

# Protection components

Zelio Control measurement and control relays  
3-phase supply control relays RM4-T



RM4-T

## Functions

These devices are designed to monitor 3-phase supplies and to protect motors and other loads against the faults listed in the table below.

They have a transparent, hinged flap on their front face to prevent any accidental alteration of the settings. This flap can be directly sealed.

	RM4-TG	RM4-TU	RM4-TR	RM4-TA
Monitoring of rotational direction of phases				
Detection of complete failure of one or more of the phases				
Undervoltage detection				
Overtoltage and undervoltage detection (2 thresholds)				
Detection of phase asymmetry (imbalance)				

■ Function performed  
■ Function not performed

## Applications

- Control for connection of moving equipment (site equipment, agricultural equipment, refrigerated trucks).
- Control for protection of persons and equipment against the consequences of reverse running (lifting, handling, elevators, escalators, etc.).
- Control of sensitive 3-phase supplies.
- Protection against the risk of a driving load (phase failure).
- Normal/emergency power supply switching.

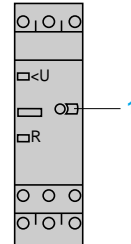
## Presentation

### RM4-TG



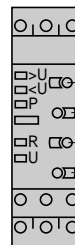
R Yellow LED: indicates relay output state.

### RM4-TU

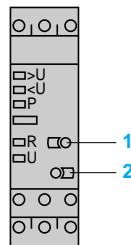


R Yellow LED: indicates relay output state.  
< U Red LED: undervoltage fault.  
1 Undervoltage setting potentiometer.

### RM4-TR31. RM4-TR32

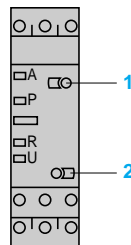


### RM4-TR33. RM4-TR34

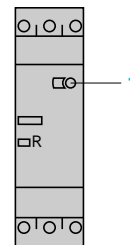


- 1 Time delay function selector:  
 Fault detection delayed.  
 Fault detection extended.
- 2 Potentiometer for setting time delay in seconds.  
 3 Potentiometer for setting overvoltage as a direct value.  
 4 Potentiometer for setting undervoltage as a direct value.
- R Yellow LED: indicates relay state.  
 U Green LED: indicates that supply to the RM4 is on.  
 > U Red LED: overvoltage fault  
 < U Red LED: undervoltage fault  
 P Red LED: phase failure or incorrect rotational direction of phases.

### RM4-TA3



### RM4-TA0





- 1 Asymmetry threshold setting potentiometer, from 5 to 15 %  
 2 Potentiometer for setting time delay, 0.1 to 10 s.  
 R Yellow LED: indicates relay state.  
 U Green LED: indicates that supply to the RM4 is on.  
 A Red LED: phase asymmetry.  
 P Red LED: phase failure or incorrect rotational direction of phases.

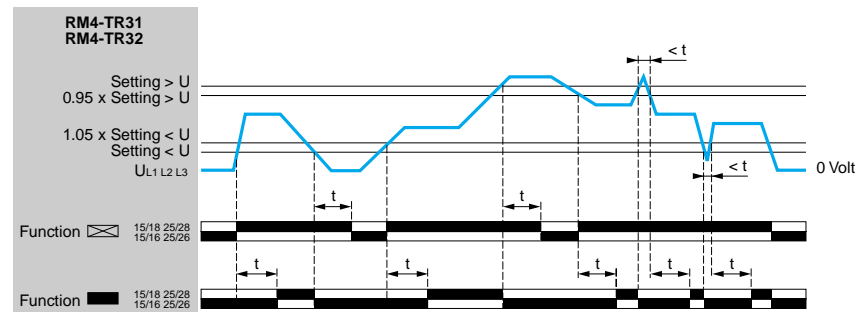
## Operating principle

The supply voltage to be monitored is connected to terminals L1, L2, L3 of the product.

There is no need to provide a separate power supply for RM4-T relays; they are self-powered by terminals L1, L2, L3.

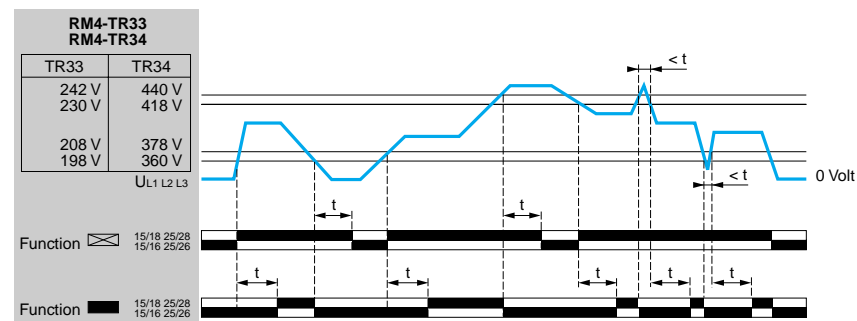
- Monitoring rotational direction of phases and detection of complete failure of one of more of the phases**  
 (RM4-T all models)  
 When terminals L1, L2, L3 are energised, the relay is energised and the yellow LED comes on if the rotational direction of phases is correct and if all 3 phases are present.  
 If one or more of the phases have failed or if the rotational direction is incorrect, the relay is not energised at switch-on. In normal operation (no fault) the relay is energised; it de-energises instantaneously in the event of failure of one or more of the phases (any time delay set is not active on these faults).  
 In the event of failure or absence of a single phase, a voltage greater than the detection threshold (<130 V on RM4-TG, undervoltage threshold setting on RM4-TU and RM4-TR) can be generated back through the control circuit, thus preventing detection of the phase failure. In this case, we recommend the use of RM4-TA relays.  
 The absence of a phase is signalled, on RM4-TR and RM4-TA, by illumination of led "P".
- Overvoltage and undervoltage detection (RM4-TR):**  
 In normal operation, the relay is energised and LEDs "U" and "R" are illuminated.  
 If the average of the 3 voltages between phases goes outside the range to be monitored, the output relay is de-energised:  
 - **overvoltage:** the Red LED "> U" illuminates.  
 - **undervoltage:** the Red LED "< U" illuminates.  
 When the supply returns towards its rated value, the relay is re-energised according to the hysteresis value (5%) and the corresponding red LED goes out.  
 A selector switch allows selection of an adjustable time delay from 0.1 s to 10 s. With function  transient "over" or "under" voltages are not taken into account. With function  all variations above or below are taken into account and re-energisation of the relay is delayed.  
 In all cases, in order to be detected, the duration of the overvoltage or undervoltage must be greater than the measuring cycle time (80 ms).

Function diagram (RM4-TR31, RM4-TR32)



t: time delay

Function diagram (RM4-TR33, RM4-TR34)



t: time delay

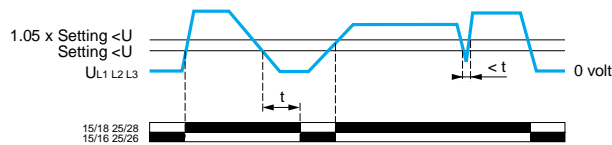
## Operating principle (continued)

### ● Undervoltage detection only (RM4-TU)

In normal operation, the output relay is energised and the yellow LED is illuminated.

If the average of the 3 voltages between phases is less than the undervoltage threshold setting, the relay is de-energised after 550 ms and the red LED "< U" illuminates.

#### Function diagram



t: fixed time delay = 550 ms

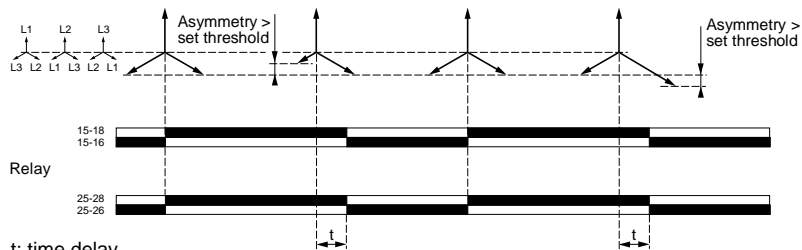
### ● Detection of phase asymmetry (RM4-TA)

In normal operation, the output relay is energised and the yellow and green LEDs are illuminated.

In the event of an asymmetry fault, after a time delay set between 0.1 s and 10 s (on RM4-TA3 only), the output relay is de-energised, the yellow LED goes out and red LED "A" illuminates (RM4-TA3 only).

The relay re-energises when the asymmetry value measured is less than half of the asymmetry value setting (hysteresis).

#### Function diagram



t: time delay

**Example:** asymmetry set at 10 %, mains supply voltage 400 V

- relay de-energisation threshold:  $400 - 10 \% = 360 \text{ V}$ .

- relay re-energisation threshold:  $400 \text{ V} - \frac{10 \%}{2} = 380 \text{ V}$ .

Type of relay			RM4-TG	RM4-TU	RM4-TR	RM4-TA
<b>Output relay and operating characteristics</b>						
Number of C/O contacts			2	2	2	RM4-TA3i: 2 RM4-TA0e: 1
Output relay state			Energised during fault free operation. De-energised or unable to energise on detection of rotational direction fault or failure of one or more phases	Energised during fault free operation. De-energised on detection of undervoltage or rotational direction fault or failure of one or more phases	Energised during fault free operation. De-energised on detection of overvoltage, undervoltage or rotational direction fault or phase failure	Energised during fault free operation. De-energised on detection of asymmetry fault, phase failure or rotational direction fault
Accuracy of switching threshold setting	As % of the set value		–	± 3 %	± 3 %	± 3 %
Switching threshold drift	Depending on the permissible ambient temperature		–	≤ 0.06 % per degree centigrade	≤ 0.06 % per degree centigrade	≤ 0.06 % per degree centigrade
	Within the measuring range		–	≤ 0.5 %	≤ 0.5 %	≤ 0.5 %
Accuracy of time delay setting	As % of the full scale value		–	± 10 %	± 10 %	± 10 %
Time delay drift	Within the measuring range		–	≤ 0.5 %	≤ 0.5 %	≤ 0.5 %
	Depending on the rated operational temperature		–	≤ 0.07 % per degree centigrade	≤ 0.07 % per degree centigrade	≤ 0.07 % per degree centigrade
Hysteresis	Fixed		–	About 5 % of the de-energisation threshold	About 5 % of the de-energisation threshold	About 50 % of the asymmetry percentage
Measuring cycle		ms	≤ 80	≤ 80	≤ 80	≤ 80
<b>Measuring input characteristics</b>						
Minimum operational voltage (1)	L1 L2 or L2 L3 or L1 L3	V	140	RM4-TU01: 160 RM4-TU02: 290	RM4-TR31, RM4-TR33: 160 RM4-TR32, RM4-TR34: 290	RM4-TA01, RM4-TA31: 160 RM4-TA02, RM4-TA32: 290
	L1 L2 L3	V	580	RM4-TU01: 300 RM4-TU02: 580	RM4-TR31, RM4-TR33: 300 RM4-TR32, RM4-TR34: 580	RM4-TA01, RM4-TA31: 300 RM4-TA02, RM4-TA32: 580

(1) Minimum voltage required for operation of indicators and of the time delay.

# Protection components

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RM4-TG20

### Control relays: rotational direction and presence of phases

Time delay	Rated mains supply voltage (1)	Width	Output relay	Reference	Weight
s	V	mm			kg
None	200...500 50/60 Hz	22.5	2 C/O	<b>RM4-TG20</b>	0.110

### Control relays: rotational direction and presence of phases + undervoltage

Time delay	Rated mains supply voltage (1)	Control threshold	Width	Output relay	Reference	Weight
s	V	V	mm			kg
None	200...240 50/60 Hz	Undervoltage 160...220	22.5	2 C/O	<b>RM4-TU01</b>	0.110
		Undervoltage 300...430			<b>RM4-TU02</b>	

### Control relays: rotational direction and presence of phases + overvoltage and undervoltage

#### Relays with fixed voltage thresholds

Adjustable time delay	Rated mains supply voltage (1)	Control threshold	Width	Output relay	Reference	Weight
s	V	V	mm			kg
0.1...10	220 50/60 Hz	Undervoltage 198 Overvoltage 242	22.5	2 C/O	<b>RM4-TR33</b>	0.110
		Undervoltage 360 Overvoltage 440			<b>RM4-TR34</b>	



RM4-TR33

#### Relays with adjustable voltage thresholds

Adjustable time delay	Rated mains supply voltage (1)	Control threshold	Width	Output relay	Reference	Weight
s	V	V	mm			kg
0.1...10	200...240 50/60 Hz	Undervoltage 160...220 Overvoltage 220...300	22.5	2 C/O	<b>RM4-TR31</b>	0.110
		Undervoltage 300...430 Overvoltage 420...580			<b>RM4-TR32</b>	

### Control relays: rotational direction and presence of phases + asymmetry

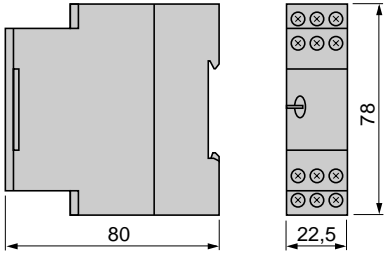
Time delay on de-energisation	Rated mains supply voltage (1)	Control threshold	Width	Output relay	Reference	Weight
s	V	%	mm			kg
<b>Fixed</b> 0.5	200...240 50/60 Hz	Asymmetry 5...15	22.5	1 C/O	<b>RM4-TA01</b>	0.110
		Asymmetry 5...15			<b>RM4-TA02</b>	
<b>Adjustable</b> 0.1...10	200...240 50/60 Hz	Asymmetry 5...15	22.5	2 C/O	<b>RM4-TA31</b>	0.110
		Asymmetry 5...15			<b>RM4-TA32</b>	



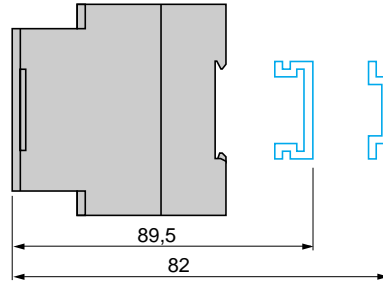
RM4-TA01

(1) Can be used on other supply voltages provided that the minimum operational voltages, maximum voltage between phases and compatibility with the control threshold ranges are complied with, see page 28473/5.

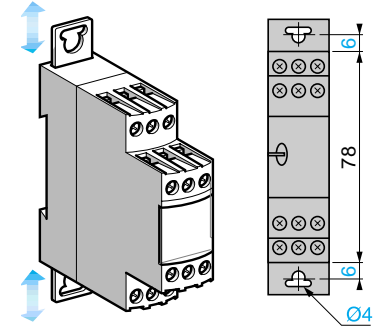
**Dimensions**  
RM4-T



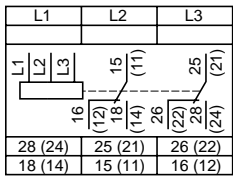
**Rail mounting**



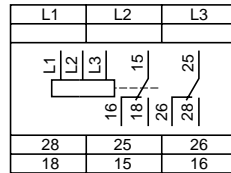
**Screw fixing**



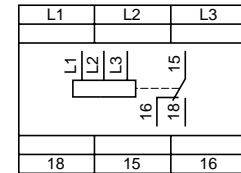
**Schemes, connection**  
Terminal blocks  
RM4-TG20, TU0i



**RM4-TR3●, TA3●**



**RM4-TA0●**



**L1, L2, L3** Supply to be monitored

**15(11)-18(14)** 1<sup>st</sup> C/O contact of the output relay

**25(21)-28(24)** 2<sup>nd</sup> C/O contact of the output relay

**L1, L2, L3** Supply to be monitored

**15-18** 1<sup>st</sup> C/O contact of the output relay

**25-28** 2<sup>nd</sup> C/O contact of the output relay

**L1, L2, L3** Supply to be monitored

**15-18** 1<sup>st</sup> C/O contact of the output relay

**Application scheme**  
Example

