3-phase monitoring relays series FP

Under-voltage monitoring with or without time-delay

Over-voltage monitoring with or without time-delay

Phase-sequence monitoring with or without time-delay

Phase asymmetry monitoring with or without time-delay

+ various combinations of these monitoring principles

Single-pole relay output 8 A-250VAC

The C-mac® 3-phase monitoring relays series FP are made particularly to meet the requirements for safe and cost-effective monitoring of the quality of the 3-phase supply voltages and to protect electrical devices connected to the mains supply.

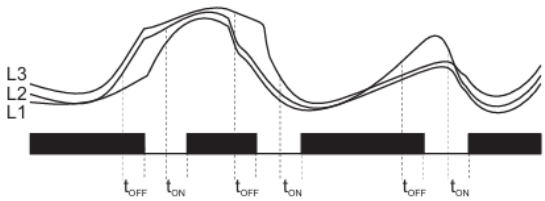
The units are enclosed in a DIN-rail housing, 35 mm wide and front height 45 mm, which makes them very suitable in industrial installations as well as domestic switchboard panels.

All units are connected to the 3-phase supply voltage with or without neutral and have a 1-pole relay output.

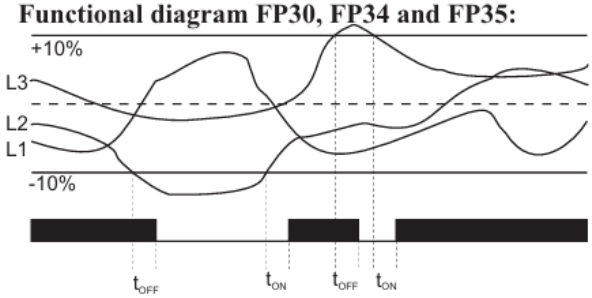
Technical data			
Supply, Voltage (ph-ph)	3 x 220 VAC +/- 25 %		
	3 x 230 VAC+/- 25 %		
	3 x 380 VAC+/- 25 %		
	3 x 400 VAC+/- 25 %		
	3 x 415 VAC+/- 25 %		
Supply frequency:	40-65 Hz		
Power consumption	Approx. 1.5 W		
Operation temp.	-20°C to +60°C		
Isolation voltage:	Supply- relay output: 4 kV		
Humidity:	0-90% RH, non-condensing		
Indications:	Green LED	activated:	Supply ON and levels are OK
		flashing:	Supply ON and level error
	Red LED:	Relay activated	
Relay output:	1-pole change-over contact		
Max.load, relay	1-pole	8 A – 250 VAC, ohmic load	

The FP series consist of the following variants:	
FP30:	Combined under- and over voltage relay with fixed reaction delay and adjustable setpoint
FP31:	Phase sequence / phase asymmetry relay with fixed reaction delay and adjustable setpoint.
FP34:	Combined phase sequence and under- and over voltage relay with fixed reaction delay and adjustable setpoint.
FP35:	Combined under- and over voltage relay with fixed setpoints and adjustable reaction delay.

Functional diagramFP31:



Functional diagram FP30, FP34 and FP35:



Example: Setpoint adjusted to +/- 10%

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Sensitivity and accuracy.

All units are universal for 3-phase supply with or without neutral. Internally, the 3 phase signals are monitored with respect to neutral, and all adjustments are made with neutral connected.
If the unit is connected to an installation without neutral, the unit will generate its own internal neutral level. In this case, the sensitivity of the unit is dependent on the way, the 3 phase-phase signals changes with respect to each other: If all 3 phases are equal, e.g. all of them are 10% lower than the nominal value, the accuracy and sensitivity of the unit is the same as if the neutral was connected, because the internal neutral remains the same. If only one of the phases changes, the result is that the internal neutral level will have an offset compared with the correct neutral, and the sensitivity of the unit will be decreased with up to 25%, depending on the difference between the 3 phase-phase voltages

Specifications type FP30.

FP30 is a combined under - and overvoltage relay with fixed reaction delay and adjustable setpoint.
The output relay activates, when all 3 voltages are within the set limits and releases, if one or more of the voltages are outside the limits.
The standard type has a delay - ON and delay - OFF time at 1 sec., and an adjustabe setpoint from +/- 5 to +/- 25 % of the nominal voltage.
Optionally, the unit can be delivered for undervoltage or overvoltage detection only, with ON - delay or OFF - delay only, with different delay time, or with different set-point range, see ordering guide.

Accuracy, setpoint: better than 2 %
Accuracy, delay: better than 1 %

Specifications type FP31.

FP31 is a phase -sequence/phase - asymmetry relay with fixed reaction delay and adjustable setpoint.
The output relay activates, if the phase sequence is OK and the phase asymmetry between the 3 phases is lower than the set limit, and releases, if the asymmetry exceeds the set point.
Compared with FP30 the relay does not release, if all 3 voltages are higher or lower than the nominal voltages, as long as the asymmetry between them is lower than the setpoint.
The standard type has a delay - ON and delay - OFF time at 1 sec., and an adjustabe setpoint from 5 to 25 %.
Option ally, the unit can be delivered with ON - delay or OFF - delay only, with different delay times, or with different setpoint range, see ordering guide.

Accuracy, setpoint: better than 2 %
Accuracy, delay: better than 1 %

Specifications type FP34.

FP34 combines the functions from FP30 and FP31, i.e. it is a combined phase sequence and under- and overvoltage relay with fixed reaction delay and adjustable setpoint.
The output relay activates, if the phase sequence is correct, and all 3 voltages are within the set limits and it releases, if one or more of the voltages are outside the limits.
The standard type has a delay - ON and delay - OFF time at 1 sec., and an adjustabe setpoint from +/- 5 to +/- 25 % of the nominal voltage. Optionally, the unit can be delivered for undervoltage or overvoltage detection only, with ON - delay or OFF - delay only, with different delay time, or with different setpoint range, see ordering guide.

Accuracy, setpoint: better than 2 %
Accuracy, delay: better than 1 %

Specifications type FP35.

FP35 is a combined under- and overvoltage relay with fixed setpoint and adjustable reaction delay.
The output relay activates, when all 3 voltages are within the set limits and releases, if one or more of the voltages are outside the limits.
The standard type has a setpoint of +/-10% of the nominal supply voltage and an adjustable delay - ON and delay - OFF time between 0 and 10 sec. Optionally, the unit can be delivered for undervoltage or overvoltage detection only, with ON - delay or OFF - delay only, with different setpoint, or with different delay range, see ordering guide.

Accuracy, setpoint: better than 2 %
Accuracy, delay: better than 1 %

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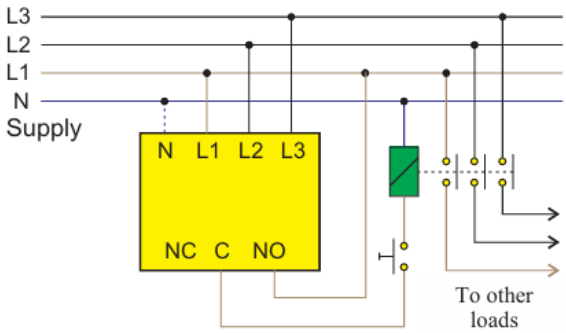
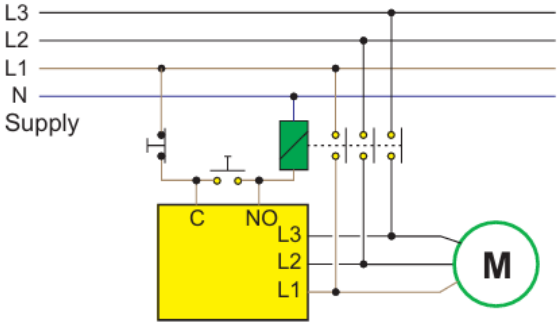
Connections:

ex. 1: Mains monitoring.



When the monitoring relay is connected as shown on the drawing above, the mains supply must be correct, before the load can be activated. This is particularly important if the load is sensitive to under - or overvoltage, and to ensure correct rotation direction of motors.
This monitoring principle is recommended, when you want a general monitoring of the mains supply to several loads at the same time

ex. 2: Load monitoring.



If instead you want to monitor the supply voltage for a single load, you can connect the monitoring relay after the contactor, in this way the contactor itself is also monitored. This principle is recommended if f.inst. you want a quick reaction in case of a phase failure to a motor.
In the example above, the relay output is connected in parallel with the start contact, thereby it latches the contactor, if the supply is OK, and in case of an error, the contactor is released.
When you connect the monitoring relay after the contactor, you must notice, that the monitoring relay is activated at the same time as the load, which means the relay cannot protect against wrong phase - sequence during the period, where the startbutton is activated.

Orderingguide:

FP30-xxx-ab-cd
FP31-xxx-e-cd
FP34-xxx-ab-cd
FP35-xxx-fg-hi

xxx= Suply voltage (phase-phase)

220 = 220 VAC
230 = 230 VAC
380 = 380 VAC
400 =-400 VAC
415 = 415 VAC

It the standard unit is, only the type number and the supply is used e.g. FP31-400.
Standard unit:

FP30-xxx:	Delay - ON and delay - OFF: fixed 1 sec. Setpoint: adjustable +/-5% to +/-25%
FP31-xxx:	Delay - ON and delay - OFF: fixed 1 sec. Setpoint: adjustable 5% to25%
FP34-xxx	Delay - ON and delay - OFF: fixed 1 sec. Setpoint: adjustable +/-5% to +/-25%
FP35-xxx	Delay - ON, delay - OFF: adjustable 0-10 sec. Setpoint: fixed +/-10%

If a special unit is ordered, the whole number must be used, e.g. FP30-400-30-31

a = *undervoltage range*, **b** =*overvoltage range*

0 = not used	5 = fixed 5 %	Note:
1 = 5 - 10 %	6 = fixed 10 %	If both under-and over
2 = 5 - 15 %	7 = fixed 15 %	voltage monitoring is
3 = 5 - 20 %	8 = fixed 20 %	used, both ranges must
4 = 5 - 25 %	9 = fixed 25 %	be the same, e.g.5-15%
X = Special		

c = t_{on} *delay* **d** = t_{off} *delay*

0 = 100 msec	3 = 3 sec	6 = 1 min	X = special
1 = 300 msec	4 = 10 sec	7 = 3 min	
2 = 1 sec	5 = 30 sec	8 = 10 min	

e = *asymmetry range*

1 = 5 – 10 %	3 = 5 – 20 %	X = Special
2 = 5 – 15 %	4 = 5 – 25 %	

f = *setpoint,undervoltage*		**g** = *setpoint, overvoltage*	
0 = not used	4 = - 20%	0 = not used	4 = + 20%
1 = - 5%	5 = - 25 %	1 = + 5%	5 = + 25 %
2 = - 10%	X = special	2 = + 10%	X = special
3 = - 15%		3 = + 15%	

H = t_{on} *delay range* **I** =t_{off} *delay range*

Note: If both t_{on} and t_{off} is adjustable, both of them must have the same range. If one of the delays is fixed, an "F " is placed before the delay range number (range 0 and 1 is always fixed)

0 = 100 msec	3 = 0 – 3 sec	6 = 0 - 1 min	X = special
1 = 300 msec	4 = 0 – 10 sec	7 = 0 – 3 min	
2 = 0 – 1 sec	5 = 0 – 30 sec	8 = 0– 10 min	

EMC and safety regulations

Emmision:	EN50081-1
Immunity:	EN50082-2
Safety:	EN60730

Materials and weight

Housing:	NORYL-SE-1, grey, self-extinguishing
Bund:	NORYL SE-1, GFN-2, black, self-extinguishing
Terminaler:	Nickel-plated brass
Weight	190 g

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