

# Zelio Control measurement and control relays

3-phase supply control relays model 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				
Oversvoltage 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.

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## 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:

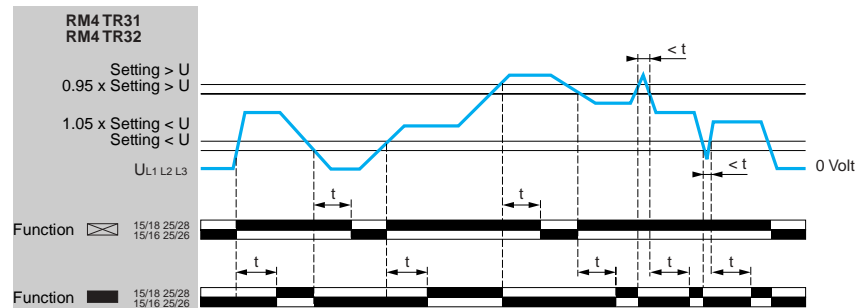
- **overvoltage:** the Red LED "> U" illuminates,
- **undervoltage:** the Red LED "< U" illuminates.

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.

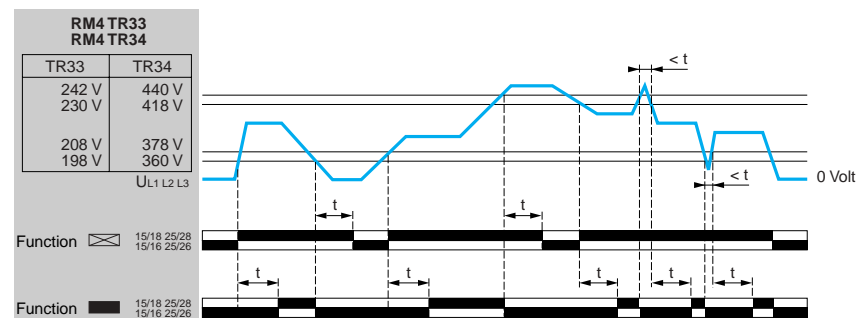
In all cases, in order to be detected, the duration of the overvoltage or undervoltage must be greater than the measuring cycle time (80 ms).

**Function diagram (RM4 TR31, RM4 TR32)**



t: time delay

**Function diagram (RM4 TR33, RM4 TR34)**



t: time delay

# Zelio Control measurement and control relays

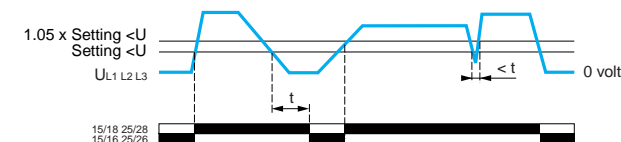
3-phase supply control relays model RM4 T

## 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

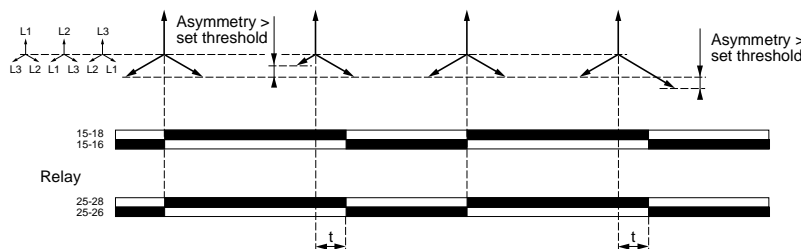


t: fixed time delay = 550 ms

### ● 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:  $400 - 10\% = 360$  V,
- relay re-energisation threshold:  $400 - \frac{10\%}{2} = 380$  V.

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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>	

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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>	

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RM4 TA01

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.

# Zelio Control measurement and control relays

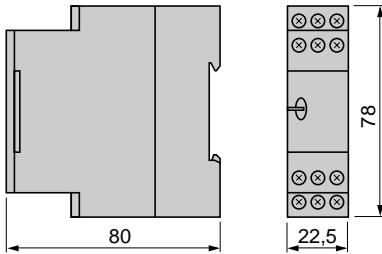
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Type of relay			RM4 TG	RM4 TU	RM4 TR	RM4 TA
<b>Output relay and operating characteristics</b>						
Number of C/O contacts			2	2	2	RM4 TA3i: 2 RM4 TA0e: 1
Output relay state			Energised during fault free operation. De-energised or unable to energise 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

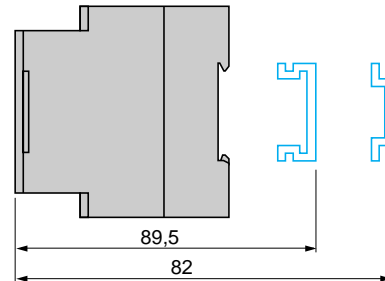
<b>Measuring input characteristics</b>						
Minimum operational voltage (1)	L1 L2 or L2 L3 or L1 L3	V	140	RM4 TU01: 160 RM4 TU02: 290	RM4 TR31, RM4 TR33: 160 RM4 TR32, RM4 TR34: 290	RM4 TA01, RM4 TA31: 160 RM4 TA02, RM4 TA32: 290
Maximum permissible voltage between phases	L1 L2 L3	V	580	RM4 TU01: 300 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.

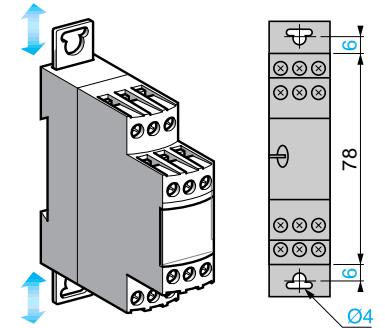
### Dimensions RM4 T



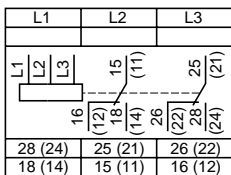
### Rail mounting



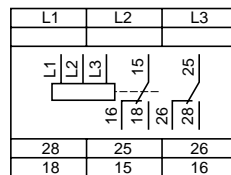
### Screw fixing



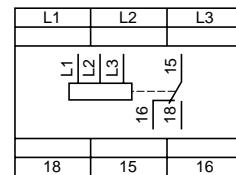
### Schemes, connection Terminal blocks RM4 TG20, TU0i



### 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

**15(11)-16(12)** of the output relay

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

**25(21)-26(22)** of the output relay

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

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

**15-16** of the output relay

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

**25-26** of the output relay

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

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

**15-16** of the output relay

### Application scheme

Example

