Power guard RP91

Power guard for 1- and 3-phase motors
Power metering (U x I x cos Φ)
Adjustable time-delay 0.1 - 30 sek. at start-up
Adjustable reaction delay 0.1 - 30 sek
Metering output indicates the power consumption
1 – pole relay output



C-mac® RP91 is used for power monitoring of 1-phase and symmetrical 3-phase loads, f. inst. motors. RP91 can be connected directly to loads with nominal current consumption up to 6 A; If the current is bigger, a standard current transformer is used.

The unit is supplied with an adjustable start-up delay, which ensures that the output relay is activated independent of the load, when the motor is started. RP 91 is supplied for both over- and underload monitoring. The module is monitoring the total power consumption (U x I x cos ϕ) which gives a much higher sensitivity than it is possible with the RP81.

The setpoint is coarse adjusted on a 10-position switch, and fine-adjusted on a potentiometer in front of the unit, which gives a very high sensitivity on the adjustment function.

When the setpoint is reached, an adjustable time-delay on 0,1 to 30 seconds starts. After this period, the relay releases, on the condition that the load has been higher than the setpoint in the whole period, in this way it is ensured, that the relay will not release in case of short changes in the power consumption.

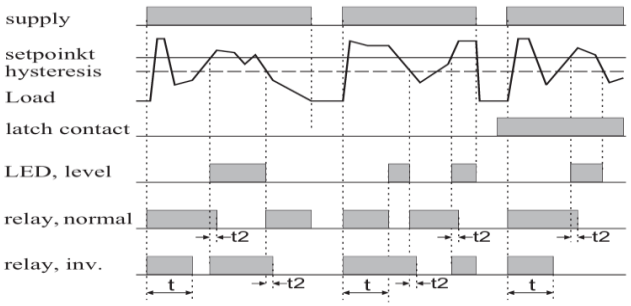
In order to get the most accurate setpoint adjustment, especially when very small loads are monitored, the unit is supplied for 4 different current ranges, and all units are available with inverted function, to detect underloads.

Technical data				
Supply voltage:	127 V + N or 3 x 230 V +/- 10 % 230 V + N or 3 x 400 V +/- 10 % 240 V + N or 3 x 415 V +/- 10 %			
Supply frequency: :	45 - 70 Hz			
Power consumption:	2,5 VA			
Operation temp.:	-20°C to+60°C			
Humidity:	0 - 90% relative luftfugtighed, ikke-kondenserende			
Metering ranges:	max. load at supply voltage:			
Current range	230 V	400 V	415 V	Int. shunt
01: max. 0,6 A	270 W	450 W	480 W	1,200 Ω
02: max. 1,2 A	540 W	900 W	960 W	0,150 Ω
03: max. 2,4 A	1100 W	1800 W	2000 W	0,068 Ω
04: max. 6,0 A	2700 W	4500 W	4800 W	0,033 Ω
Hysterese:	1,3% of the total metering range			
Adjustments:	Start-up delay:	Potentiometer, 0.1-30 sec		
	Level, coarse:	10-position switch on the top of the unit		
	Level, fine:	Potentiometer, scale 0-10		
	Reaction delay:	0,1-30 sec		
Accuracy, scale:	5 %			
Indications:	Green LED:	Supply voltage connected		
	Red LED:	Relay activated		

Latch:
Pin 8-7: If pins 8-7 is connected, and the relay releases, it will remain released, no matter if the load changes, until the connection is opened, or the supply voltage is disconnected.

Start-up:
start contact, pins 6 - 7. If pins 6 and 7 is connected, the relay and the start-up delay is activated, when the supply voltage is connected. This principle is used, if the unit is connected in parallel with the load. If the unit is constantly connected to the supply voltage, the start delay (and the metering) can be separately activated by connecting pins 6 and 7, f.inst. with a spare contact in the motorswitch.

Functional diagram:

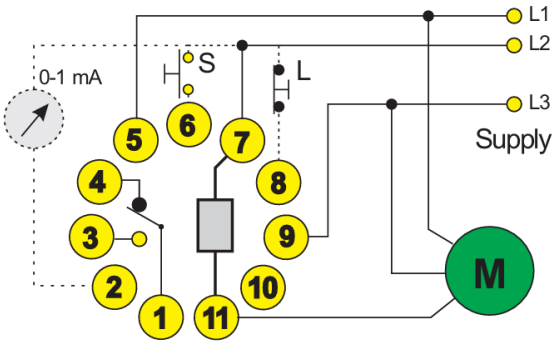


t = selected start-up delay, t2 = reaction delay

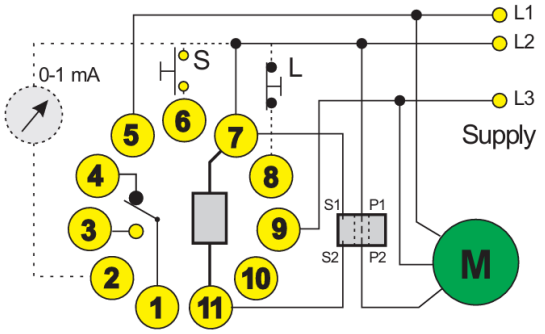
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Connections:

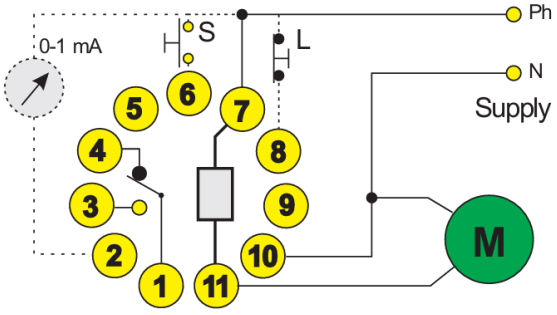


Example 1: 3-phase without current transformer.
(load current smaller than 6 A)



Example 2: 3-phase with current transformer.
(load current bigger than 6 A)

Note: the current transformer must be connected as shown
(P1 / P2 and S1 / S2)



Example 3: 1-phase without current transformer.
(load current smaller than 6 A)

Mechanical dimensions:



Materials and weight:

Housing:	NORYL-SE-1, grey, self-extinguishing
Housing bottom:	NORYL SE-1, GFN-2, black self-extinguishing
Terminals	Nickel-plated brass
Weight:	110 g

EMC and safety regulations

Product:	EN 61131-2:2025
Emmision:	EN 61000-6-4
Immunity:	EN 61000-6-2

** Description autostart function:

The relay activates, when the supply voltage is connected.
When pins 6 and 7 is connected, the start-up time is activated, and remains activated during start-up (overload only))

Ordering guide:				
Type:	**Relay:**	**Supply:**	**function:**	**current range:**
RP91-	**1=** 1 polet	**3-230** = 230 VAC **3-400** = 400 VAC **3-415** = 415 VAC	**0 = normal (overload)** **1 = inverted (underload)** **2 = autostart ****	**1 = max. 0,6 A** **2 = max. 1,2 A** **3 = max. 2,4 A** **4 = max. 6,0 A**
Eksempel:	**RP91-1-3-400-04**			

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Adjustment of RP91



Adjustment, overload function:

A 10-position rotary switch, used for coarse adjustment of the setpoint is placed on top of the unit.
Set the switch on 9.
The potentiometer for start-up delay is set at minimum the time needed for the motor to reach its normal load/speed.
Potentiometer for fine adjustment is set at minimum.
Potentiometer for reaction delay is set at maximum.

The motor is started, and after the start-up delay has expired, the coarse switch is gradually turned down, (9-8-7 etc.), until the relay LED starts flashing.

The potentiometer for fine adjustment is turned against max., until the relay LED stops flashing, and now you have found the normal power consumption of the motor.

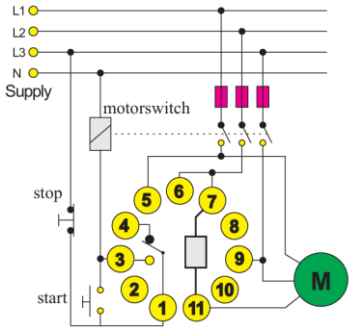
If wanted, you can now set the fine adjustment a little bit higher, which ensures a reasonable margin of security, before the overload alarm is activated.

Finally the potentiometer for reaction delay is set at the wanted position.

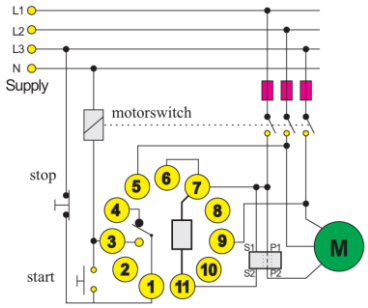
Adjustment, underload function:

If the unit is used for underload monitoring, the coarse adjustment is set at 0 and the fine adjustment at max from the beginning, and instead you will turn up gradually on the coarse switch and down on the fine adjustment in order to find the normal power consumption of the motor. The other adjustments are exactly as for overload monitoring.

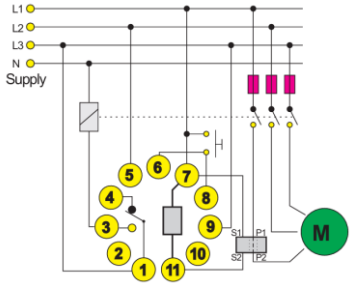
Connection examples:



Example 1:
Monitoring of motor with current smaller than 6 A.
When the start contact is activated, the units makes its own latch.
the motor stops by opening the stop contact or in case of over/underloads, detected by RP91



Example 2:
Same function as example 1, but for bigger motors, where a current transformer with 0-5 A output is used.



Example 3:
Combined Start/stop contact. The relay remains released in case of errors because the latch contact is activated.

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Monitoring and protection of motors and machinery.

Protection of motors and machinery are normally made by means of motor switches or the like, but in many applications, f.inst, if you need a quick reaction in connection with overload, or an alarm in case of underload, it is an advantage to use a monitoring relay.

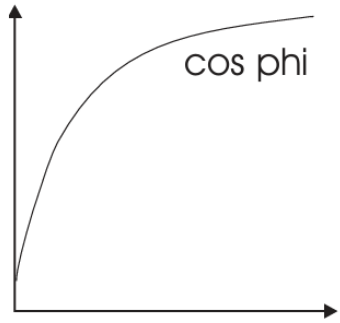
Please note, that the monitoring relay cannot replace the mandatory motor switch, which is used for safety reasons.

On the figures below you can see, how the different parameters are influenced by the motor load, and which C-mac® relays to use for various applications.

The descriptions must be understood as rules of thumb and they are not necessarily correct in all applications as well as the curves are only intended as guide and not covering all motor types.

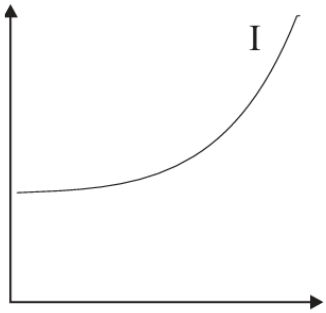
There are C-mac® relays that can be used if you want an interruption, or converters that can be used if you want an analog signal, possibly in connection with PLC or PC controls.

Fasevinkel (cos ϕ)



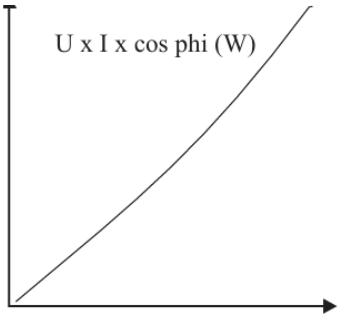
The phase angle between current and voltage (cos ϕ) is changing a lot between 0 and 60% load, therefore it is an advantage to monitor the phase angle if you want an alarm in connection with underload, f.inst. breakage of belts, pumps running dry, blocking of filters, etc.
Recommended relay type:
RP81 (only 3-phase loads)

Motorstrøm



The current consumption of a motor is almost the same from 0 to 50% load, and after that it will increase with increasing load.
Current monitoring is used, if you want to protect the motor against blocking, f.inst. grinding mills, screw conveyors, etc.
Recommended relay types:
RC15, RC30 or LC10-R
Recommended converter:
LC10-0, KC62

Motoreffekt



With power monitoring you can monitor all variables (supply voltage, current and phase angle), ensuring a very high sensitivity to even very small load changes, making this principle preferable for both over- and underload monitoring.
Recommended relay type:
RP91
Recommended converter:
FPA38

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