

# Measurement and control relays - Zelio Control

## Industrial 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 avoid 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                                     |        |        |        |        |
| Overvoltage 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



##### RM4 TU

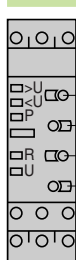


**R** Yellow LED: indicates relay output state.

**<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 output state.

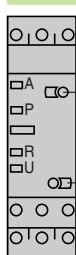
**U** Green LED: indicates that supply to the RM4 is on.

**>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 output 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.

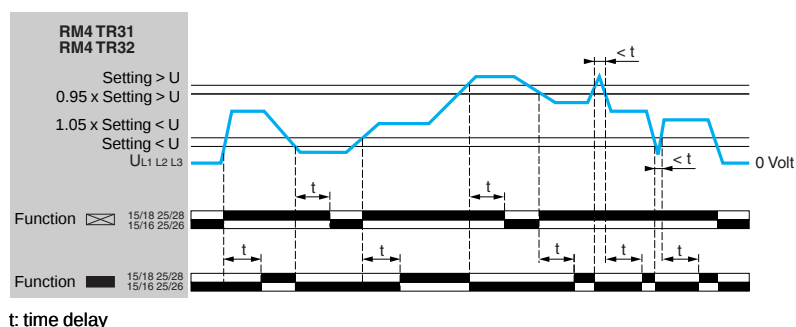
#### ■ Monitoring rotational direction of phases and detection of complete failure of one or more phases (RM4 T all models):

- 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 ( $\approx 130$  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".

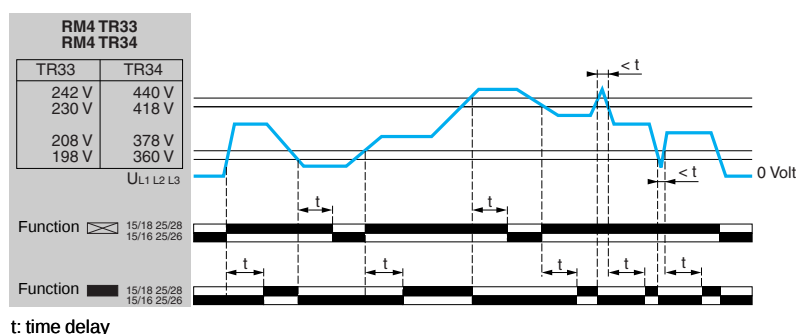
#### ■ Overvoltage and undervoltage detection (RM4 TR):

- 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)



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



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## Industrial relays

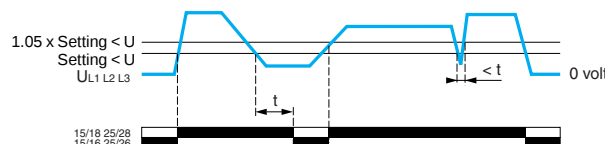
### 3-phase supply control relays RM4 T

#### 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

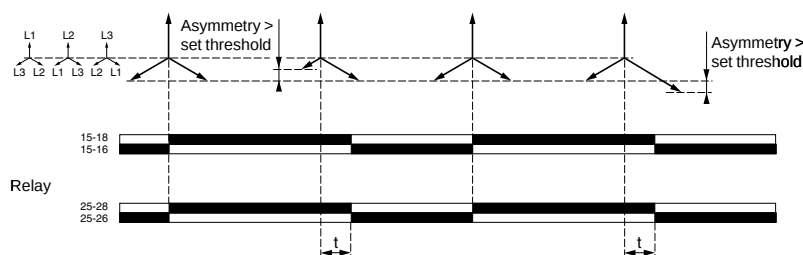


t : fixed time delay = 550 ms

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

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**Note :** If there is distortion of the 3-phase supply sine wave, malfunctioning of the RM4 T 3-phase supply control relay is possible.

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### 3-phase supply control relays RM4 T



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     |
| Without                                                     | 220...440<br>50/60 Hz          | 22.5  | 2 C/O        | RM4 TG20  | 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     |
| Without                                                                    | 220...240<br>50/60 Hz          | Undervoltage<br>160...220 | 22.5  | 2 C/O        | RM4 TU01  | 0.110  |
|                                                                            | 380...440<br>50/60 Hz          | Undervoltage<br>300...430 | 22.5  | 2 C/O        | RM4 TU02  | 0.110  |

| Control relays: rotational direction and presence of phases + overvoltage & 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<br>50/60 Hz                | Undervoltage<br>198<br>Overvoltage<br>242 | 22.5  | 2 C/O        | RM4 TR33  | 0.110  |
|                                                                                          | 400<br>50/60 Hz                | Undervoltage<br>360<br>Overvoltage<br>440 | 22.5  | 2 C/O        | RM4 TR34  | 0.110  |

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                                  | 220...240<br>50/60 Hz          | Undervoltage<br>160...220<br>Overvoltage<br>220...300 | 22.5  | 2 C/O        | RM4 TR31  | 0.110  |
|                                           | 380...440<br>50/60 Hz          | Undervoltage<br>300...430<br>Overvoltage<br>420...480 | 22.5  | 2 C/O        | RM4 TR32  | 0.110  |



RM4 TA01

| 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     |
| Fixed<br>0.5                                                            | 220...240<br>50/60 Hz          | Asymmetry<br>5...15 | 22.5  | 1 C/O        | RM4 TA01  | 0.110  |
|                                                                         | 380...440<br>50/60 Hz          | Asymmetry<br>5...15 | 22.5  | 1 C/O        | RM4 TA02  | 0.110  |
| Adjustable<br>0.1...10                                                  | 220...240<br>50/60 Hz          | Asymmetry<br>5...15 | 22.5  | 2 C/O        | RM4 TA31  | 0.110  |
|                                                                         | 380...440<br>50/60 Hz          | Asymmetry<br>5...15 | 22.5  | 2 C/O        | RM4 TA32  | 0.110  |

(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.