

# Phase and temperature control

## → Motor phase and temperature control relay - 35 mm

- Control of 3-phase networks: phase sequence, phase failure
- Multi-voltage
- True RMS measurement
- Motor temperature control via PTC probes
- With line break or probe short-circuit detection
- Version with fault latching function and reset / test
- LED status indication



HWTM



HWTM2

### Part numbers

Type	Functions	Nominal voltage (V)	Phase control voltage range	Code
HWTM	Phase sequence, phase failure, motor temperature via PTC probe, test, memory	24 → 240 V $\sim$	3 x 208 → 3 x 480 V $\sim$	84873027
HWTM2	Phase sequence, phase failure, motor temperature via PTC probe, test, memory	24 → 240 V $\sim$	3 x 208 → 3 x 480 V $\sim$	84873028

### Product adaptations



- Customisable colours and labels

### Accessories

Description	Code
Removable sealable cover for 35 mm casing	84800001

### General characteristics

HWTM / HWTM2

Supply	
Supply voltage Un	24 V → 240 V $\sim$
Voltage supply tolerance	-15% / +10%
Operating range	20.4 V → 264 V $\sim$
Polarity with DC voltage	No
$\sim$ supply voltage frequency	50 / 60 Hz $\pm$ 10%
Galvanic isolation of power supply/measurement	No (current limiting)
Power consumption at Un	4 VA in $\sim$ / 0.5 W in $\text{---}$
Immunity from micro power cuts	20 ms at 20.4 V

## General characteristics

### Inputs and measuring circuit

#### 3-phase control

Measurement ranges	3 x 208 → 3 x 480 V $\sim$ *
Operating range	176 → 528 V $\sim$
Frequency of measured signal	50 / 60 Hz $\pm$ 10%
Input resistance	602 K $\Omega$ / line

#### Temperature control

Maximum voltage of heat detection circuit	3.6 V (T1-T2 open)
Short-circuit current	7 mA (T1, T2 close circuit)
Maximum heat detector resistance at 20°C	1500 $\Omega$
Trip threshold	3100 $\Omega$ $\pm$ 10%
Reset threshold	1650 $\Omega$ $\pm$ 10%
Short-circuit detection range	0 → 15 $\Omega$ $\pm$ 5 $\Omega$
Resistance measurement temperature drift	$\pm$ 0.1% / °C max.
Repetition accuracy with constant parameters	$\pm$ 0.5%

#### Timing

Delay on threshold crossing	300 ms max. (phase) 300 ms typical (temperature)
Response time for input Y1 and PB	50 ms typical
Reset time	10 s max. à 264 V $\sim$
Delay on pick-up	500 ms

#### Output

Type of output	2 NO relays
Type of contacts	No cadmium
Maximum breaking voltage	250 V $\sim$
Max. breaking current	5 A $\sim$
Min. breaking current	10 mA / 5 V $\sim$
Electrical life (number of operations)	1 x 10 <sup>4</sup>
Breaking capacity (resistive)	1250 VA $\sim$
Maximum rate	360 operations/hour at full load
Operating categories acc. to IEC 60947-5-1	AC12, AC13, AC14, AC15, DC12, DC13, DC14
Mechanical life (operations)	30 x 10 <sup>6</sup>

#### Insulation

Nominal insulation voltage IEC 60664-1	400 V
Insulation coordination (IEC 60664-1 / 60255-5)	Overvoltage category III: degree of pollution 3
Rated impulse withstand voltage IEC 60664-1/60255-5	4 kV (1.2 / 50 $\mu$ s)
Dielectric strength IEC 60664-1/60255-5	2 kV AC 50 Hz 1 min.
Insulation resistance IEC 60664-1 / 60255-5	> 500 M $\Omega$ / 500 V $\equiv$

#### General characteristics

"Phase" relay status indication	Yellow LED
"Temperature" relay status indication	Yellow LED
Display power supply	Green LED
Casing	35 mm
Mounting	On 35 mm symmetrical DIN rail, IEC/EN 60715
Mounting position	All positions
Material: enclosure plastic type VO to UL94 standard	Incandescent wire test according to IEC 60695-2-11 & NF EN 60695-2-11
Protection (IEC 60529)	Terminal block: IP20 Casing: IP30
Weight	107.1 g
Connecting capacity IEC 60947-1	Rigid: 1 x 4 <sup>2</sup> - 2 x 2.5 <sup>2</sup> mm <sup>2</sup> 1 x 11 AWG - 2 x 14 AWG Flexible with ferrules: 1 x 2.5 <sup>2</sup> - 2 x 1.5 <sup>2</sup> mm <sup>2</sup> 1 x 14 AWG - 2 x 16 AWG
Max. tightening torques IEC 60947-1	0.6 → 1 Nm / 5.3 → 8.8 Lbf.In
Operating temperature IEC 60068-2	-20 → +50°C
Storage temperature IEC 60068-2	-40 → +70°C
Humidity IEC 60068-2-30	2 x 24 hr cycle 95% RH max. without condensation 55°C
Vibrations according to IEC/EN60068-2-6	10 → 150 Hz, A = 0.035 mm
Shocks IEC 60068-2-6	5 g

#### Standards

Marking	CE (LVD) 73/23/EEC - EMC 89/336/EEC
Product standard	NF EN 60255-6 / IEC 60255-6 / CEI 60034-11-2 / UL 508 / CSA C22.2 N°14
Electromagnetic compatibility	Immunity EN 61000-6-2/IEC 61000-6-2 Emission EN 61000-6-4/EN 61000-6-3 IEC 61000-6-4/IEC 61000-6-3 Emission EN 55022 class B
Certifications	UL, CSA, GL pending
Conformity with environmental directives	RoHS, WEEE

#### Comments

\* 3-phase mains with earth

# Phase and temperature control

## Principles

### Overview

Relays HWTM and HWTM2 check the availability of the 3-phase network and the temperature of the motors using integrated PTC probes.

The "phase" and "temperature" control functions are independent of one another.

The 3-phase (208 to 480 V) network control verifies the sequence of phases L1, L2, L3 and their presence:

- the complete failure of a phase is detected, also in the event of regeneration (U measured < 0.7 x Un).

The result of the check is indicated by the status of the "phase" output relay. NO contact 21-24 will be open in case of fault.

The temperature control accepts up to 6 PTC probes (positive temperature coefficient resistor) wired in series between terminals T1 and T2.

A fault is reported if the resistance of the thermal detector circuit exceeds 3100 Ω.

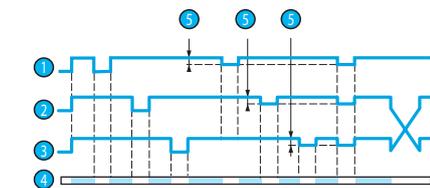
Return to normal is verified when the resistance falls below 1650 Ω.

The result of the check is indicated by the status of the "temperature" output relay. NO contact 11-14 will be open in case of fault.

Opening of the thermal detector circuit has the same effect as high temperature (resistance exceeding 3100 Ω) and is therefore interpreted as a fault.

Total short-circuit of the thermal probe (s), detected when resistance is less than 15 Ω ± 5 Ω is treated as a fault.

### HWTM - Phase failure and phase sequence

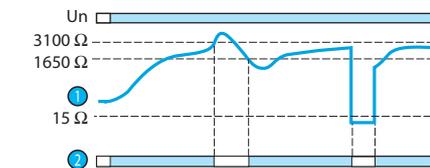


- ① Phase L1
- ② Phase L2
- ③ Phase L3
- ④ Relay R2
- ⑤ 30% of Un

### Control of 3-phase network

As soon as the phase sequence (L1 L2 L3) and phase amplitude symmetry ( $D < 30\%$ ) are considered correct, the contact of the output relay closes and, subject to the result of the temperature check, LED "R2" lights up.

In case of total failure or a drop in the amplitude of a phase (absence of phase with regeneration) or inversion of the phase sequence, the contact of the output relay opens and LED "R2" is extinguished.



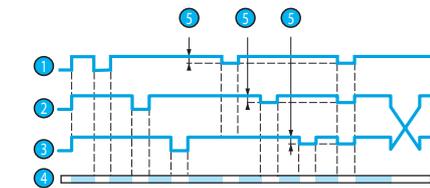
- ① Resistance between terminals T1 and T2
- ② Relay R1

### Temperature control without latching

As soon as it is verified that the resistance of the thermal detector is between 15 and 3.100Ω, the contact of the output relay closes and, subject to the result of the phase control check, LED "R1" lights up.

If the resistance of the thermal detector circuit exceeds 3.100 Ω, the output relay opens and LED "R1" is extinguished. After an overheating fault, the resistance must fall below 1.650 Ω for the output relay contact to reclose and, subject to the result of the phase check, LED "R1" to light up. If the resistance falls below 15 Ω (short-circuit), the output relay opens and LED "R1" is extinguished. As soon as it returns to between 15 and 3.100Ω, the contact of the output relay closes again and, subject to the result of the phase control check, LED "R1" lights up.

### HWTM2 - Phase failure and phase sequence



- ① Phase L1
- ② Phase L2
- ③ Phase L3
- ④ Relay R2
- ⑤ 30% of Un

The configuration is taken into account on energisation of the relay HWTM2.

Selecting the operating mode:

Using the selector switch, select one of two modes:

- Thermal control without latching,
- Thermal control with latching.

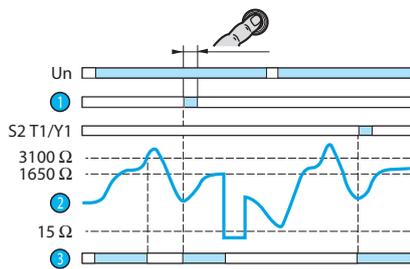
**NB:** On energisation, the switch placed in one of the five intermediate positions keeps the relays in the open contact state and the error is signalled by the LEDs flashing simultaneously.

The mode selector switch position is taken into account on energisation.

Changes made during operation have no effect: the active configuration may therefore be different from that indicated by the switch; relay HWTM2 operates normally but the change in configuration is signalled by both LEDs flashing simultaneously.

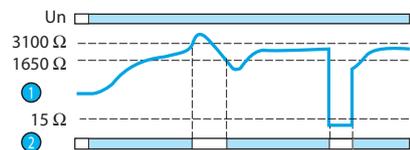
## Principles

### HWTM2 with latching



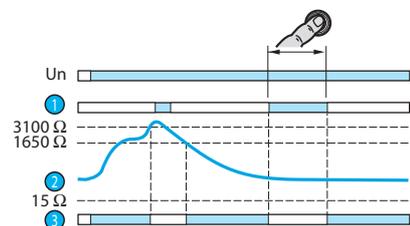
- ① Test / Reset
- ② Resistance between terminals T1 and T2
- ③ Relay R1

### HWTM2 without latching



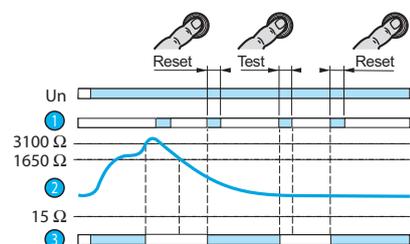
- ① Resistance between terminals T1 and T2
- ② Relay R1

### HWTM2 Test/Reset without latching



- ① Test / Reset
- ② Resistance between terminals T1 and T2
- ③ Relay R1

### HWTM2 Test/Reset with latching



- ① Test / Reset
- ② Resistance between terminals T1 and T2
- ③ Relay R1

### Latching (HWTM2)

The HWTM2 version has a rotary switch which can be used to configure the temperature control operating mode with or without latching.

In "memory" mode, when a fault has been recorded, the "temperature" relay latches in the open position.

Once the temperature has returned to a correct value, the relay can be unlatched (reset), either by pressing the "Test/Reset" pushbutton (50 ms minimum), or by closing (50 ms minimum) a volt-free contact between terminals Y1 and T1 (without parallel load).

The HWTM2 can also be reset, more abruptly, by switching it off and on again several times in succession (see reset time).

HWTM2 version has a "test/reset" button for checking the operating state of the temperature control: When the temperature is normal, pressing the "test/reset" button simulates overheating, the yellow LED is extinguished and the contact of the "temperature" output relay opens; if "memory" mode is active, the fault indication is latched (the button must be released for at least 50 ms, then pressed again to reset the function).

### Using the "test/reset" button

HWTM2 version has a "test/reset" button for checking the operating state of the temperature control and resetting it after latching in "memory" mode.

For both functions, the button must be pressed and released for 50 ms.

When the temperature is normal, pressing the "test/reset" button simulates overheating, the contact of the "temperature" output relay opens and the "no fault" LED is extinguished.

If "memory" mode is inactive, the "fault" indication is maintained as long as the button is pressed.

If "memory" mode is active, the "fault" indication is latched. The button must be released, then pressed again to reset the function.

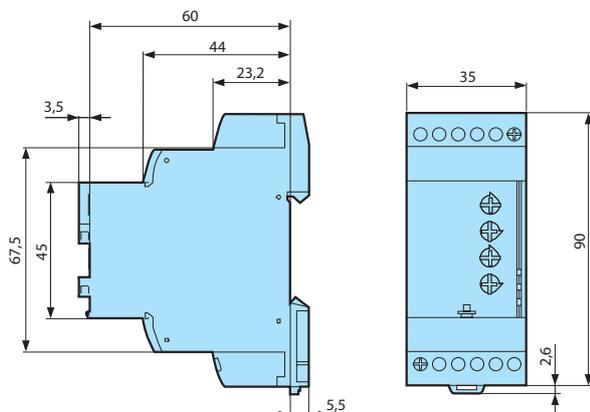
In "memory" mode, if a fault has been detected and the temperature is now correct again, the "temperature" relay can be unlatched (reset) with the "test/reset" button.

As long as the temperature is abnormal, i.e. as long as the resistance of the thermal detector circuit is greater than 3.100 Ω or, having exceeded 3.100 Ω it has not fallen back to below 1.650 Ω, pressing the "test/reset" button has no effect.

# Phase and temperature control

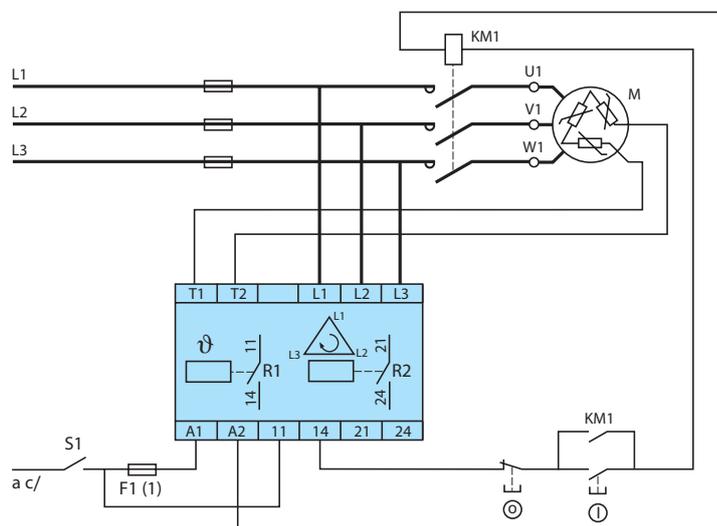
## Dimensions (mm)

HWTM



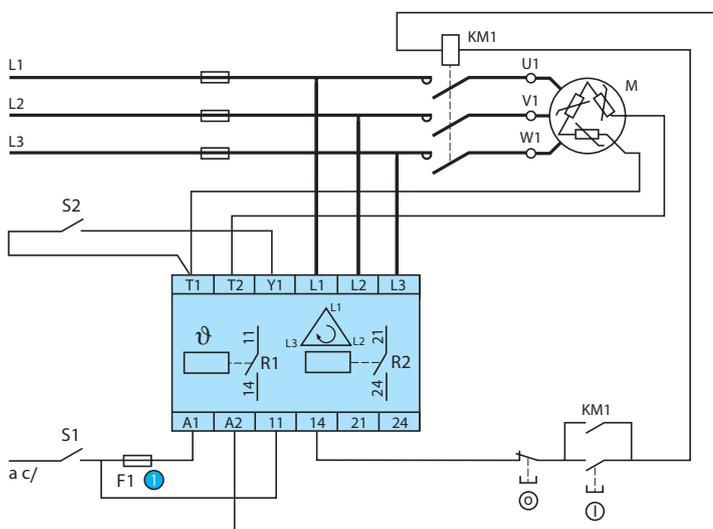
## Connections

HWTM



① 1 A fast-blow fuse or cut-out

HWTM2



① 1 A fast-blow fuse or cut-out