

## Operating Manual MSF220K

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### - PTC-relay for dry transformers



## Table of contents

<b>1</b>	<b>Application and short description</b> .....	<b>3</b>
<b>2</b>	<b>Overview of functions</b> .....	<b>3</b>
<b>3</b>	<b>Connection plan</b> .....	<b>3</b>
<b>4</b>	<b>Display and controls</b> .....	<b>4</b>
<b>5</b>	<b>Detailed description</b> .....	<b>4</b>
<b>6</b>	<b>Important notes</b> .....	<b>5</b>
<b>7</b>	<b>Installation</b> .....	<b>5</b>
<b>8</b>	<b>Putting into operation</b> .....	<b>6</b>
<b>9</b>	<b>Troubleshooting and remedies</b> .....	<b>6</b>
<b>10</b>	<b>Technical data</b> .....	<b>7</b>
<b>11</b>	<b>Dimensions - Design K</b> .....	<b>8</b>

# 1 Application and short description

## General

The PTC-relay MSF220K is especially suitable for monitoring temperatures in dry transformers. Relay K2 (Alarm 2/Trip) is connected in operating current mode. It makes no trip signal when supply voltage is switched on. A delayed switching time relay in series is not required. Thus the MSF220K can also be used when the supply voltage for the device is provided by the monitored transformer. The built in test button allows easy test of the device and the connected components. Additional terminals make it easy to bridge supply voltage to K1 and K2.

## Approvals:

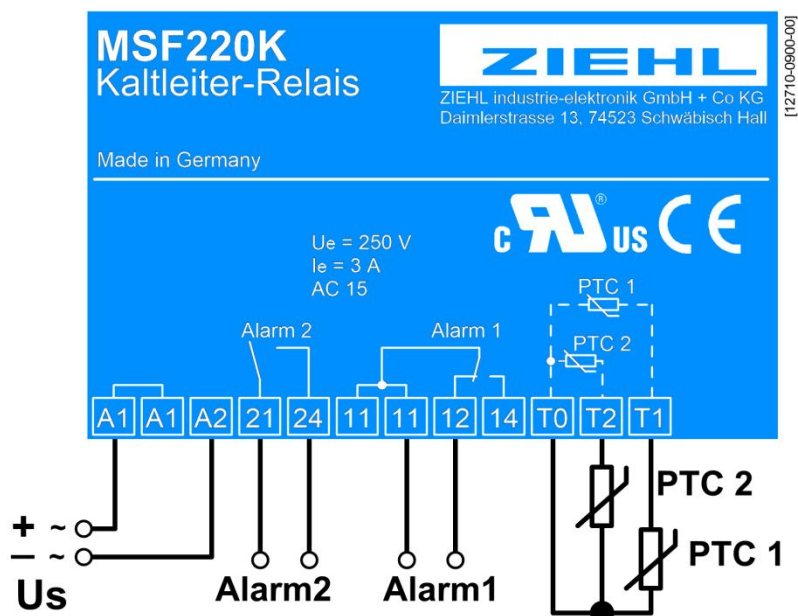


UL Recognized Component

## 2 Overview of functions

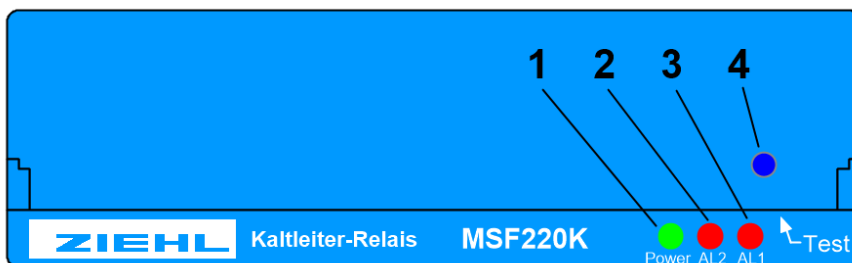
- 2 PTC-circuits with different temperatures for monitoring
- monitoring of sensor errors (PTC circuit is monitored for break and short circuit)
- TEST-button for testing relays
- LEDs signal state of relays
- ALARM 1 in closed-circuit current mode (relay K1, 1 change-over contact) for pre alarm. Signals also error in any sensor (when activated) and interruption of supply voltage.
- ALARM 2 in operation current mode (relay K2, 1 NO contact). No signal when switching on and off the supply voltage.

## 3 Connection plan



## 4 Display and controls

- 1 LED Power on
- 2 LED Alarm 2
- 3 LED Alarm 1
- 4 Button Test



## 5 Detailed description

PTC sensors with different nominal response temperatures (NRT) can be connected to MSF220K.

When everything is ok, relay K1 (Alarm 1) is picked up (11-14 closed) and relay K2 (Alarm 2, trip) is released (21-24 open). Green LED Power is on.

When nominal response temperature of PTC 1 (T1) is exceeded, relay K1 releases and red LED Alarm 1 is on.

Relay K1 picks up again, when temperature at sensor comes below switching back temperature.

When temperature of transformer continues rising and nominal response temperature of PTC 2 (T2) is exceeded, relay K2 (Alarm 2) picks up (21-24 closed) and red LED Alarm 2 is on.

Monitoring of sensors for errors (short circuit or interrupt) can be activated.

The contacts at both relay are potential free.  
Function of relays can be tested with button test.

### table of function

overload: PTC > 3650 Ω

normal: PTC < 1600 Ω

∞/0: PTC = ∞ Ω / PTC = 0 Ω -> Sensor error

PTC-temperature sensor		alarm relays		alarm LEDs *	
PTC 1 (T0-T1)	PTC 2 (T0-T2)	alarm 1	alarm 2	AL1	AL2
normal	normal	off (terminal 11-14)	off	○	○
overload	normal	on (terminal 11-12)	off	●	○
overload	overload	on (terminal 11-12)	on (terminal 21-24)	●	●
normal	overload	off (terminal 11-14)	on (terminal 21-24)	○	●

### only at parameterization: "monitoring sensor error on "

∞/0 *1	normal *1	on (terminal 11-12)	off	⊛	○
normal *1	∞/0 *1	on (terminal 11-12)	off	○	⊛
overload *1	∞/0 *1	on (terminal 11-12)	on (terminal 21-24)	●	⊛
∞/0 *1	overload *1	on (terminal 11-12)	on (terminal 21-24)	⊛	●
∞/0 *1	∞/0 *1	on (terminal 11-12)	off	⊛	⊛

\*) LED: ○ off ● on ⊛ flash

## 6 Important notes



### **WARNING!**

**Dangerous electrical voltage**

**Disconnect power before working on equipment.**

**Read and understand these instructions before installing, operating or maintaining the equipment.**

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

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



### **Attention!**

**Before switching on make sure that the operational voltage  $U_s$  of the type- plate and the mains voltage are the same! Before switching on ensure, that the supply voltage  $U_s$  written on the lateral type plate corresponds to the mains voltage!**

**When installing the device into the switchgear cabinet, please observe the max. admissible temperature. Care for both, sufficient clearance to other devices or sources of heat or enough forced draught. If cooling is made more difficult, e.g. close devices with increased surface temperature or by handicap of airflow cooling, the permissible ambient temperature has to be reduced.**



**In case of failure of supply voltage, the monitored unit is not protected any more. The operator must ensure, that a failure is detected, e.g. by monitoring Alarm 1 (K1) or by testing the unit regularly.**

## 7 Installation

The unit can be installed as follows:

- Installation in switchgear cabinet on 35 mm mounting rail according to EN 60715
- With 2 screws M4 for installation on wall or panel

Connection according to connection plan.

## 8 Putting into operation

### Parameterization of monitoring sensor errors (factory settings: monitoring sensor errors off )

- Power off the device
- Press button [Test] and keep pressed
- Power on the device, and keep pressed the button [Test]
  - After 5s blinks the green LED, release button [Test]
- Press Button [Test] again to switch the function
  - monitoring sensor errors on (red LEDs on)
  - monitoring sensor errors off
- Keep button [Test] pressed (2s) to save the function (the Power LED blinks fast, release button [Test])
- The MSF220K makes a reset and restarts with the set function

### Checking the function of device

- Power on the device (green LED Power is on)
- The relay K1 switch on (Terminals 11-14 closed) and the red LEDs AL1 and AL2 are off

### Function of button [Test] under operation

- Press button [Test] and keep pressed
- The green LED signals the status of monitoring sensor errors
  - monitoring sensor error on: LED blinks -> 2 x fast – pause - 2 x fast – pause - ...)
  - monitoring sensor error off: LED blinks evenly
- after 5s: Alarm 1 becomes active (relay K1 = off, terminals 11-12 closed, red LED AL1 = on)
- after 8s: Alarm 2 becomes active (relay K2 = on, terminals 21-24 closed, red LED AL2 = on)
- release button [Test] to cancel the test function

Even if no temperature warning is monitored with alarm 1, the function of the relay K1 must be evaluated, otherwise the monitoring can fail unnoticed (missing supply- voltage, equipment failure etc.). Connect a resistor (0,1k $\Omega$ ...1,5k $\Omega$ ) to sensor input PTC 1 (T0-T1), also 0 $\Omega$  if monitoring sensor error = off.

## 9 Troubleshooting and remedies

- LED Power is off
  - ⇒ Make sure that supply voltage is connected correctly (+/-) to terminals A1/A2 and correspond with the voltage on type plate
- Alarm 1 / Alarm 2 always active (LED AL1 / AL2 is on)
  - ⇒ Make sure, that the PTCs are correct connected and the voltage at the terminals is < DC 0,8 V. The resistance of the PTCs in cold state should be < 1,5 k $\Omega$ .
  - ⇒ Check PTC's only with measuring voltages of < 2.5 V.
- LED Power blinks and Alarm 1 is active (button Test is not pushed, not at parameterization)
  - ⇒ internal device error, switch it off and on. If the error persists please replace device. Send in together with a description of the occurred malfunction.
- Alarm 1 constantly active (K1 off, 11-12 on) and at least one alarm LED blinks:
  - ⇒ monitoring sensor error active, check sensors for short circuit and interruption
  - ⇒ monitoring sensor error in PTC 1 (AL1 blinks) and/or sensor error in PTC 2 (AL2 blinks)

## 10 Technical data

<b>Power supply (A1, A2)</b>	
Rated supply voltage $U_s$	see type plate on device
Model $U_s = AC/DC 24...240 V$	DC 20,4 ... 297 V / AC 20 ... 264 V
Frequency	AC 40...500 Hz, from AC 80 V: 10...500 Hz
Power consumption	< 1 W < 3 VA
Model $U_s = AC 220...240 V$	AC 0,9 $U_s$ -1,1 $U_s$ 40 ... 62 Hz
Power consumption	< 2 W < 2 VA
<b>Relay output</b>	
	EN 60947-5-1
Contacts	1 change-over contact , 1 NO contact
Switching voltage	max. AC 300 V; DC 300 V
Minimum voltage / current	12 V / 10 mA
Switching current $I_{th}$	max. 5 A
Current per terminal	max. 5 A
Switching power (ohm resistive load)	max. 1250 VA
	max. 120 W at DC 24 V
rated operating current $I_e$	AC-15 $I_e = 3 A U_e = 250 V$
rated operational voltage $U_e$	DC-13 $I_e = 2 A U_e = 24 V$
	DC-13 $I_e = 0,2 A U_e = 240 V$
UL electrical ratings	250 V ac, 3 A, general use
	240 V ac, 1/4 hp, 2.9 FLA
	120 V ac, 1/10 hp, 3.0 FLA
	C 300
<b>PTC thermistor input (T0-T1, T0-T2)</b>	
	acc. DIN 44081 / DIN 44082
Number	2 x 1...6 PTC thermistor in series
Rated response temperature TFS	60 °C ... 180 °C
Response tolerance	±6 °C
Temperature monitor cut-out-point	3,3 kΩ...3,65 kΩ...3,85 kΩ
Temperature monitor reclosing point	1,5 kΩ...1,6 kΩ ...1,65 kΩ
Collective resistance cold thermistor	≤ 1,5 kΩ
Terminal voltage (PTC thermistor)	≤ 2,2 V at $R \leq 3,65 k\Omega \leq 5 V$ at $R = \infty$
Terminal current (PTC thermistor)	≤ 1 mA
Power consumption	≤ 1,5 mW
Short circuit monitor	On: approx. 20 Ω Off: approx. 40 Ω
Interruption monitor	On: approx. 20 kΩ, only if temperature monitor cut-out-point has not previously exceeded, Off: approx. 1,6 kΩ
<b>Test conditions</b>	
	EN 60947-8
Rated impulse voltage	4000 V
Overvoltage category	III
Pollution degree	2
Rated insulation voltage $U_i$	300 V
Transformer	EN 61558-2-6 (VDE 0551)
On-period	100 %
EMC immunity (industry)	EN 61000-6-2
EMC emission	EN 61000-6-3
<b>Installation conditions</b>	
Fitting position	any
Rated ambient temperature range	-20 °C ... +55 °C
Storage temperature	-20 °C ... +70 °C

Temperature for wiring (admissible)  
 Altitude  
 Climatic conditions  
 Vibration resistance EN 60068-2-6

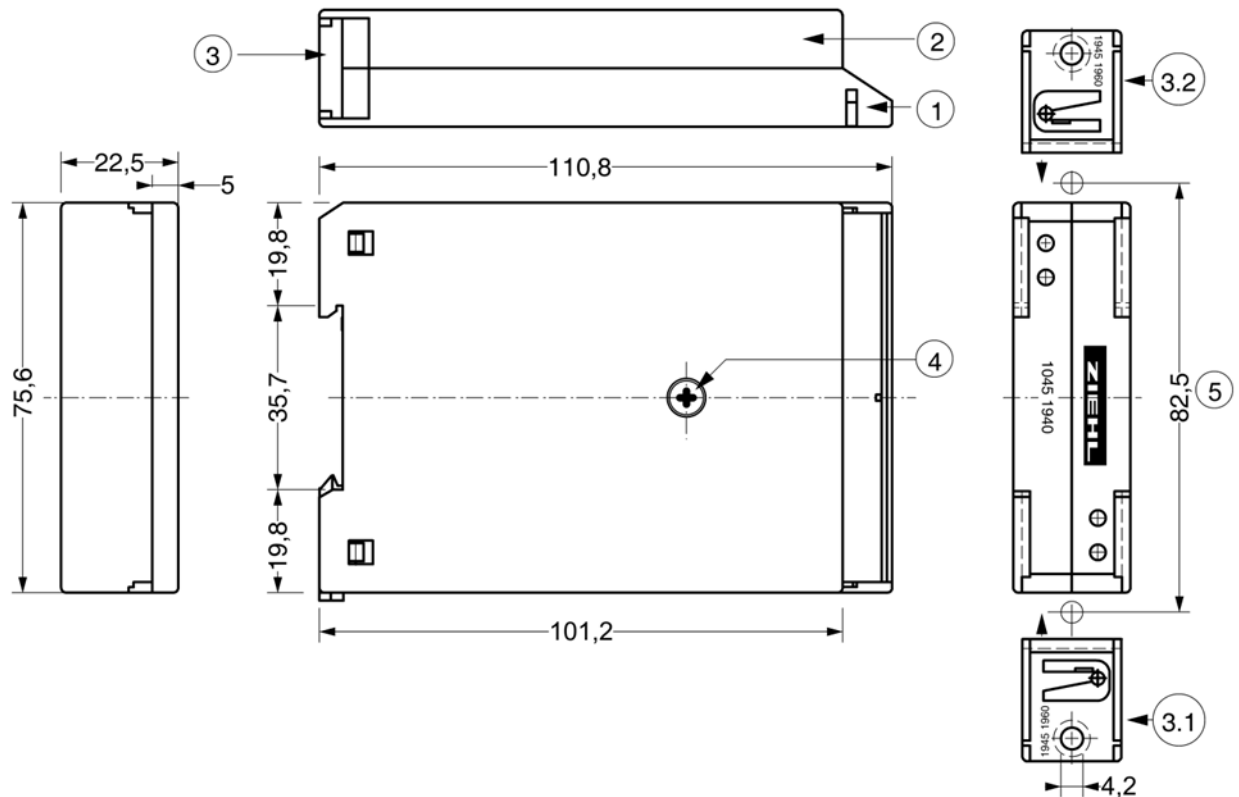
-5 °C ...+70 °C  
 up to 2000 m  
 5-85% rel. F., no condensation  
 2...13,2 Hz ±1 mm  
 13,2...100 Hz 0,7g

Housing		Design K	
Plastic Material		Polyamid PA 66, UL 94 V-2	
Dimensions (H x W x D) mm		without terminals:	75,6 x 22,5 x 110,8 mm
		with terminals:	75,6 x 22,5 x 115,7 mm
Line connection 1 wire		1 x 0,5 ... 2,5 mm <sup>2</sup> (AWG 22-14)	
Stranded wire with wire-end sleeves		1x 0,14 ... 1,5 mm <sup>2</sup>	
Insulation Strip length		8 mm	
Tightening torque		0,5 Nm, UL: 7 lb-in	
Protection housing/terminals EN 60529		IP 20	
Fitting position		any	
Fastening, fixing		standard rail 35 mm EN 60715	
Optional: Screw mounting		M4, only with additional bolt	
Weight	Model	AC 220...240 V	approx. 140 g
		AC/DC 24...240 V	approx. 110 g

Subject to technical modifications

## 11 Dimensions - Design K

Dimensions in mm



- 1 Bottom
- 2 Top
- 3 Bolt
- 4 Screw
- 5 Holes for screw mounting