Zelio® Control Measurement Relays
RM4T Three-Phase Monitoring Relays

RM4T

FUNCTIONS

These devices monitor three-phase supplies, and protect motors and other loads against the faults listed in the table below. They have a transparent, hinged cover on their front face to prevent accidental alteration of the settings. This cover can be sealed.

Fault	RM4TG	RM4TU	RM4TR	RM4TA
Phase Reversal	Yes	Yes	Yes	Yes
Phase Loss	Yes	Yes	Yes	Yes
Undervoltage	No	Yes	No	No
Overvoltage and Undervoltage (2 thresholds)	No	No	Yes	No
Phase Imbalance	No	No	No	Yes

Applications

- Control for connection of moving equipment (site equipment, agricultural equipment, refrigerated trucks)
- Control for protection of personnel and equipment against the consequences of reverse running (lifting, handling, elevators, escalators, etc.)
- Control of sensitive three-phase supplies
- Phase loss protection
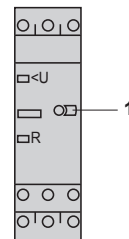- Normal/emergency power supply switching

Features

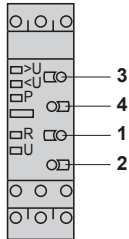**RM4TG**
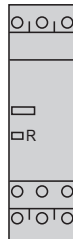
R Yellow LED: Indicates relay output state.

RM4TU

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

RM4TR31
RM4TR32

RM4TR33
RM4TR34

1   Time delay function selector:
✉   Fault detection delayed (off delay).
▬   Fault detection extended (on delay).
2   Potentiometer for setting time delay in s.
3   Potentiometer for setting overvoltage.
4   Potentiometer for setting undervoltage.
R   Yellow LED: Indicates the relay state.
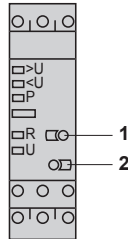U   Green LED: Indicates that the relay power supply is on.
> U Red LED: Overvoltage fault.
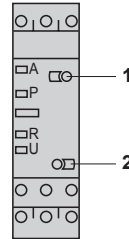< U Red LED: Undervoltage fault.
P   Red LED: Phase failure or phase reversal.

RM4TA3

RM4TA0

1   Phase imbalance setting potentiometer, from 5–15%
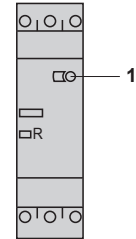2   Potentiometer for setting time delay, 0.1 to 10 s.
R Yellow LED: Indicates the relay state.
U Green LED: Indicates that the relay power supply is on.
A Red LED: Phase imbalance.
P Red LED: Phase failure or phase reversal.

OPERATING PRINCIPLE

The supply voltage to be monitored is connected to product terminals L1, L2, and L3.
RM4T relays are self-powered by terminals L1, L2, and L3; they require no separate power supply.

- Monitoring rotation direction of phases and detection of complete loss of one or more phases
  (**RM4T** all models)

  When terminals L1, L2, and L3 are energized, the relay is energized and the yellow LED comes on
  only if *(a)* the rotation direction of phases is correct, and *(b)* all three phases are present. If one or
  more phases have failed, or if the rotation direction is incorrect, the relay is not energized at
  switch-on. In normal operation (no fault), the relay is energized; it de-energizes instantaneously (or
  after the time delay) if one or more phases fails. To prevent detection of the absence or failure of a
  single phase, a voltage exceeding the detection threshold ($\approx$130 V on RM4TG, undervoltage
  threshold setting on RM4TU and RM4TR) can be generated back through the control circuit. For
  this purpose, we recommend using RM4TA relays. The illumination of LED **P** signals the absence
  of a phase on RM4TR and RM4TA.

- Overvoltage and undervoltage detection (**RM4TR**):

  In normal operation, the relay is energized and LEDs **U** and **R** are lit.
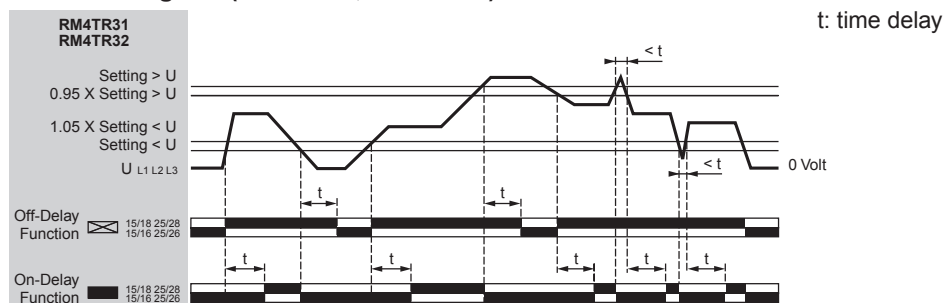 If the average of the three voltages between phases fluctuates outside the range to be monitored,
  the output relay is de-energized.

 — Overvoltage: the Red LED "> U" illuminates.
  — Undervoltage: the Red LED "< U" illuminates.

  When the supply returns toward its rated value, the relay is re-energized according to the
  hysteresis value (5%), and the corresponding red LED goes out. A switch allows selection of a time
  delay, adjustable from 0.1 s to 10 s. With the off-delay function ⊠, over- or undervoltages have no
  effect. With the on-delay function ▪, over- or undervoltages delay the re-energization of the relay.
  Regardless of the switch setting, an over- or undervoltage is detected only if its duration exceeds
  the measuring cycle time (80 ms).

Function Diagram (RM4TR31, RM4TR32)

### Function Diagram (RM4TR33, RM4TR34)
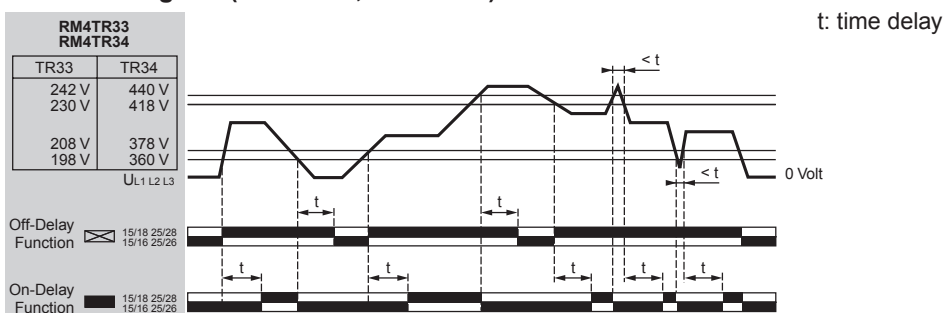
OPERATING PRINCIPLE

- Undervoltage detection only (**RM4TU**)

  In normal operation, the output relay is energized and the yellow LED is lit.

  When the average of the three voltages between phases falls below the undervoltage threshold setting, the relay is de-energized after 550 ms and the red LED "< U" illuminates.

Function Diagram

t: fixed time delay = 550 ms
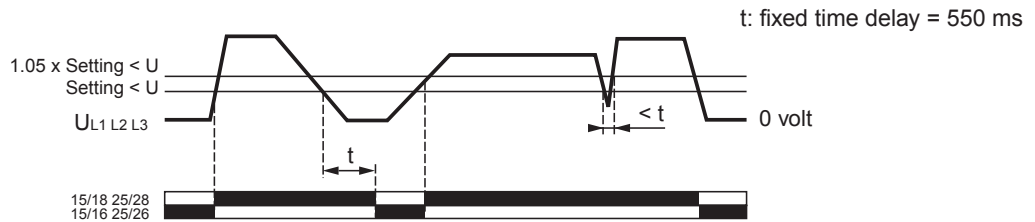
- Detection of phase imbalance (**RM4TA**)

  In normal operation, the output relay is energized and the yellow and green LEDs are lit.

  In the event of an imbalance fault, after a time delay set between 0.1 s and 10 s (on RM4TA3 only), the output relay is de-energized, the yellow LED goes out, and red LED **A** illuminates (RM4TA3• only).

  The relay re-energizes when the measured imbalance value drops below 50% of the imbalance setting (hysteresis).

Function Diagram

t: time delay
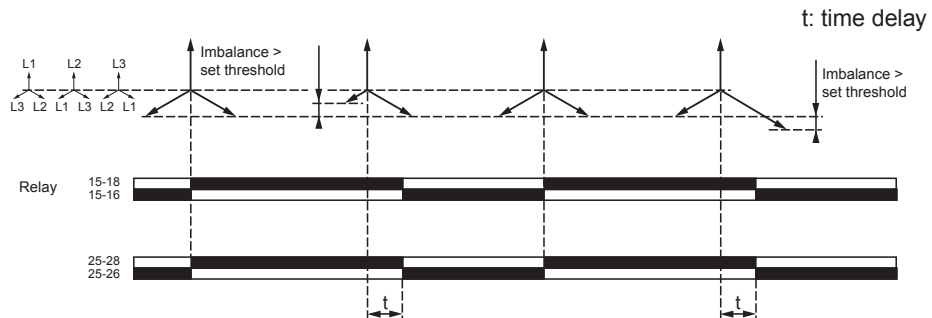
Example: Imbalance set at 10%, mains supply voltage 400 V

— Relay de-energization threshold: $400\ V - 10\% = 360\ V$

— Relay re-energization threshold: $400\ V - \dfrac{10\%}{2} = 380\ V$

NOTE: Distortion in the sine wave of the three-phase supply can cause the RM4T phase supply control relay to malfunction.

Telemecanique

Output relay and operating characteristics

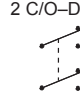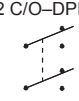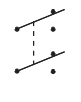| Relay type			RM4 TG	RM4 TU	RM4 TR	RM4 TA
Number of C/O contacts			2 C/O–DPDT	2 C/O–DPDT	2 C/O–DPDT	**RM4 TA3•** 2 C/O–DPDT ⟍ **RM4 TA0•** 1 C/O–SPDT ⟍
Output relay state				Energized during fault-free operation. De-energized or unable to energize on detection of rotation direction fault or failure of one or more phases.	Energized during fault-free operation. De-energized on detection of undervoltage or rotation direction fault or failure of one or more phases.	Energized during fault-free operation. De-energized on detection of overvoltage, undervoltage or rotation direction fault or phase failure.	Energized during fault-free operation. De-energized on detection of asymmetry fault, phase failure or rotation direction fault.
Switching threshold setting accuracy	As a percentage of the set value		–	±3%	±3%	±3%
Switching threshold drift	Depending on the permissible ambient temperature		–	≤ 0.06% per °C	≤ 0.06% per °C	≤ 0.06% per °C
	Within the measuring range		–	≤ 0.5%	≤ 0.5%	≤ 0.5%
Time delay setting accuracy	As a percentage 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 °C	≤ 0.07% per °C	≤ 0.07% per °C
Hysteresis	Fixed		–	About 5% of the de-energization threshold	About 5% of the de-energization threshold	About 50% of the asymmetry percentage
Delay on pick-up		ms	< 650	< 650	< 650	< 650
Measuring cycle		ms	≤ 80	≤ 80	≤ 80	≤ 80

Measuring input characteristics

Relay type			RM4 TG	RM4 T••1 RM4 TR33	RM4 T••2 RM4 TR34
Nominal voltage		V	220–440	**RM4 T••1:** 220–240 **RM4 TR33:** 220	**RM4 T••2:** 380–440 **RM4 TR34:** 400
Maximum operating range		V	198–484	160–300	290–484

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

Zelio® Control Measurement Relays
RM4T Three-Phase Monitoring Relays

SELECTION

RM4TG20

RM4TR33

RM4TA01

Control Relays: Phase Reversal and Presence of Phases

Time Delay	Rated Mains Supply Voltage ■		Width in (mm)	Output Relay	Catalog Number	Weight lb (kg)
None	220–440 Vac 50/60 Hz		0.89 in (22.5 mm)	2 C/O–DPDT	RM4TG20	0.24 (0.110)

Control Relays: Phase Reversal and Presence of Phases + Undervoltage

Time Delay	Rated Mains Supply Voltage ■	Control Threshold	Width in (mm)	Output Relay	Catalog Number	Weight lb (kg)
None	220–240 V 50/60 Hz	Undervoltage 160–220 V	0.89 in (22.5 mm)	2 C/O–DPDT	RM4TU01	0.24 (0.110)
	380–440 V 50/60 Hz	Undervoltage 300–430 V	0.89 in (22.5 mm)	2 C/O–DPDT	RM4TU02	0.24 (0.110)

Control Relays: Phase Reversal and Presence of Phases + Overvoltage and Undervoltage

Relays with Fixed Voltage Thresholds

Adjustable Time Delay	Rated Mains Supply Voltage ■	Control Threshold	Width in (mm)	Output Relay	Catalog Number	Weight lb (kg)
0.1–10 s	220 V 50/60 Hz	Undervoltage 198 V Overvoltage 242 V	0.89 in (22.5 mm)	2 C/O–DPDT	RM4TR33	0.24 (0.110)
	400 V 50/60 Hz	Undervoltage 360 V Overvoltage 440 V	0.89 in (22.5 mm)	2 C/O–DPDT	RM4TR34	0.24 (0.110)

Relays with Adjustable Voltage Thresholds

Adjustable Time Delay	Rated Mains Supply Voltage ■	Control Threshold	Width in (mm)	Output Relay	Catalog Number	Weight lb (kg)
0.1–10 s	220–240 V 50/60 Hz	Undervoltage 160–220 V Overvoltage 220–300 V	0.89 in (22.5 mm)	2 C/O–DPDT	RM4TR31	0.24 (0.110)
	380–440V 50/60 Hz	Undervoltage 300–430 V Overvoltage 420–480 V	0.89 in (22.5 mm)	2 C/O–DPDT	RM4TR32	0.24 (0.110)

Control Relays: Phase Reversal and Presence of Phases + Imbalance

| Time Delay on De-Energization	Rated Mains Supply Voltage ■	Control Threshold	Width in (mm)	Output Relay	Catalog Number	Weight lb (kg)
Fixed 0.5 s	220–240 V 50/60 Hz	Imbalance 5–15%	0.89 in (22.5 mm)	1 C/O–SPDT	RM4TA01	0.24 (0.110)
	380–440 V 50/60 Hz	Imbalance 5–15%	0.89 in (22.5 mm)	1 C/O–SPDT	RM4TA02	0.24 (0.110)
Adjustable 0.1–10 s	220–240 V 50/60 Hz	Imbalance 5–15%	0.89 in (22.5 mm)	2 C/O–DPDT	RM4TA31	0.24 (0.110)
	380–440 V 50/60 Hz	Imbalance 5–15%	0.89 in (22.5 mm)	2 C/O–DPDT	RM4TA32	0.24 (0.110)

■ Can be used on other supply voltages if the minimum operational voltages, maximum voltage between phases, and compatibility are within the control threshold ranges shown in the specification table on page 31.

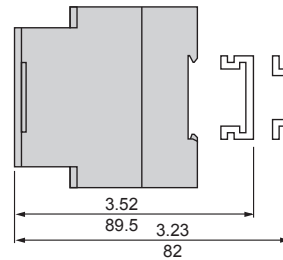For additional application data, refer to page 2.

Telemecanique   6/2005

DIMENSIONS (approximate)

RM4T
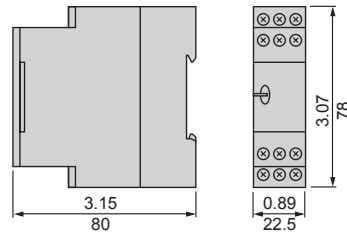
Rail Mounting

Direct Mounting

3.07 / 78

3.15 / 80

0.89 / 22.5

3.52 / 89.5

3.23 / 82

0.24 / 6

3.07 / 78

0.24 / 6

Ø 0.16 / 4
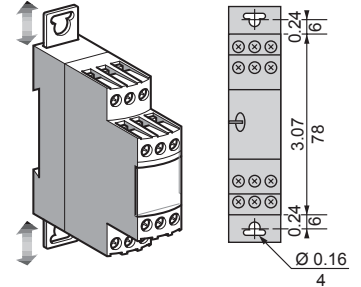
Dual Dimensions = $\frac{in}{mm}$

WIRING

Terminal Blocks
RM4TG20, TU0●

L1	L2	L3
L1 L2 L3	15 (11)	25 (21)
16 (12)	18 (14) 26 (22)	28 (24)
28 (24)	25 (21)	26 (22)
18 (14)	15 (11)	16 (12)
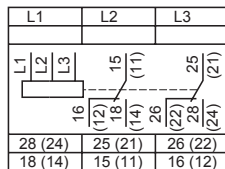
L1, L2, L3 — Supply to be monitored
15(11)-18(14) — 1st C/O contact
15(11)-16(12) — of the output relay
25(21)-28(24) — 2nd C/O contact
25(21)-26(22) — of the output relay

RM4TR3●, TA3●

L1	L2	L3
L1 L2 L3	15	25
16	18 26	28
28	25	26
18	15	16
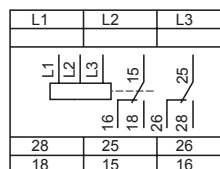
L1, L2, L3 — Supply to be monitored
15–18 — 1st C/O contact
15–16 — of the output relay
25–28 — 2nd C/O contact
25–26 — of the output relay

RM4TA0●
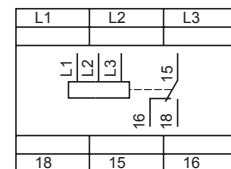
L1	L2	L3
L1 L2 L3	15	
16	18	
18	15	16

L1, L2, L3 — Supply to be monitored
15–18 — 1st C/O contact
15–16 — of the output relay

Application Diagram

Example

Select based on load

Q1

Q2

L3 L2 L1 RM4T

26 28 16 18

25 15

I> I> I>

M1

M1

M1

N

U1 2 V1 4 W1 6

M1
3 Vac
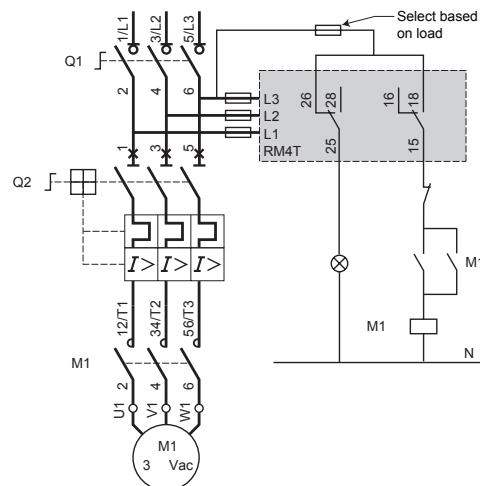
Suggested Line Fuses for L1, L2, and L3

100 mA, fast blow or standard