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

Operating Manual MSF220VL

updated: 2016-10-12/Sc/sm
from Firmware: 01

PTC-relay for dry transformers

Fan, warning, trip winding and trip core
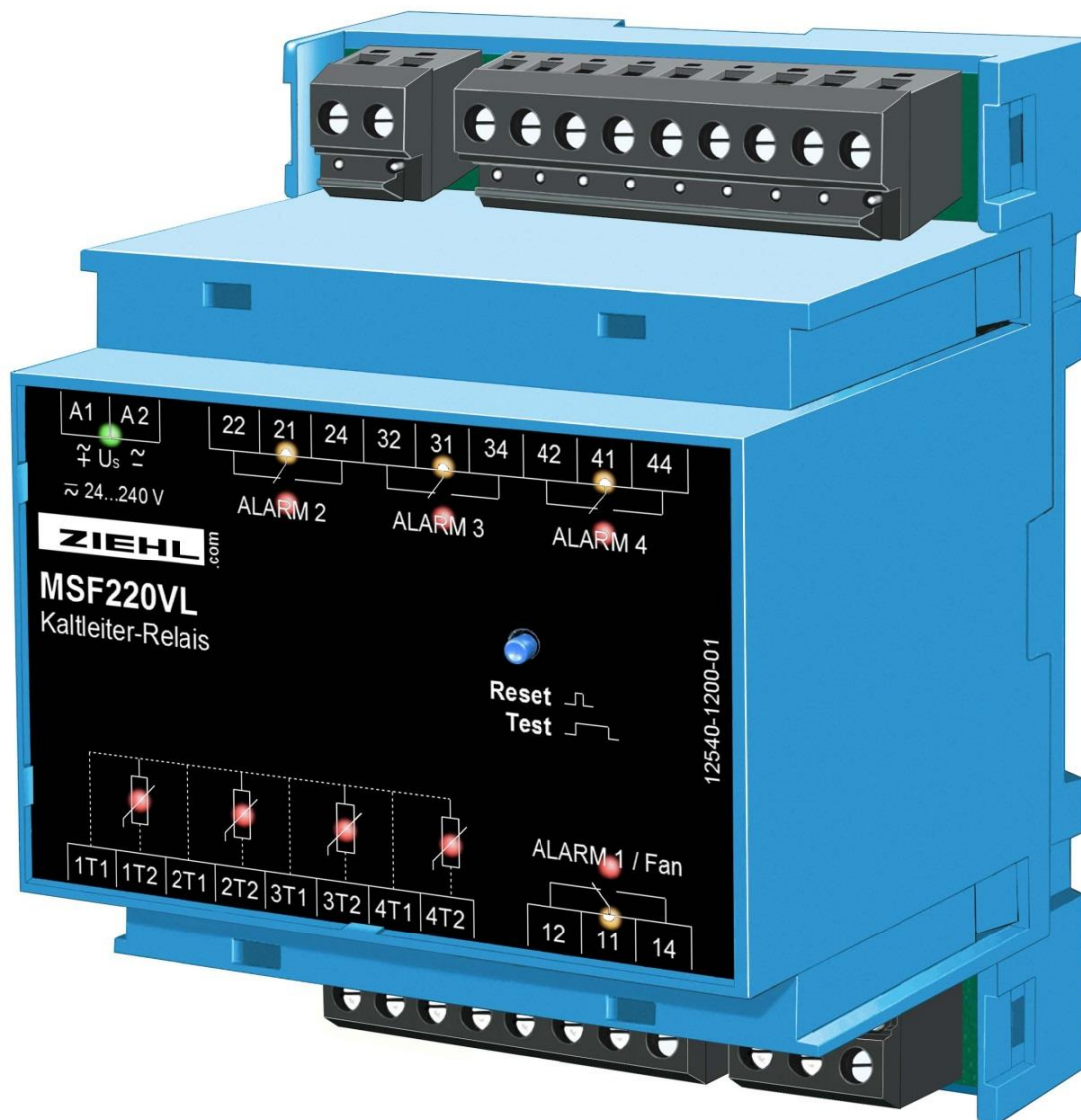
Integrated control off an and monitoring of core

Table of contents

1 Application and short description

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

Approvals:

UL Recognized Component

2 Overview of functions

- 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 disconnect table 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
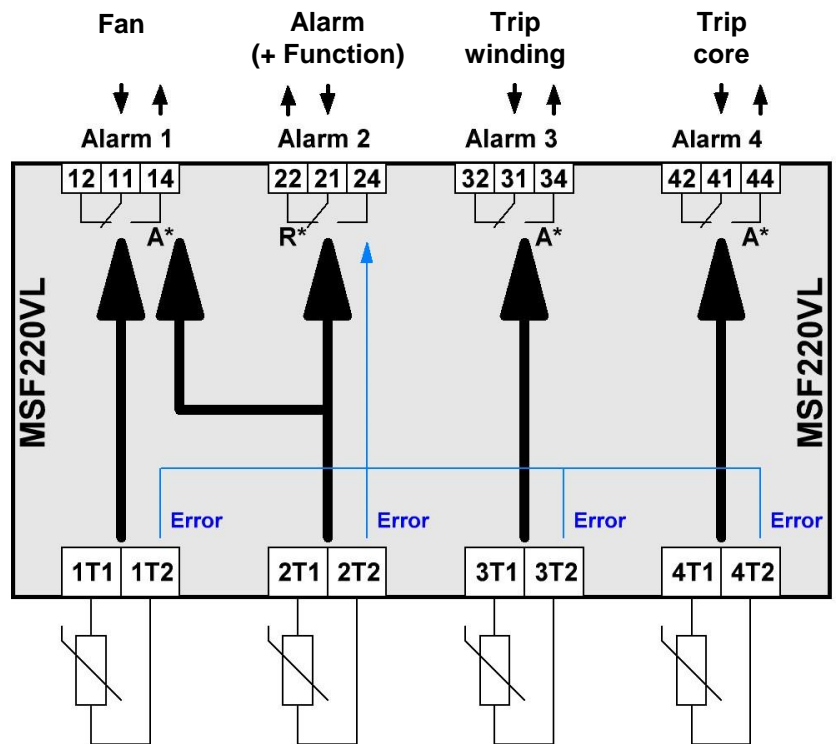
3 Connection plan

4x 1...6 PTC
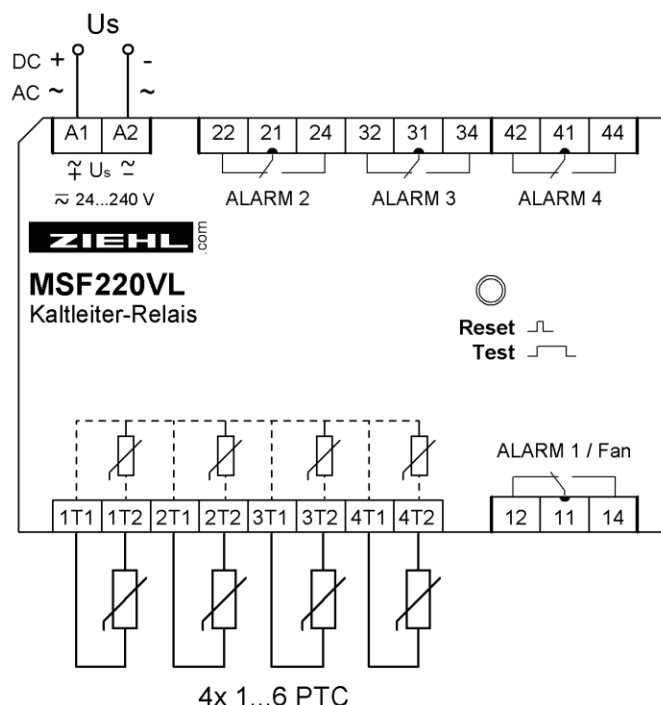
3.1 Program 1 (default ex works)

Fan-control – Alarm – Trip (winding) – Trop (core)

- Alarm 1 periodic test of fan
  - → 1x per week for 12 minutes

- Resistor 1kΩ at 1T1/1T2
  - → Test of fan deactivated,
    Alarm 1 (=Alarm 2) controlled
    by PTC 2T1/2T2 only

- Program 1R:
  - → Alarm 3 and Alarm 4 =
    Electronic reclosing lock:
    reset with button Reset or
    disconnection of Us

Fan	Alarm (+ Function)	Trip winding	Trip core
Alarm 1	Alarm 2	Alarm 3	Alarm 4
12 11 14	22 21 24	32 31 34	42 41 44
A*	R*	A*	A*

MSF220VL

Error Error Error Error
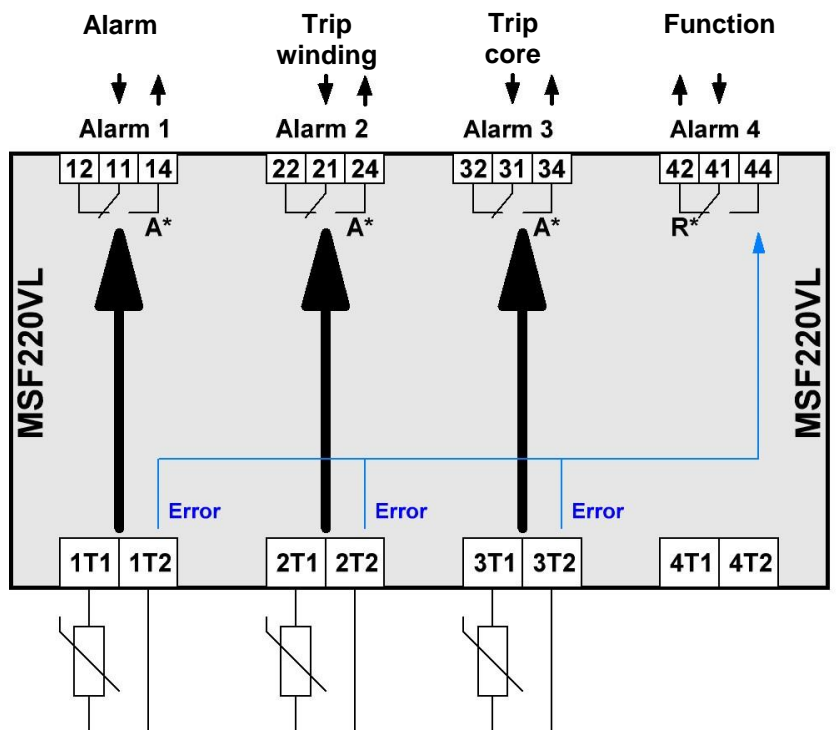
| 1T1 1T2 | 2T1 2T2 | 3T1 3T2 | 4T1 4T2 |

3.2 Program 2

Alarm – Trip (winding) – Trip (core) – Alarm (function)

- without fan control

- Alarm 4 = monitoring of function
  (fault)

- Program 2R:
  - → Alarm 2 and Alarm 3 =
    Electronic reclosing lock:
    reset with button Reset or
    disconnection of Us

Alarm	Trip winding	Trip core	Function
Alarm 1	Alarm 2	Alarm 3	Alarm 4
12 11 14	22 21 24	32 31 34	42 41 44
A*	A*	A*	R*

MSF220VL

Error Error Error

| 1T1 1T2 | 2T1 2T2 | 3T1 3T2 | 4T1 4T2 |

A = operating current mode -> relay picks up at alarm   R* = closed current mode -> relay releases at alarm*

3.3 Program 3

Fan control – Alarm – Trip (winding) – Alarm (function)

- Alarm 1 periodic test of fan
  → 1x per week for 12 minutes

- Resistor 1kΩ at 1T1/1T2
  → Test of fan deactivated,
  Alarm 1 (=Alarm 2) controlled
  by PTC 2T1/2T2 only

- Alarm 4 = monitoring of function (fault)

- Program 3R:
  → Alarm 3 =
  Electronic reclosing lock:
  reset with button Reset or
  disconnection of Us
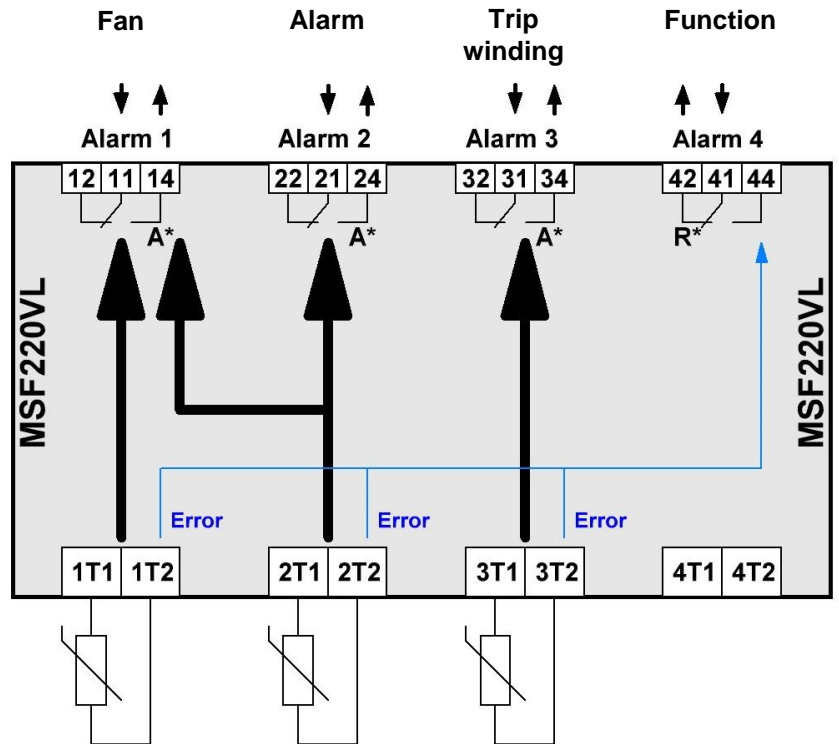
3.4 Program 4

Fan control with hysteresis 1T/2T – Alarm – Trip (winding) – Time relay

- Alarm 1 periodic test of fan
  → 1x per week for 12 minutes

- Resistor 1kΩ at 1T1/1T2
  → Test of fan deactivated,
  Alarm 1 (=Alarm 2) controlled
  by PTC 2T1/2T2 only

- Alarm 4 (time relay) picks up 2s
  after switching on Us and releases
  first when switching off Us
  → Connected in series with alarm
  1 and/or alarm 2 it suppresses
  alarms when Us is switched on

- PTC at 1T1/1T2 and 2T1/2T2 not
  connected when switching on
  → No evaluation of signals at
  1T1/1T2 and 2T1/2T2

- Sensor error at
  1T1/1T2 or 2T1/2T2
  → Fan on

- Program 4R:
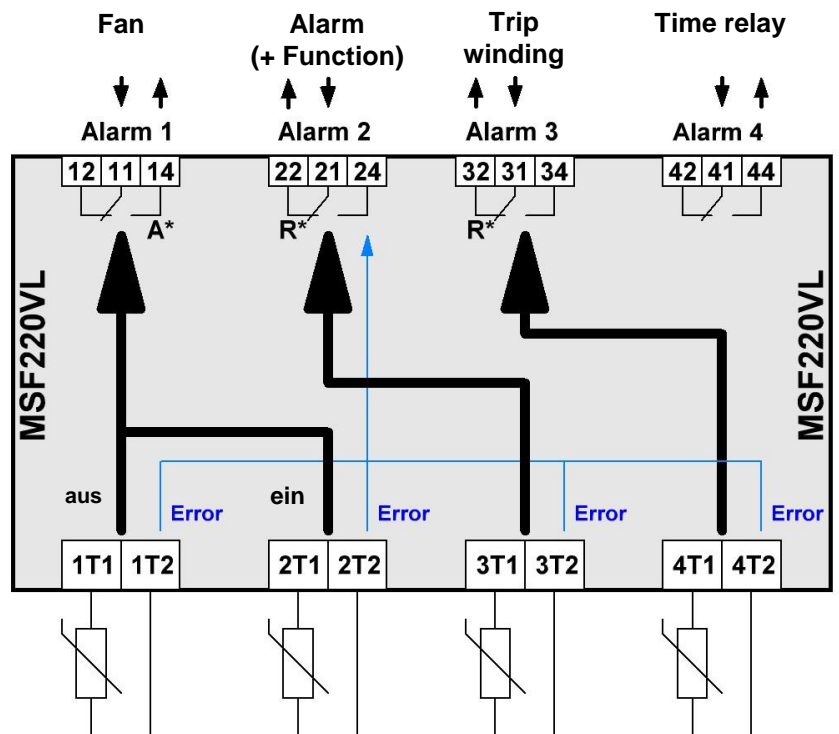
  → Alarm 3 = Electronic reclosing lock: reset with button Reset or disconnection of Us

A* = operating current mode -> relay picks up at alarm   R* = closed current mode -> relay releases at alarm

4 Display and controls
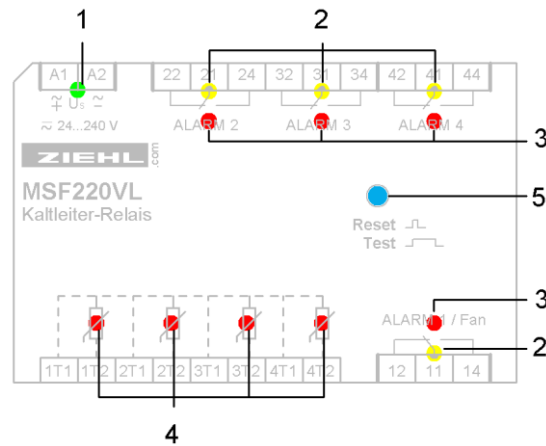
1 LED Us
- on = normal operation
- blinking slowly = function test starts
- blinking quickly = setup mode
  (monitoring of sensor break or sensor short circuit deactivated)
- blinking rhythmic 2x = program select

2 LED state of relays
- on = relay picked up
- off = relay released

3 LED Alarm
- on = Alarm
- off = no Alarm
- blinking slowly = stored alarm (delete with button Reset)
- = locked alarm, reset with button Reset or disconnection of Us
  = delayed switch off of fan (Alarm 1 only, not in program 2)
- blinking quickly (alarm 1 only) = fan test running (not in program 2)

4 LED sensors
- on = nominal response temperature (NAT) of sensor exceeded
- off = ok, temperature of sensor < NAT
- blinking = sensor error

5 Button Reset / Test
- Stop of delayed switch off of fan (not in program 2)
- Delete stored alarms
- Test function -> activated by button Reset / Test > 2 s
  (Aborts the test function when released)
  - after 2 s: LED „Us" blinking, Alarm 1 on
  - after 5 s: LED „Us" blinking, Alarm 2 on
  - after 8 s: LED „Us" blinking, Alarm 3 on
  - after 11 s: LED „Us" blinking, Alarm 4 on
  - after 15 s: all alarms off, **setup mode:**
    -> on for 10 minutes (termination with reset)
    -> LED „Us" blinking fast
    -> monitoring of sensor break or sensor short circuit deactivated
    -> no reset after alarms required

5 Important information

Connect wires as per connection plan

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

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

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

The equipment is built according to DIN / EN and checked and leave the plant according to security in perfect condition. To keep this condition, observe the security instructions with the headline „Attention" in the instructions manual. Ignoring of the security instructions may lead to death, physical injury or damage of the equipment itself and of other apparatus and equipment.

If, in any case the information in the instructions manual is not sufficient, please contact our company or the responsible representative.

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

When installing the device into the switch-gear cabinet, please observe the max. admissible temperature. Care for both, sufficient clearance to other devices or sources of heat or enough forced draught.

Attention! Universal power supply

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

⚠	**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 2 (programs 1 and 4) or alarm 4 (programs 2 and 3) and/or by testing the device regularly.**

6 Assembly

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 (required latch not included)

Connection according to connection plan.

7 Putting into operation

7.1 Program select

Prog.-No.	PTC-circuit		Operates	Connected device	Relay		Monitoring of function
1 **(1R)** default	1T..		Alarm 1	Fan	A	1) 2) 3)	Alarm 2
	2T..						
			Alarm 2	Alarm	R	7)	
	3T..		Alarm 3	Trip winding	A	7) 8) 9)	
	4T..		Alarm 4	Trip core	A	7) 8) 9)	
2 **(2R)**	1T..		Alarm 1	Alarm	A	7)	Alarm 4
	2T..		Alarm 2	Trip Winding	A	7) 8) 9)	
	3T..		Alarm 3	Trip core	A	7) 8) 9)	
	4T not used		Alarm 4	Function	R		
3 **(3R)**	1T..		Alarm 1	Fan	A	1) 2) 3)	Alarm 4
	2T..						
			Alarm 2	Alarm	A	7)	
	3T..		Alarm 3	Trip	A	7) 8) 9)	
	4T not used		Alarm 4	Function	R		
4 **(4R)**	1T..		Alarm 1	Fan (1T.. = on / 2T.. = off)	A	1) 3) 4) 5)	Alarm 2
	2T..						
	3T..		Alarm 2	Alarm	R	7)	
	4T..		Alarm 3	Trip	R	7) 8) 9)	
			Alarm 4	Time relay	X	6)	

1) Periodic test off an every 7 days for 12 minutes
2) Resistor 1kΩ at 1T.. = test off an disabled
3) Resistor 1kΩ at 1T.. = Fan controlled by PTC at 2T.. only
4) 1T.. and 2T.. not connected when switched on = no evaluation of 1T.. and 2T..
5) Error sensor at 1T.. or 2T.. = Fan on
6) Relay picks up 2s after switching on Us and releases first when switching off Us
7) Alarm LED blinking after alarm (stored alarm), reset with button Reset
8) Error sensor at this input and simultaneous alarm = trip
9) in programs 1R, 2R, 3R or 4R: locked alarm, reset with button Reset or disconnection of Us

Monitoring of function (relay releases at an alarm):
- Alarm at missing supply voltage of MSF220VL
- Alarm at sensor error (short circuit or break) in a PTC-circuit

Relay:
- Operating mode (A)   ->   Relay picks up at alarm
- Closed current mode (R) ->   Relay releases at alarm
- Time relay (X)   ->   Us=on -> relay picks up after 2s,   Us=off -> relay releases first

Delayed switch off of fan:
- First activation of fan -> delay = 20 minutes
- Next activation after max. 60 minutes   -> delay = 40 minutes
- Next activation after max. 30 minutes   -> delay = 60 minutes
- After 5 hours without activation off an or disconnection of Us -> delay = 20 minutes

7.2 Program setup

- Disconnect supply voltage Us
- Press button Reset/Test and keep it pressed
- Switch on supply voltage Us (keep button Reset/Test pressed)
- LED Us starts blinking (rhythmic 2x) after 5s
- Select program with button Reset/Test (see also 7.4)

• red LED 1T blinks	= program 1
• red LED 1T + alarm 3 + alarm 4 blinks	= program 1R, alarm 3 und alarm 4 locked
• red LED 2T blinks	= program 2
• red LED 2T + alarm 2 + alarm 3 blinks	= program 2R, alarm 2 und alarm 3 locked
• red LED 3T blinks	= program 3
• red LED 3T + alarm 3 blinks	= program 3R, alarm 3 alarm
• red LED 4T blinks	= program 4
• red LED 4T + alarm 3 blinks	= program 4R, alarm 3 locked

To store the program press button Reset/Test for 2 s.
When no button has been pressed for >30 s, the device switches back in operating mode.
Changes are rejected.

When supply voltage Us switched on, all LEDs are on for 1 s. The red LEDs indicate the program by blinking fast.
(see table 7.4 Program-No. and query of firmware-version).

7.3 Setup operation

See 4. Display and Controls -> button Reset / Test

7.4 Number of program and query of firmware-version

- Press button Reset/Test 5x quickly in succession (within 2 s)
- green LED power off, number of program and firmware-version are displayed for 5s
- yellow LEDs alarm 2 … alarm 4 = firmware-version (binary coded, AL2 = Bit0 … AL4 = Bit2)
- red LEDs indicate the program by blinking fast:

rote LED an …	1T	2T	3T	4T	Alarm 1	Alarm 2	Alarm 3	Alarm 4
Program 1	blinks							
Program 1R	blinks						blinks	blinks
Program 2		blinks						
Program 2R		blinks				blinks	blinks	
Program 3			blinks					
Program 3R			blinks				blinks	
Program 4				blinks				
Program 4R				blinks			blinks	

<u>ATTENTION:</u> while displaying number of program and firmware-version monitoring functions of MSF220VL are disabled.

7.4.1 Revision Firmware

Version 00 :   final version
Version 01 + 02: new programs (program 1R, program 2R, program 3R, program 4R)

8 Trouble shooting

Function and meaning of LEDs see

Display of program-no. And firmware-version see

9 Maintenance

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10 Technical Data

Supply voltage Us:	AC/DC 24 – 240 V
Tolerance	DC 20,4 - 297 V AC 20 - 264 V 50/60 Hz
Power consumption	< 1,5 W < 5 VA

PTC-resistor input	
Inputs	4 x 1…6 PTCs (thermistors) in series
Cut-out point	3,3 kΩ…4,0 kΩ, typ. 3,65 kΩ
Reclosing point	1,5 kΩ…1,65 kΩ, typ. 1,6 kΩ
Collective resistance of cold sensor	≤ 1,5 kΩ
Short-circuit monitoring	Rmin>40 Ω, Rk = 20…40 Ω
Terminal voltage (sensors)	≤ 0,5 V at R ≤ 250 Ω, ≤ 3,3 V at R ≥ 4000 Ω
Terminal current (sensors)	max. 1,2 mA

Relay data K2, K3, K4 (alarms 2, 3, 4)	3 x 1 changeover contact
Switching voltage	max. AC 400 V
	max. DC 300 V
Switch-on current (no)	30 A 4s 10% on period
Minimum voltage / current	12 V / 10 mA
Switching current Ith	max. 5 A
Switching power max. AC (cos φ = 1)	2000 VA
Switching power max. DC	0,3 A DC 300 V
	0,4 A DC 120 V
	0,8 A DC 60 V
Rated operational current Ie	category AC 15 / Ie = 3 A / Ue = 250 V
	category DC 13 / Ie = 2 A / Ue = 24 V
Recommended fuse	T 3,15 A (gL)
Electrical contact life	cos φ = 1 -> 5 x 10^5 operations at AC 250 V / 2 A
UL electrical ratings	250 V ac, 3A, general use
	240 V ac, 1/4 hp, 2.9 FLA
	120 V ac, 1/10 hp, 3.0 FLA
	C 300

Relay data K1 (alarm 1 / fan)	1 changeover contact
Switching voltage	max. AC 400 V
	max. DC 300 V
Switch-on current (no)	30 A 4s 10% on period
Minimum voltage / current	12 V 10 mA
Switching current Ith	max. 10 A
Switching power max. AC (cos φ = 1)	4000 VA
Switching power max. DC	0,3 A DC 300 V
	0,4 A DC 120 V
	0,8 A DC 60 V

Rated operational current Ie	category AC 15 / Ie = 6 A / Ue = 250 V
	category DC 13 / Ie = 2 A / Ue = 24 V
Recommended fuse	gG/gL 10 A
Electrical contact life	cos φ = 1 -> 1 x 10^5 operations at AC 400 V / 10 A
UL electrical ratings	250 V ac, 3A, general use
	240 V ac, 1/4 hp, 2.9 FLA
	120 V ac, 1/10 hp, 3.0 FLA
	C 300

Testing conditions   EN 60947-8
  Rated insulation voltage   Ui AC 300 V
  Contamination level   2
  Overvoltage category   III
  Rated impulse voltage: 4000 V
  EMC – immunity (industry)   EN 61000-6-2
  EMC – emission class B   EN 61000-6-3
  On period   100 %

Environmental conditions
  Rated ambient temperature range   -20 °C ... +60 °C
  Storage temperature range   -20 °C …+70 °C
  Altitude   < 2000 m above MSL
 Climatic conditions   5-85% rel. humidity, no condensation

Housing: design V4
  Mounting height   55 mm
  Dimensions (W x H x D)   70 x 90 x 58 mm
  Plastic Material   PA66, UL 94 V-2
  Line connection solid wire   1 x 0,14 mm^2 – 2,5 mm^2
  Stranded wire with insulated ferrules   je 1 x 0,14 mm^2 – 1,5 mm^2
  Strip length   min. 8 mm
  Torque   0,5 Nm
  Protection housing   IP 30
  Protection terminals   IP 20
  Attachment   Snap-mount on 35 mm standard rail acc. to EN 60715
                                      or with 2 screws M 4 (required latch not included)
  Weight   app. 190 g

Subject to technical modifications

11 Form V4

dimensions in mm
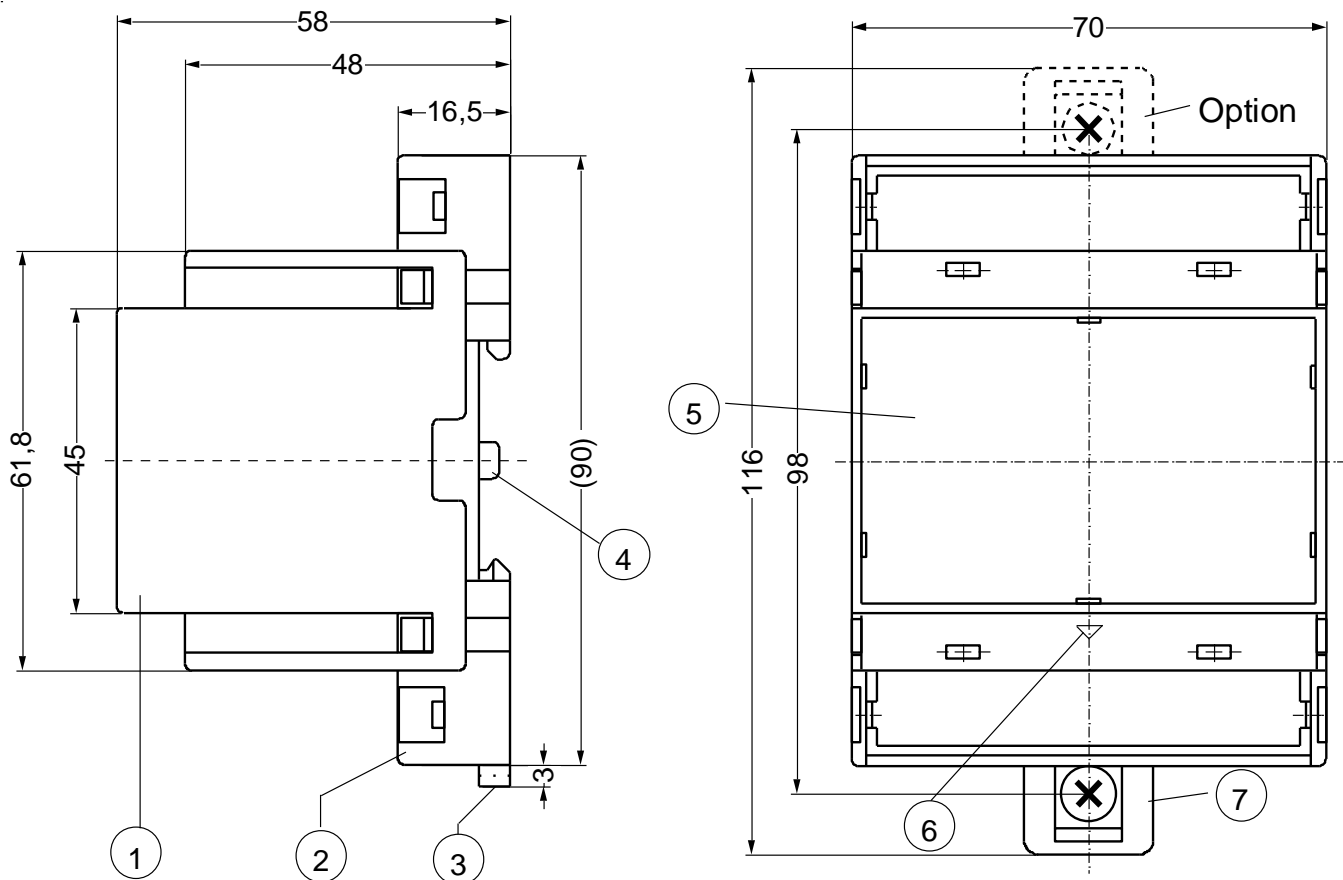
1   cover
2   base
3   bar for snap mounting
4   latch for sealing
5   front panel
6   position downward
7   for fixing to wall with screws, Ø 4.2 mm

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

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