect sensor and extension leads against push and pull forces. Thermal response time  $T_{0,9}$  in the air 100 s, in water 19 s.

With 2-wire connection and cable-length of 2 m there is a temperature-failure of approx.  $0.51 \Omega = 1.32 K$  caused by the line resistance.

Cable length: 2000 mm

Weight: 10 g

**Part numbers: T223154 2-wire  
T223134 3-wire**



### TF101U2

-30°C...+105°C



-50°C...+170°C



-30°C...+80°C



Sensors TF101U2 are encapsulated in a stainless-steel-shell V4A. They are suitable for measuring temperatures in fluids, at surfaces or for inside or outside applications. The protection class is IP 66. The version with PVC-insulated cable (3 x 0,25 mm<sup>2</sup> in one cable) can be easily wired. The maximum ambient temperature is 105 °C.

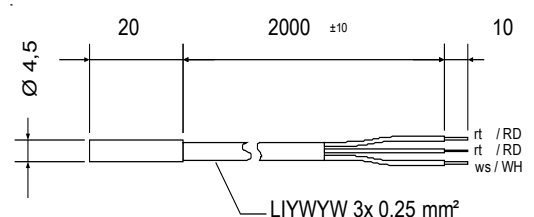
The sensor with cable 30mm (PVC) can be mounted in terminals in switchgear cabinets to measure temperature in enclosure.

The version with PTFE-insulation (3 x 0,14 mm<sup>2</sup> single wires) withstands peak-temperatures up to 200 °C

Weights: PVC: 2 m = 50 g, 10 m = 250 g,  
30 mm = 15 g  
PTFE: 2 m = 20 g

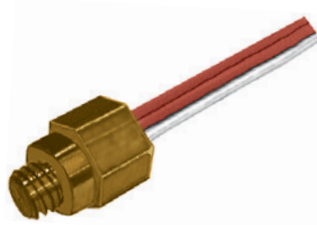
**Part numbers:**

<b>T223051</b>	3-wire	2 m	PVC	-30...+105 °C
<b>T223058</b>	3-wire	10 m	PVC	-30...+105 °C
<b>T223052</b>	3-wire	2 m	PTFE	-50...+170 °C
<b>T223047</b>	2-wire	30 mm	PVC	-30... +80 °C



**TF101G3**

-50°C...+170°C  
mit Gewinde



Platinum resistance temperature sensor on ceramic substrate built into a M6 brass threaded bush, especially suitable for being screwed into metal, e.g. for monitoring temperature of heat sinks or heating plates. Please note that there will be a measuring error due to the design, as the sensor can lose heat via the connection strand.

Cable length: 2000 mm

Weight: 21 g.

(Dimensions see Dimension illustrations)

**Part number:** T223143 3-wire

**TF101ZG2**

-50°C...+170°C



Platinum resistance temperature sensor built into steel tube V4A, 1/2 inch, suitable for installation in pipes. Thermal response time T<sub>0,9</sub> in the air 255 s, in water 45 s. Connection flat plug 2,8 mm, Gasket IP55, clamping diameter 8-12 mm, cable connection max 100 °C Suitable for transmission in 2- or 3-wire technique

Weight 120 g

(Dimensions see Dimension illustrations)

**Part number:** T223137  
110 mm depth of immersion

**TF101R**

-20...+70°C



Sensor for measuring ambient temperatures inside or outside.

Protection class IP 54. Cabling can be connected in 2- or 3-wire technique.

Housing W x H x D = 65 x 50 x 38 mm

Weight: app. 70 g

**Part number:** T223060

## Technical Data

Nominal resistance  
Temperature coefficient  
Class B, DIN EN 60751  
Test voltage  
Extension leads

Shrink sleeve  
max. temperature at sensors  
with max. 170°C

100 Ω at 0 °C  
3,85 x 10<sup>-3</sup>/K (see table)  
Δθ = ± (0,3 + 0,005 θ) [°C]  
2,5 kV AC (not 019061 and T223047)  
PTFE; silver-plated stranded copper wire 0,14 mm<sup>2</sup>  
or PVC isolated copper wire  
Kynar  
200 °C (max. 170 h)



## Cabling

ZIEHL thermostats of TR series are generally insensitive to interference in the sensor line. Occasionally, however, undesirable switching is unavoidable, especially when temperature is near the switching point. For this reason it is highly recommended that cables are not laid parallel to power current lines over long distances. When appropriate, cables should be screened or twisted together.

## Line-resistance

With RTD sensors the resistance of the connecting cable should be considered, otherwise there is an measuring error. The resistance must be compensated. The resistance of a connecting cable can be calculated as follows:

$$R [\Omega] = l / (k \times A),$$

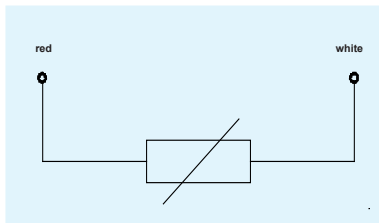
$l$  = cable length [m],

$k$  = conductivity [S x m/mm<sup>2</sup>] e.g. Cu = 56,

$A$  = wire cross-section [mm<sup>2</sup>]

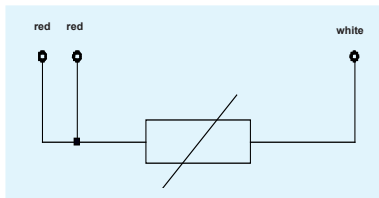
Example sensor with cable 50 m: ( $l = 2 \times 50 \text{ m} = 100 \text{ m}$ ), with wire cross-section 1 mm<sup>2</sup>:  
 $R = 100 / (56 \times 1) = 1,79 \Omega$ , Resulting error =  $1,79 \Omega / 0,385 \Omega \times K = 4,6 \text{ K}$ .

## Linecompensation



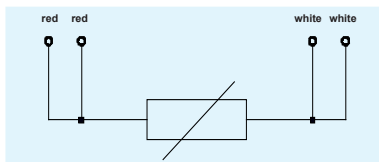
### 2-wire technique

With 2-wire connection the line resistance is compensated for by a potentiometer in the thermostat, by programming (e.g. TR122D, TR600) or via wiring an external resistor. The advantage of the possibly simpler and more economical running of just two wires is counteracted by the disadvantage of the manual compensation required in the case of longer wiring. Differences in resistance caused by temperature changes cannot be compensated.



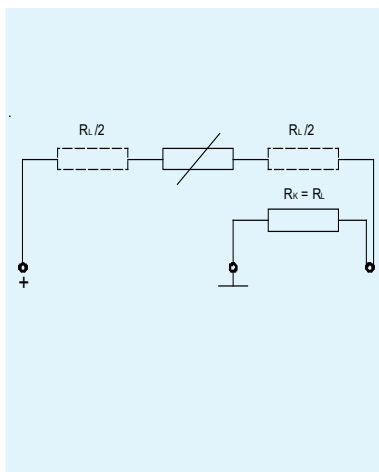
### 3-wire technique

With 3-wire connection, a third wire (sense) connected to the sensor registers the drop in voltage in one line. For compensation of line resistance it is assumed that the voltage drop in the second line is identical (i.e. the same wire and same wire temperature). Compensation is then performed automatically. Possible changes of resistance in the line due to temperature changes are also compensated for.



### 4-wire technique

With 4-wire connection, impressed current flows via two wires to the sensor. Via a two sensor line the drop in voltage is measured directly at the sensor. Possible differences in the sensor connection wiring can be disregarded. A disadvantage is the higher costs involved in running 4 wires.



### Combination of 2- and 3-wire technique

When connecting 2-wire-sensors to units with 3-wire input, the line resistance can be compensated by connecting a compensation resistor ( $R_k$ ) between ground and sense-input.  $R_k$  must have the same value as the resistance of the line. The sensor then has to be connected to the + and the sense- input.  $R_k$  must be lower than the permitted resistance for 1 line of the 3-wire-input.

Units requiring 3-wire configurations can also be operated by 2-wire sensors. The sensor input is simply shortened. The line resistance need not be compensated.

3-wire sensors can be used as 2-wire sensors, simply by omitting one wire.

2-wire sensors can be branched at any desired position in a 3 or 4-wire connection system. In this case though, the line resistance of the two wires from the branching point to the sensor is not compensated.

ZIEHL thermostats, series TR are designed for use with 2 or 3-wire connection.

## Pt100 resistance table

Basic values in  $\Omega$  for measuring resistors Pt 100 according to DIN/ IEC 751

$^{\circ}\text{C}$	$\Omega$	$^{\circ}\text{C}$	$\Omega$	$^{\circ}\text{C}$	$\Omega$	$^{\circ}\text{C}$	$\Omega$	$^{\circ}\text{C}$	$\Omega$	$^{\circ}\text{C}$	$\Omega$
-200	18,49	0	100,00	200	175,84	400	247,04	600	313,59	800	375,51
-190	22,80	10	103,90	210	179,51	410	250,48	610	316,80	810	378,48
-180	27,08	20	107,79	220	183,17	420	253,90	620	319,99	820	381,45
-170	31,32	30	111,67	230	186,82	430	257,32	630	323,18	830	384,40
-160	35,53	40	115,54	240	190,45	440	260,72	640	326,35	840	387,34
-150	39,71	50	119,40	250	194,07	450	264,11	650	329,51	850	390,26
-140	43,87	60	123,24	260	197,69	460	267,49	660	332,66		
-130	48,00	70	127,07	270	201,29	470	270,86	670	335,79		
-120	52,11	80	130,89	280	204,88	480	274,22	680	338,92		
-110	56,19	90	134,70	290	208,45	490	277,56	690	342,03		
-100	60,25	100	138,50	300	212,02	500	280,90	700	345,13		
- 90	64,30	110	142,29	310	215,57	510	284,22	710	348,22		
- 80	68,33	120	146,06	320	219,12	520	287,53	720	351,30		
- 70	72,33	130	149,82	330	222,65	530	290,83	730	354,37		
- 60	76,33	140	153,58	340	226,17	540	294,11	740	357,42		
- 50	80,31	150	157,31	350	229,67	550	297,39	750	360,47		
- 40	84,27	160	161,04	360	233,17	560	300,65	760	363,50		
- 30	88,22	170	164,76	370	236,65	570	303,91	770	366,52		
- 20	92,16	180	168,46	380	240,13	580	307,15	780	369,53		
- 10	96,09	190	172,16	390	243,59	590	310,38	790	372,52		

## Pt1000 Temperature Sensor

The Pt1000 sensor is the "big brother" of the Pt100 sensor. Its nominal resistance at  $0^{\circ}\text{C}$  is  $1000 \Omega$ . Resistance values of the whole series are higher by a factor of 10. The sensor is used in the same way as the Pt100 sensor. Its dimensions are slightly larger (4 x 5 un-insulated). Thermostats and sensors for Pt1000 on request.

## Pt1000 resistance table

values see Pt100, multiplied by the factor of 10.

# Limit Value Switch Type TR210

for 2 Temperature-Sensors or 0/4-20 mA, 0-10 V, 2 Limits, Analog-output

## TR210



Part number: T224071

## Function

The limit value switch TR210 monitors up to 2 measuring inputs for Pt100 (RTD), Pt1000, thermocouples, or standard-signals 0/4-20 mA, 0-10 V.

The signals are monitored for up to 4 limits. The value of one or of both inputs can be read out at an analog output.

## Application:

The TR210 is very versatile and can thus be used in many applications. Nevertheless multiple preset programs allow an easy setting.

It can be used as a limit switch or as a controller for 2 limits (with day/night shift up to 4 limits).

As a measuring transducer it can convert signals from the temperature-sensors to standard-signals or change the scaling of standard-signals. The user can also select, if minimum or maximum of 2 signals or the difference of 2 signals is connected to the analog output.

For more applications see basic programs.

- Measuring and monitoring range -170...+1820 °C
- resolution 0,1°C (to 999.9 °C)
- Analog output (scaleable) for 1 input, min./max. of 2 inputs or difference of 2 sensors (no isolation between inputs and output)
- 2 relay outputs
- Shifting of day/night (selectable with contact at terminals Y1/Y2)
- Universal power supply AC/DC 24-240 V
- Easy setting with 3 buttons and preset programs
- Storing of min- and max-values of inputs
- Code-lock against manipulation of settings
- Terminals pluggable

## 2 Measuring-Inputs:

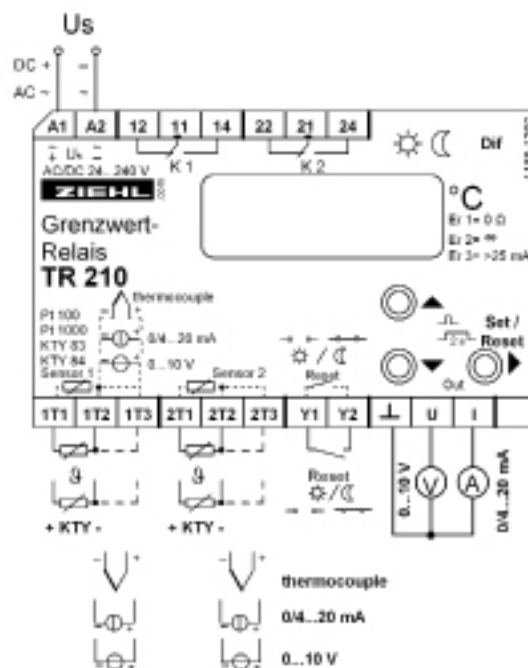
- Resistance-sensors Pt 100 (RTD), Pt1000, KTY83/84 in 2- or 3-wire-connection
- Thermocouples types B, E, J, K, L, N, R, S or T
- different sensors at both inputs possible
- Standard-signals 0/4-20 mA, 0-10 V (scaleable)

## Displays:

- 4-digit for measuring value
- 2 LEDs for state of relays
- 3 LEDs sensor/difference
- 2 LEDs day/night

## Switching-Functions:

- 2 relays (co-contacts)
- 2-4 limits
- Warmest/coldest sensor switches relay
- Programmable for every relay:
  - hysteresis (+ or - = MIN- or MAX-function) -199.9...999.9 s
  - autoreset or electronic reclosing lock
  - elay-time for switching and switching back 0...9999 s
  - operating- or closed current-mode
  - cyclic check of function
- Monitoring of difference in temperature
- Preset basic programs



## Basic Programs

**Program 1:****1 Temperature-sensor,  
2 Limits**

Application: Monitoring of a temperature for 2 limits, e.g. over-temperature with warning and switching off or monitoring of a temperature-range (min/max).

**Program 2:****2 Temperature-Sensors,  
1 Limit for each Sensor**

Application: Monitoring of 2 temperatures for 1 limit each, e.g. over-temperature or as double electronic controller.

**Program 3:****1 Temperature-Sensor,  
2 Limits each day/night**

Application: Controlling of a temperature with first limit, different for day and night.

Monitoring of the same temperature with second limit, different for day and night.

**Program 4:****2 Temperature-Sensors,  
each 1 Limit for day/night**

Application: Monitoring or controlling of 2 temperatures for 2 limits, depending on operation mode, e.g. controlling of 2 circulation pumps (day/night) or of processes (active/stand-by).

**Program 5:****2 Temperature-Sensors for  
monitoring of differences in  
temperature, 2 Limits**

Application: Regulation or monitoring of the difference of 2 measuring-points for 2 limits, e.g. circulation pumps in solar systems.

**Program 6:****1 Standard-Signal 0/4-20 mA or 0-10 V, 2 Limits**

Display can be scaled, e.g. measuring input 4-20 mA = display 0...1200 l/h.

Application: Monitoring of signals from a measuring transducer for 2 limits, e.g. over- or under- exceeding of limits with pre-alarm and alarm or monitoring of a signal-range (min/max) and/or as measuring-transducer.

In combination with any measuring-transducers, signals like pressure, volume-flow, pH-value, ... can be monitored.

**Program 7:****2 Standard-Signals 0/4-20 mA or 0-10 V,  
1 Limit each**

Display can be scaled, e.g. measuring input 4-20 mA = display 0...1200 l/h.

Application: Monitoring of signals from 2 measuring transducers, each for 1 limit, e.g. over- or under- exceeding of a limit as double electronic controller.

**Program 8:****2 Standard-Signals 0/4-20 mA or 0-10 V for monitoring of differences of signals**

Application: Regulation or monitoring of the difference of 2 analog signals for 2 limits, e.g. levels of liquids.

**Program 9:****22 Temperature-Sensors, 2 shared Limits**

Application: Coldest (MIN) or warmest (MAX) sensor switches relay. Monitoring of 2 bearings for pre-alarm and alarm.

Application as Measuring-Transducer:

At programs **with 1 measuring-input** the output can be scaled for this input, e.g. 0...200.0 = 4-20 mA.

At programs **with 2 measuring-inputs** the output can be scaled for 1 input or min- or max- value of both inputs.

At programs **for measuring of differences** output can be scaled for 1 signal or for the difference input 2 minus input or for min- or max- value of both inputs.

Thus the TR 210 can be used as limit value switch and/or measuring-transducer simultaneously. The measured values can be forwarded to e.g. a remote display or a superior control.

## Technical Data

Rated supply voltageUs	AC/DC 24-240V, <3W, <5VA (AC 20-264 V, DC 20,4-297 V)
2 Measuring inputs	Pt 100, Pt 1000 according to EN 60 751 Thermocouples types B, E, J, K, L, N, R, S, according to EN 60 584, DIN 43 710 0/4-20 mA (22Ω), 0-10 V (13 kΩ)
Measuring-time	<2,5s to 5s, depending on speed of change of signal
Analog output	0/4-20 mA, max. 500 Ω. 0-10 V, max. 10 mA (without isolation to inputs)
Relay output	type 3, see "general technical informations" 2 x 1 co- (change-over) contact
Test conditions	see "general technical informations"
Rated ambient temperature range	-20...+60°C
Dimensions h x w x d	design V4: 90x70x58 [mm], mounting height 55 mm
Protection housing / terminals	IP 30 / IP 20 (terminals pluggable)
Weight	app. 200 g
Attachment	on 35 mm DIN-rail or with screws M 4

## Temperature-Measuring with Thermocouples

A thermocouple consists of two spot welded wires of different metals or metal alloys. When the joint (measuring point) is heated, a voltage is produced at the free ends (connection or reference junction). This effect, which is essential for the action of the thermocouple, results from the fact that a contact voltage is produced at the contact of two different metals, the value of which depends on the temperature (thermo-voltage).

The value of the contact voltage at metal junctions can be taken from the thermoelectric voltage series.

The contact value of the measuring point cannot be measured easily. When the metallic line ends form a circuit, by connecting to a measuring instrument, there are additional contact voltages at each metal junction. The total voltage in the closed circuit will equal zero as long as all junctions are on the same temperature level.

This calls for three essential requirements:

1. The open ends of the thermocouples must be led to the measuring instrument on special compensating leads in order to avoid additional contact voltages.
2. To avoid distorting contact voltages at the measuring instrument, both connecting terminals must have the same temperature (isothermal block).
3. As with the thermocouples, only the temperature difference between the measuring point and the reference junction can be measured. The temperature at the reference junction must be kept constant (by measuring with 2 thermocouples) or the measuring instrument must automatically compensate for the error incurred by the change of the ambient temperature at the reference junction (in this case at the terminal) in some electronic way.

Thermocouples cover a vast temperature range, from -270°C to +2800°C. Their accuracy is guaranteed to DIN 43 710 and IEC 584-1 standards which facilitates their interchangeability. Their performance curves show mainly non-linear characteristics so that a linearisation becomes necessary. Thermocouples are very small, have short response times and a stability of just a few ° Kelvin variation year by year. Their range of applications depends on the materials used for the thermocouple and the medium to be measured. Thermocouple suppliers give exact information with regard to the service life and the admissible maximum short-time temperatures.

### Which Thermocouple for which application?

#### Pt 30 Rh-Pt 6 Rh Typ B DIN EN 60 584-1

in mV temperatures in steps of 10 °C  
reference junction 0 °C

°C	0	10	20	30	40	50	60	70	80	90
0	0	-0,002	-0,003	-0,002	-0	0,002	0,006	0,011	0,017	0,025
100	0,033	0,043	0,053	0,065	0,078	0,092	0,107	0,123	0,140	0,159
200	0,178	0,199	0,220	0,243	0,266	0,291	0,317	0,344	0,372	0,401
300	0,431	0,462	0,494	0,527	0,561	0,596	0,632	0,669	0,707	0,746
400	0,786	0,827	0,870	0,913	0,957	1,002	1,048	1,095	1,143	1,192
500	1,241	1,292	1,344	1,397	1,450	1,505	1,560	1,617	1,674	1,732
600	1,791	1,851	1,912	1,974	2,036	2,100	2,164	2,230	2,296	2,363
700	2,430	2,499	2,569	2,639	2,710	2,782	2,855	2,928	3,003	3,078
800	3,154	3,231	3,308	3,387	3,466	3,546	3,626	3,708	3,790	3,873
900	3,957	4,041	4,126	4,212	4,298	4,386	4,474	4,562	4,652	4,742
1000	4,833	4,924	5,016	5,109	5,202	5,297	5,391	5,487	5,583	5,680
1100	5,777	5,875	5,973	6,073	6,172	6,273	6,374	6,475	6,577	6,680
1200	6,783	6,887	6,991	7,096	7,202	7,308	7,414	7,521	7,628	7,736
1300	7,845	7,953	8,063	8,172	8,283	8,393	8,504	8,616	8,727	8,839
1400	8,953	9,065	9,178	9,291	9,405	9,519	9,634	9,748	9,863	9,979
1500	10,094	10,210	10,325	10,441	10,558	10,674	10,790	10,907	11,024	11,141
1600	11,257	11,374	11,491	11,608	11,725	11,842	11,959	12,076	12,193	12,310
1700	12,426	12,543	12,659	12,776	12,892	13,008	13,124	13,239	13,354	13,470

#### Pt 15 Rh-Pt Typ R DIN EN 60 584-1

in mV temperatures in steps of 10 °C  
reference junction 0 °C

°C	0	10	20	30	40	50	60	70	80	90
0	0	0,054	0,111	0,171	0,232	0,296	0,363	0,431	0,501	0,573
100	0,647	0,723	0,800	0,879	0,959	1,041	1,124	1,208	1,294	1,380
200	1,468	1,557	1,647	1,738	1,830	1,923	2,017	2,111	2,207	2,303
300	2,400	2,498	2,596	2,695	2,795	2,896	2,997	3,099	3,201	3,304
400	3,407	3,511	3,616	3,721	3,826	3,933	4,039	4,146	4,254	4,362
500	4,471	4,580	4,689	4,799	4,910	5,021	5,132	5,244	5,356	5,469
600	5,582	5,696	5,810	5,925	6,040	6,155	6,272	6,388	6,505	6,623
700	6,741	6,860	6,979	7,098	7,218	7,339	7,460	7,582	7,703	7,826
800	7,949	8,072	8,196	8,320	8,445	8,570	8,696	8,822	8,949	9,076
900	9,203	9,331	9,460	9,589	9,718	9,848	9,978	10,109	10,240	10,371
1000	10,503	10,636	10,768	10,902	11,035	11,170	11,304	11,439	11,574	11,710
1100	11,846	11,983	12,119	12,257	12,394	12,532	2,669	12,808	12,946	13,085
1200	13,224	13,363	13,502	13,642	13,782	13,922	14,062	14,202	14,343	14,483
1300	14,624	14,765	14,906	15,047	15,188	15,329	15,470	15,611	15,752	15,893
1400	16,035	16,176	16,317	16,458	16,599	16,741	16,882	17,022	17,163	17,304
1500	17,445	17,585	17,726	17,866	18,006	18,146	18,286	18,425	18,564	18,703
1600	18,842	18,981	19,119	19,257	19,395	19,533	19,670	19,807	19,944	20,080

**Pt 10 Rh-Pt Typ S**  
DIN EN 60 584-1

in mV temperatures in steps of 10 °C  
reference junction 0 °C

°C	0	10	20	30	40	50	60	70	80	90
0	0	0,055	0,113	0,173	1,234	0,299	0,365	0,432	0,502	0,573
100	0,645	0,719	0,795	0,872	0,950	1,029	1,109	1,190	1,273	1,356
200	1,440	1,525	1,611	1,698	1,785	1,873	1,962	2,051	2,141	2,232
300	2,323	2,414	2,506	2,599	2,692	2,786	2,880	2,974	3,069	3,164
400	3,260	3,356	3,452	3,549	3,645	3,743	3,840	3,938	4,036	4,135
500	4,234	4,333	4,432	4,532	4,632	4,732	4,832	4,933	5,034	5,136
600	5,237	5,339	5,442	5,544	5,648	5,751	5,855	5,960	6,064	6,169
700	6,274	3,380	6,486	6,592	6,699	6,805	6,913	7,020	7,128	7,236
800	7,345	7,454	7,563	7,672	7,782	7,892	8,003	8,114	8,225	8,336
900	8,448	8,560	8,673	8,786	8,899	9,012	9,126	9,240	9,355	9,470
1000	9,585	9,700	9,816	9,932	10,048	10,165	10,282	10,400	10,517	10,635
1100	10,754	10,872	10,991	11,110	11,229	11,348	11,467	11,587	11,707	11,827
1200	11,947	12,067	12,188	12,308	12,429	12,550	12,671	12,792	12,913	13,034
1300	13,155	13,276	13,397	13,519	13,640	13,761	13,883	14,004	14,125	14,247
1400	14,368	14,489	14,610	14,731	14,852	14,973	15,094	15,215	15,336	15,456
1500	15,576	15,697	15,817	15,937	16,057	16,176	16,296	16,415	16,534	16,653
1600	16,771	16,890	17,008	17,125	17,243	17,360	17,477	17,594	17,711	17,826

**Cu-CuNi, Typ T**  
DIN EN 60 584-1

in mV temperatures in steps of 10 °C  
reference junction 0 °C

°C	0	-10	-20	-30	-40	-50	-60	-70	-80	-90
-200	-5,603	-	-	-	-	-	-	-	-	-
-100	-3,378	-3,656	-3,923	-4,177	-4,419	-4,648	-4,865	-5,069	-5,261	-5,439
0	0	-0,383	-0,757	-1,121	-1,1475	-1,819	-2,152	-2,475	-2,788	-3,089
°C	0	10	20	30	40	50	60	70	80	90
0	0	0,391	0,789	1,196	1,611	2,035	2,467	2,908	3,357	3,813
100	4,277	4,749	5,227	5,712	6,204	6,702	7,207	7,718	8,235	8,757
200	9,286	9,5820	10,360	10,905	11,456	12,011	12,572	13,137	13,707	14,281
300	14,860	15,443	16,030	16,621	17,217	17,816	18,420	19,027	19,638	20,252

**Fe-CuNi, Typ J**  
DIN EN 60 584-1

in mV temperatures in steps of 10 °C  
reference junction 0 °C

°C	0	-10	-20	-30	-40	-50	-60	-70	-80	-90
-200	-7,890	-	-	-	-	-	-	-	-	-
-100	-4,632	-5,036	-5,426	-5,801	-6,159	-6,499	-6,821	-7,122	-7,402	-7,659
0	0	-0,501	-0,995	-1,481	-1,960	-2,431	-2,892	-3,344	-3,785	-4,215
°C	0	10	20	30	40	50	60	70	80	90
0	0	0,507	1,019	1,536	2,058	2,585	3,115	3,649	4,186	4,725
100	5,268	5,812	6,359	6,907	7,457	8,008	8,560	9,113	9,667	10,222
200	10,777	11,332	11,887	12,442	12,998	13,553	14,108	14,663	15,217	15,771
300	16,325	16,879	17,432	17,984	18,537	19,089	19,640	20,192	20,743	21,295
400	21,846	22,397	22,949	23,501	24,054	24,607	25,161	25,716	26,272	26,829
500	27,388	27,949	28,511	29,075	29,642	30,210	30,782	31,356	31,933	32,513
600	33,096	33,683	34,273	34,867	35,464	36,066	36,671	37,280	37,893	38,510
700	39,130	39,754	40,382	41,013	41,647	42,283	42,922	43,563	44,207	44,852

**Fe-CuNi, Typ L**

in mV temperatures in steps of 10 °C  
reference junction 0 °C

°C	0	-10	-20	-30	-40	-50	-60	-70	-80	-90
-200	-8,15	-	-	-	-	-	-	-	-	-
-100	-4,75	-5,15	-5,53	-5,90	-6,26	-6,60	-6,93	-7,25	-7,56	-7,86
0	0	-0,51	-1,02	-1,53	-2,03	-2,51	-2,98	-3,44	-3,89	-4,33
°C	0	10	20	30	40	50	60	70	80	90
0	0	0,52	1,05	1,58	2,11	2,65	3,19	3,73	4,27	4,82
100	5,37	5,92	6,47	7,03	7,59	8,15	8,71	9,27	9,83	10,39
200	10,95	11,51	12,07	12,63	13,19	13,75	14,31	14,88	15,44	16,00
300	16,56	17,12	17,68	18,24	18,80	19,36	19,92	20,48	21,04	21,60
400	22,16	22,72	23,29	23,86	24,43	25,00	25,57	26,14	26,71	27,28
500	27,85	28,43	29,01	29,59	30,17	30,75	31,33	31,91	32,49	33,08
600	33,67	34,26	34,85	35,44	36,04	36,64	37,25	37,85	38,47	39,09
700	39,72	40,35	40,98	41,62	42,27	42,92	43,57	44,23	44,89	45,55
800	46,22	46,89	47,57	48,25	48,94	49,63	50,32	51,02	51,72	52,43

**NiCr-CuNi, Typ E**  
DIN EN 60 584-1

in mV temperatures in steps of 10 °C  
reference junction 0 °C

°C	0	-10	-20	-30	-40	-50	-60	-70	-80	-90
-200	-8,824	-9,063	-9,274	-9,455	-9,604	-9,719	-9,797	-9,835	-	-
-100	-5,237	-5,680	-6,107	-6,516	-6,907	-7,279	-7,631	-7,963	-8,273	-8,561
0	0	-0,581	-1,151	-1,709	-2,254	-2,787	-3,306	-3,811	-4,301	-4,771
°C	0	10	20	30	40	50	60	70	80	90
0	0	0,591	1,192	1,801	2,419	3,047	3,683	4,329	4,983	5,646
100	6,317	6,996	7,683	8,377	9,078	9,787	10,501	11,222	11,949	12,681
200	13,419	14,161	14,909	15,661	16,417	17,178	17,942	18,710	19,481	20,256
300	21,033	21,814	22,597	23,383	24,171	24,961	25,754	26,549	27,345	28,143
400	28,943	29,744	30,546	31,350	32,155	32,960	33,767	34,574	35,382	36,190
500	36,999	37,808	38,617	39,426	40,236	41,045	41,853	42,662	43,470	44,278
600	45,085	45,891	46,697	47,502	48,306	49,109	49,911	50,713	51,513	52,312
700	53,110	53,907	54,703	55,498	56,291	57,083	57,873	58,663	59,451	60,237
800	61,022	61,806	62,588	63,368	64,147	64,924	65,700	66,473	67,245	68,015
900	68,783	69,549	70,313	71,075	71,835	72,593	73,350	74,104	74,857	75,608

**NiCr-Ni, Typ K**  
DIN EN 60 584-1

in mV temperatures in steps of 10 °C  
reference junction 0 °C

°C	0	-10	-20	-30	-40	-50	-60	-70	-80	-90
-200	-5,891	-	-	-	-	-	-	-	-	-
-100	-3,554	-3,852	-4,138	-4,411	-4,669	-4,913	-5,141	-5,354	-5,550	-5,730
0	0	-0,392	-0,778	-1,156	-1,527	-1,889	-2,243	-2,587	-2,920	-3,243
°C	0	10	20	30	40	50	60	70	80	90
0	0	0,397	0,798	1,203	1,612	2,023	2,436	2,851	3,267	3,682
100	4,096	4,509	4,920	5,328	5,735	6,138	6,540	6,941	7,340	7,739
200	8,138	8,539	8,940	9,343	9,747	10,153	10,561	10,971	11,382	11,795
300	12,209	12,624	13,040	13,457	13,874	14,293	14,713	15,133	15,554	15,975
400	16,397	16,820	17,243	17,667	18,091	18,516	18,941	19,366	19,792	20,218
500	20,644	21,071	21,497	21,924	22,350	22,776	23,203	23,629	24,055	24,480
600	24,905	25,330	25,755	26,179	26,602	27,025	27,447	27,869	28,289	28,710
700	29,129	29,548	29,965	30,382	30,798	31,213	31,628	32,041	32,453	32,865
800	33,075	33,685	34,093	34,501	34,908	35,313	35,718	36,121	36,524	36,925
900	37,326	37,725	38,124	38,522	38,918	39,314	39,708	40,101	40,494	40,885
1000	41,276	41,665	42,053	42,440	42,826	43,211	43,595	43,978	44,359	44,740
1100	45,119	45,497	45,873	46,249	46,623	46,995	47,367	47,737	48,105	48,473
1200	48,838	49,202	49,565	49,926	50,286	50,644	51,000	51,355	51,708	52,060
1300	52,410	52,759	53,106	53,451	53,795	54,138	54,479	54,819	-	-