Measurement and control relays - Zelio Control

Industrial relays

Current measurement relays RM4 J

RM4 JA01

RM4 JA32

Functions

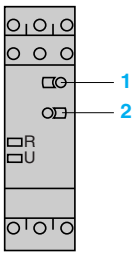
These devices are designed to detect when current rises above or drops below a preset threshold, on an a.c. or a d.c. supply.
They have a transparent, hinged flap on their front face to avoid any accidental alteration of the settings. This flap can be directly sealed.

Relay type	Overcurrent detection	Overcurrent or undercurrent detection *(1)*	Measuring range
RM4 JA01	Yes	No	3 mA...1 A
RM4 JA31	Yes	Yes	3 mA...1 A
RM4 JA32	Yes	Yes	0.3 A...15 A

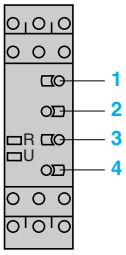
Applications :
- excitation control of d.c. machines,
- control of load state of motors and generators,
- control of current drawn by a 3-phase motor,
- monitoring of heating or lighting circuits,
- control of pump draining (undercurrent),
- control of overtorque (crushers),
- monitoring of electromagnetic brakes or clutches.

Description

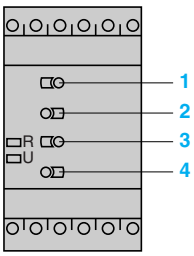
RM4 JA01
Width 22.5 mm



RM4 JA31
Width 22.5 mm



RM4 JA32
Width 45 mm



1 Adjustment of current threshold as % of setting range max. value.
2 Hysteresis adjustment from 5 to 30 % *(2)*.
3 Fine adjustment of time delay as % of setting range max. value.
4 10-position switch combining:
- selection of the timing range: 1 s, 3 s, 10 s, 30 s, no time delay,
- selection of overcurrent (>) or undercurrent (<) 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	Undercurrent detection	No time delay
< 1	Undercurrent detection	0.05 to 1 s
< 3	Undercurrent detection	0.15 to 3 s
< 10	Undercurrent detection	0.5 to 10 s
< 30	Undercurrent detection	1.5 to 30 s
> 0	Overcurrent detection	No time delay
> 1	Overcurrent detection	0.05 to 1 s
> 3	Overcurrent detection	0.15 to 3 s
> 10	Overcurrent detection	0.5 to 10 s
> 30	Overcurrent detection	1.5 to 30 s

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

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Operating principle

The supply voltage is connected to terminals A1-A2.
The current to be monitored is connected to terminals B1, B2, B3 and C. See diagram below.

Hysteresis is adjustable between 5 and 30 %: for **overcurrent** h = (IS1 - IS2) / IS1, for **undercurrent** h = (IS2 - IS1) / IS1.
A measuring cycle lasts only 80 ms, which allows rapid detection of changes in current.

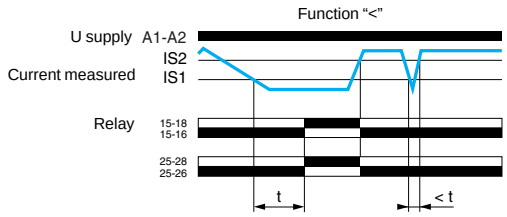
Relay set for overcurrent detection (RM4 JA01 or selector on ">" for model RM4 JA3●).
If the current is > the setting threshold IS1, the output relay is energised with or without a time delay, depending on the model. When the current returns to a value IS2 below the threshold, depending on the hysteresis setting, the relay is instantaneously de-energised.

Relay set for undercurrent detection (selector on "<", model RM4 JA3● only).
If the current is <, the setting threshold IS1, the output relay is energised with or without a time delay, depending on the model. When the current returns to a value IS2 above the threshold, depending on the hysteresis setting, the relay is instantaneously de-energised.

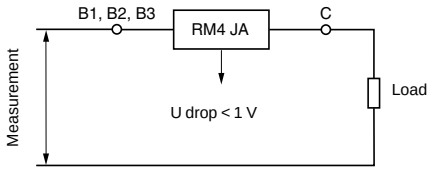
Function diagrams

■ Functions

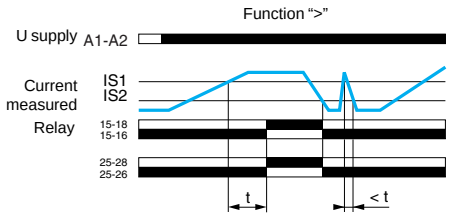
□ Undercurrent detection



t : time delay



□ Overcurrent detection



t : time delay

Note: The measurement ranges can be extended by means of a current transformer, the secondary of which is connected to the measuring terminals of the RM4 relay, or by means of a resistor connected in parallel with the measuring input (see example page 28471/7 "Setting-up").

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RM4 JA01

Overcurrent detection

Time delay	Current to be measured depending on connection ∿ or ⎓	Width	Output relay	Basic reference, to be completed by adding the voltage code *(1)*	Weight
s		**mm**			**kg**
Without	3...30 mA 10...100 mA 0.1...1 A	22.5	1 C/O	**RM4 JA01●**	0.172

RM4 JA32

Overcurrent or undercurrent detection

Adjustable time delay	Current to be measured depending on connection ∿ or ⎓	Width	Output relay	Basic reference, to be completed by adding the voltage code *(1)*	Weight
s		**mm**			**kg**
0.05...30	3...30 mA 10...100 mA 0.1...1 A	22.5	2 C/O	**RM4 JA31●●**	0.172
	0.3...1.5 A 1...5 A 3...15 A	45	2 C/O	**RM4 JA32●●**	0.204

(1) Standard supply voltages

RM4 JA01	Volts	**24**	**110...130**	**220...240**	
	∿ 50/60 Hz	B	F	M	
RM4 JA31	Volts	**24...240**	**110...130**	**220...240**	**380...415**
and **RM4 JA32**	∿ 50/60 Hz	MW	F	M	Q
	⎓	MW	–	–	–

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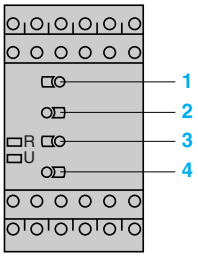
Setting-UP

Example of overcurrent to be measured

Overcurrent threshold at: 13 A.
Output relay time delay: 5 s.
Reset current threshold: 11 A
Supply voltage: 127 V ⎓



Product selected **RM4 JA32MW**
Connection of current to be measured B3-C (3 to 15 A)

■ **Adjustments:**

□ Adjustment of function and timing range, switch **4**:
- determine whether overcurrent or undercurrent detection is required; in this example, overcurrent,
- determine the timing range, immediately greater than the time required; in this example 10 s,
- position switch **4** according to the above 2 criteria; in this example, switch **4** on **> 10**.

□ Fine adjustment of time delay:
Depending on the max. range setting displayed at **4** (in the above example: 10 s) use potentiometer **3** to set the required time delay as a % of value **4**.
In the above example, the required time = 5 s therefore:

$\frac{t \times 100}{4} = \frac{5 \times 100}{10} = \mathbf{50\ \%}$ Set the time delay potentiometer **3** to **50**.

□ Set the current threshold setting potentiometer **1** as a percentage of the maximum value of the measuring range selected when wiring.
In the above example: wiring B3-C, max. value of measuring range = 15 A, therefore:

Setting 1 = $\frac{13 \times 100}{15} = \mathbf{87\ \%}$ Set the current threshold setting potentiometer **1** to **87**.

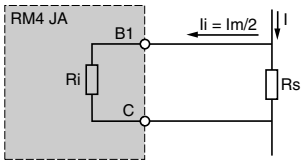
□ Set the hysteresis **2** as a % of the threshold value; in this example:

Setting 2 = $\frac{13 - 11}{13} = \mathbf{15.4\ \%}$ Set the hysteresis **2** to **15**
(13 - 11 = 2 i.e. 15.4 % of the current to be measured).

Extension of the measuring range

■ **d.c. or a.c. supply**

Simply connect a resistor “Rs” to terminals B1-C (or B2, B3-C) on the measuring input.
The relay energisation threshold will be towards the middle of the setting potentiometer range if the value of Rs is in the region of:



$Rs = \frac{Ri}{(2I/Im) - 1}$ where:

Ri Internal resistance of input B1-C,
Im Maximum value of threshold setting range,
I Current threshold to be measured.

Power dissipated by Rs: $P = Rs\ (I - Im/2)^2$

■ **Application:**

Use of relay **RM4 JA31●●** (10 to 100 mA).
Connection B2-C to measure a threshold of 1 A, knowing that Ri = 10 Ω for this rating and that Im = 100 mA.
The value of Rs will be: $\frac{10}{(2 \times 1/0.1) - 1} = 0.526\ \Omega$

$P = (1 - \frac{0.1}{2})^2 \times 0.526$ i.e. 0.47 W

Select a resistor Rs capable of dissipating at least twice the calculated value, i.e. 1 W for this example, in order to limit temperature rise.
On an a.c. supply, it is also possible to use a current transformer.