Zelio Control measurement and control relays

Voltage measurement relays model RM4 U

RM4 UA01

Functions

These devices are designed to detect when a preset voltage threshold is exceeded, on a.c. or d.c. supply.
They have a transparent, hinged flap on their front face to prevent any accidental alteration of the settings. This flap can be directly sealed.
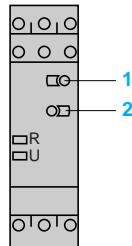
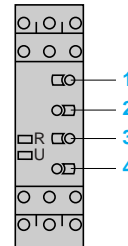| Type of relay	Voltage control	Overvoltage or undervoltage control (1)	Measuring range
RM4 UA0●	Yes	No	50 mV…500 V
RM4 UA3●	Yes	Yes	50 mV…500 V

Applications:
- d.c. motor overspeed control,
- battery monitoring,
- monitoring of a.c. or d.c. supplies,
- speed monitoring (with tacho-generator).

Presentation

RM4 UA0●
Width 22.5 mm

RM4 UA3●
Width 22.5 mm

1 Adjustment of voltage threshold as % of setting range max. value.

2 Hysteresis adjustment from 5 to 30 % (2).

3 Adjustment of time delay as % of setting range max. value.

4 Switch combining:
  - selection of the timing range: 1s, 3s, 10s, 30s, no time delay,
  - selection of overvoltage (>) or undervoltage (<) detection.
  See table below.

R Yellow LED: indicates relay state.

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

Table showing details for switch 4

Switch position	Function	Time delay (t)
< 0	Undervoltage detection	No time delay
< 1	Undervoltage detection	0.05 to 1 s
< 3	Undervoltage detection	0.15 to 3 s
< 10	Undervoltage detection	0.5 to 10 s
< 30	Undervoltage detection	1.5 to 30 s
> 0	Overvoltage detection	No time delay
> 1	Overvoltage detection	0.05 to 1 s
> 3	Overvoltage detection	0.15 to 3 s
> 10	Overvoltage detection	0.5 to 10 s
> 30	Overvoltage detection	1.5 to 30 s

(1) Selection by switch on front face.
(2) Value of voltage difference between energisation and de-energisation of the output relay (% of the voltage threshold to be measured).

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Operating principle

The supply voltage is connected to terminals A1-A2.
The voltage to be monitored is connected to terminals B1, B2 or B3 and C.

Hysteresis is adjustable between 5 and 30 %:
for overvoltage h = (US1 - US2) / US1, **for undervoltage** h = (US2 - US1) / US1.
A measurement cycle lasts only 80 ms, which allows rapid detection of changes in voltage.

**Relays set for overvoltage detection** (RM4 UA0● or selector on ">" for model RM4 UA3●):
If the voltage is greater than the threshold setting US1, the output relay is energised, with or without a time delay. When the voltage returns to a value US2 below the threshold, depending on the hysteresis setting, the relay is instantaneously de-energised.

Relays set for undervoltage detection (selector on "<", model RM4 UA3● only):
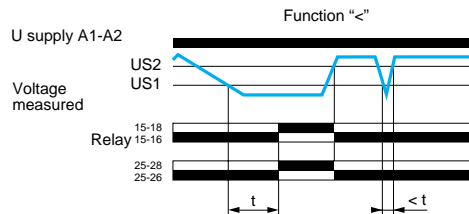If the voltage is less than the threshold setting US1, the output relay is energised, with or without a time delay. When the voltage returns to a value US2 above the threshold, depending on the hysteresis setting, the relay is de-energised.

Function diagrams

Overvoltage control
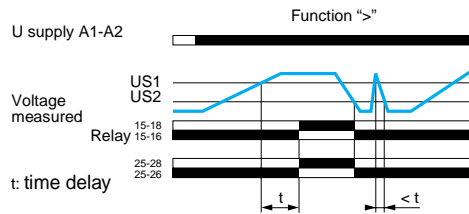
Undervoltage control

Note: the measurement ranges can be extended above 500 V by adding a resistor, see page 28472/7.
The measurement range on ∿ supply can be extended by means of a voltage transformer, the secondary of which is connected to the measuring terminals of the corresponding RM4.

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Voltage measurement relays: overvoltage detection

Time delay	Voltage to be measured depending on connection $\sim$ or $=$	Width	Output relay	Basic reference. Complete with code indicating the voltage code (1)	Weight
	V	**mm**			**kg**
None	0.05...0.5 0.3…3 0.5…5	22.5	1 C/O	**RM4 UA01●**	0.168
	1...10 5…50 10…100	22.5	1 C/O	**RM4 UA02●**	0.168
	30...300 50…500	22.5	1 C/O	**RM4 UA03●**	0.168

Voltage measurement relays: overvoltage or undervoltage detection

Adjustable time delay	Voltage to be measured depending on connection $\sim$ or $=$	Width	Output relay	Basic reference. Complete with code indicating the voltage code (1)	Weight
s	**V**	**mm**			**kg**
0.05...30	0.05...0.5 0.3…3 0.5…5	22.5	2 C/O	**RM4 UA31●●**	0.168
	1...10 5…50 10…100	22.5	2 C/O	**RM4 UA32●●**	0.168
	30...300 50…500	22.5	2 C/O	**RM4 UA33●●**	0.168

(1) Standard supply voltages					
RM4 UA0●	Volts	**24**	**110...130**	**220...240**	
	$\sim$ 50/60 Hz	B	F	M	
RM4 UA3●	Volts	**24...240**	**110...130**	**220...240**	**380...415**
	$\sim$ 50/60 Hz	MW	F	M	Q
	$=$	MW	–	–	–

Presentation : pages 28472/2 and	28472/3 Characteristics :	page 28472/5 Dimensions, schemes :	page 28472/6 Setting-up :	page 28472/7

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Power supply circuit characteristics

Type of relay			RM4 UA0●			RM4 UA3●			
Rated supply voltage (Un)	$\sim$ 50/60 Hz	V	24	110...130	220...240	24...240	110...130	220...240	380...415
	$---$	V	–	–	–	24...240	–	–	–
Average consumption at Un	$\sim$	VA	2	1.9…3.3	2.7…3.5	1.5…3.3	1.9…3.3	2.7…3.4	2.7…3
	$---$	W	–	–	–	1.2	–	–	–

Output relay and operating characteristics

| Type of relay		RM4 UA0●	RM4 UA3●
Number of C/O contacts		1	2
Output relay state		Energised when: voltage measured > threshold setting	Energised when: voltage measured > threshold setting (">" function) voltage measured < threshold setting ("<" function)
Setting accuracy of the switching threshold		As % of the full scale value: ± 5 %	
Switching threshold drift	%	≤ 0.06 per degree centigrade, depending on the permissible ambient temperature	
	%	≤ 0.5, within the supply voltage range (0.85…1.1 Un)	
Hysteresis (adjustable)	%	5…30 of the voltage threshold setting	
Setting accuracy of the time delay		As % of the full scale value: ± 10 %	
Time delay drift	%	–	≤ 0.5, within the supply voltage range (0.85…1.1 Un)
			≤ 0.07 per degree centigrade, depending on the rated operating temperature
Measuring cycle	ms	≤ 80	

Measuring input characteristics

Internal input resistance and permissible overload depending on the voltage measurement ranges
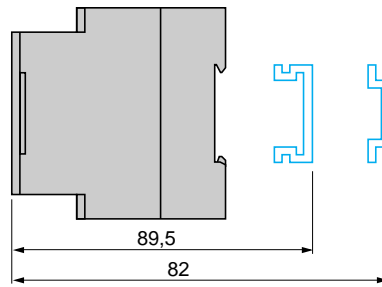
Type of relay		RM4 UA●1			RM4 UA●2			RM4 UA●3	
Measurement range $\sim$ 50-60 Hz and $---$	V	0.05…0.5	0.3…3	0.5…5	1…10	5…50	10…100	30…300	50…500
Internal input resistance Ri	kΩ	6.6	43	71	23	112	225	668	1111
Permissible continuous overload	V	20	60	80	90	150	300	400	550
Permissible non repetitive overload for t ≤ 1 s	V	25	80	100	100	200	400	500	550

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Dimensions
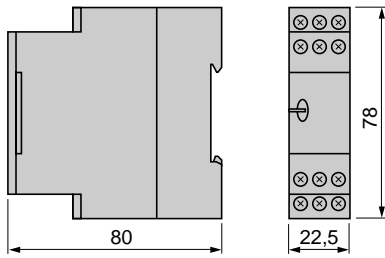
Dimensions RM4 UA	Rail mounting	Screw fixing
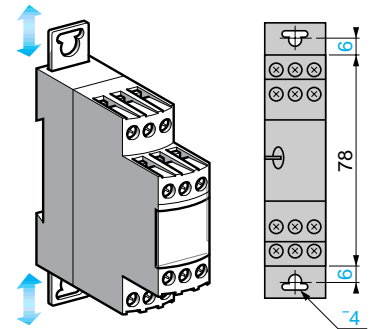
Schemes, connection

Terminal blocks

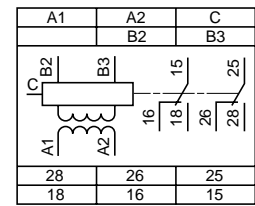**RM4 UA01, UA02**
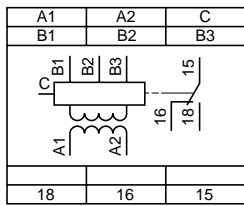
RM4 UA03
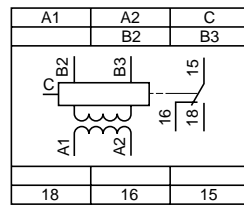
RM4 UA31, UA32
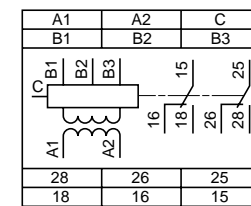
RM4 UA33
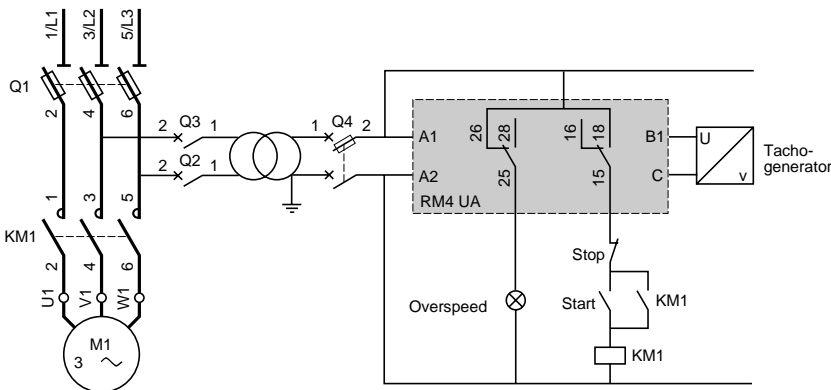

A1-A2 Supply voltage

B1, B2. Voltages to be measured
B3, C (see table opposite)

Connection and voltage values to be measured, depending on type of **RM4 UA**

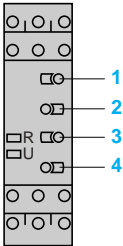| **RM4 UA•1**			**RM4 UA•2**			**RM4 UA•3**		
	B1-C	0.05…0.5 V		B1-C	1…10 V		B2-C	30…300 V
	B2-C	0.3…3 V		B2-C	5…50 V		B3-C	50…500 V
	B3-C	0.5…5 V		B3-C	10…100 V			

Application scheme
Example: overspeed monitoring (undervoltage function)

Example of undervoltage to be measured

Undervoltage threshold to be measured: 12 V $=$.
Time delay of the output relay: 20 s.
Reset voltage threshold: 13.2 V.
Supply voltage: 230 V $\sim$ 60 Hz.

- Product selected **RM4 UA32M**
  Connection of voltage to be measured B2-C (5 to 50 V)

Adjustments:

- Adjustment of function and timing range, switch **4**:
  - determine the timing range, immediately greater than the time required, in this example 30 s,
  - determine whether overvoltage or undervoltage detection is required, in this example undervoltage,
  - position switch **4** according to the above 2 criteria, in this example, switch **4** on **< 30**.

- Fine adjustment of time delay:
  Depending on the max. range setting displayed at **4** (in this example: 30 s) use potentiometer **3** to set the required time delay as a % of value **4**.
  In this example, the required time = 20 s therefore:

$$\frac{t \times 100}{4} = \frac{20 \times 100}{30} = \mathbf{66\ \%}$$ Set the time delay potentiometer **3** to **66**.

- Set the voltage threshold setting potentiometer **1** as a percentage of the maximum value of the measuring range selected when wiring.
  In this example: wiring B2-C, max. value of measuring range = 50 V, therefore:

Setting **1** $= \dfrac{12 \times 100}{50} = \mathbf{24\ \%}$ Set the voltage threshold setting potentiometer **1** to **24**.

- Set the hysteresis **2** as a % of the threshold value; in this example:

Setting **2** $= \dfrac{13.2 - 12}{12} = \mathbf{10\ \%}$ Set the hysteresis **2** to **10**.

Extension of the measuring range
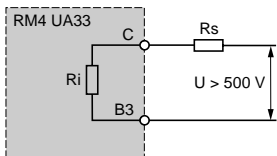
d.c. or a.c. supply
Simply connect an additional resistor (Rs) in series with the measuring input B3 or C.
If the value of Rs is in the region of:

$Rs = Ri \left(\dfrac{U}{Um} - 1 \right)$ where: **Ri** Internal resistance of input B3-C.
Um Maximum value of threshold setting range.
U Voltage threshold to be measured.

The tripping threshold of the relay will be towards the maximum graduation on the threshold setting potentiometer.
In general, the power consumed by the resistor does not exceed 0.5 W.

For a.c. voltages, it is also possible to use a voltage transformer.

Supply by the measured voltage
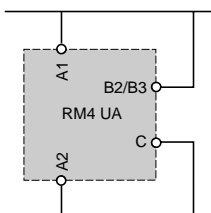
For monitoring mains and power supplies, the RM4 UA can be supplied by the voltage to be controlled, provided that:

- the measurement threshold is within the operating range of the product's power supply (0.85…1.1 Uc),

- variations of the voltage to be measured are compatible with the supply and measurement voltage ranges.

Presentation : pages 28472/2 and	28472/3 References :	page 28472/4 Characteristics :	page 28472/5 Dimensions, schemes :	page 28472/6

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