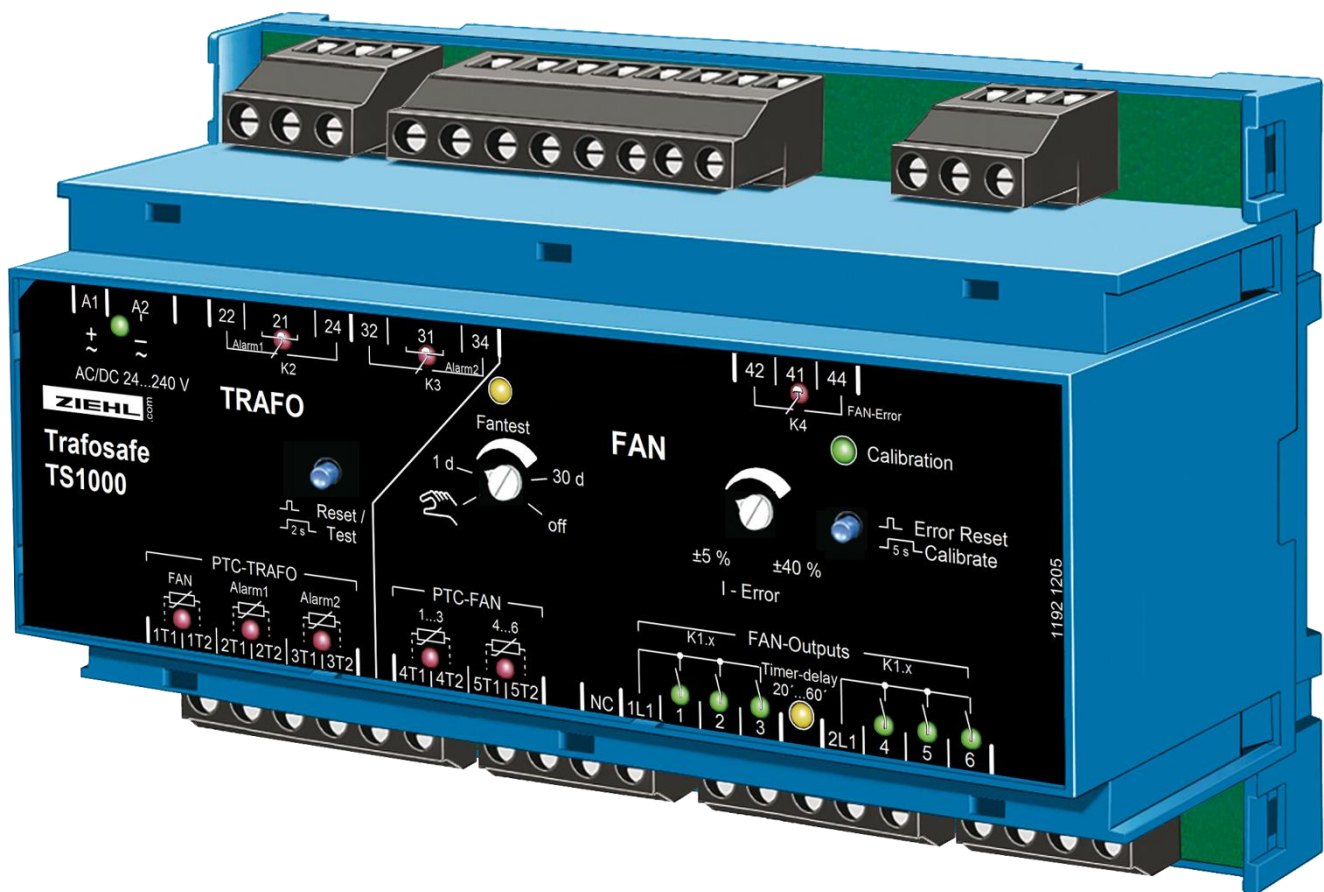


# Operating Manual TS1000

updated: 2018-06-05 / Fz

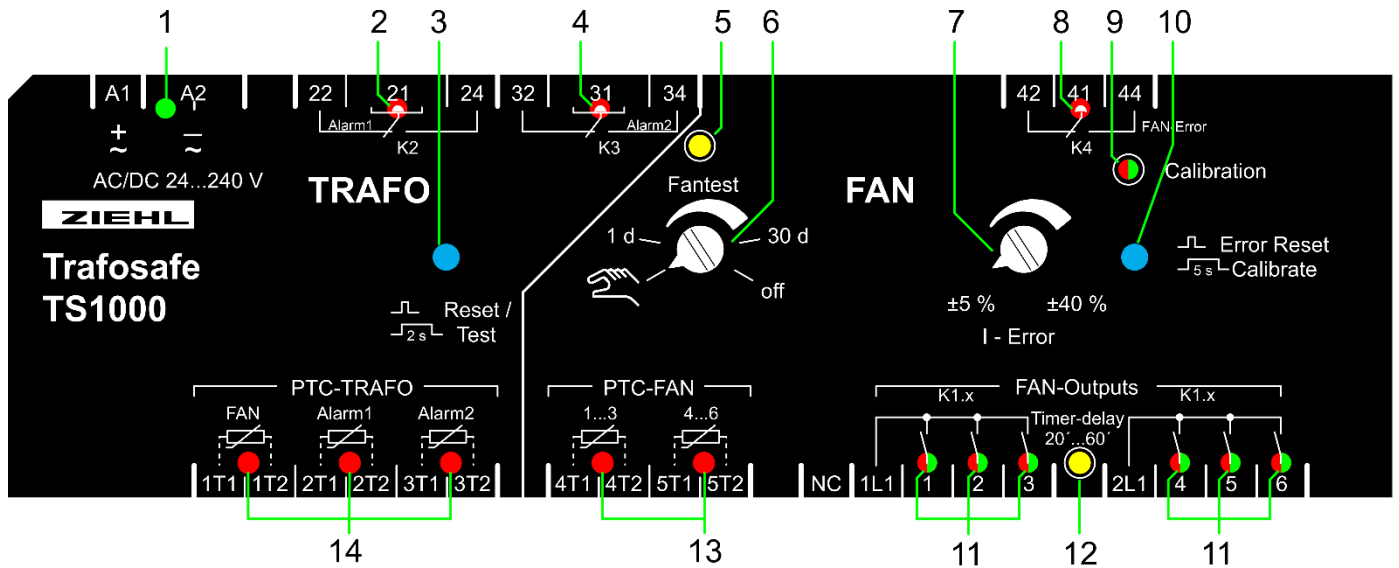
## - Trafosafe



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# 1 Display and controls



	LED	Illuminated	Flashes	Flashes rapidly	Display function
1	Power supply	green	green	green	Unit switched on Test mode 1T, 2T and 3T Setup mode 1T, 2T and 3T
2	Alarm 1 (21)	red	red	red	PTC on 2T > NAT 3T sensor error NAT on sensor circuit 2T was exceeded 2T sensor error
4	Alarm 2 (31)	red	red	red	PTC on 3T > NAT NAT on sensor circuit 3T was exceeded 3T sensor error
5	Fan test	yellow	yellow		Manual mode fan test Automatic fan test
8	FAN-Error (41)	red			FAN error (Under-Overcurrent, Temperature PTC-FAN > NAT)
9	Calibration	red green	red		Unit not calibrated Calibration process started Calibration completed / Valid calibration present
11	FAN-Outputs	red green	green red	red	FAN overcurrent detected FAN switched on FAN power up (FAN still off) FAN current > 4A (during calibration) FAN undercurrent detected
12	Timer-delay	yellow			Fan run-on
13	PTC-FAN 1...3 (4T1/4T2) 4...6 (5T1/5T2)	red	red		Temperature > NAT PTC-FAN saved triggering
14	PTC-TRAFO FAN (1T1/1T2) Alarm1 (2T1/2T2) Alarm2 (3T1/3T2)	red red red	red red		PTC > NAT PTC > NAT 2T sensor error PTC > NAT 3T sensor error

### 3 Functions Reset/Test (PTC-TRANS) button

- Stops fan during run-on
- Resets PTC-TRANS FAN
- Resets Alarm1 and Alarm2 display
- Activate test function with Reset/Test button pressed > 2 s
- Aborts the test function when released
  - after 2 sec.: "ON" LED flashes
  - after 5 sec.: "ON" LED flashes, Alarm1 on (K2 off), LED Alarm1 on
  - after 8 sec.: "ON" LED flashes, Alarm2 on (K3 on), LED Alarm2 on
  - after 15 sec.: **Setup mode:**
    - Switched on for 10 min. (abort with reset)
    - "ON" LED flashes quickly
    - Alarm1 off (K2 on), LED Alarm1 off
    - Alarm2 off (K3 off), LED Alarm2 off
    - Sensor error detection switched off
    - No reset after PTC triggering required

### 6 Poti Fantest

Automatic fan test, can be set with the rotary fan test poti  
"Manual mode – 1...30 days – off"

### 7 Potentiometer I Error

permissible deviation  $\pm 5\%$  to  $\pm 40\%$ .

### 10 Functions Error Reset/Calibrate

- Rests "FAN Error" (LED FAN Error on)
- Start calibration (pressed > 5s)

## 2 Factory setting

The unit is not calibrated in the factory.

The customer must calibrate. To reset the unit to the factory settings, take the steps below:

- Switch off the supply voltage
- Keep the "Reset/Test" and "Error Reset" buttons pressed
- Switch on the supply voltage
- Release buttons after 3 s
  - Unit was reset to factory settings ("Calibration" LED illuminated red, message FAN-Error).

### Calibrating the fan monitor:

Calibrate during

- First commissioning
- Changes made on the fans (e.g., repair, replacement)

Keep the "Error Reset/Calibrate" button pressed for 5 s until the "Calibration" LED flashes red

- Fans are switched on pair by pair with 10 s interval (1+4, 2+5, 3+6), each FAN-LEDs illuminated green, not yet switched in flash green
- LEDs of non-connected FAN outputs shine red and the FAN relay is switched off (10 s delay)
- FAN outputs with overcurrent (>4A) flash red and the FAN relay is switched off after 10 s
- Abort the calibration by pressing the "Error Reset/Calibrate" button again

A valid calibration is indicated with the "Calibration" LED (illuminated green).

**During or after calibration ("Fan test" on manual mode), you must check whether all fans have been detected, triggered and work correctly.**

### 3 Application and brief description

The Trafosafe TS1000 is used on dry transformers with forced cooling.

It monitors the temperature of the transformer, controls the fans for cooling, sends an alarm when an advance warning temperature has been exceeded and switches the transformer off if the temperature continues to increase.

Up to 6 fans can be individually controlled by the TS1000; contactors and motor protection switches are omitted.

When monitoring the transformer with a Pt 100 temperature sensor, the TS1000 can be used as a pure fan controller.

### 4 Overview of the functions

- Universal control voltage AC/DC 24-240 V

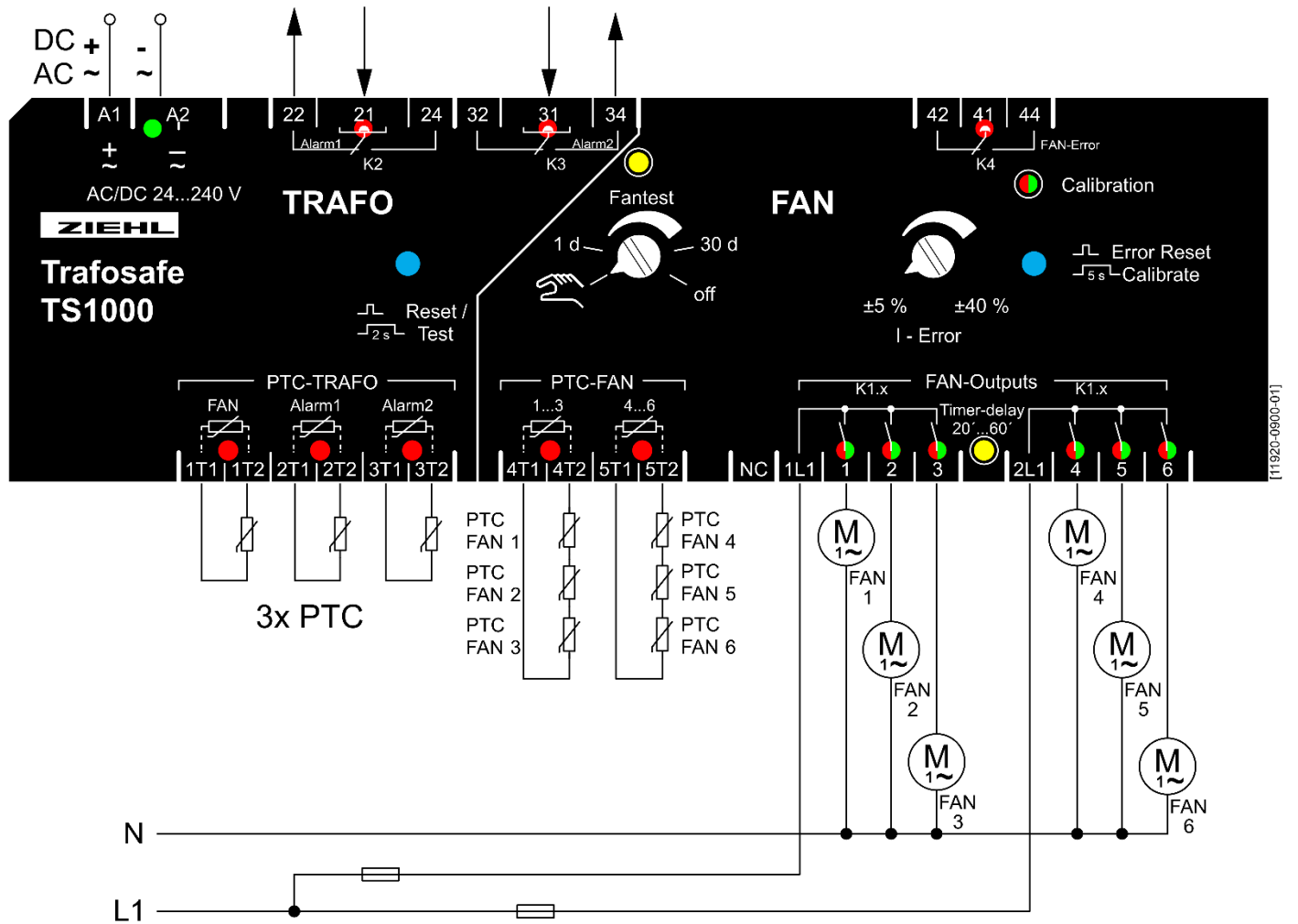
#### Temperature monitoring:

- 1 PTC thermistor for the fan control (1T1/1T2) = triggering with an external contact when using as a fan control
- 1 each PTC thermistor advance warning (2T1/2T2) and shutdown (3T1/3T2) with monitoring of short-circuits and interruptions  
**Caution:** When using as a fan controller, the inputs must each be wired with one each 1kOhm resistor.
- 1 relay for advance warning (K2) in closed-circuit current version = function monitoring
- 1 relay for shutdown (K3) in open-circuit version = no on-pulse contact
- Test/Reset button for function test

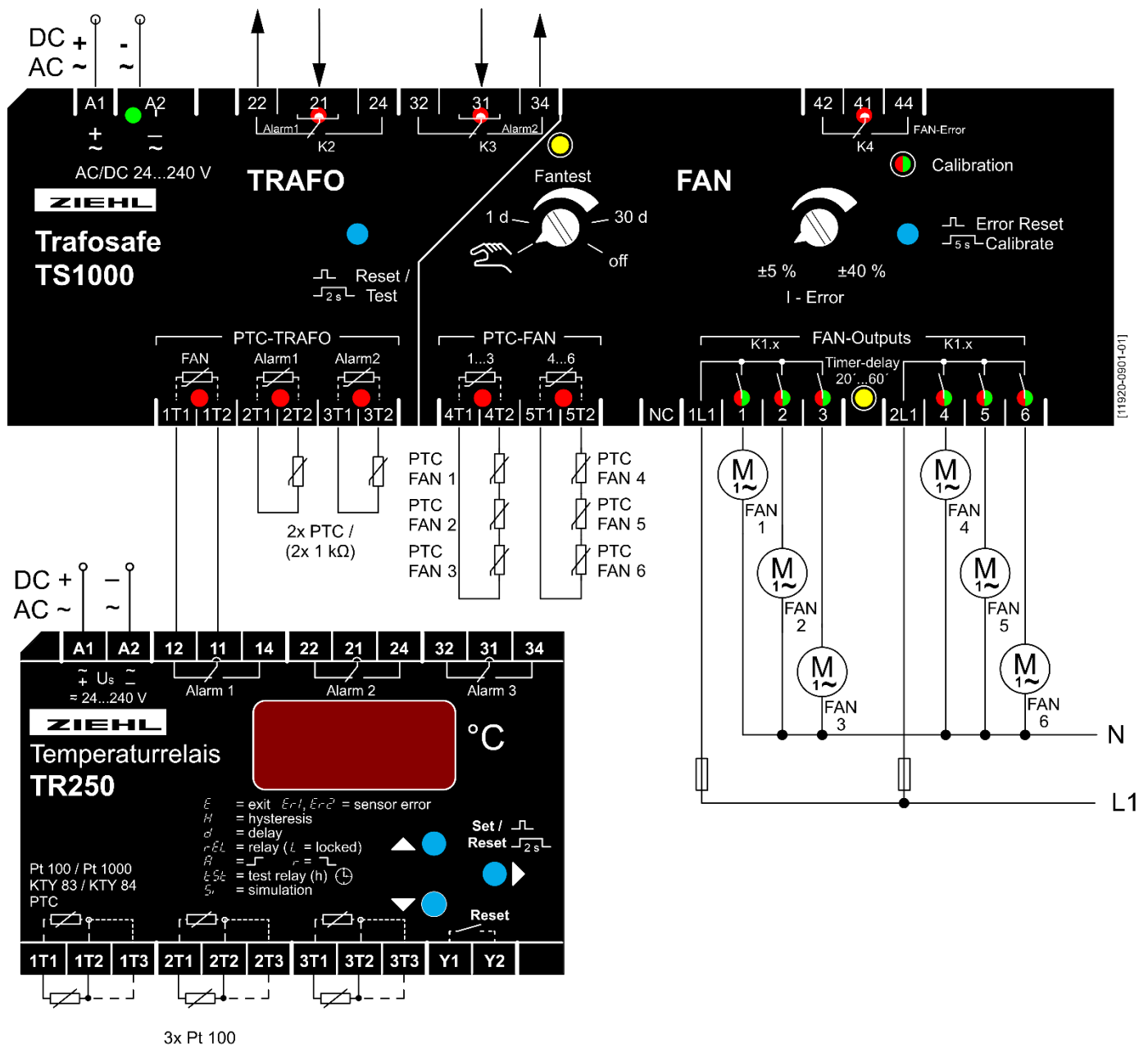
#### Air controller and monitor:

- Direct connection for up to 6 fans
- Automatic extension of the fan mode during higher loads
- Monitoring for errors (over/under current)
- Self-calibration of the current monitoring to the fans
- Adjustable current threshold for fan control ( $\pm 5\%$  ...  $\pm 40\%$ )
- Automatic fan test every 1-30 days, disconnectible
- Current relay for fan errors
- Clear displays with LEDs

## 5 Wiring diagram PTC sensors



## 5.1 Wiring diagram Pt 100 sensors



## 6 Important Information



### ATTENTION

**Dangerous electrical voltage!**

**May lead to electrical shock and burn.**

**Before beginning of work switch unit and equipment free of voltage.**

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

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

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

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

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

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## 7 Installation

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

The unit can be installed as follows:

- Installation in switchgear cabinet on 35 mm mounting rail according to EN 60715
- With screws M4 for installation on walls or panel. (additional latch included in delivery)

Connection according to connection plan or type plate.

Even if no advanced warning temperature is being monitored with Alarm 1, the function of Relay K2 must be evaluated; otherwise, the monitoring can fail unnoticed (no control voltage, unit defective). While doing so, a resistor (100 ... 1000 Ω) must be wired into the Alarm1 input (2T1/2T2).

Before you apply voltage to the unit, make sure that the control voltage stated on the unit matches the connected mains voltage!

- Mains voltage AC on A1 and A2 or DC+ on A1 and DC- on A2.
- When the unit is ready for operation, Relay K2 switches on, the green "ON" LED shines. Contacts 21-24 closed.



## 8 Detailed Description

- 3 PTC thermistors (PTC-TRANS), per 1...6 PTC thermistors in series can be connected (max. summing initial resistance 1500  $\Omega$ ) for the functions fan (FAN), advance warning (Alarm1) and shutdown (Alarm2)
- Fan function (FAN): When the rated trigger temperature (NAT) of the thermistor (PTC) is exceeded on 1T1/1T2, the FAN relays switch on consecutively pair by pair with 10s intervals (FAN 1+4, FAN 2+5 and FAN 3+6). Red LED 1T1/1T2 illuminated.
- Function Alarm 1 (advance warning and function monitoring): 1 dry contact (reversing switch). Relay K2 drops if thermistor on 2T1/2T2 NAT exceeds. (Closed-circuit current version, short wiper signal when switching on the control voltage). Red LED 2T1/2T2 illuminated when NAT was exceeded and flashes on sensor error.
- Function Alarm 2 (shutdown): 1 dry contact (reversing switch). Relay K3 energizes if thermistor on 2T1/2T2 NAT exceeds. Red LED 3T1/3T2 illuminated when NAT was exceeded and flashes on sensor error.
- Sensor interruption and short-circuit monitoring of the PTC for Alarm1 (2T1/2T2) and Alarm2 (3T1/3T2), with message to Alarm1 (to test the device for 10 minutes disconnectible, press Reset/Test button for 15 s)
- Saves triggering of Alarm1 and Alarm2 (Alarm LEDs flash, relays switch back)
- Fan run-on 20 min., automatic extension during frequent fan use
- Test / Reset button for testing the relay outputs, fan run-on abort and LED messages reset
- Alarm state display through LED
- Temperature monitoring of the fan motors (PTC-FAN) with 2 PTC thermistors, connectible per 1...9 thermistor in series (max. summing initial resistance 1500  $\Omega$ ).
- Self-monitoring routine when switching on (power up test LED for 2s)
- Error Reset / Calibrate button resetting FAN error messages and calibrating the fan motor current monitor.
- Rotary knob fan test for cyclically repeating fan test, adjustable "Manual mode / 1...30 days / off"
- I-Error rotary knob for setting the permissible  $\pm$  deviation from the calibrated rated current

## 9 Commissioning

### 9.1 Fan mode

When using purely as a fan controller, the inputs 2T1/2T2 and 3T1/3T2 must each be wired with one each 1kOhm resistor.

#### Shutdown value on 1T1/1T2 reached or start with external contact (break contact)

- Fans power up with 10 s interval pair-by-pair (1+4, 2+5, 3+6), each FAN-LEDs illuminated green, FAN LEDs not yet switched in flash green
- Non-used FAN outputs do not switch in
- Red LED 1T1/1T2 illuminated

#### Reclosing value reached on 1T1/1T2

- LED "Timer delay" illuminated
- FAN run-on time running
- Switch off of the fan after expiration of the run-on time
- Red LED 1T1/1T2 off

### 9.2 FAN run-on times

- After switching on (first fan mode), 20 minutes
  - When fans switched on again within 60 minutes, the run-on time is extended to 40 minutes
  - When fans switched on again within 30 minutes, the run-on time is extended to 60 minutes
- (Reset to 20 min. after 5 hours without fan mode or if the control voltage fails).

### 9.3 FAN current monitor

During fan mode, the fan currents are monitored (after a power up time of 10 s).  
The permissible deviation is set using the potentiometer "I Error" to  $\pm 5\%$  to  $\pm 40\%$ .

#### Undercurrent detection:

- FAN LED flashes red rapidly
- FAN remains switched on
- Relay K4 "FAN Error" attracts (41/44 closes) and reports error, LED "FAN Error" illuminates

#### Overcurrent detection:

- FAN LED shines red
- FAN is switched off
- Relay K4 "FAN Error" attracts (41/44 closes) and reports error, LED "FAN Error" illuminates

The detection of current errors (message K4) is saved zero-voltage maintained.

Reset of error with the "Error Reset" button

### 9.4 PTC FAN

To operate without fan temperature monitoring, one bridge each between 4T1/4T2 and between 5T1/5T2 is required (included in scope of delivery)

#### Shut-off value reached 4T1/4T2 (5T1/5T2)

- Fans 1...3 (4...6) will be switched off
- LED "PTC-FAN 1...3" (4...6) shines
- Relay K4 "FAN Error" attracts (41/44 closes) and reports error, LED "FAN Error" illuminates

#### Reclosing value reached 4T1/4T2 (5T1/5T2)

- Fans 1...3 (4...6) start up consecutively with 10 s interval
- LED "PTC-FAN 1...3" (4...6) flashes
- "FAN Error" remains until reset through "Error Reset" button.

### 9.5 Functions Alarm 1

#### Shut-off value reached on 2T1/2T2 (PTC-TRANS Alarm1)

- Relay K2 "Alarm1" drops (21/22 closes) and reports error, LED "Alarm1" illuminates
- Red LED 2T1/2T2 illuminated

#### Reclosing value reached on 2T1/2T2 (PTC-TRANS Alarm1)

- Relay K2 "Alarm1" attracts (21/24 closes), LED "Alarm1" flashes and indicates that temperature in the sensor circuit was exceeded.
- Red LED 2T1/2T2 off

#### Sensor error on 2T1/2T2 (PTC-TRANS Alarm1)

- Relay K2 "Alarm1" drops (21/22 closes) and reports error, LED "Alarm1" flashes rapidly (is not saved)
- Red LED 2T1/2T2 flashes fast

### 9.6 Functions Alarm 2

#### Shut-off value reached on 3T1/3T2 (PTC-TRANS Alarm2)

- Relay K3 "Alarm2" attracts (31/34 closes) and reports error, LED "Alarm2" illuminates
- Red LED 3T1/3T2 illuminated

#### Reclosing value reached on 3T1/3T2 (PTC-TRANS Alarm2)

- Relay "Alarm2" drops (31/34 opens), LED "Alarm2" flashes and indicates that temperature in the sensor circuit was exceeded.
- Red LED 3T1/3T2 off

#### Sensor error on 3T1/3T2 (PTC-TRANS Alarm2)

- Relay "Alarm1" drops (21/22 closes) and reports error, LED "Alarm1" illuminates, LED "Alarm2" flashes rapidly (is not saved)
- Red LED 3T1/3T2 flashes fast

## 9.7 Functions Fan test

Automatic fan test, can be set with the rotary fan test poti

"Manual mode – 1...30 days – off"

- Position 1...30 days:
  - Automatic periodical fan test according to preset time.  
The expired time is saved zero-voltage maintained ( $\pm 1h$ )
  - LED "Fan test" illuminated
  - Fans run pair-by-pair consecutively for 60 s each (1+4, 2+5, 3+6)
  - Non-connected FAN outputs do not switch in
  - Monitoring of fans for under/ and overcurrent
- Off position:
  - Fan test switched off
- Manual mode position:
  - LED "Fan test" flashes
  - Fans power up pair-by-pair with 10 s intervals (1+4, 2+5, 3+6)
  - Non-connected FAN outputs do not switch in
  - Monitoring of fans for under/ and overcurrent

## 9.8 Functions Error Reset/Calibrate button

- Rests "FAN Error" (LED FAN Error on)
- Start calibration (pressed > 5s)

## 9.9 Functions Reset/Test (PTC-TRANS) button

- Stops fan during run-on
- Resets PTC-TRANS FAN
- Resets Alarm1 and Alarm2 display
- Activate test function with Reset/Test button pressed > 2 s
- Aborts the test function when released
  - after 2 sec.: "ON" LED flashes
  - after 5 sec.: "ON" LED flashes, Alarm1 on (K2 off), LED Alarm1 on
  - after 8 sec.: "ON" LED flashes, Alarm2 on (K3 on), LED Alarm2 on
  - after 15 sec.: **Setup mode:**
    - Switched on for 10 min. (abort with reset)
    - "ON" LED flashes quickly
    - Alarm1 off (K2 on), LED Alarm1 off
    - Alarm2 off (K3 off), LED Alarm2 off
    - Sensor error detection switched off
    - No reset after PTC triggering required

## 10 Technical Data

<u>Control voltage Us:</u> Tolerance	AC/DC 24 – 240 V 0/45-120 Hz < 2 W < 4 VA DC 20.4 – 297 V, AC 20 – 264 V
<u>Rated fan current:</u>	0.07 A ... 4.0 A
<u>Relay output ALARM + ERROR:</u> Contact material Switching voltage Switching current Switching capacity  Reduction factor at $\cos \varphi$ 0.7 UL electrical ratings:  Rated operating current Ie: AC15  DC13	per 1 x U AgNi90/10 max. AC 415 V max. 5 A max 1250 VA (ohmic load) max.48 W at DC 24 V 0.5 3A Resistive, 240 VAC D300 1A 240 VAC  Ie = 1 A    Ue = 400 V Ie = 2 A    Ue = 250 V Ie = 2 A    Ue = 24 V Ie = 0.2 A    Ue = 125 V Ie = 0.1 A    Ue = 250 V
Recommended series fuse Mechanical contact service life Electrical contact service life	T 3.15 A (gL) 1 x 10 <sup>7</sup> operating cycles 1 x 10 <sup>5</sup> operating cycles at AC 250 V / 5 A 2 x 10 <sup>5</sup> operating cycles at AC 250 V / 3 A 6 x 10 <sup>5</sup> operating cycles at AC 250 V / 1 A 6 x 1 closer(make contact)
<u>Relay output FAN:</u> Rated operation current Ie (AC 15) Power up current (at 10 % ED) Recommended series fuse Mechanical contact service life Electrical contact service life  ratings:	4 A AC 250 V 30 A max. 4 s / 60 A max. 1 s circuit breaker 13 A characteristic C 30 x 10 <sup>6</sup> operating cycles 1 x 10 <sup>6</sup> operating cycles at AC 400 V / 3 A 2 x 10 <sup>5</sup> operating cycles at AC 400 V / 6 A $\cos \varphi$ 0.5 UL electrical Pilot Duty A 300 1 hp 240 VAC    1/2 hp 120 VAC
<u>Test conditions:</u> Rated impulse withstand voltage Degree of soiling Rated insulation voltage Ui Operating time Perm. ambient temperature  EMC interference immunity EMC interference emissions Vibration resistance	EN 50178 / EN 60947 4000 V 3 250 V 100 % -20 °C ... +55 °C EN 60068-2-2 dry heat EN 61000-6-2 EN 61000-6-3 EN 60068-2-6    2...25 Hz $\pm$ 1.6 mm 25...150 Hz 5 g
<u>Inputs 1T, 2T, 3T, 4T and 5T:</u> Shut-off value Reset value Summing resistance of the sensor circuit Sensor current	PTC thermistor acc DIN 44081 / 44082 3.3 k $\Omega$ ...4.0 k $\Omega$ , typ. 3.65 k $\Omega$ 1.5 k $\Omega$ ...1.65 k $\Omega$ , typ. 1.6 k $\Omega$ $\leq$ 2.5 V at R $\leq$ 250 $\Omega$ , $\leq$ 5 V at R $\geq$ 4000 $\Omega$ Max. 2 mA

**Housing:**

Mounting depth  
Width  
Dimensions (W x H x D)  
Wire connection, single strand  
Finely stranded with wire-end sleeve  
Housing protection class  
Terminals protection class  
Fixation

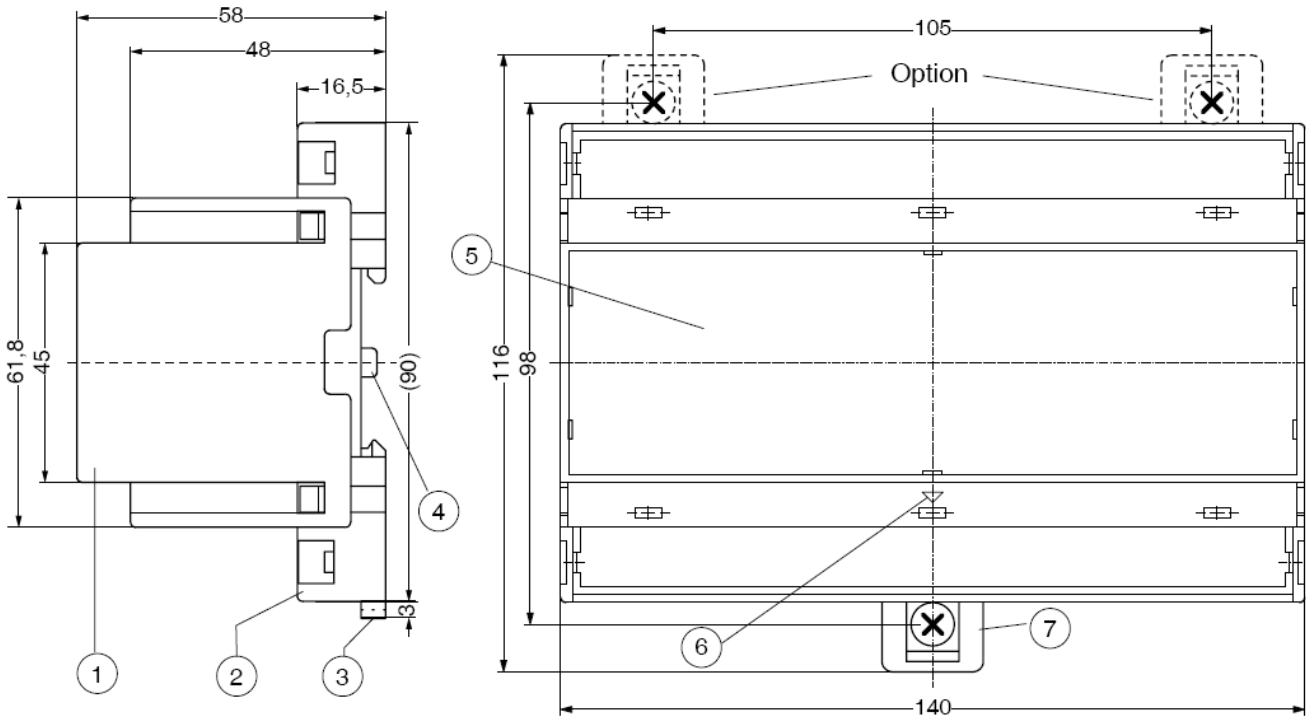
Mounting type V8      Distribution board  
55 mm  
8 TE  
140 x 90 x 58 mm  
1 x 4 mm<sup>2</sup> each  
1 x 2.5 mm<sup>2</sup> each  
IP 30  
IP 20  
Snap-on plug on standard rails  
35 mm acc EN 60715 or  
Screw fastening 3 X M4

Weight      ca. 400 g

**We reserve the right to make technical changes.**

## 11 Mounting type V8

Dimensions in mm



- 1 Cover
- 2 Base
- 3 Bar for snap mounting
- 4 Latch for sealing
- 5 Front panel
- 6 Position downward
- 7 Bar for wall mounting with screws. Bar hole  $\varnothing$  4.2 mm / for fixing to wall with screws,  $\varnothing$  4.2 mm.