Zelio Control measurement and control relays

Current measurement relays RM4

RM4 JA01

RM4 JA32

Functions

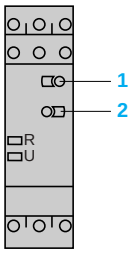
These devices are designed to detect when a preset current threshold is exceeded, on a.c. or d.c. supply.
They have a transparent, hinged flap on their front face to prevent any accidental alteration of the settings. This flap can be directly sealed.

Type of relay	Overcurrent control	Overcurrent or undercurrent control (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

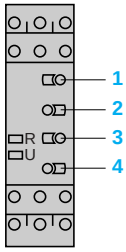
Applications:
- excitation control of d.c. machines,
- control of load state of motors and generators,
- control of current drawn by a 3-phase motor,
- monitoring of heating or lighting circuits,
- control of pump draining (undercurrent),
- control of overtorque (crushers),
- monitoring of electromagnetic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

Description

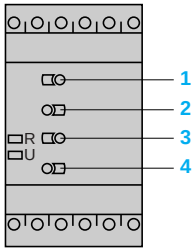
RM4 JA01
Width 22.5 mm



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).

References: page 28471/4
Characteristics: page 28471/5
Dimensions, schemes: page 28471/6
Setting-up: page 28471/7

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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.

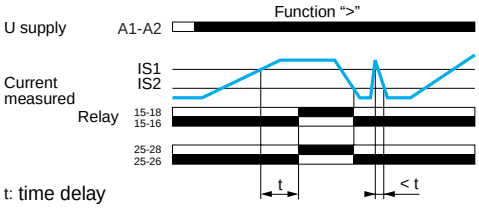
Hysteresis is adjustable between 5 and 30 %: for **overcurrent** h = (IS1 - IS2) / IS1, for **undercurrent** h = (IS2 - IS1) / IS1.
A measuring cycle lasts only 80 ms, which allows rapid detection of changes in current.

Relay set for overcurrent detection (RM4 JA01 or selector on “>” for model RM4 JA3●).
If the current is greater than 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.

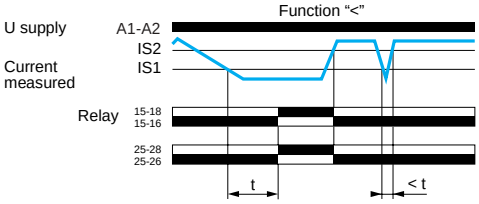
Relay set for undercurrent detection (selector on “<”, model RM4 JA3● only).
If the current is less than the threshold setting IS1, the output relay is energised with or without a time delay, depending on the model. When the current returns to a value IS2 above the threshold, depending on the hysteresis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

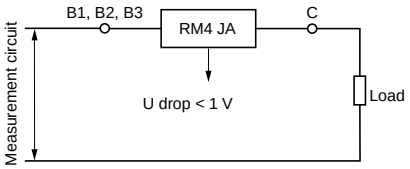
Function diagrams:

Overcurrent detection



Undercurrent detection





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

Zelio Control measurement and control relays

Current measurement relays RM4

RM4 JA01

Current measurement relays: overcurrent detection

Time delay	Current to be measured depending on connection ∿ or ⎓	Width	Output relay	Basic reference. Complete with code indicating the voltage code (1)	Weight
		mm			kg
None	3...30 mA 10...100 mA 0.1...1 A	22.5	1 C/O	**RM4 JA01●**	0.172

RM4 JA32

Current measurement relays: overcurrent or undercurrent detection

Adjustable time delay	Current to be measured depending on connection ∿ or ⎓	Width	Output relay	Basic reference. Complete with code indicating 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	–	–	–

Presentation: pages 28471/2 and 28471/3 | Characteristics: page 28471/5 | Dimensions, schemes: page 28471/6 | Setting-up: page 28471/7

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Current measurement relays RM4

Power supply circuit characteristics

Type of relay			RM4 JA01			RM4 JA31 and RM4 JA32			
Rated supply voltage (Un)	∿ 50/60 Hz	**V**	24	110...130	220...240	24...240	110…130	220...240	380...415
	⎓	**V**	–	–	–	24...240	–	–	–
Average consumption at Un	∿	**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 JA01	RM4 JA31 and RM4 JA32
Number of C/O contacts		1	2
Output relay state		Energised when: current measured > threshold setting	Energised when: current measured > threshold setting (“>” function) current 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 current threshold setting	
Setting accuracy of the time delay		As % of the full scale value: ± 10 %	
Time delay drift	**%**	–	≤ 0.07 per degree centigrade, depending on temperature
			≤ 0.5, within the supply voltage range (0.85…1.1 Un)
Measuring cycle	**ms**	≤ 80	

Measuring input characteristics

Internal input resistance and permissible overload depending on the current measurement ranges

Type of relay		RM4 JA01 and RM4 JA31			RM4 JA32		
Measurement range ∿ 50-60 Hz and ⎓		3…30 mA	10…100 mA	0.1…1 A	0.3…1.5 A	1…5 A	3…15 A
Internal input resistance Ri	Ω	33	10	1	0.06	0.02	0.006
Permissible continuous overload	**A**	0.05	0.15	1.5	2	7	20
Permissible non repetitive overload for t ≤ 3 s	**A**	0.2	0.5	5	10	15	100

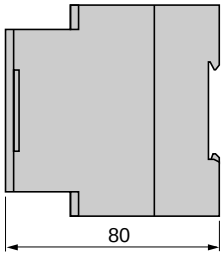
Presentation: pages 28471/2 and 28471/3 References: page 28471/4 Dimensions, schemes: page 28471/6 Setting-up: page 28471/7

Zelio Control measurement and control relays

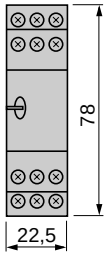
Current measurement relays RM4

Dimensions

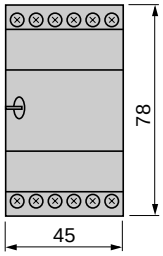
Dimensions
RM4 JA (common side view)



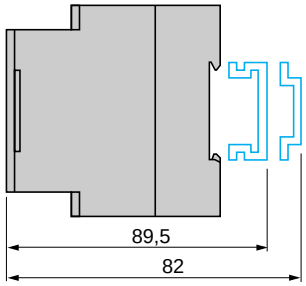
RM4 JA●1



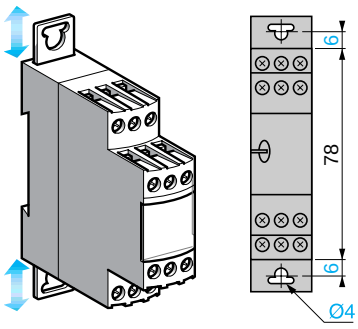
RM4 JA32



Rail mounting



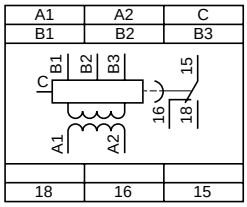
Screw fixing



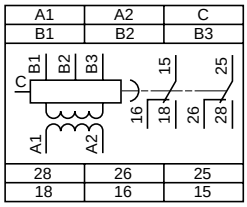
Schemes, connection

Terminal blocks

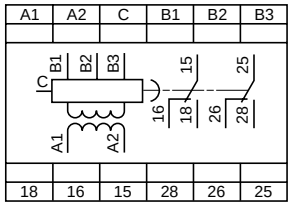
RM4 JA01



RM4 JA31



RM4 JA32



A1-A2 Supply voltage

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

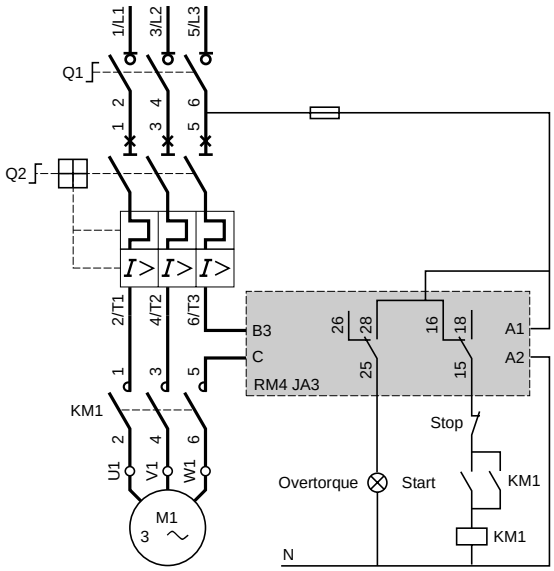
Connection and current values to be measured, depending on type of **RM4 JA**

RM4 JA01 and RM4 JA31	B1-C	3…30 mA	**RM4 JA32**	B1-C	0.3…1.5 A
	B2-C	10…100 mA		B2-C	1…5 A
	B3-C	0.1…1 A		B3-C	3…15 A

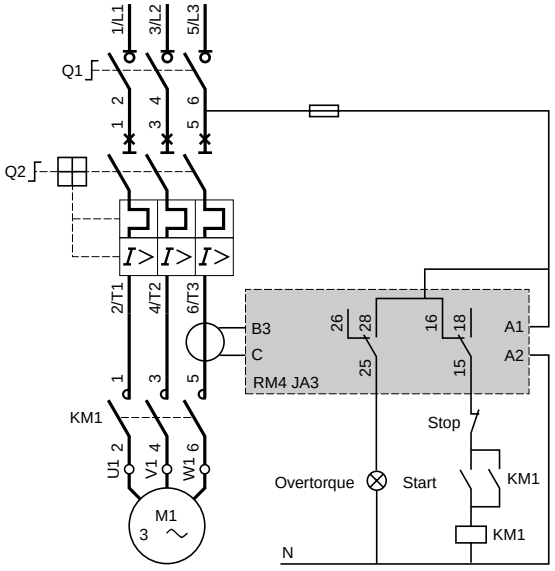
Application schemes

Example: detection of blockage on a crusher (overcurrent function)

Current measured ≤ 15 A



Current measured > 15 A



Presentation: pages 28471/2 and 28471/3 **References:** page 28471/4 **Characteristics:** page 28471/5 **Setting-up:** page 28471/7

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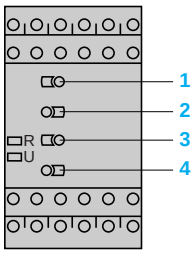
Example of overcurrent to be measured

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 this example: 10 s) use potentiometer 3 to set the required time delay as a % of value 4.
  In this example, the required time = 5 s therefore:

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

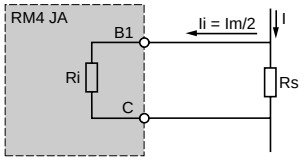
- Set the current threshold setting potentiometer 1 as a percentage of the maximum value of the measuring range selected when wiring.
  In this example: wiring B3-C, max. value of measuring range = 15 A, therefore:

Setting 1 $= \frac{13 \times 100}{15} =$ **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 $= \frac{13 - 11}{13} =$ **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.