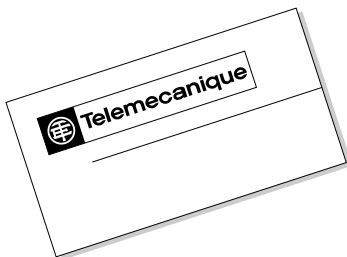
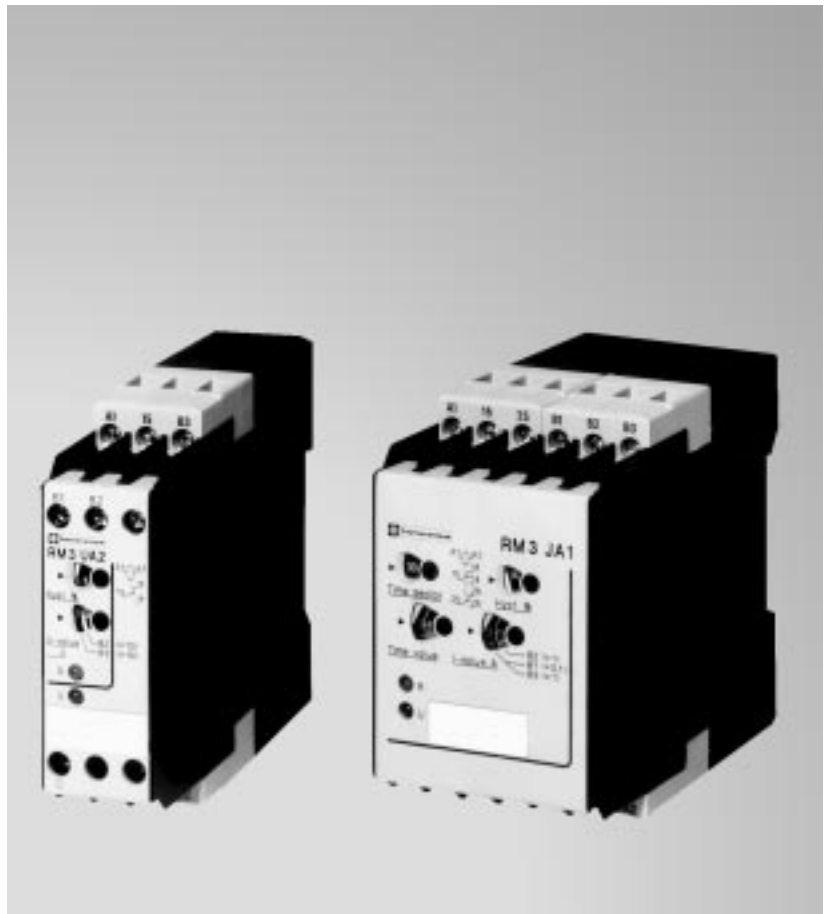


# RM3 Specialty Relays

File 8430





## Contents

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RM3 Measurement and Control Relays .....	2-5
RM3JA2 Current Measurement Relays .....	6-9
RM3JA1 Current Measurement Relays .....	10-13
RM3UA2 Voltage Measurement Relays .....	14-17
RM3UA1 Voltage Measurement Relays .....	18-21
RM3TG2 3-Phase Supply Relays .....	22-25
RM3TR1 3-Phase Supply Relays .....	26-29
RM3TA2 3-Phase Supply Relays.....	30-33
RM3TAR1 3-Phase Supply Relays .....	34-37
RM3LG2 Liquid Level Control Relay .....	38-41
RM3LA1 Liquid Level Control Relay .....	42-45
RM3PA1 Insulation Control Relay .....	46-49
RM3EA1 Sensitive Contact Protection Relay .....	50-53

# RM3 Specialty Relays Selection guide



<b>Applications</b>	Current measurement		Voltage measurement		3-phase supply control
	Overcurrent	Undercurrent and overcurrent	Overvoltage	Undervoltage or overvoltage	
<b>Measurement or control</b>	Adjustable threshold 0.003 to 1 A		Adjustable thresholds 0.003 to 1 A or 0.3 to 15 A depending on relay		Detects: proper phase rotation and phase loss
			Adjustable thresholds 0.05 to 5 V or 1 to 100 V or 30 to 500 V depending on relay		
<b>Supply voltage</b>	24 Vac 42 to 48 Vac 110 to 130 Vac 220 to 240 Vac		24 to 240 Vac or dc 110 to 130 Vac 220 to 240 Vac 380 to 415 Vac		220 to 500 Vac
			24 Vac 42 to 48 Vac 110 to 130 Vac 220 to 240 Vac		
<b>Number of output relay contacts</b>	1 Form C		2 Form C		2 Form C
<b>Output relay state</b>	Energized when threshold is exceeded				De-energized on detection of a fault
<b>Display</b>	Green LED : Supply voltage is present to the relay Yellow LED : Relay has been energized.				Yellow LED : Relay has been energized
<b>Built-in time delay</b>	Fixed 80 ms		Adjustable 0.05 to 30 s		None
			Fixed 80 ms		
<b>Width</b>	.89 inches 22.5 mm		1.77 inches 45 mm		.89 inches 22.5 mm
			.89 inches 22.5 mm		
<b>Catalog Number</b>	<b>RM3JA2</b>	<b>RM3JA1</b>	<b>RM3UA2</b>	<b>RM3UA1</b>	<b>RM3TG2</b>
<b>Pages</b>	6 to 9	10 to 13	14 to 17	18 to 21	22 to 25



			Liquid level control		Insulation control	Protection of sensitive contacts
Control : rotational direction and total failure of one or more phases, undervoltage, overvoltage, 220 400, 500, 380 to 420 430 to 500V	Control : asymmetry of phases, failure of one or more phases rotational direction of phases. 220 to 240 V 380 to 415 V	Control : asymmetry of phases, phase failure, rotational direction of phases, 220 to 240 V 380/415V to 500V	Measurement of liquid resistance by submersible probes	Adjustable threshold 1 to 110 kΩ	Control of contact closing	
110 to 130 Vac 160 to 300 Vac 220 to 240 Vac 300 to 500 Vac 380 to 415 Vac	220 to 240 Vac 380 to 415 Vac	110 to 130 Vac 220 to 240 Vac 380 to 415 Vac	24 Vac 110 to 130 Vac 220 to 240 Vac 380 to 415 Vac	24 to 240 Vac or dc 110 to 130 Vac 220 to 240 Vac 380 to 415 Vac	24 to 240 Vac or dc 110 to 130 Vac 220 to 240 Vac	24 Vac 110 to 130 Vac 220 to 240 Vac 380 to 415 Vac
2 Form C 	1 Form C 	2 Form C 	1 Form C 	2 Form C 	1 Form C 	2 Form C 
De-energized on detection of a fault			Energized when high level electrode immersed. De-energized when low level electrode not immersed.	Energized when high level electrode immersed. De-energized when low level electrode not immersed.	Energized on detection of a fault.	
Green LED : Supply voltage is present. Yellow LED : Relay has been energized. 3 red LEDs : faults have occurred.	Yellow LED : Relay has been energized.	Green LED : Supply voltage is present. Yellow LED : Relay has been energized. 2 red LEDs : faults have occurred.	Green LED : Supply voltage is present. Yellow LED : Relay has been energized.	Green LED : Supply voltage is present. Yellow LED : Relay has been energized.		
Adjustable 0.1 to 10 s	Fixed 500 ms	Adjustable 0.1 to 10 s	Fixed 250 ms	Adjustable 0.1 to 10 s	None	None or adjustable 0.05 to 30 s
1.77 inches 45 mm	.89 inches 22.5 mm	1.77 inches 45 mm	.89 inches 22.5 mm	1.77 inches 45 mm	1.77 inches 45 mm	1.77 inches 45 mm
<b>RM3TR1</b>	<b>RM3TA2</b>	<b>RM3TAR1</b>	<b>RM3LG2</b>	<b>RM3LA1</b>	<b>RM3PA1</b>	<b>RM3EA1</b>
26 to 29	30 to 33	34 to 37	38 to 41	42 to 45	46 to 49	50 to 53



## Environment

<b>Conforming to standards</b>			IEC 801 part 1-4 level III IEC 68 part 2-3/2-6 VDE 0435 part 303, 4.8.3/class II and 303, 4.2.1/class I min. 2.5 kV VDE 57160 part 0160/5.84 paragraph 4.8.8 VDE 0110/overvoltage category III
<b>Approvals</b>			UL listed file E39281 guide E164353 CSA, GV
<b>Ambient air temperature around the device</b>	Storage	<b>°F (°C)</b>	-40 to 185 (-40 to 85)
	Operation	<b>°F (°C)</b>	-13 to 140 (-25 to 60)
<b>On-load factor</b>			100%
<b>Supply voltage range</b>			-15% to +10% of rated supply voltage
<b>Insulation voltage</b>	Between input and output	<b>kV</b>	2.5
<b>Vibration resistance</b>	Conforming to IEC 68-2-6		10 gn/F = 55 Hz/a = ± 0.95 mm 2h per level
<b>Shock resistance</b>			10 gn
<b>Degree of protection</b>	Conforming to VDE 0106 (part 100) and VBG 4 for the terminal block		
	Terminals		IP 20 protected against direct finger contact
	Enclosure		IP 50
<b>Settings</b>	Direct		By absolute scales
<b>Operating status indication</b>	Green LED on		Supply voltage is present to terminals A1 and A2
	Yellow LED on		Output relay has been energized
	Red LED on		Indicate that a fault has occurred
<b>Connection</b>	By captive recessed +/- screws		All products
<b>Wire Combinations</b>	Stranded wire	<b>AWG (mm<sup>2</sup>)</b>	≤ 2 #14 (≤ 2 x 2.5) without cable end ≤ 2 #14 (≤ 2 x 2) with cable end
<b>Mounting positions</b>			Any
<b>Mounting method</b>	Clip-on		On 35mm DIN3 mounting track
<b>Cover accessory</b>	Optional		To reduce the chance of unauthorized changing of settings
<b>Housing, terminal covers and top cover material</b>	Self-extinguishing plastic		Class V0 or V1 (UL 94)
<b>Product Carton</b>			Recyclable

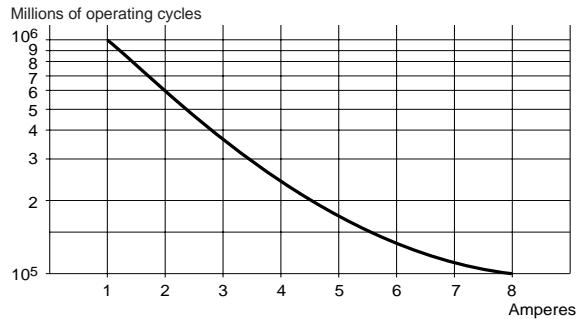
## Output relay characteristics

<b>Mechanical durability</b>	In millions of operating cycles		30
<b>Minimum switching capacity</b>	Resistive circuit		17 V and 10 mA
<b>Galvanic separation between input and measurement circuits</b>			All products

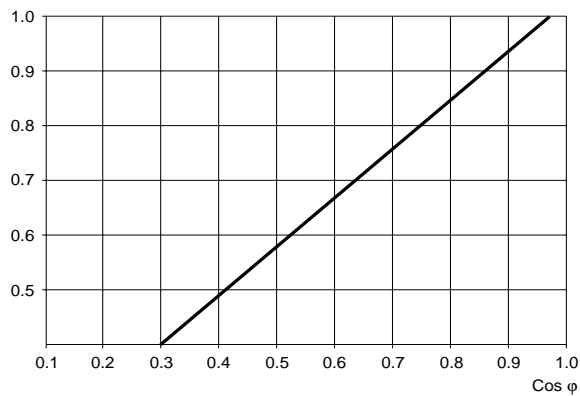
## Output characteristics

### Load on a.c. supply

Electrical durability of contacts, in millions of operating cycles  
220 V 50 Hz AC-1, 360 operating cycles/hour

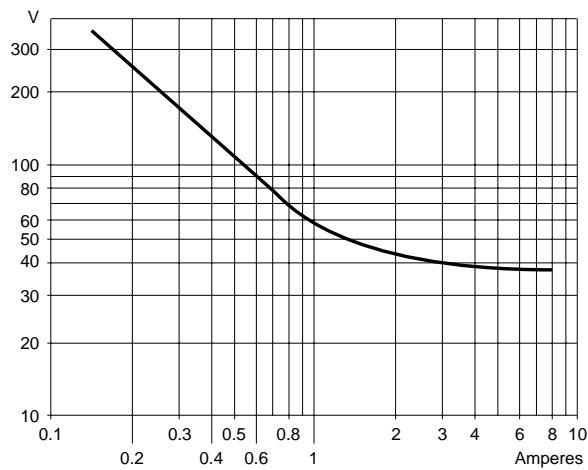


Reduction factor K for inductive loads (to be applied to the values obtained above)

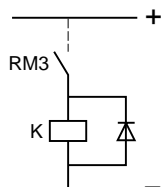


### Load on d.c. supply

Load limit curve (resistive load)



**Note:** When used with a d.c. contactor or relay, it is recommend that a freewheel diode be connected in parallel to the coil.



# RM3 Specialty Relays

## RM3JA2 Current Measurement Relays

### Operating Principles



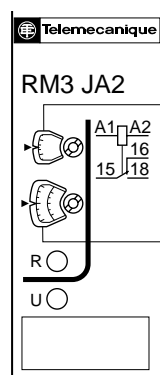
RM3JA2

This device is used anywhere it is important to detect when a preset a.c. or d.c. current threshold is exceeded. This relay can be used to monitor currents between 3mA and 1A. Some examples of applications for this relay are:

- To detect whether a conveyor is loaded or not.
- To detect a load on a pump.
- To detect a fan belt breaking.
- To monitor loading of single phase motors.
- To monitor heating and lighting circuits.

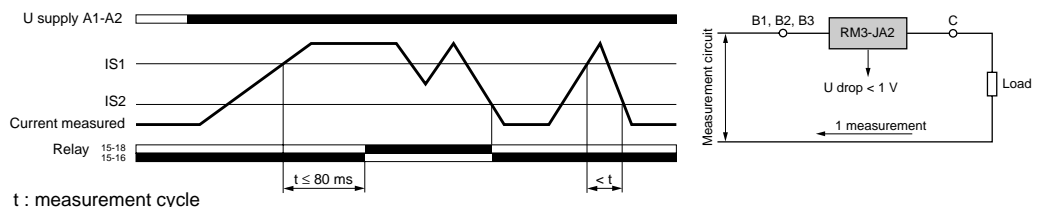
### Operating principles

- Apply the appropriate supply voltage (U supply) to terminals A1 and A2. This supplies power to the electronics inside this device.
- The current to be monitored is connected to terminal B1 or B2 or B3 (depending on current to be monitored) and terminal C.
- The output relay terminal (15-common, 16-normally close contact, 18-normally open contact) is used to signal that the current is or is not above the preset current threshold setting.
- The current threshold setting (IS1)(refer to the diagrams below) is set to the current above which it is desired to have the output relays change state.
- The hysteresis needs to be set. Hysteresis is the difference between the current threshold setting and the dropout current setting (IS2) of the output relay. It is expressed as a percentage:  $h = (IS1 - IS2)/IS1$



- 1 Hysteresis setting, 5 to 30%
  - 2 Current threshold setting (IS1)
- If the current to be monitored is connected to:
- B1 and C = Use the white scale times 0.001 (3 to 30mA)
  - B2 and C = Use the yellow scale times 0.001 (10 to 100mA)
  - B3 and C = Use the yellow scale times 0.01 (0.1 to 1A)
- R** The yellow LED labeled with an R indicates that the output contacts have been energized when it is illuminated.
- U** The green LED labeled with a U (Voltage) indicates that supply voltage is present to the RM3 relay when illuminated.

### Functional diagram

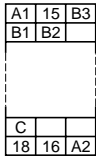
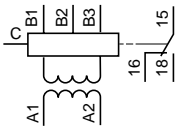


- If the supply voltage (U supply) is not applied to terminals A1 and A2, the output relays will be in its deenergized state (contact 15-16 will be closed and contact 15-18 will be open).
- When supply voltage is applied to terminal A1 and A2, the output relay will not change state until the current has exceeded the current threshold setting (IS1) and the current remains above the current threshold setting (IS1) level for more than the measuring cycle of  $\leq 80$  milliseconds.
- After the output relay has changed state, it will remain energized unless the current falls below the dropout current setting (current threshold setting minus the hysteresis) or supply voltage is lost from terminals A1 or A2 or the measured current exceeds the upper limits of the RM3 relay, which results in damage to the RM3 relay.
- The measure range of this relay can be extended by:
  - Using a current transformer and connecting the secondary to the terminals on the RM3 relay.
  - Connecting a resistor in parallel with the measuring input (see the next page for an example).





#### Wiring

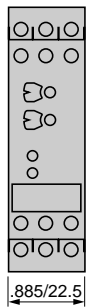


**A1-A2** Supply voltage  
**B1, B2, B3, C** Currents to be measured (see table to the right)  
**15-18** Form C contact of output relay  
**15-16**

Connection and current values to be measured

RM3JA211	Connection	Current values
	B1-C	3 to 30 mA
	B2-C	10 to 100 mA
	B3-C	0.1 to 1 A

#### Approximate dimensions



Dimensions Inches  
MM

#### Setup information

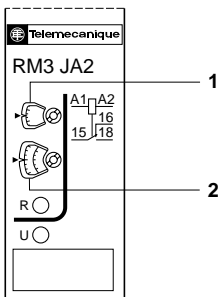
• Setup example is based on the following information :

- Overcurrent threshold to be measured is 0.8A.
- Dropout current threshold is 0.6 A.
- The supply voltage is 120 Vac

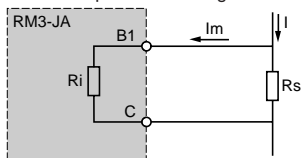
- Using page 8, an **RM3JA211FG7** relay would be selected because of the 120 Vac supply voltage and it has a measurement range of 3mA to 1A.
- Wire the **RM3JA211FG7** relay as explained under operating principles on the previous page.
- Set the current threshold potentiometer (2) to 80 on the yellow scale. Current is being measured on terminals B3 and C, which means you use the yellow scale times 0.01 (80x0.01=0.8A).
- Set the hysteresis potentiometer to 25

$$h = (IS1-IS2)/IS1$$

$$(0.8-0.6)/0.8=0.25 \text{ or } 25\%$$



• Example of extending 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 energization 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 the threshold setting range  
 $I$  Current threshold to be measured

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

**Application :** use of relay **RM3JA211\*\*\*** (10 to 100 mA). Connection B2-C to measure a threshold of 1 A, knowing that  $Ri = 10 \Omega$  for this rating and that  $Im = 100 \text{ mA}$

The value Rs will be :  $\frac{10}{(2 \times 1/0.1) - 1} = 0.526 \Omega$

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

Select a resistor Rs capable of dissipating at least twice the calculated value, i.e. 1 W for this example, in order to limit the temperature rise.



# RM3 Specialty Relays

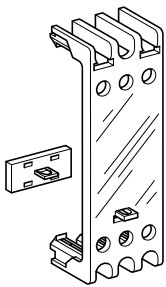
## RM3JA2 Current Measurement Relays

### Ordering Information



RM3JA2

Current to be measured depending on connection ac or dc	Control Circuit Voltage 50/60 Hz	Catalog Number	Approximate Weight lb. / (kg)
3 to 30 mA	24	<b>RM3JA211B7</b>	0.39/(0.175)
10 to 100 mA	42-48	<b>RM3JA211DE7</b>	0.39/(0.175)
0.1 to 1 A	110-130	<b>RM3JA211FG7</b>	0.39/(0.175)
	220-240	<b>RM3JA211MU7</b>	0.39/(0.175)



LA9RE02

### Accessories (to be ordered separately)


Description	Catalog Number	Approximate Weight lb. / (kg)
Sealing cover	<b>LA9RE02</b>	0.01/(0.003)
Replacement Marking Tab	<b>LA9D92</b>	0.01/(0.001)



## Control circuit characteristics

Rated supply voltage (Un)	Vac 50/60 Hz	V	24	42 to 48	110 to 130	220 to 240
Average consumption at Un	Vac	VA	2.1	2.9	2.4	3.2

## Output relay and operating characteristics

Number of C/O (Form C) contacts			1
Output relay state			Energized when current threshold exceeded
Rated operational voltage (switching)	IEC	V	250
	UL	V	300
Conventional thermal current	IEC	A	4
	UL	A	5
Rated breaking capacity	AC-15, 220 V NEMA	A	1.5 B300
Time delay			None
Switching threshold drift	Depending on permissible ambient temperature		≤ 0.06 % per degree centigrade
	Within the supply voltage range (85% to 110% of Un)		≤ 0.5 %
Hysteresis	Adjustable		5 to 30 % of the current threshold setting
Measuring cycle		ms	≤ 80
Operating status indication	Green LED on		Supply Voltage (Un) is present to the relay.
	Yellow LED on		Relay energized (current threshold exceeded)

## Measuring input characteristics

Internal input resistance and permissible overload depending on the current measurement ranges	Measurement range Vac 50-60 Hz and Vdc	Internal input resistance Ri	Permissible continuous overload	Permissible overload for t ≤ 3 s (Not repetitive)
	3 to 30 mA 10 to 100 mA 0.1 to 1 A	33 Ω 10 Ω 1 Ω	50 mA 150 mA 1.5 A	200 mA 0.5 A 5 A

# RM3 Specialty Relays

## RM3JA1 Current Measurement Relays

### Operating Principles



RM3JA1

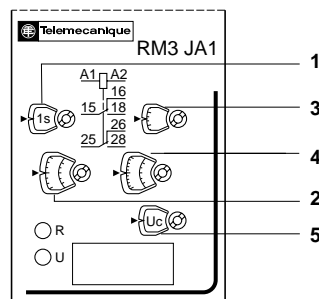
This device is designed to detect when a preset current threshold is exceeded, on a.c. or d.c. supply. The **RM3JA1••MW** relay can monitor overcurrent or undercurrent. All the other relays can only monitor overcurrent. These relays can be used to monitor currents between 3 mA to 15 A.

Some examples of applications for these relays are:

- To detect whether a conveyor is loaded or not
- To detect a load on a pump
- To detect a fan belt breaking
- To monitor the loading of a single phase motor
- To monitor heating and lighting loads

### Operating principles

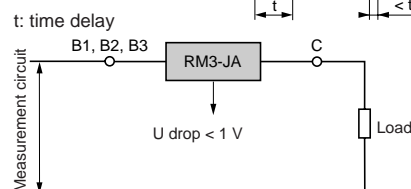
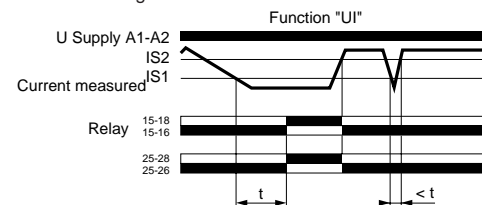
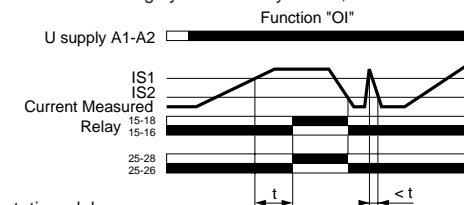
- Apply the appropriate supply voltage (U Supply) to terminals A1 and A2. This supplies power to the electronics inside the device.
- The current to be monitored is connected to terminal B1 or B2 or B3, depending on current to be monitored, and terminal C.
- The output relay terminals (15 and 25 -Common, 16 and 26 -Normally closed contact, and 18 and 28- Normally open contact) are used to signal that the current is or is not above the preset current threshold setting.
- The current threshold setting (IS1) (refer to the diagram below) is set to the current above which it is desired to have the output relays change state.
- The hysteresis needs to be set. Hysteresis is the difference between the current threshold setting and the dropout current setting (IS2) of the output relays. It is expressed as a percentage:  $h = (IS1-IS2)/IS1$ . Hysteresis is adjustable between 5 and 30%.



- 1 Time delay range selector switch (0.05 to 1 sec. and 1.5 to 30 sec.).
  - 2 Time delay setting.
  - 3 Hysteresis setting 5 to 30%.
  - 4 Current threshold setting (IS1).  
If the current to be monitored is connected to:
    - B1 and C = Use the yellow scale times 0.1
    - B2 and C = Use the white scale times 1.0
    - B3 and C = Use the yellow scale times 1.0
  - 5 Undercurrent (UC) or Overcurrent (OC) selector switch.  
This is only available on the **RM3JA1••MW** relay.
- R** The yellow LED labeled with an R indicates that the output contacts have been energized when it is illuminated.
- U** The green LED labeled with a U (voltage) indicates that supply voltage is present to the RM3 relay when illuminated.

### Functional diagram

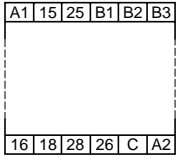
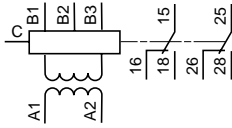
- If the supply voltage (U supply) is not applied to terminals A1 and A2, the output relays will be in the de-energized state (Contacts 15-16 and 25-26 will be closed and contacts 15-18 and 25-28 will be open).
- If the **RM3JA1••MW** set to OC or any of the other **RM3JA1** relays monitors a current greater than the threshold setting (IS1), the output relay will energize with or without time delay, depending on the relay chosen. When the current returns to a value IS2 below the threshold, depending on the hysteresis setting, the relay is instantaneously de-energized.
- If the **RM3JA1••MW** relay set to UC monitors a current less than the threshold setting IS1, the output relay will energize with or without time delay, depending on the relay chosen. When the current returns to a value IS2 above the threshold, depending on the hysteresis setting, the relay is instantaneously de-energized.
- A measuring cycle lasts only 80 ms, which allows rapid detection of changes in current.



**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 RM3, or by means of a resistor connected in parallel with the current being measured (see the next page for an example).



#### Wiring

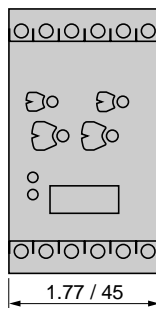


<b>A1-A2</b>	Supply voltage
<b>B1, B2, B3, C</b>	Currents to be measured (see table to the right)
<b>15-18</b>	1 <sup>st</sup> Form C contact of output relay
<b>15-16</b>	1 <sup>st</sup> Form C contact of output relay
<b>25-28</b>	2 <sup>nd</sup> Form C contact of output relay
<b>25-26</b>	2 <sup>nd</sup> Form C contact of output relay

Connection and current values to be measured according to the type of **RM3JA1**

RM3JA1 Type	Connection	Current Values
<b>RM3JA1•1</b>	B1-C	3 to 30 mA
	B2-C	10 to 100 mA
	B3-C	0.1 to 1 A
<b>RM3JA1•2</b>	B1-C	0.3 to 1.5 A
	B2-C	1 to 5 A
	B3-C	3 to 15 A

#### Approximate dimensions

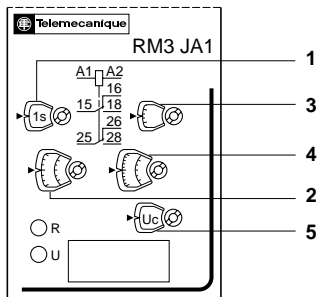


Dimensions Inches  
MM

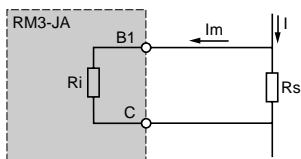
#### Setup information

- Setup example of overcurrent based on the following information:
  - Overcurrent threshold to be measured is 13 amperes
  - Output relay time delay : 5 sec
  - Reset current threshold : 11 A
  - Supply voltage : 120 Vac 60 Hz

- Using page 12, an **RM3JA112MW** could be selected because it will work on 120 Vac 60 Hz, it has a range from 0.3 to 15 Amperes, and it has an adjustable time delay.
- Wire the relay as explained under operating principles on the previous page.
- To setup the relay:
  - Place the function selector **5** on Oc.
  - Place the timing range selector **1** on 30 s.
  - Set the time delay potentiometer **2** to 5 s on the yellow scale.
  - Set the current threshold setting potentiometer **4** to 13 on the yellow scale.
  - Set the hysteresis **3** to 15.4 % on the yellow scale.  
 $(13 - 11)/13 = 2/13 = .154 = 15.4 \%$



- Extending 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 energization threshold will be towards the middle of the setting potentiometer range if the value of RS is in the region of :  $R_s = \frac{R_i}{(2I/I_m) - 1}$

- where: **Ri** Internal resistance of input B1-C
- Im** Maximum value of the threshold setting range
- I** Current threshold to be measured

Power dissipated by Rs :  $P = R_s (I - I_m/2)^2$

- **Application:** use of relay **RM3JA111FG7** (10 to 100 mA). Connection B2-C to measure a threshold of 1 A, knowing that Ri = 10 W for this rating and that Im = 100 mA

The value of Rs will be :  $\frac{10}{(2 \times 1/0.1) - 1} = 0.526 \Omega$

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

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.



# RM3 Specialty Relays

## RM3JA1 Current Measurement Relays

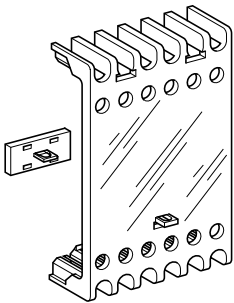
### Ordering Information



RM3JA1

Time delay	Current to be measured depending on connection Vac or Vdc	Control Circuit Voltage 50/60 Hz	Catalog Number	Weight lb./ (kg)	
Adjustable 0.05 to 30 s	3 to 30 mA	24 to 240 Vac or 24 to 240 Vdc	<b>RM3JA111MW</b>	0.65/(0.295)	
	10 to 100 mA	110 to 130 Vac	<b>RM3JA111FG7</b>	0.65/(0.295)	
	0.1 to 1 A	220 to 240 Vac	<b>RM3JA111MU7</b>	0.65/(0.295)	
		380 to 415 Vac	<b>RM3JA111QN7</b>	0.65/(0.295)	
	None	0.3 to 1.5 A	24 to 240 Vac or 24 to 240 Vdc	<b>RM3JA112MW</b>	0.65/(0.295)
			110 to 130 Vac	<b>RM3JA112FG7</b>	0.65/(0.295)
1 to 5 A		220 to 240 Vac	<b>RM3JA112MU7</b>	0.65/(0.295)	
		380 to 415 Vac	<b>RM3JA112QN7</b>	0.65/(0.295)	
None	3 to 30 mA	24 to 240 Vac or 24 to 240 Vdc	<b>RM3JA101MW</b>	0.65/(0.295)	
		110 to 130 Vac	<b>RM3JA101FG7</b>	0.65/(0.295)	
	10 to 100 mA	220 to 240 Vac	<b>RM3JA101MU7</b>	0.65/(0.295)	
		380 to 415 Vac	<b>RM3JA101QN7</b>	0.65/(0.295)	
	None	0.3 to 1.5 A	24 to 240 Vac or 24 to 240 Vdc	<b>RM3JA102MW</b>	0.65/(0.295)
			110 to 130 Vac	<b>RM3JA102FG7</b>	0.65/(0.295)
1 to 5 A		220 to 240 Vac	<b>RM3JA102MU7</b>	0.65/(0.295)	
		380 to 415 Vac	<b>RM3JA102QN7</b>	0.65/(0.295)	

### Accessories (to be ordered separately)



LA9RM301


Description	Catalog Number	Weight lb./ (kg)
Sealing cover	<b>LA9RM301</b>	0.01/(0.005)
Replacement Marking Tab	<b>LA9D92</b>	0.01/(0.001)



### Control circuit characteristics

Rated supply voltage (Un)	Vac 50/60 Hz	<b>V</b>	24 to 240	110 to 130	220 to 240	380 to 415
	Vdc	<b>V</b>	24 to 240	–	–	–
Average consumption at Un	Vac	<b>VA</b>	2.2 to 6	4.8	3.5	4
	Vdc	<b>W</b>	2	–	–	–

### Output relay and operating characteristics

Number of C/O (Form C) contacts			2
Output relay state			Energized when current threshold exceeded
Rated operational voltage (switching)	IEC	<b>V</b>	400
	UL	<b>V</b>	300
Conventional thermal current	IEC	<b>A</b>	5
	UL	<b>A</b>	5
Rated breaking capacity	AC-15		230 V-3 A, 400 V-2 A
	NEMA		B300
Time delay	Adjustable on <b>RM3JA11</b>	<b>s</b>	0.05 to 30
Switching threshold drift	Depending on permissible ambient temperature		≤ 0.06 % per degree centigrade
	Within the supply voltage range (85% to 110% Un)		≤ 0.5 %
Time delay drift	Within the supply voltage range (85% to 110% Un)		≤ 0.5 %
	Depending on temperature		≤ 0.06 % per degree centigrade
Hysteresis	Adjustable		5 to 30 % of the current threshold setting
Measuring cycle		<b>ms</b>	≤ 80
Operating status indication	Green LED on		Supply Voltage (Un) is present to the relay.
	Yellow LED on		Relay energized (current threshold exceeded)

### Measuring input characteristics

Internal input resistance and permissible overload depending on the current measurement ranges	Measurement range Vac 50-60 Hz and Vdc	Internal input resistance Ri	Permissible continuous overload	Permissible overload for t ≤ 3 s
	3 to 30 mA	33 Ω	50 mA	200 mA
	10 to 100 mA	10 Ω	150 mA	0.5 A
	0.1 to 1 A	1 Ω	1.5 A	5 A
	0.3 to 1.5 A	0.06 Ω	2 A	10 A
	1 to 5 A	0.02 Ω	7 A	15 A
	3 to 15 A	0.006 Ω	20 A	100 A

# RM3 Specialty Relays

## RM3UA2 Voltage Measurement Relays

### Operating Principles



RM3UA2

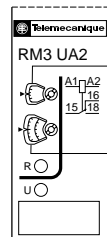
This device is designed to detect when a preset voltage threshold is exceeded, on a.c. or d.c. Monitoring is on overvoltage, within a measurement range of 50 mV to 500 V.

**Some examples of applications for these relays are:**

- d.c. motor overspeed control,
- battery monitoring,
- monitoring of a.c. or d.c. supplies.

### Operating principles

- Apply the appropriate supply voltage (U Supply) to terminals A1 and A2. This supplies power to the electronics inside this device.
- The voltage to be monitored is connected to terminals B1 or B2 or B3 (Depending on the voltage to be monitored.) and C.
- The output relay terminals (15 - Common, 16 - Normally closed contact, 18 - Normally open contact) is used to signal that the voltage is or is not above the preset voltage threshold setting.
- The voltage threshold setting (US1) (refer to the diagram below) is set to the voltage above which it is desired to have the output relays change state.
- The hysteresis needs to be set. The hysteresis is the difference between the voltage threshold setting and the dropout voltage setting (US2) of the output relays. It is expressed as a percentage:  $h = (US1/US2)/US1$ . Hysteresis is adjustable between 5 and 30%.

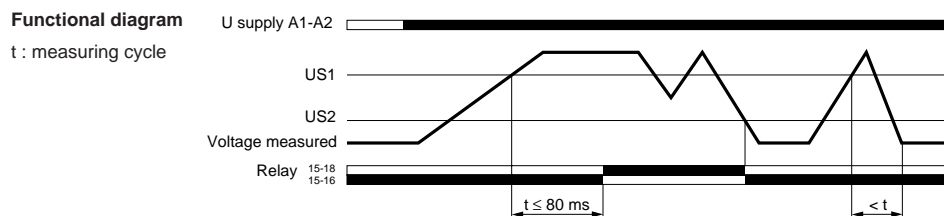


- 1 Hysteresis setting 5 to 30%.
- 2 Voltage threshold setting (US1).

**R** The yellow LED labeled with an R indicates that the output contact has been energized when it is illuminated.  
**U** The green LED labeled with a U (Voltage) Indicates that supply voltage is present to the RM3 relay when illuminated.

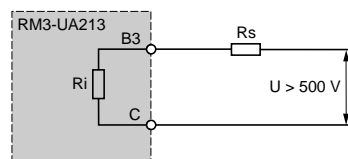
### Functional diagram

- If the supply voltage is not applied to terminals A1 and A2, the output relays will be in the deenergized state (Contacts 15-16 will be closed and contacts 15-18 will be open).
- The voltage to be monitored is connected to terminals B1, B2 or B3 and C.
- When supply voltage is applied to terminal A1 and A2, the output relay will not change state until the voltage has exceeded the voltage threshold setting (US1) and the voltage remains above the voltage threshold setting (US1) level for more than the measuring cycle of  $\leq 80$  milliseconds.
- After the output relay has changed state, it will remain energized unless the voltage falls below the dropout voltage setting (voltage threshold setting minus the hysteresis) or the supply voltage is lost from terminals A1 and A2 or the measured voltage exceeds the upper limits of the RM3 relay, which results in damage to the RM3 relay.



The measurement ranges can be extended beyond 500 V by adding a resistor on model **RM3UA213**.

**Voltage a or c**



Simply connect an additional resistor ( $R_s$ ) in series with measuring input B3.

If the value of  $R_s$  is in the region of :

$$R_s = R_i \left( \frac{2U}{U_m} \right) - 1$$

where

- R<sub>i</sub>** : internal resistance seen from input B3/C
- U<sub>m</sub>** : maximum value of the threshold setting range
- U** : voltage threshold to be measured

The relay energization threshold will be towards the middle of the threshold setting potentiometer travel.

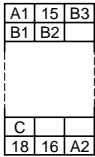
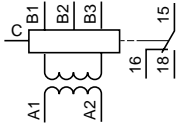
In general, the power consumed by the resistor does not exceed 0.5 W.

Note :The measurement range on Vac supply can be extended by means of a voltage transformer, the secondary of which is connected to the measuring terminals of the corresponding RM3.





#### Wiring

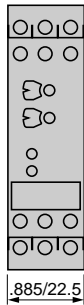
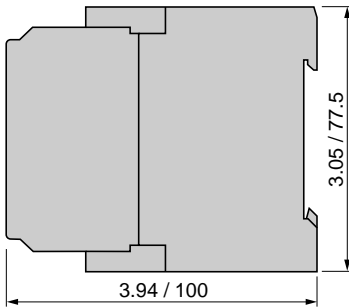


**A1-A2** Supply voltage  
**B1, B2** Voltages to be measured (see table to the right)  
**B3, C** Form C contact of output relay  
**15-18**  
**15-16**

Connection and voltage values to be measured according to the type of **RM3UA2**

<b>RM3UA211</b>	B1-C	50 to 500 mV
	B2-C	0.3 to 3 V
	B3-C	0.5 to 5 V
<b>RM3UA212</b>	B1-C	1 to 10 V
	B2-C	5 to 50 V
	B3-C	10 to 100 V
<b>RM3UA213</b>	B2-C	30 to 300 V
	B3-C	50 to 500 V

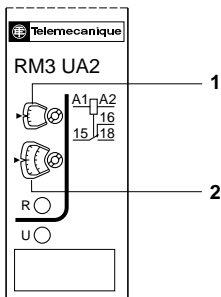
#### Approximate dimensions



Dimensions Inches  
MM

#### Setup information

- Example of overvoltage to be measured:
  - Overvoltage threshold to be measured 460 V
  - Reset voltage threshold 410 V
  - Supply voltage 120 V ac 50/60 Hz



- Product selected is a **RM3UA213FG7** from page 16.
  - Voltage measurement range 30 to 500 V
  - Connection of voltage to be measured B3-C (50 to 500 V)
- Measuring principle :
  - Set the voltage threshold setting potentiometer **2** to 46  
(46 x 10 = 460).
  - Set the hysteresis **1** to 10.8 %  
(460-410) / 460 = .108 = 10.8%

# RM3 Specialty Relays

## RM3UA2 Voltage Measurement Relays

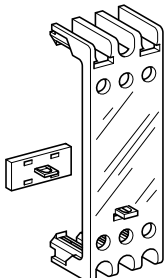
### Ordering Information



RM3UA2

Voltage to be measured depending on connection Vac or Vdc	Control Circuit Voltage 50/60 Hz	Catalog Number	Weight lb./ (kg)
50 to 500 mV	24	<b>RM3UA211B7</b>	0.43/(0.195)
0.3 to 3 V	42 to 48	<b>RM3UA211DE7</b>	0.43/(0.195)
0.5 to 5 V	110 to 130	<b>RM3UA211FG7</b>	0.43/(0.195)
	220 to 240	<b>RM3UA211MU7</b>	0.43/(0.195)
1 to 10 V	24	<b>RM3UA212B7</b>	0.43/(0.195)
5 to 50 V	42 to 48	<b>RM3UA212DE7</b>	0.43/(0.195)
10 to 100 V	110 to 130	<b>RM3UA212FG7</b>	0.43/(0.195)
	220 to 240	<b>RM3UA212MU7</b>	0.43/(0.195)
30 to 300 V	24	<b>RM3UA213B7</b>	0.43/(0.195)
50 to 500 V	42 to 48	<b>RM3UA213DE7</b>	0.43/(0.195)
	110 to 130	<b>RM3UA213FG7</b>	0.43/(0.195)
	220 to 240	<b>RM3UA213MU7</b>	0.43/(0.195)

### Accessories (to be ordered separately)



LA9RE02


Description	Catalog	Weight lb. / (kg)
Sealing cover	<b>LA9RE02</b>	0.01/(0.003)
Replacement Marking Tab	<b>LA9D92</b>	0.01/(0.001)



### Control circuit characteristics

<b>Rated supply voltage (Un)</b>	Vac 50-60 Hz	<b>V</b>	24	42 to 48	110 to 130	220 to 240
<b>Average consumption at Un</b>	Vac	<b>VA</b>	2.1	2.9	2.4	3.2

### Output relay and operating characteristics

<b>Number of C/O (Form C) contacts</b>			1
<b>Output relay state</b>			Energized when voltage threshold exceeded
<b>Rated operational voltage</b> (switching)	IEC	<b>V</b>	250
	UL	<b>V</b>	300
<b>Conventional thermal current</b>	IEC	<b>A</b>	4
	UL	<b>A</b>	5
<b>Rated breaking capacity</b>	AC-15, 220 V NEMA	<b>A</b>	1.5 B300
<b>Time delay</b>			None
<b>Switching threshold drift</b>	Depending on permissible ambient temperature		≤ 0.06 % per degree centigrade
	Within the supply voltage range (85% to 110% of Un)		≤ 0.5 %
<b>Hysteresis</b>	Adjustable		5 to 30 % of the voltage threshold setting
<b>Measuring cycle</b>		<b>ms</b>	≤ 80
<b>Operating status indication</b>	Green LED on		Supply Voltage (Un) is present to the relay.
	Yellow LED on		Relay energized (voltage threshold exceeded)

### Measuring input characteristics

<b>Internal input resistance and permissible overload depending on the voltage measurement ranges</b>	Measurement range Vac 50-60 Hz and Vdc	Internal input resistance Ri	Permissible continuous overload	Permissible overload for t ≤ 1 s
	50 to 500 mV	7.7 kΩ	20 V	25 V
	0.3 to 3 V	46.5 kΩ	60 V	80 V
	0.5 to 5 V	77.5 kΩ	80 V	100 V
	1 to 10 V	19 kΩ	90 V	100 V
	5 to 50 V	95 kΩ	150 V	200 V
	10 to 100 V	190 kΩ	300 V	400 V
	30 to 300 V	570 kΩ	400 V	500 V
	50 to 500 V	950 kΩ	550 V	550 V

# RM3 Specialty Relays

## RM3UA1 Voltage Measurement Relays

### Operating Principles



RM3UA1

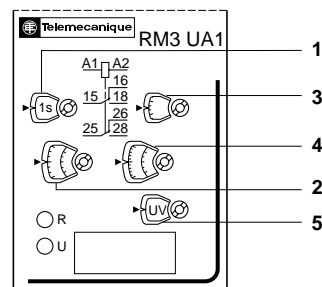
This device is designed to detect when a preset voltage threshold is exceeded, on a.c. or d.c. supply. Monitoring is on overvoltage or undervoltage, within a measurement range of 50 mV to 500 V.

**Applications :**

- d.c. motor overspeed control,
- battery monitoring,
- monitoring of a.c. or d.c. supplies.

### Operating principles

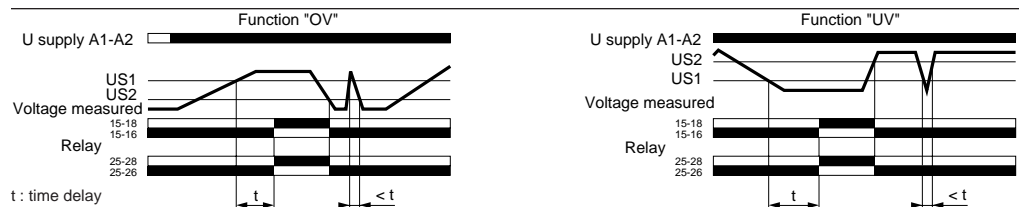
- Apply the appropriate supply voltage (U Supply) to terminals A1 and A2. This supplies power to the electronics inside this device.
- The voltage to be monitored is connected to terminals B1 or B2 or B3 (Depending on the voltage to be monitored.) and C.
- The output relay terminals (15 & 25 - Commons, 16 & 26 - Normally closed contacts, 18 & 28 - Normally open contacts) are used to signal that the voltage is or is not above the preset voltage threshold setting.
- **Relay set for overvoltage detection (OV) :**  
If the voltage is greater than the threshold setting US1, the output relay is energized with or without time delay. When the voltage returns to a value US2 below the threshold, depending on the hysteresis setting, the relay is instantaneously de-energized.
- **Relay set for undervoltage detection (UV) :**  
If the voltage is less than the threshold setting US1, the output relay is energized with or without time delay. When the voltage returns to a value US2 above the threshold, depending on the hysteresis setting, the relay is de-energized.
- The hysteresis needs to be set. The hysteresis is the difference between the voltage threshold setting and the dropout voltage setting (US2) of the output relays. It is expressed as a percentage:  $h = (US1/US2)/US1$ . Hysteresis is adjustable between 5 and 30 %.
- A measuring cycle lasts only 80 ms, which allows rapid detection of changes in voltage.



- 1 Time delay range selector switch (0.05 to 1 s or 1.5 to 30 s).
  - 2 Time delay setting.
  - 3 Hysteresis setting 5 to 30 % (1).
  - 4 Voltage threshold setting.
  - 5 Undervoltage (UV) or overvoltage (OV) setting selector.
- R** The yellow LED labeled with an R indicates that the output contacts have been energized when it is illuminated.
- U** The green LED labeled with a U (Voltage) indicates that the supply voltage is present to the RM3 relay when illuminated.

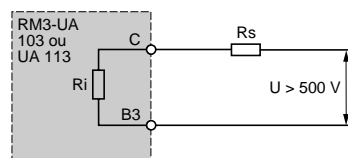
(1) Value of the voltage differential between energization and de-energization of the output relay (% of the voltage threshold to be measured).

### Functional diagram



The measurement ranges can be extended beyond 500 V by adding a resistor on models **RM3UA103** and **RM3UA113**.

**Voltage a or c**



Simply connect an additional resistor ( $R_s$ ) in series with the measuring input B3 or C. If the value of  $R_s$  is in the region of :

$$R_s = R_i \left( \frac{2U}{U_m} \right) - 1$$

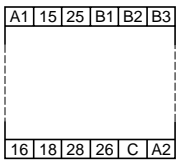
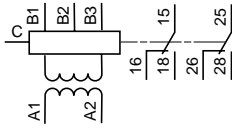
where  $R_i$  : internal resistance seen from input B3/C  
 $U_m$  : maximum value of threshold setting range  
 $U$  : voltage threshold to be measured

The relay energization threshold will be towards the middle of the threshold setting potentiometer travel. In general, the power consumed by the resistor does not exceed 0.5 W

**Note** :The measurement range on Vac supply can be extended by means of a voltage transformer, the secondary of which is connected to the measuring terminals of the corresponding RM3.



#### Wiring



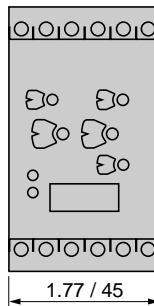
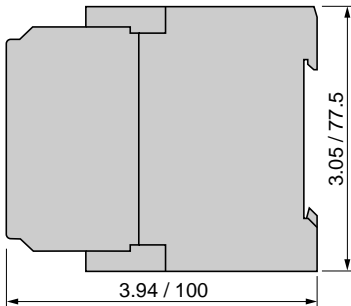
- A1-A2** Supply voltage
- B1, B2, B3, C** Voltages to be measured (see table to the right)
- 15-18** 1<sup>st</sup> C/O (Form C) contact of output relay
- 15-16** 1<sup>st</sup> C/O (Form C) contact of output relay
- 25-28** 2<sup>nd</sup> C/O (Form C) contact of output relay
- 25-26** 2<sup>nd</sup> C/O (Form C) contact of output relay

Connection and voltage values to be measured according to the type of **RM3UA1**

RM3UA1 Type	Measurement Points	Voltage Range
<b>RM3UA1•1</b>	B1-C	50 to 500 mV
	B2-C	0.3 to 3 V
	B3-C	0.5 to 5 V
<b>RM3UA1•2</b>	B1-C	1 to 10 V
	B2-C	5 to 50 V
	B3-C	10 to 100 V
<b>RM3UA1•3</b>	B2-C	30 to 300 V
	B3-C	50 to 500 V

#### Approximate dimensions

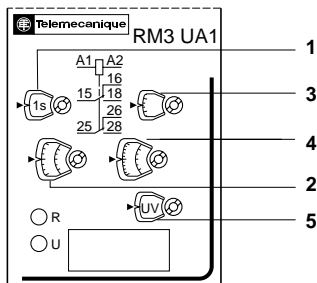
Dimensions Inches  
MM



#### Setup information

- Example of undervoltage to be measured :
  - Undervoltage threshold to be measured 24 Vdc
  - Output relay time delay 20 seconds
  - Reset voltage threshold 27 Vdc
  - Supply voltage 120 Vac 60 Hz

- Using page 20, an **RM3UA112FG7** would be selected because it will work on 120 Vac and has a range of 1 to 100 V and has an adjustable time delay of from 0.05 to 30 seconds.
- To set up the relay:
  - Place the function selector **5** on UV.
  - Place the timing range selector **1** on 30 s.
  - Set the potentiometer **2** to 20.
  - Set the voltage threshold setting potentiometer **4** to 24 (24 x 1 = 24). Voltage to be measured would be connected to terminals B2 and C.
  - Set the hysteresis **3** to 12.5 %  $(27 - 24) / 27 = .125 = 12.5\%$



# RM3 Specialty Relays

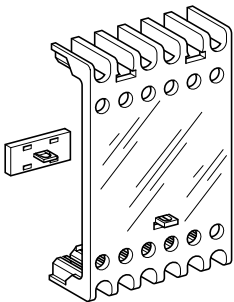
## RM3UA1 Voltage Measurement Relays

### Ordering Information



RM3UA1

Time delay	Voltage to be measured depending on connection	Supply Voltage (Vac 50/60 Hz.)	Catalog Number	Weight lb./ (kg)	
Adjustable 0.05 to 30	50 to 500 mV	24 to 240 Vac or Vdc	<b>RM3UA111MW</b>	.66/(0.300)	
	0.3 to 3 V	110 to 130 Vac	<b>RM3UA111FG7</b>	.66/(0.300)	
		220 to 240 Vac	<b>RM3UA111MU7</b>	.66/(0.330)	
		380 to 415 Vac	<b>RM3UA111QN7</b>	.66/(0.300)	
	1 to 10 V	24 to 240 Vac or Vdc	<b>RM3UA112MW</b>	.66/(0.300)	
		5 to 50 V	110 to 130 Vac	<b>RM3UA112FG7</b>	.66/(0.300)
		10 to 100 V	220 to 240 Vac	<b>RM3UA112MU7</b>	.66/(0.300)
	30 to 300 V	50 to 500 V	380 to 415 Vac	<b>RM3UA112QN7</b>	.66/(0.300)
			24 to 240 Vac or Vdc	<b>RM3UA113MW</b>	.66/(0.300)
			110 to 130 Vac	<b>RM3UA113FG7</b>	.66/(0.300)
	None	50 to 500 mV	220 to 240 Vac	<b>RM3UA113MU7</b>	.66/(0.300)
			380 to 415 Vac	<b>RM3UA113QN7</b>	.66/(0.300)
24 to 240 Vac or Vdc			<b>RM3UA101MW</b>	.66/(0.300)	
0.3 to 3 V		110 to 130 Vac	<b>RM3UA101FG7</b>	.66/(0.300)	
		220 to 240 Vac	<b>RM3UA101MU7</b>	.66/(0.300)	
		380 to 415 Vac	<b>RM3UA101QN7</b>	.66/(0.300)	
1 to 10 V		5 to 50 V	24 to 240 Vac or Vdc	<b>RM3UA102MW</b>	.66/(0.300)
			110 to 130 Vac	<b>RM3UA102FG7</b>	.66/(0.300)
			10 to 100 V	220 to 240 Vac	<b>RM3UA102MU7</b>
30 to 300 V		50 to 500 V	380 to 415 Vac	<b>RM3UA102QN7</b>	.66/(0.300)
			24 to 240 Vac or Vdc	<b>RM3UA103MW</b>	.66/(0.300)
			110 to 130 Vac	<b>RM3UA103FG7</b>	.66/(0.300)
None	50 to 500 mV	220 to 240 Vac	<b>RM3UA103MU7</b>	.66/(0.300)	
		380 to 415 Vac	<b>RM3UA103QN7</b>	.66/(0.300)	



LA9RM301

### Accessories (to be ordered separately)


Description	Catalog Number	Weight lb./ (kg)
Sealing cover	<b>LA9RM301</b>	0.01/(0.005)
Replacement Marking Tab	<b>LA9D92</b>	0.01/(0.001)



## Control circuit characteristics

Rated supply voltage (Un)	Vac 50-60 Hz	<b>V</b>	24 to 240	110 to 130	220 to 240	380 to 415
	Vdc	<b>V</b>	24 to 240	–	–	–
Average consumption at Un	Vac	<b>VA</b>	2.2 to 6	4.8	3.5	4
	Vdc	<b>W</b>	2	–	–	–

## Output relay and operating characteristics

Number of C/O (Form C) contacts			2
Rated operational voltage (switching)	IEC	<b>V</b>	400
	UL	<b>V</b>	300
Conventional thermal current	IEC	<b>A</b>	5
	UL	<b>A</b>	5
Rated breaking capacity	AC-15		230 V-3 A, 400 V-2 A
	NEMA		B300
Time delay on energization	<b>RM3UA11</b>	<b>sec.</b>	Adjustable from 0.05 to 30
	<b>RM3UA10</b>		None
Switching threshold drift	Depending on permissible ambient temperature		≤ 0.06 % per degree centigrade
	Within the supply voltage range (85 to 110% Un)		≤ 0.5 %
Time delay drift	Within the supply voltage range		≤ 0.5 %
	Depending on nominal operating temperature		≤ 0.06 % per degree centigrade
Output relay state			Energized when voltage threshold exceeded
Operating status indication	Green LED on		Supply Voltage (Un) is present to the relay.
	Yellow LED on		Relay energized (voltage threshold exceeded)
Hysteresis	Adjustable		5 to 30 % of the voltage threshold setting
Measuring cycle		<b>ms</b>	≤ 80

## Measuring input characteristics

Internal input resistance and permissible overload depending on the voltage measurement ranges	Measurement range Vac 50-60 Hz and Vdc	Internal input resistance Ri	Permissible continuous overload	Permissible overload for t ≤ 1 sec.
	50 to 500 mV	7.7 Ω	20 V	25 V
	0.3 to 3 V	46.5 Ω	60 V	80 V
	0.5 to 5 V	77.5 Ω	80 V	100 V
	1 to 10 V	19 Ω	90 V	100 V
	5 to 50 V	95 Ω	150 V	200 V
	10 to 100 V	190 Ω	300 V	400 V
	30 to 300 V	570 Ω	400 V	500 V
	50 to 500 V	950 Ω	550 V	550 V

# RM3 Specialty Relays RM3TG2 3-Phase Supply Relays Operating Principles



RM3TG2

This device monitors the presence and rotational direction of the phases in a 3-phase supply **under no-load condition**.

**Applications:**

- Connection of moving equipment :
  - site equipment (cranes, pumps, conveyors, etc.),
  - agricultural equipment,
  - refrigerated trucks.
- Protection of persons and equipment against the consequences of reverse running:
  - lifting, handling, elevators, escalators, etc.
- Control of sensitive 3-phase supplies.

## Operating principle

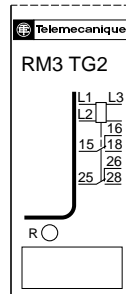
The voltage of the supply to be monitored, connected to terminals L1, L2, L3 of the relay, also provides its power supply.

In normal operation, the output relay is energized, the yellow LED is on. If a fault occurs - reversal in rotational direction of phases, failure of one or more phases - the relay is de-energized (or cannot energize at switch-on) and the yellow LED goes out.

This relay is specifically designed for control of supplies under **no-load** conditions.

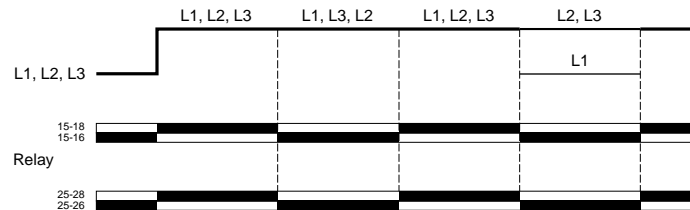
In the case of a supply under load, a return voltage can be registered by the RM3 in spite of a phase failure, thereby preventing detection of the true fault (phase failure detection threshold  $U < 60\text{ V}$ ).

For control of supplies under load, select an **RM3TR** or **TAR1**.



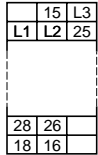
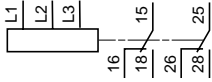
**R** The yellow LED labeled with an R indicates that the output contacts have been energized when it is illuminated.

## Functional diagram





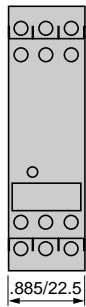
#### Wiring



<b>L1, L2, L3</b>	Supply voltage
<b>L1, L2, L3</b>	3-phase voltages to be controlled (see table to the right)
<b>15-18</b>	1 <sup>st</sup> C/O (Form C) contact of output relay
<b>15-16</b>	
<b>25-28</b>	2 <sup>nd</sup> C/O (Form C) contact of output relay
<b>25-26</b>	

Connection and voltage values to be controlled		
<b>RM3TG2</b>	L1-L2-L3	220 to 500 V (50-60 Hz)

#### Approximate dimensions



Dimensions **Inches**  
MM

For a voltage equal to or greater than 415 V, a minimum distance of 10 mm must be left between relays if several are mounted side by side.

# RM3 Specialty Relays

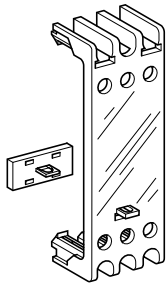
## RM3TG2 3 Phase Supply Relays

### Ordering Information



RM3TG2

Time delay	Control and supply voltage Vac 50-60 Hz	Catalog Number	Weight
<b>Seconds</b>	<b>Volts</b>		<b>lb./(kg)</b>
None	220 to 500	<b>RM3TG201MS7</b>	0.36/(0.165)



LA9RE02

### Accessories (to be ordered separately)


Description	Catalog Number	Weight lb./(kg)
Sealing cover	<b>LA9RE02</b>	0.01/(0.003)
Replacement Marking Tab	<b>LA9D92</b>	0.01/(0.001)



### Control circuit characteristics

<b>Rated supply voltage (Un)</b>	Vac 50-60 Hz	<b>V</b>	220 to 500
<b>Average consumption at Un</b>	Phases L1, L2 Vac	<b>VA</b>	2.2 to 12.5

### Output relay and operating characteristics

<b>Number of C/O (Form C) contacts</b>			2
<b>Output relay state</b>			Energized during fault free operation De-energized or unable to energize on detection of rotational direction fault or phase failure
<b>Rated operational voltage</b> (switching)	IEC	<b>V</b>	250
	UL	<b>V</b>	300
<b>Conventional thermal current</b>	IEC	<b>A</b>	4
	UL	<b>A</b>	5
<b>Rated breaking capacity</b>	AC-15, 220 V	<b>A</b>	1.5
	NEMA		B300
<b>Time delay</b>			None
<b>Operating status indication</b>	Yellow LED on		Relay energized

# RM3 Specialty Relays

## RM3TR1 3-Phase Supply Relays

### Operating Principles



RM3TR110

RM3TR111, TR113, TR115

TR112, TR114

This multifunction device is designed to monitor the presence and rotational direction of the phases in a three-phase supply, as well as overvoltage ( $U > U_n$ ) or undervoltage ( $U < U_n$ ).

#### Applications

- Connection of moving equipment:
  - site equipment (cranes, pumps, conveyors, etc.),
  - agricultural equipment,
  - refrigerated trucks.
- Protection of persons and equipment against the consequences of reverse running:
  - lifting, handling, elevators, escalators, etc.

### Operating principles

The control circuit supply voltage ( $U_{supply}$ ) is applied to terminals A1-A2.

Monitoring of the 3-phase supply ( $U_n$ ) is performed on terminals L1, L2, L3.

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



The output relay is de-energized and the yellow LED goes out if any of the following faults are detected:

#### • Overtoltage or undervoltage

If the voltage goes outside the range of  $U_n$ , the output relay is de-energized:



- **overtoltage**: the red LED  $> U$  illuminates,
- **undervoltage**: the red LED  $< U$  illuminates.

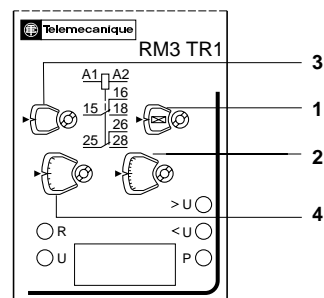
When the supply returns to its rated value, the relay is reenergized according to the hysteresis value (5 %) and the corresponding indicator goes out.

A selector switch allows selection of an adjustable 0.1 to 10 second time delay. With function , this delay will allow the relay to ignore transient "over" and "under" voltages that might occur. With function , all transients above and below are taken into account and re-energization of the relay is delayed.



#### • Phase failure or incorrect rotational direction of phases

The output relay is de-energized **without a time delay** in the event of a phase failure or incorrect rotational direction of phases, the red LED "P" illuminates.

The output relay is energized and the fault indicator goes out as soon as the 3-phase supply ( $U_n$ ) returns to normal, (function ) or after a preset time delay, (function ) .



1 Time delay function selector:

-  Fault detection delayed.
-  Fault detection extended.

2 Potentiometer for setting time delay, in seconds.

3 Potentiometer for setting overvoltage.

4 Potentiometer for setting undervoltage.

R Yellow LED : indicates output relay has been energized when illuminated.

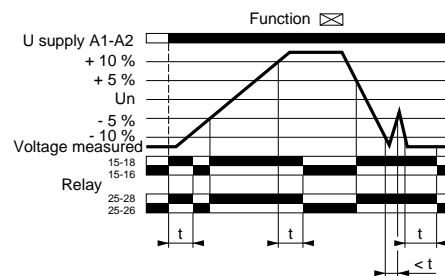
U Green LED : indicates that supply voltage ( $U_{supply}$ ) is present to the RM3 relay when illuminated.

>U Red LED : overvoltage fault exists.

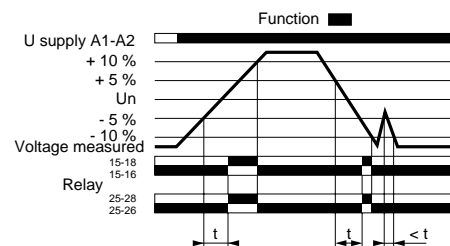
<U Red LED : undervoltage fault exists.

P Red LED : phase failure or incorrect rotational direction of phases exists.

### Functional diagram



RM3TR110  
TR112, TR114

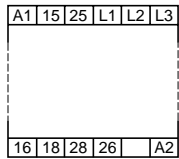
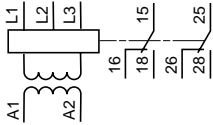


RM3TR111, TR113, TR115

1 Depending on the setting of overvoltage potentiometer 3 above.  
2 Depending on the setting of undervoltage potentiometer 4 above.



#### Wiring



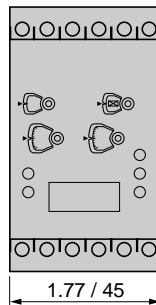
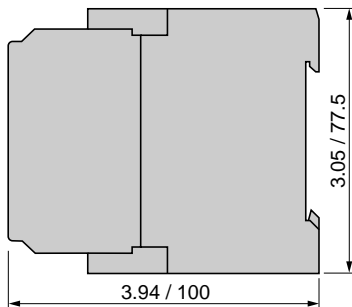
<b>A1-A2</b>	Supply voltage
<b>L1, L2, L3</b>	Supply to be monitored (see table to the right)
<b>15-18</b>	1 <sup>st</sup> C/O (Form C) contact of output relay
<b>15-16</b>	1 <sup>st</sup> C/O (Form C) contact of output relay
<b>25-28</b>	2 <sup>nd</sup> C/O (Form C) contact of output relay
<b>25-26</b>	2 <sup>nd</sup> C/O (Form C) contact of output relay

Connection and voltage values to be monitored according to the type of **RM3TR1**

RM3TR110	L1-L2-L3	220 V-50/60 Hz
RM3TR111	L1-L2-L3	220 V - 50 Hz
RM3TR112	L1-L2-L3	380 to 420 V-50/60 Hz
RM3TR113	L1-L2-L3	400 V - 50 Hz
RM3TR114	L1-L2-L3	430 to 500 V-50/60 Hz
RM3TR115	L1-L2-L3	500 V - 50 Hz

#### Approximate dimensions

Dimensions Inches  
MM



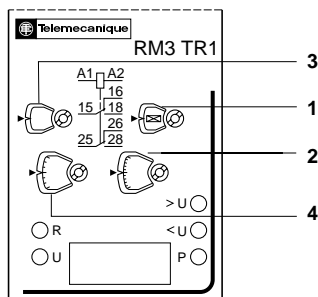
#### Setup information

If the supply voltage ( $U_n$ ) is coming from the 3-phase voltage to be monitored, connect A1 to L1, and A2 to L3. When this is done, some faults cannot be displayed: failure of phase L1 or L3 for example.

Example of undervoltage and overvoltage to be monitored :

- Nominal 3-phase voltage to be monitored 480 Vac 60 Hz
- Overvoltage threshold to be monitored : 500 Vac
- Undervoltage threshold to be monitored : 400 Vac
- Control circuit voltage : 480 Vac

- Using page 28, an **RM3TR114VS7** relay would be selected.
- Wire the **RM3TR114VS7** relay as explained under operating principles on the previous page.
- Connect the 3-phase voltage to be monitored to terminals L1, L2, L3.
- Adjust the overvoltage to be monitored to 500 V by means of potentiometer 3.
- Adjust the undervoltage to be monitored to 400 V by means of potentiometer 4.



# RM3 Specialty Relays

## RM3TR1 3-Phase Supply Relays

### Ordering Information



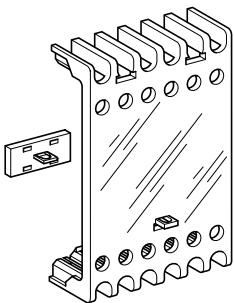
RM3TR1

### Adjustable voltage threshold relays

Adjustable time delay	Control voltage Vac 50-60 Hz	Voltage threshold to be monitored	Nominal voltage to be monitored	Catalog Number	Weight
Seconds	V	%	V		lb./(kg)
0.1 to 10	160 to 300	min 160 to 220 max 220 to 300	220-50/60 Hz	<b>RM3TR110GV7</b>	0.71/(0.320)
	300 to 500	min 300 to 380 max 420 to 500	380 to 420 50/60 Hz	<b>RM3TR112VS7</b>	0.71/(0.320)
	300 to 500	min 350 to 430 max 500 to 580	430 to 500 50/60 Hz	<b>RM3TR114VS7</b>	0.71/(0.320)

### Fixed voltage threshold relays

Adjustable time delay	Control voltage Vac 50-60 Hz	Voltage threshold to be monitored	Nominal voltage to be monitored	Catalog Number	Weight
Seconds	V	%	V		lb./(kg)
0.1 to 10	110 to 130	± 10	220 - 50 Hz	<b>RM3TR111FG7</b>	0.71/(0.320)
	220 to 240	± 10	220 - 50 Hz	<b>RM3TR111MU7</b>	0.71/(0.320)
	380 to 415	± 10	220 - 50 Hz	<b>RM3TR111QN7</b>	0.71/(0.320)
	110 to 130	± 10	400 - 50 Hz	<b>RM3TR113FG7</b>	0.71/(0.320)
	220 to 240	± 10	400 - 50 Hz	<b>RM3TR113MU7</b>	0.71/(0.320)
	380 to 415	± 10	400 - 50 Hz	<b>RM3TR113QN7</b>	0.71/(0.320)
	110 to 130	± 10	500 - 50 Hz	<b>RM3TR115FG7</b>	0.71/(0.320)
	220 to 240	± 10	500 - 50 Hz	<b>RM3TR115MU7</b>	0.71/(0.320)
	380 to 415	± 10	500 - 50 Hz	<b>RM3TR115QN7</b>	0.71/(0.320)



LA9RM301

### Accessories (to be ordered separately)


Description	Catalog Number	Weight lb./(kg)
Sealable cover (45mm Width)	<b>LA9RM301</b>	0.01/(0.005)
Replacement Marking Tab	<b>LA9D92</b>	0.01/(0.001)



### Control circuit characteristics

<b>Rated supply voltage (Un)</b>	Vac 50-60 Hz	<b>V</b>	110 to 130	220 to 240	160 to 300	380 to 415	300 to 50
<b>Average consumption at Un</b>	Vac	<b>VA</b>	2.7	2.8	3	3	3

### Output relay and operating characteristics

<b>Number of C/O (Form C) contacts</b>			2
<b>Output relay state</b>			De-energized on detection of overvoltage, undervoltage or on phase failure or rotational direction of phases fault
<b>Rated operational voltage (switching)</b>	IEC	<b>V</b>	400
	UL	<b>V</b>	300
<b>Conventional thermal current</b>	IEC	<b>A</b>	5
	UL	<b>A</b>	5
<b>Rated breaking capacity</b>	AC-15		230 V- 3A, 400 V-2 A
	NEMA		B300
<b>Time delay</b>	On overvoltage or undervoltage fault only	<b>sec.</b>	1 to 10
<b>Switching threshold drift</b>	Depending on permissible ambient temperature		≤ 0.06 % per degree centigrade
	Within the supply voltage range (85 to 110 % of Un)		≤ 0.5 %
<b>Time delay drift</b>	Within the supply voltage range (85 to 110% of Un)		≤ 0.5 %
	Depending on the rated operational temperature		≤ 0.06 % per degree centigrade
<b>Hysteresis</b>	Fixed		About 5 % of the de-energization threshold
<b>Measuring cycle</b>	Fixed	<b>ms</b>	≤ 80
<b>Operating status display</b>	<b>U</b> Green LED on		Supply Voltage (Un) is present to the relay.
	<b>R</b> Yellow LED on		Output relay is energized.
	<b>&gt; U</b> Red LED on		An overvoltage situation exists.
	<b>&lt; U</b> Red LED on		An undervoltage situation exists.
	<b>P</b> Red LED on		Incorrect rotational direction of phases or phase failure exists.

### Control input characteristics

<b>Nominal voltages to be monitored</b>	Vac 50 Hz	<b>V</b>	220, 400, 500
	Vac 50-60 Hz	<b>V</b>	220, 380 to 420, 430 to 500

# RM3 Specialty Relays

## RM3TA2 3-Phase Supply Relay

### Operating Principles



RM3TA2

This device detects:

- A phase imbalance (asymmetry fault) within an adjustable threshold from 5 to 15 % (reduction or increase in voltage of one phase in relation to the other two).
- Failure of one or more phases.
- A phase reversal (Rotational direction of phases fault).

**Applications:**

- Connection of moving equipment:
  - site equipment (cranes, pumps, conveyors, etc.),
  - agricultural equipment,
  - refrigerated trucks.
- Protection of motors against single-phase operation.
- Control of sensitive 3-phase supplies.

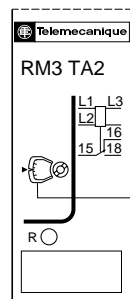
## Operating principle

The supply voltage to be monitored is connected to terminals L1, L2, L3 of the relay, it also provides the power for the relay to operate.

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

When a phase imbalance (asymmetry fault), phase failure or phase reversal (rotational direction fault) is detected, the output relay de-energizes after a fixed time delay of 0.5 seconds (or cannot energize at start up), and the yellow LED goes out.

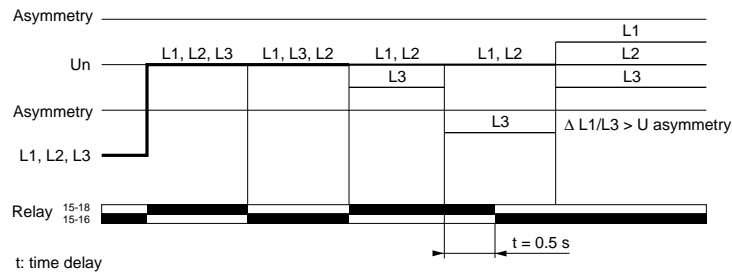
A fixed hysteresis (1) of 20 % is built-into the relay.



1 Phase imbalance (Asymmetry) threshold setting potentiometer, from 5 to 15 %.

R Yellow LED is illuminated when no fault condition exists and the output relay is energized.

## Functional diagram



(1) Hysteresis is the voltage differential (dissymmetry) between energization and de-energization of the output relay (% in relation to the preset asymmetry value).

**Example:** Phase imbalance is set at 10 %, 480 Vac supply

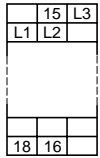
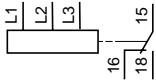
- relay de-energization threshold:  $480 - 10\% = 432\text{ V}$ ,

- relay re-energization threshold:  $432\text{ V} + (20\% \times 10\%) \text{ of } 432\text{ V} = 440.6\text{ V}$ .





#### Wiring



**L1, L2, L3** Supply voltage and voltages to be monitored (see table to the right)

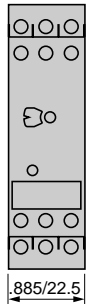
**15-18** 1<sup>st</sup> C/O (Form C) output relay  
**15-16**

Connection and voltage values to be controlled according to the type of **RM3TA2**

Model	Connection	Voltage and Frequency
<b>RM3TA210</b>	L1-L2-L3	220 to 240 V - 60 Hz
<b>RM3TA211</b>	L1-L2-L3	220 to 240 V - 50 Hz
<b>RM3TA212</b>	L1-L2-L3	380 to 415 V - 60 Hz
<b>RM3TA213</b>	L1-L2-L3	380 to 415 V - 50 Hz

#### Approximate dimensions

Dimensions Inches  
MM



# RM3 Specialty Relays

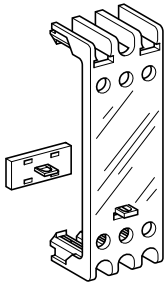
## RM3TA2 3-Phase Supply Relays

### Ordering Information



RM3TA2

Time delay on de-energization	Supply voltage and voltages to be monitored	Catalog Number	Weight
Seconds	V		lb./(kg)
Fixed 0.5	220 to 240 - 60 Hz	<b>RM3TA210M6</b>	0.42/(0.190)
	220 to 240 - 50 Hz	<b>RM3TA211M5</b>	0.42/(0.190)
	380 to 415 - 60 Hz	<b>RM3TA212V6</b>	0.42/(0.190)
	380 to 415 - 50 Hz	<b>RM3TA213V5</b>	0.42/(0.190)



LA9RE02

### Accessories (to be ordered separately)


Description	Catalog Number	Weight lb./(kg)
Sealing cover (22.5 mm width)	<b>LA9RE02</b>	0.01/(0.003)
Replacement marking tab	<b>LA9D92</b>	0.01/(0.001)



### Control circuit characteristics

<b>Rated supply voltage (Un)</b>	Vac 50/60 Hz	<b>V</b>	220 to 240	380 to 415
<b>Average consumption at Un</b>	Phases L2, L3 Vac	<b>VA</b>	1.3	1.4
<b>Rated supply and monitoring voltage tolerance</b>			+ or - 15 %	+ or - 15%

### Output relay and operating characteristics

<b>Number of C/O (Form C) contacts</b>			1
<b>Output relay state</b>			De-energized on detection of phase imbalance, phase failure or phase reversal.
<b>Rated operational voltage (switching)</b>	IEC	<b>V</b>	250
	UL	<b>V</b>	300
<b>Conventional thermal current</b>	IEC	<b>A</b>	4
	UL	<b>A</b>	5
<b>Rated breaking capacity</b>	AC-15, 220 V	<b>A</b>	1.5
	NEMA		B300
<b>Time delay on de-energization</b>	Fixed	<b>Sec.</b>	0.5
<b>Switching threshold drift</b>	Depending on permissible ambient temperature		≤ 0.06 % per degree centigrade
	Within the supply voltage range (85 to 110% of Un)		≤ 0.5%
<b>Hysteresis</b>	Fixed		Approximately 20% in relation to phase imbalance threshold.
<b>Phase imbalance</b>	Adjustable		5 to 15%
<b>Operating status indication</b>	Yellow LED on		Relay is energized

# RM3 Specialty Relays

## RM3TAR1 3-Phase Supply Relay

### Operating Principles



RM3TAR1

This device detects:

- A phase imbalance (asymmetry fault) within an adjustable threshold from 5 to 15 % (Reduction or increase in voltage of one phase in relation to the other two.).
- Failure of one or more phases.
- A Phase reversal (Rotational direction of phases fault).

#### Applications:

- Connection of moving equipment:
  - site equipment (cranes, pumps, conveyors, etc.),
  - agricultural equipment,
  - refrigerated trucks.
- Protection of persons and equipment against the consequences of reverse running: lifting, handling, elevators, escalators, etc.
- Control of sensitive 3-phase supplies.

## Operating principle

The supply voltage is connected to terminals A1 and A2.

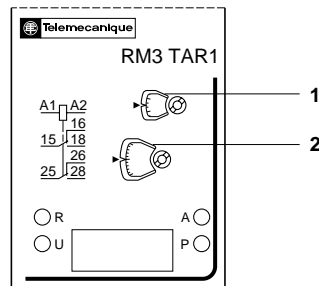
The 3-phase voltage to be monitored is connected to L1, L2, and L3 of the relay.

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

If a phase reversal (rotational direction) or phase failure fault is detected, the relay is de-energized (or cannot energize at start up), the yellow LED goes out, the red LED (P) illuminates.

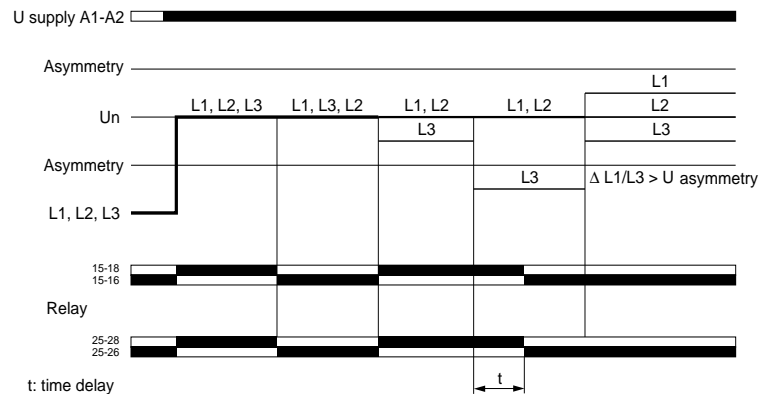
If a phase imbalance (asymmetry fault) is detected, the output relay de-energizes after a preset time delay between 0.1 and 10 seconds, the yellow LED goes out and the red LED (A) illuminates.

A fixed hysteresis (1) of 20 % is built into the relay.



- 1 Phase imbalance (Asymmetry) threshold setting potentiometer, from 5 to 15 %.
- 2 Time delay setting potentiometer, from 0.1 to 10 s.
- R The yellow LED labeled with an R indicates that the output contacts have been energized when it is illuminated.
- U The green LED labeled with a U (Supply voltage) indicates that supply voltage is present to the RM3 relay when illuminated.
- A Red LED: A phase imbalance (dissymmetry) exists.
- P Red LED: A phase failure (2 or 3) exists.
- P and A Red LEDs: A phase reversal (Incorrect rotational direction of phases) exists

## Functional diagram

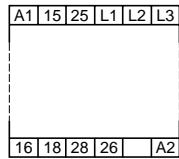
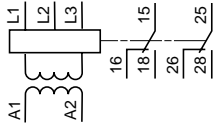


(1) Hysteresis is the voltage differential (dissymmetry) between energization and de-energization of the output relay. (% in relation to the preset phase imbalance (asymmetry) value).

**Example:** asymmetry set at 10 %, 480 Vac supply  
 - relay de-energization threshold:  $480 - 10\% = 432\text{ V}$ ,  
 - relay re-energization threshold:  $432\text{ V} + (20\% \times 10\%) \text{ of } 432\text{ V} = 440.6\text{ V}$ .



#### Wiring



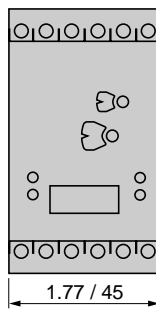
- A1-A2** Supply voltage
- L1, L2, L3** 3-phase voltages to be monitored (See table to the right.)
- 15-18** 1<sup>st</sup> C/O (Form C) contact of output relay
- 15-16** 1<sup>st</sup> C/O (Form C) contact of output relay
- 25-28** 2<sup>nd</sup> C/O (Form C) contact of output relay
- 25-26** 2<sup>nd</sup> C/O (Form C) contact of output relay

Connection and voltage values to be controlled according to the type of **RM3TAR1**

Model	Control Voltage	Control Frequency
<b>RM3TAR110</b>	L1-L2-L3	220 to 240 V - 60 Hz
<b>RM3TAR111</b>	L1-L2-L3	220 to 240 V - 50 Hz
<b>RM3TAR112</b>	L1-L2-L3	380 to 415 V - 60 Hz
<b>RM3TAR113</b>	L1-L2-L3	380 to 415 V - 50 Hz
<b>RM3TAR114</b>	L1-L2-L3	480 to 500 V - 60 Hz
<b>RM3TAR115</b>	L1-L2-L3	480 to 500 V - 50 Hz

#### Approximate dimensions

Dimensions **Inches**  
MM



# RM3 Specialty Relays

## RM3TAR1 3-Phase Supply Relays

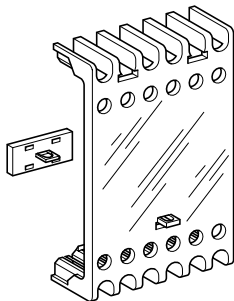
### Ordering Information



RM3TAR1

Adjustable time delay	Voltage to be monitored	Supply Voltage (Vac 50/60 Hz.)	Catalog Number	Weight
Sec.	V	V		lb./ (kg)
0.1 to 10	220 to 240 - 60 Hz	110 to 130	<b>RM3TAR110FG7</b>	0.69/(0.315)
		220 to 240	<b>RM3TAR110MU7</b>	0.69/(0.315)
	380 to 415 - 60 Hz	110 to 130	<b>RM3TAR112FG7</b>	0.69/(0.315)
		220 to 240	<b>RM3TAR112MU7</b>	0.69/(0.315)
		380 to 415	<b>RM3TAR112QN7</b>	0.69/(0.315)
		480 to 500 - 60 Hz	110 to 130	<b>RM3TAR114FG7</b>
	480 to 500 - 60 Hz	220 to 240	<b>RM3TAR114MU7</b>	0.69/(0.315)
		380 to 415	<b>RM3TAR114QN7</b>	0.69/(0.315)
		480 to 500	<b>RM3TAR114TS7</b>	0.69/(0.315)
	220 to 240 - 50 Hz	110 to 130	<b>RM3TAR111FG7</b>	0.69/(0.315)
		220 to 240	<b>RM3TAR111MU7</b>	0.69/(0.315)
		380 to 415	<b>RM3TAR111QN7</b>	0.69/(0.315)
	380 to 415 - 50 Hz	110 to 130	<b>RM3TAR113FG7</b>	0.69/(0.315)
		220 to 240	<b>RM3TAR113MU7</b>	0.69/(0.315)
		380 to 415	<b>RM3TAR113QN7</b>	0.69/(0.315)
	480 to 500 - 50 Hz	110 to 130	<b>RM3TAR115FG7</b>	0.69/(0.315)
		220 to 240	<b>RM3TAR115MU7</b>	0.69/(0.315)
		380 to 415	<b>RM3TAR115QN7</b>	0.69/(0.315)

### Accessories (to be ordered separately)



LA9RM301


Description	Catalog Number	Weight lb./ (kg)
Sealing cover (45mm width)	<b>LA9RM301</b>	0.01/(0.005)
Replacement marking tab	<b>LA9D92</b>	0.01/(0.001)



### Control circuit characteristics

Rated supply voltage (Un)	Vac 50-60 Hz	<b>V</b>	110 to 130	220 to 240	380 to 415 <b>Except for RM3TAR110</b>	480 to 500 <b>RM3TAR114 ONLY</b>
Average consumption at Un	Vac	<b>VA</b>	2.7	2.8	3	3

### Output relay and operating characteristics

Number of C/O (Form C) contacts			2
Output relay state			De-energizes on detection of a phase imbalance (asymmetry fault), a phase failure or a phase reversal (rotational direction of phases fault).
Rated operational voltage (switching)	IEC	<b>V</b>	400
	UL	<b>V</b>	300
Conventional thermal current	IEC	<b>A</b>	5
	UL	<b>A</b>	5
Rated breaking capacity	AC-15		230 V-3 A, 400 V-2 A
	NEMA		B300
Time delay on de-energization	Adjustable	<b>Sec.</b>	0.1 to 10
Switching threshold drift	Depending on permissible ambient temperature		≤ 0.06% per degree centigrade
	Within the supply voltage range (85 to 110% of Un)		≤ 0.5%
Time delay drift	Within the supply voltage range		≤ 0.5%
	Depending on nominal operating temperature		≤ 0.06% per degree centigrade
Hysteresis	Fixed		Approximately 20% in relation to phase imbalance (asymmetry) threshold
Phase asymmetry control	Adjustable		5 to 15%
Measuring cycle		<b>ms</b>	≤ 100
Operating status indication	<b>U</b> Green LED on		Supply voltage (Usupply) is present to the relay.
	<b>R</b> Yellow LED on		Relay is energized
	<b>A</b> Red LED on		Phase imbalance (asymmetry) fault exists.
	<b>P</b> Red LED on		Phase failure (2 or 3) exists.
	<b>P and A</b> LEDs on		Phase reversal (Incorrect rotational direction of phases or phase failure.)

### Measuring input characteristics

Monitoring voltage tolerance			+ or - 15 %
------------------------------	--	--	-------------

# RM3 Specialty Relays

## RM3LG2 Liquid Level Control Relay

### Operating Principles



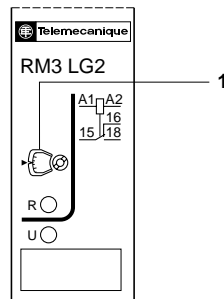
RM3LG2

This device monitors the levels of conductive liquids. **Do not use with flammable liquids.**

It controls the actuation of pumps or valves to regulate the levels and is also suitable for protecting submersible pumps against running empty, or protecting tanks from "overflow". It can also be used to control dosing of liquids in mixing processes.

- Some examples of liquids in which the **RM3LG2** relay can be used:
  - spring, town, industrial and sea water
  - metallic, acid or basic salt solutions
  - liquid fertilizers
  - non concentrated alcohol (< 40 %)
  - liquids in the food processing industry: milk, beer, coffee, etc.
- Some examples of liquids in which the **RM3LG2** relay CAN NOT be used:
  - chemically pure water
  - fuels, liquid gasses (flammable)
  - oil, concentrated alcohol (> 40 %)
  - ethylene, glycol, paraffin, varnish and paints

## Presentation

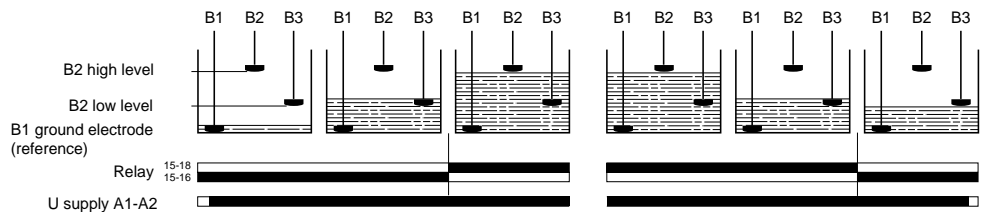


- 1 Response sensitivity potentiometer (in kW).
- R The yellow LED labeled with an R indicates that the output relays have been energized when it is illuminated.
- U The green LED labeled with a U (Supply voltage) indicates that supply voltage is present to the RM3 relay when illuminated.

## Operating principle

The operating principle is based on a change in the resistance measured between immersed or non immersed electrodes. The electrodes may be replaced by other sensors or probes which transmit values representing variations in resistance (Refer to page 39, "Setting-up").

- 3 electrodes (1)



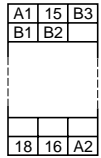
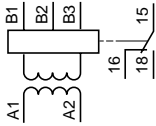
**Note:** If a metallic tank is used, the ground electrode (B1) can be eliminated by connecting the cable directly to one of the tank's metallic surfaces.

(1) This product can be used with only 2 electrodes. In this case, electrode B2 performs both the high level and low level functions. The absence of a time delay can cause oscillation of the output relay (wave effect).





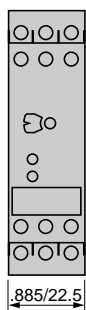
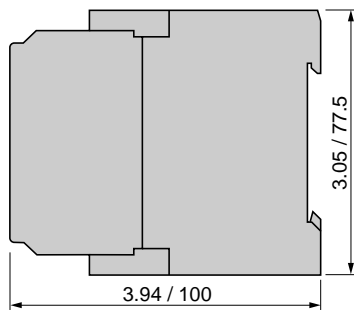
#### Wiring



<b>A1-A2</b>	Supply voltage
<b>B1, B2, B3</b>	Electrodes (see table to the right)
<b>15-18</b>	C/O (Form C) contact of output relay

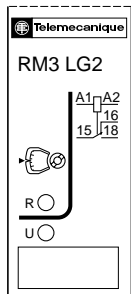
Electrodes and levels controlled	
<b>B1</b>	Ground electrode
<b>B2</b>	Max. level
<b>B3</b>	Min. level

#### Approximate dimensions



Dimensions Inches  
MM

#### Setup information



Set the potentiometer to the minimum value.  
Connect the electrodes as shown below.  
Apply power to terminals A1 and A2.

When all the electrodes are simultaneously immersed in the liquid to be monitored, slowly turn the potentiometer towards the maximum value (100 W) until the relay is energized. Exceed the tripping threshold of the relay by 10 kW to compensate for variations in the supply voltage. (The relay may already be energized before turning the potentiometer). If the relay will not energize, a more sensitive device must be used (greater ohmic value): see **RM3LA1**. Then check that the relay de-energizes correctly as soon as electrodes EH and EB are out of the liquid (see examples below). If the relay does not de-energize, select a less sensitive device (see **RM3LA1**). The electrode connection point must be protected against corrosion, by sticking or sealing. In areas where thunderstorms are likely to occur, measures must also be taken to protect the electrode lines.

#### Probe LA9RM201

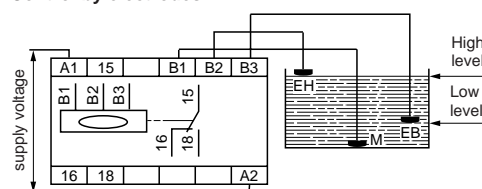
This probe is of the "suspended" type. It is coaxial; i.e. in addition to the normal (central) electrode, the stainless steel skirt can also act as ground (reference) electrode, which means that there is no need to install a separate reference probe. In this way, for controlling one level, only one probe is required instead of 2; for controlling 2 levels, only 2 probes are required instead of 3.

The connecting cable must be of the "2-conductor" type with common cylindrical PVC sheath, having a maximum diameter of 6.3 mm. The skirt also acts as a "calming chamber", so avoiding inaccuracy due to an agitated surface of the liquid (waves).

Maximum operating temperature: 212 °F (100 °C).

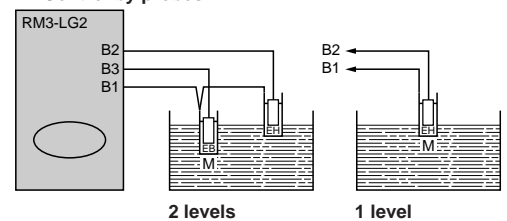
#### Connection examples

##### Control by electrodes



EH = High level electrode  
EB = Low level electrode  
M = Reference electrode (common)

##### Control by probes



2 levels

1 level

# RM3 Specialty Relays

## RM3LG2 Liquid Level Control Relay

### Ordering Information



RM3LG2

### Liquid level relay

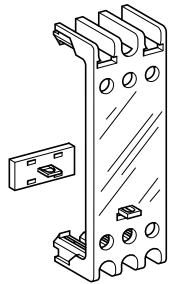
Fixed time delay	Sensitivity Scale	Control Circuit Voltage 50/60 Hz	Catalog Number	Weight
ms	$\Omega$	V		lb./ (kg)
250	5 to 100	24	<b>RM3LG201B7</b>	0.43/(0.195)
		110 to 130	<b>RM3LG201FG7</b>	0.43/(0.195)
		220 to 240	<b>RM3LG201MU7</b>	0.43/(0.195)
		380 to 415	<b>RM3LG201QN7</b>	0.43/(0.195)



LA9RM201

### Liquid level control probe

Type of installation	Maximum operating temperature	Catalog Number	Weight
			lb./ (kg)
Suspended by cable	212°F (100 °C)	<b>LA9RM201</b>	0.22/(0.100)



LA9RE02

### Accessories (to be ordered separately)


Description	Catalog Number	Weight
		lb./ (kg)
Sealing cover (22.5mm width)	<b>LA9RE02</b>	0.01/(0.003)
Replacement Marking Tab	<b>LA9D92</b>	0.01/(0.001)



## Control circuit characteristics

<b>Rated supply voltage (Un)</b>	Vac 50-60 Hz	<b>V</b>	24	110 to 130	220 to 240	380 to 415
<b>Average consumption at Un</b>	Vac	<b>VA</b>	1.9	2.6	2.4	2.9

## Output relay and operating characteristics

<b>Number of C/O (Form C) contacts</b>			1
<b>Output relay state</b>			Energized when the high level electrode is immersed and de-energized when the low level electrode is no longer immersed
<b>Rated operational voltage</b> (switching)	IEC	<b>V</b>	250
	UL	<b>V</b>	300
<b>Conventional thermal current</b>	IEC	<b>A</b>	4
	UL	<b>A</b>	5
<b>Rated breaking capacity</b>	AC-15, 220 V	<b>A</b>	1.5
	NEMA		B300
<b>Time delay</b>	Fixed	<b>ms</b>	250
<b>Operating status indication</b>	<b>U</b> Green LED on		Supply Voltage (U supply) is present to the relay.
	<b>R</b> Yellow LED on		Output relay is energized.

## Electrode circuit characteristics (1)

<b>Sensitivity scale</b>	Adjustable	$\Omega$	5 to 100
<b>Maximum electrode voltage</b>	Vac	<b>V</b>	30
<b>Maximum electrode current</b>		<b>mA</b>	1
<b>Maximum cable capacity</b>		<b>nF</b>	10
<b>Maximum cable length</b>		<b>m</b>	100

(1) The electrodes may also be built into the probes. The probes are designed to be either fixed to a tank, by means of a bracket with a seal (closed tanks), or suspended by their own electrical connecting cable (bore holes, etc.). Refer to "Setting-up" (Probe LA9RM201) section on page 39.

# RM3 Specialty Relays

## RM3LA1 Liquid Level Control Relay

### Operating Principles



RM3LA1

This device monitors the levels of conductive liquids. **Do not use with flammable liquids.**

It controls the actuation of pumps or valves to regulate the levels.

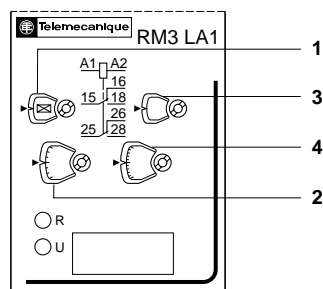
It is also suitable for protecting submersible pumps against running empty, or protecting tanks from "overflow". It can also be used to control dosing of liquids in mixing processes.

• **Some examples of liquids in which the RM3LA1 can be used with:**

- spring, town, industrial and sea water
- metallic, acid or basic salt solutions
- liquid fertilizers
- non concentrated alcohol (< 40 %)
- liquids in the food processing industry : milk, beer, coffee, etc.

• **Some examples of liquids in which the RM3LA1 CAN NOT be used with:**

- chemically pure water
- fuels, liquid gasses (flammable)
- oil, concentrated alcohol (> 40 %)
- ethylene, glycol, paraffin, varnish and paints



1 Selector for time delay on energization ☒ or on de-energization ■ of the relay.

2 0.1 to 10 second time delay potentiometer.

3 Sensitivity range adjustment (5k, 50k or 500k).

4 Fine sensitivity adjustment

5k range (potentiometer setting times 0.1).

50k range (potentiometer setting times 1).

500k range (potentiometer setting times 10).

U The green LED labeled with a U (Supply voltage) indicates that the supply voltage is present to the RM3 relay when illuminated.

R The yellow LED labeled with an R indicates that the output relay is energized when it is illuminated.

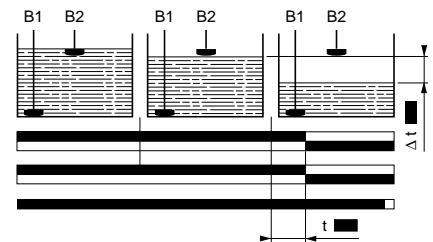
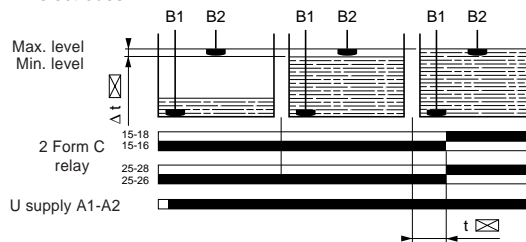
## Operating principle

The operating principle is based on a change in the resistance measured between immersed or non immersed electrodes. The electrodes may be replaced by other sensors or probes which transmit values representing variations in resistance (Refer to page 43, "Setting-up").

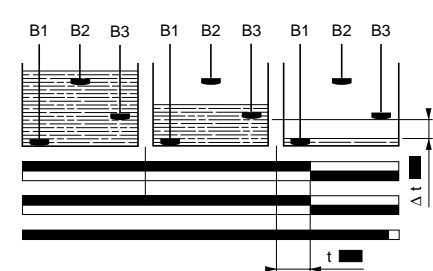
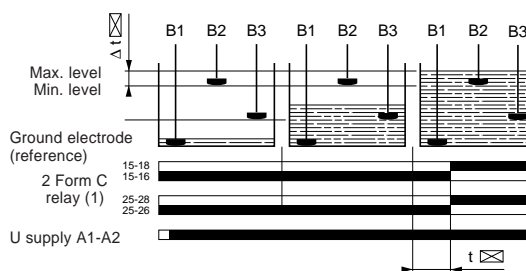
**Time delay on filling ☒ (1)**

**Time delay on emptying ■ (1)**

• 2 electrodes



• 3 electrodes

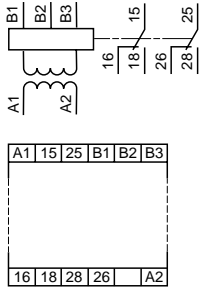


**Note :** If a metallic tank is used, the ground electrode (B1) can be eliminated by connecting the cable directly to one of the tank's metallic surfaces.

(1) Level exceeded, see page 43 "Setting-up".



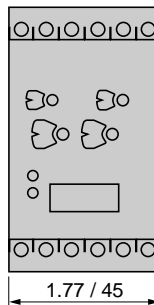
#### Wiring



<b>A1-A2</b>	Supply voltage
<b>B1, B2, B3</b>	Electrodes (see table to the right)
<b>15-18</b>	1 <sup>st</sup> C/O (Form C) contact of output relay
<b>25-28</b>	2 <sup>nd</sup> C/O (Form C) contact of output relay

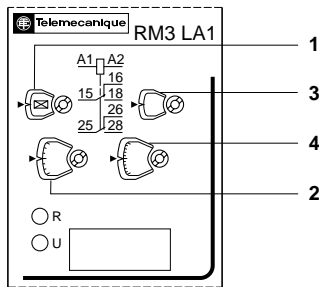
Electrodes and levels controlled	
<b>B1</b>	Ground electrode
<b>B2</b>	Max. level
<b>B3</b>	Min. level

#### Approximate dimensions



**Dimensions** Inches  
MM

#### Setup information



Set potentiometers **4** and **2** to the minimum value and set switch **3** to 5 k. Connect the electrodes as shown below. Apply power to terminals A1 and A2.

When all the electrodes are simultaneously immersed in the liquid to be monitored, slowly turn the sensitivity potentiometer **4** towards the maximum value (50) until the relay is energized. (The relay may energize before turning the potentiometer. If it does you are finished with this step.). If the relay will not energize, set potentiometer **4** back to its minimum setting and turn switch **3** to 50k and repeat the above procedure. If the relay still doesn't energize, set potentiometer **4** back to its minimum setting again and turn switch **3** to 500k and repeat the above procedure. If the relay still doesn't energize, this relay will not work for the application.

Then make sure the relay de-energizes correctly when electrodes EH and EB are removed from the liquid.

**Note :** The maximum level EH on a time delay on filling application can be raised by means of the adjustable time delay from 0.1 to 10 seconds, using function . The minimum level EB on a time delay on emptying application can be lowered by means of the adjustment delay from 0.1 to 10 seconds, using function .

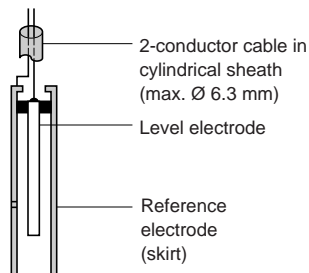
The electrode connection point must be sealed to protect against corrosion. In areas where thunderstorms are likely to occur, the electrode lines must be protected.

#### Probe LA9RM201

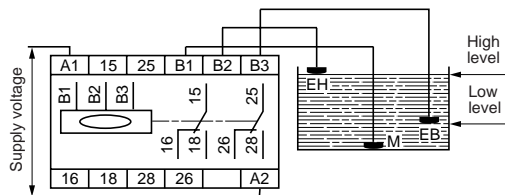
This probe is of the "suspended" type. It is coaxial ; i.e. in addition to the normal (central) electrode, the stainless steel skirt can also act as ground (reference) electrode, which means that there is no need to install a separate reference probe. In this way, for controlling one level, only one probe is required instead of 2 ; for controlling 2 levels, only 2 probes are required instead of 3.

The connecting cable must be of the "2-conductor" type with common cylindrical PVC sheath, having a maximum diameter of 6.3 mm. The skirt also acts as a "calming chamber", so avoiding inaccuracy due to an agitated surface of the liquid (waves).

Maximum operating temperature: 212 °F (100 °C).

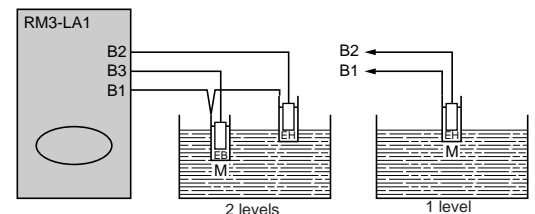


#### Control by electrodes



EH = High level electrode  
EB = Low level electrode  
M = Reference electrode (common)

#### Control by probes



# RM3 Specialty Relays

## RM3LA1 Liquid Level Control Relay

### Ordering Information



RM3LA1

### Liquid level control relays

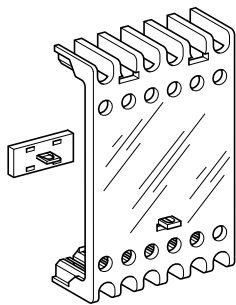
Adjustable time delay	Sensitivity Scale	Control Circuit Voltage (Vac are 50/60 Hz)	Catalog Number	Weight
<b>Seconds</b>	$\Omega$			<b>lb./ (kg)</b>
<b>0.1 to 10</b>	250 to 500	24 to 240 Vac or 24 to 240 Vdc	<b>RM3LA111MW</b>	0.54/(0.245)
		24 Vac	<b>RM3LA111B7</b>	0.54/(0.245)
		110 to 130 Vac	<b>RM3LA111FG7</b>	0.54/(0.245)
		220 to 240 Vac	<b>RM3LA111MU7</b>	0.54/(0.245)
		380 to 415 Vac	<b>RM3LA111QN7</b>	0.54/(0.245)



LA9RM201

### Liquid level control probe

Type of installation	Maximum operating temperature	Catalog Number	Weight lb./ (kg)
Suspension by cable	212 °F (100 °C)	<b>LA9RM201</b>	0.22/(0.100)



LA9RM301

### Accessories (to be ordered separately)


Description	Catalog Number	Weight lb./ (kg)
Sealing cover (45mm width)	<b>LA9RM301</b>	0.01/(0.005)
Replacement Marking Tab	<b>LA9D92</b>	0.01/(0.001)



### Control circuit characteristics

Rated supply voltage (Un)	Vac 50-60 Hz	<b>V</b>	24 to 240	24	110 to 130	220 to 240	380 to 415
	Vdc	<b>V</b>	24 to 240	–	–	–	–
Average consumption at Un	Vac	<b>VA</b>	2 to 7	3.1	2.7	2.6	3.4
	Vdc	<b>W</b>	2.4	–	–	–	–

### Output relay and operating characteristics

Number of C/O (Form C) contacts			2
Output relay state			Energized when the high level electrode is immersed and de-energized when the low level electrode is no longer immersed
Rated operational voltage (switching)	IEC	<b>V</b>	400
	UL	<b>V</b>	300
Conventional thermal current	IEC	<b>A</b>	5
	UL	<b>A</b>	5
Rated breaking capacity	AC-15		230 V-3 A, 400 V-2A
	NEMA		B300
Time delay	Adjustable	<b>sec.</b>	0.1 to 10
Operating status indication	U Green LED on		Supply voltage is present to the relay.
	R Yellow LED on		Output relay is energized.

### Electrode circuit characteristics

Maximum electrode voltage	a.c. supply	<b>V</b>	20		
Definition of electrodes and cables (1)	Sensitivity scale		Maximum electrode current	Maximum cable capacity	Maximum cable length
	Ω				
	250 to 5 k		10 mA	200 nF	1000 m
	2.5 to 50 k		4 mA	25 nF	100 m
	25 to 500 k		0.5 mA	4 nF	20 m

(1) The electrodes may also be built into the probes. The probes are designed to be either fixed to a tank, by means of a bracket with a seal (closed tanks), or suspended by their own electrical connecting cable (bore holes, etc.). Refer to page 43 "Setting-up" (Probe LA9RM201).

# RM3 Specialty Relays

## RM3PA1 Insulation Control Relay

### Operating Principles



RM3PA1

This device monitors the presence of an insulation resistance on an a.c. supply (with neutral insulated from ground) and the ground connection.

- The RM3PA1 insulation control relay is only for equipment monitoring and should not be used for personnel electrical protection.

Its detection threshold range is 1 to 110 kW.

A fault memory is possible (automatic or manual, local or remote reset), refer to page 47 "Setting-up".

A pushbutton on the front face of the relay allows an "ground fault" TEST to be performed. This test can also be performed remotely, the LED on the front of the relay indicates the various states, refer to page 47 "Setting-up".

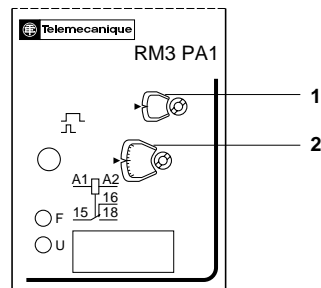
#### Applications on a.c. supply

3-phase supplies :

- without neutral conductor,
- with artificial neutral,
- with insulated neutral.

Single-phase supplies :

- control circuit of automation equipment,
- control circuit,
- any auxiliary control circuit galvanically isolated from the mains supply.



- 1 Resistance range selector (11k or 110k W).
- 2 Fine resistance setting potentiometer  
11k range (potentiometer setting times 1)  
110k W range (potentiometer setting times 10)

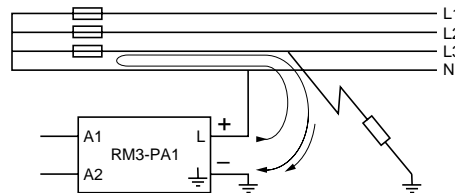
F The red LED labeled with a F indicates that the output relay has been energized when it is illuminated.

U The green LED labeled with a U (Supply Voltage) indicates that supply voltage is present to the RM3 relay when illuminated.

### Operating principle

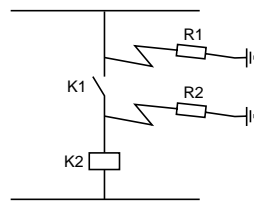
The supply voltage is connected to terminals A1-A2 or A1-B2. Its value can be identical to that of the supply to be monitored.

A continuous voltage (Terminal L) is connected between one phase (or neutral if present) of the installation and ground (s terminal).



As soon as a ground insulation fault occurs, it causes a non infinite resistance to appear between the installation and ground. A fault current is established and this current then passes through the so-called "insulation" resistance.

When this current exceeds a value corresponding to the preset threshold resistance, the output relay is energized with a time delay (refer to curve on page 47 "Setting-up") and a fault indicator illuminates on the relay.

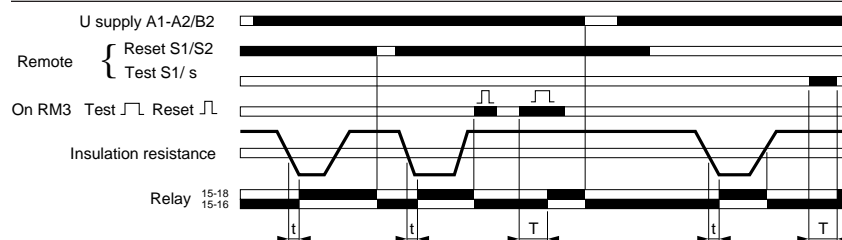


#### Purpose of continuous insulation monitor RM3PA1

The main purpose of this device is to indicate the first insulation fault in an installation in order to protect it against incorrect operation due to the appearance of a second fault.

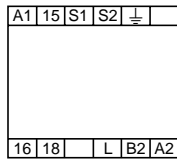
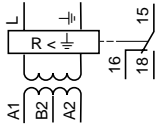
On the figure to the left, resistances R1 and R2, corresponding to two successive insulation faults, are in series and can keep K2 energized when contact K1 is open. This incorrect operation can have very serious consequences in some installations.

### Functional diagram





#### Wiring



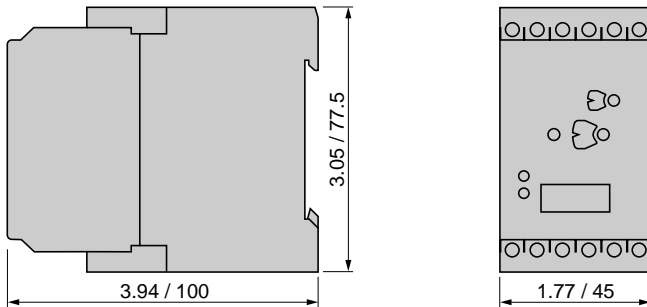
Supply voltages :

- Mixed Vac or Vdc
- A1-A2** 24 to 240 V
- Dual voltage Vac 50/60 Hz
- A1-B2** 110 to 130 V
- A1-A2** 220 to 240 V
- L, s** Insulation measurement (see table to the right)
- S1- s** Remote TEST
- S1-S2** Remote Reset
- 15-18** C/O (Form C) contact of output relay
- 15-16** C/O (Form C) contact of output relay

Connection and values of the 2 resistance ranges to be controlled

RM3PA101	L to s	1 to 11 kΩ
		10 to 110 kΩ
		depending on setting of switch 1

#### Approximate dimensions



Dimensions Inches  
MM

#### Setup information

##### Fault memory

Short-circuiting of terminals S1 and S2 (see scheme to the right) allows the fault to be memorized as soon as it appears, even if only briefly. The duration of the fault must exceed the response time of the relay (see curve below) for it to be detected. If this short-circuiting is achieved by means of a N/C pushbutton, this acts as the remote reset button (if the fault has disappeared). Manual local resetting is achieved by briefly pressing (less than 0.5 s) the RESET/TEST button on the front of the relay.

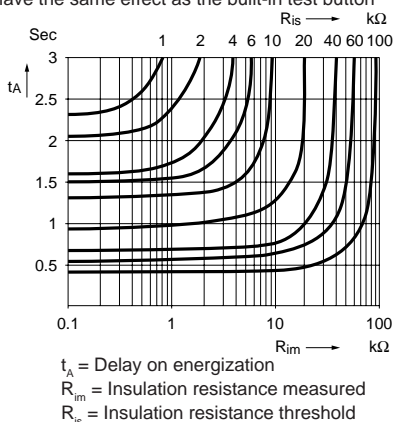
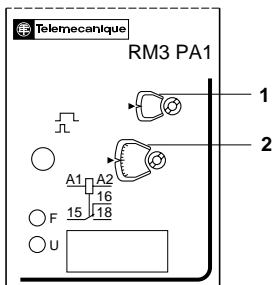
##### Test

When the installation being controlled does not have an insulation fault, pressing the RESET/TEST button on the relay causes 2 simultaneous actions:

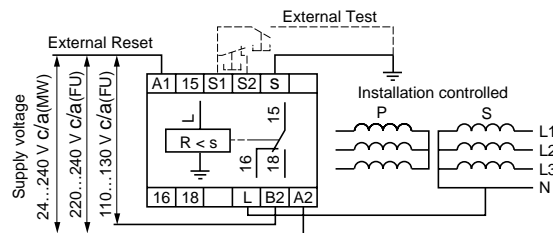
- the measuring input terminal not connected to ground (L) is disconnected from the line being controlled,
- a resistance (internal) of 820 W is connected to this input in order to simulate an insulation fault.

The relay must then react in the same way as for a real fault.

A N/O pushbutton may be connected to terminals S1 and s which will act as the remote test button and which will have the same effect as the built-in test button (See scheme to the right).

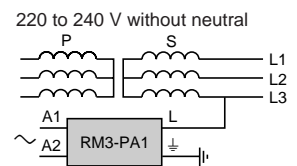
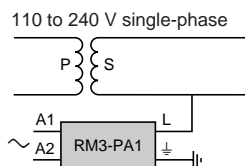
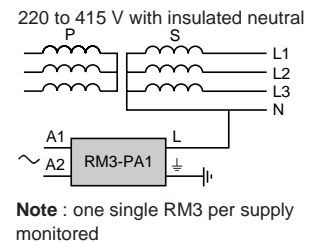
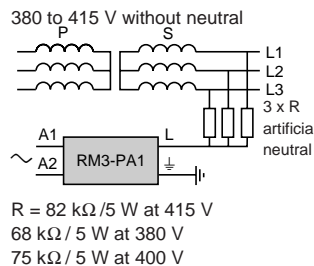


#### Basic scheme of the installation



#### Various schemes depending on maximum voltages

- The RM3PA1 insulation control relay can only monitor circuits with:
  - A maximum of **415 VAC** phase-phase when terminal L is connected to the **neutral** of a 3 phase circuit.
  - A maximum of **240 VAC** phase-phase when terminal L is connected to a **phase** of a 2 or 3 phase circuit.



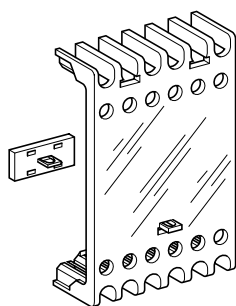
# RM3 Specialty Relays RM3PA1 Insulation Control Relays Ordering Information



RM3LA1

## Insulation control relay

Insulation Measurement	Control Circuit Voltage	Catalog Number	Weight
<b>k Ω</b>	<b>V</b>		<b>lb./(kg)</b>
1 to 110	24 to 240 Vac 50/60 Hz or 24 to 240 Vdc	<b>RM3PA101MW</b>	0.55/(0.250)
	110 to 130 Vac 50/60 Hz or 220 to 240 Vac 50/60 Hz	<b>RM3PA101FU7</b>	0.55/(0.250)



LA9RM301

## Accessories (to be ordered separately)

Description	Catalog Number	Weight
Sealing cover (45mm width)	<b>LA9RM301</b>	0.01/(0.005)
Replacement Marking Tab	<b>LA9D92</b>	0.01/(0.001)




## Environment

<b>Conforming to standards</b>			UTE 63080, DIN 0413 (part 2), VDE 0413 part. 2
--------------------------------	--	--	--

## Control circuit characteristics

<b>Rated supply voltage (Un)</b>	Vac 50-60 Hz	<b>V</b>	24 to 240	110 to 130	220 to 240
	Vdc	<b>V</b>	24 to 240	–	–
<b>Average consumption at Un</b>	Vac	<b>VA</b>	4.5	2.5	2.5
	Vdc	<b>W</b>	4.5	–	–

## Output relay and operating characteristics

<b>Number of C/O (Form C) contacts</b>			1
<b>Output relay state</b>			Energized on detection of an insulation fault
<b>Rated operational voltage</b> (switching)	IEC	<b>V</b>	400
	UL	<b>V</b>	300
<b>Conventional thermal current</b>	IEC	<b>A</b>	6
	UL	<b>A</b>	5
<b>Rated breaking capacity</b>	AC-15, 250 V	<b>A</b>	5
	NEMA		B300
<b>Time delay</b>	Delay on energization		See curve page 47.
<b>Relay resetting threshold</b> (tripping of relay)	Fixed setting		1.6 times the insulation resistance value set
<b>Operating status indication</b>	<b>U</b> Green LED on		Supply Voltage (U supply) is present to the relay.
	<b>F</b> Red LED on		Relay is energized on detection of fault

## Measuring input characteristics

<b>Setting range</b>		<b>kΩ</b>	1 to 11, 10 to 110 kΩ
<b>Minimum internal resistance</b>	Vac or Vdc	<b>kΩ</b>	100
<b>Internal test resistance</b>		<b>Ω</b>	820
<b>Maximum insulation voltage</b>	Between L and s	<b>V</b>	415
<b>Measurement voltage</b>	Vdc	<b>V</b>	30 maximum
<b>Maximum length of Test or Reset cable</b>		<b>m</b>	10

# RM3 Specialty Relays

## RM3EA1 Sensitive Contact Protection Relay

### Operating Principles



RM3EA1

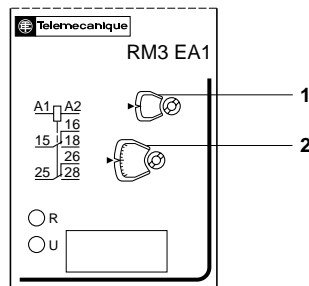
This device relays, protects and amplifies a low level “Discrete” output. It may be used with or without memory function. The adjustable time delay from 0.05 to 30 seconds avoids oscillations of the relay in the event of interference or bouncing of the contact to be protected.

It can be controlled by a mechanical contact or by a 3-wire solid state switch (see examples on page 51, “Setting-up”).

#### Applications :

- protection,
- ensuring reliability,
- amplification of low level outputs on measuring devices, sensors, probes etc.

## Presentation

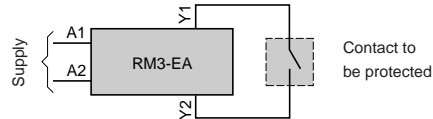


- 1 Time delay range selector switch (0.05 to 1 second and 1.5 to 30 seconds).
  - 2 Fine adjustment time delay potentiometer.
- R** The yellow LED labeled with an R indicates that the output relay has been energized when it is illuminated.
- U** The green LED labeled with a U (Supply Voltage) indicates that supply voltage is present to the RM3 relay when illuminated.

## Operating principle

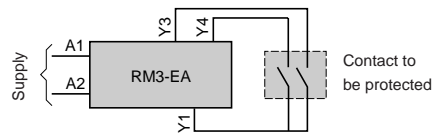
The supply voltage is connected to terminals A1-A2.

#### Protection of “Discrete” contacts



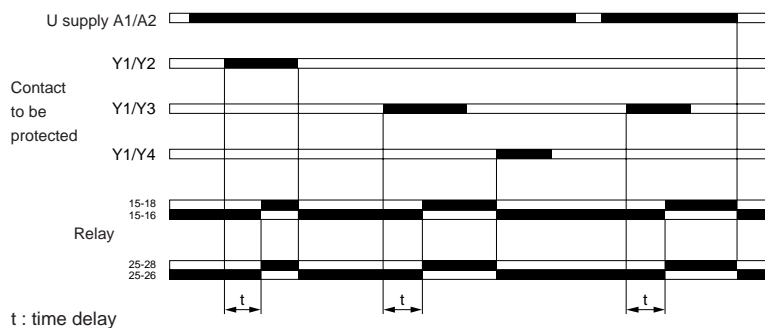
The RM3's output relay is energized when terminals Y1-Y2 are connected to the contact to be protected and this contact is closed.

#### Protection of contacts with memory (latching)

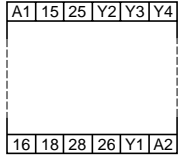
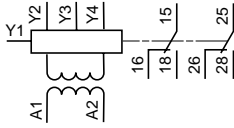


The RM3's output relay is energized when terminals Y1-Y3 are connected to the contact to be protected and this contact is closed for a time  $\geq 20$  ms. It remains energized after opening of Y1-Y3. It de-energizes when Y1 - Y4 are short-circuited.

## Functional diagram



#### Wiring

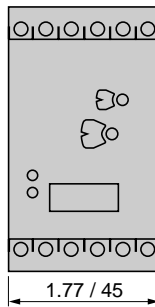


<b>A1-A2</b>	Supply voltage
<b>Y1, Y2, Y3, Y4</b>	Connection of contacts to be monitored (see table to the right)
<b>15-18</b>	1 <sup>st</sup> C/O (Form C) contact of output relay
<b>15-16</b>	
<b>25-28</b>	2 <sup>nd</sup> C/O (Form C) contact of output relay
<b>25-26</b>	

#### Connection and type of protection

RM3EA1•1	Y1-Y2	Protection of "Discrete" contact
		Protection of contact with memory "Latching" :
	Y1-Y3	Energization
	Y1-Y4	De-energization

#### Approximate dimensions



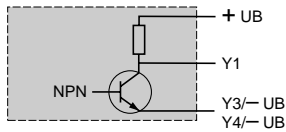
**Dimensions** Inches  
MM

#### Setup information

Energization by 3-wire NPN solid state switch

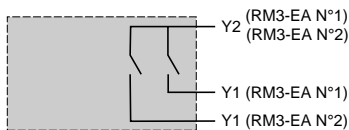
On : the relay is energized (Y1-Y3).

Off : the relay is de-energized (Y1-Y4).



Relays having two contacts with common point may be connected to two separate **RM3EA1** relays.

The common point of the contacts must be connected to terminal Y2 of each **RM3EA1**.



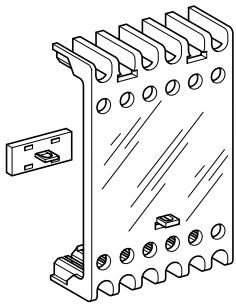
**RM3 Specialty Relays**  
**RM3EA1 Sensitive Contact Protection Relay**  
**Ordering Information**



**RM3EA1**

**Sensitive contact protection relays**

Time Delay	Control Circuit Voltage	Catalog Number	Weight
<b>Seconds</b>	<b>Vac 50/60Hz</b>		<b>lb./ (kg)</b>
0.05 to 30	24	<b>RM3EA111B7</b>	0.68/(0.310)
	110 to 130	<b>RM3EA111FG7</b>	0.68/(0.310)
	220 to 240	<b>RM3EA111MU7</b>	0.68/(0.310)
	380 to 415	<b>RM3EA111QN7</b>	0.68/(0.310)
None	24	<b>RM3EA101B7</b>	0.68/(0.310)
	110 to 130	<b>RM3EA101FG7</b>	0.68/(0.310)
	220 to 240	<b>RM3EA101MU7</b>	0.68/(0.310)
	380 to 415	<b>RM3EA101QN7</b>	0.68/(0.310)



**LA9RM301**

**Accessories (to be ordered separately)**


Description	Catalog Number	Weight
Sealing cover (45mm width)	<b>LA9RM301</b>	0.01/(0.005)
Replacement Marking Tab	<b>LA9D92</b>	0.01/(0.001)



### Control circuit characteristics

<b>Rated supply voltage (Un)</b>	Vac 50-60 Hz	<b>V</b>	24	110 to 130	220 to 240	380 to 415
<b>Average consumption at Un</b>	Vac	<b>VA</b>	3.4	3.4	3.4	3.4

### Output relay and operating characteristics

<b>Number of C/O (Form C) contacts</b>			2
<b>Output relay state</b>			See diagram on page 50 and the note (1) below.
<b>Rated operational voltage</b> (switching)	IEC	<b>V</b>	400
	UL	<b>V</b>	300
<b>Conventional thermal current</b>	IEC	<b>A</b>	5
	UL	<b>A</b>	5
<b>Rated breaking capacity</b>	AC-15		230 V-3 A, 400 V-2 A
	NEMA		B300
<b>Time delay on energization</b>	Adjustable	<b>sec.</b>	0.05 to 30
<b>Time delay on de-energization</b>		<b>ms</b>	50
<b>Minimum closing time for memory</b> (latching)		<b>ms</b>	20
<b>Operating status indication</b>	U Green LED on		Supply Voltage (U supply) is present to the relay.
	R Yellow LED on		Relay is energized.

### Measuring input characteristics

<b>Resistance</b>	Energization guaranteed		"Discrete" contacts Y1-Y2 < 6.5 kΩ "Latching" contacts Y1-Y3 < 6.5 kΩ
	De-energization guaranteed		"Discrete" contacts Y1-Y2 > 19 kΩ "Latching" contacts Y1-Y4 < 16 kΩ
<b>No-load voltage</b>	Vdc current	<b>V</b>	≤ 10
<b>Switching current</b>		<b>mA</b>	≤ 3
<b>Continuous voltage applied</b> (maximum)	3-wire control, Vdc current	<b>V</b>	≤ 30

(1) If circuits Y1-Y3 and Y1-Y4 are closed, the output relay is energized.  
The relay memory is reset to zero when the power supply is switched off.  
In the event of a power failure, the relay de-energizes and is re-energized at switch-on only if circuit Y1-Y3 is closed.



*Notes:*







*Notes:*





*Notes:*





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