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PH001 + PAN45-01-00

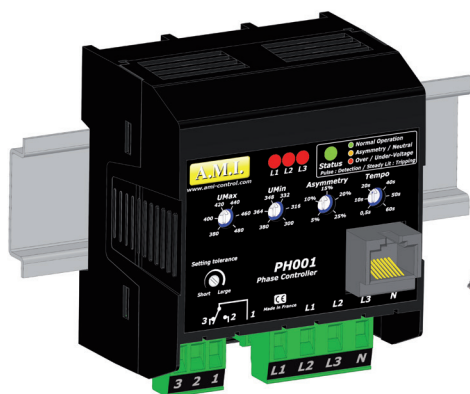
PHASE ROTATION CONTROLLER



Protection against :

- reverse phase rotation.
- overvoltages and undervoltages.
- the voltage differences between phases due to loss of neutral or asymmetry.

(Over / undervoltage protection usable in a single-phase)

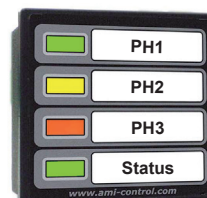


PH001
Inside cabinet

Quick connect cable
provided



Display on cabinet door in very
low voltage (5V isolated)



PAN45-01-00
48x48 DIN format

The three-phase power grid controller makes it possible to protect the installation **BEFORE** and **AFTER** starting up against an always possible failure of the power grid.

CHARACTERISTICS:

It constantly monitors :

- the presence of the 3 phases and the direction of rotation.
- the undervoltage and overvoltage of each of the phases.
- the asymmetry of each phase and loss of neutral.

He rocks :

- an adjustable delayed shutdown when exceeding the setting.
- an instantaneous shutdown in the event of an abnormally high overshoot.

The set includes :

- a box to be mounted inside the cabinet on a symmetrical DIN rail.
- a DIN 48x48 display unit equipped with 4 very high brightness LEDs.

(delivered with an extra flexible connection cord equipped with 2 RJ45 connectors).

In «three-phase without neutral» use, it effectively protects the motors and all elements.

In «three-phase with neutral» use, it provides protection against loss of neutral for PH/N powered elements.

It also allows a display outside the cabinet in «very low voltage» security.

With an intuitive display, it indicates:

- the presence of the 3 phases with the clockwise or anti-clockwise direction of rotation.
- the undervoltage and overvoltage of each of the phases.
- asymmetry or loss of neutral.
- the status of the output (possible use of the power grid or not).

PH001 PART:

The PH001 is mounted inside the cabinet on a symmetrical DIN rail.

Power supply : PH001 is self-powered by the controlled inputs (C). It monitors the power grid as soon as there is any phase and neutral or any two phases. In the event of loss of supply or insufficient supply, the output relay is deactivated (positive safety).

It includes :

- (A) - 4 LEDs for signaling the operation.
- (B) - 4 potentiometers for setting the limits.
- (C) - 1 removable 4-points terminal block for connecting the 3 phases and the optional neutral.
- (D) - 1 removable 3-points terminal block for connection of the positive safety relay output contact with 1RT contact.
- (E) - 1 RJ45 connector powered by 3kV isolated optocouplers, for connecting the LEDs to the remote PAN45-01-00.
- 1 switching power supply, isolated at 1kV, intended to supply the remote light box, the PAN45-01-00.

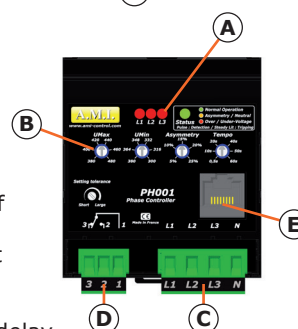
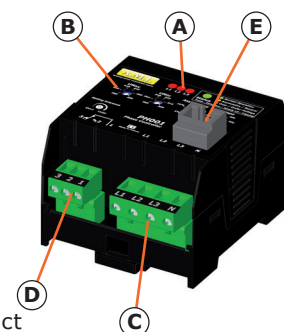
In front :

- 4 LEDs: the first 3 LEDs (L1, L2, L3) are used to display the state of each phase and direction of rotation.

The 4th LED (Status) displays whether the power grid is usable or not, as well as the type of fault found.

(see next page, the different possible displays)

- 4 adjustment potentiometers: overvoltage, undervoltage, asymmetry / loss of phase and time delay.
- An RJ45 socket isolated by optocoupler and by internal switching power supply.



LED Indicator
Display

PAN45-01-00 DISPLAY BOX:

The PAN45-01-00 allows you to indicate the installation status, without having to open the cabinet door.
It is intended to report the display states on the front while ensuring galvanic separation from the power grid. The front IP65 safety box is supplied with «very low voltage» (5Vdc by 1kV isolated converter and 3kV optocouplers located in the PH001 box).

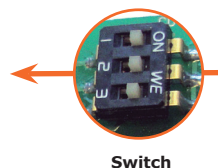
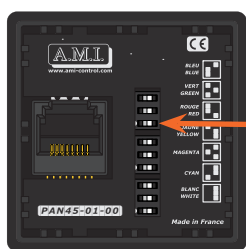
In DIN 48x48 format, with bracket mounting, it has 4 high-brightness LEDs. The first 3 LEDs are used to display the state of each phase, as well as to indicate the direction of rotation. The 4th LED displays whether the power grid is usable or not, as well as the type of fault found. (see on the next page, the different possible displays).

- Quick connection by extra flexible RJ45 cable, supplied with the box.
- Possibility to select a color among 7 for each of the first 3 LEDs.
- Removable front label wich can be easily created by the user.

SETTING THE LED COLOR:

The LEDs are of the CMS tri-LEDs type. For each channel, a switch located at the rear, allows you to select a display color for among 7 :

Red, Green, Yellow, Blue, White, Cyan, Magenta



Switch

	OFF	ON
Bleu Blue		
Vert Green		
Rouge Red		
Jaune Yellow		
Magenta		
Cyan		
Blanc White		
Eteint Off		

ACHIEVEMENT OF LABELS:

The labels are simple sheets of paper which slip into a transparent pocket included in the tickness of the facade. A blank label is provided with each device.

They can be done by hand, or edited on a color printer (laser or inkjet).

PC software allows you to create them, include an image, save and duplicate the creations.

This software is free and downloadable from our website :

www.ami-control.com

Possibility of printing on plastic sheets for countries with high humidity.

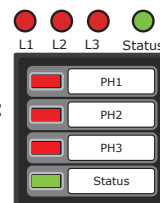
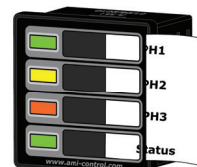
OPERATION:

The box is operational as soon as :

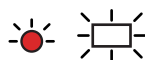
- a voltage of 150V Ph/Ph minimum between two phases present in three-phase assembly.
- a voltage of 120V Ph/Ph minimum between two phases present and the neutral connected in three-phase + neutral mounting.
- a voltage of 150V Ph/N between phase and neutral in single phase connection.

With a correct phase rotation and with all voltages within the adjustment limits, the signaling will be as follows :

- the phase indication LEDs (L1, L2, L3, PH1, PH2, PH3) are ON steady.
- the «Status» LED is lit in GREEN steady.
- the output relay is normally activated.



In the following explanations, no account is taken of the presence of induced voltage or of voltage return on the absent phase. To simplify, the measurements and examples are made from channel 2 (L2, PH2).

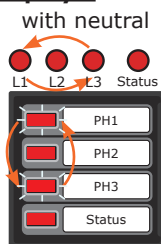


Indicate SLOW blinking



Indicate FAST blinking

The different possible displays:



- Three-phase installation, with only one phase present correct (PH2) and neutral connected :
- without voltage return, the display will be in running light effect.
 - with voltage return, the other phases will be displayed under voltage.

Use	
Three phase without neutral	The neutral terminal is not used.
Three-phase with elements connected in PH / Neutral	When supplying single-phase elements, connection of Neutral is compulsory. In three-phase, the connected neutral allows display in all situations, including in the case where only one phase is present. this avoids having a display turned off while a dangerous voltage is present.
Single phase	The phase used is connected to the 3 terminals L1 / L2 / L3. The neutral terminal is connected to the neutral Note that the indication of over and under voltage is indicated in three phase.

Phase rotation:

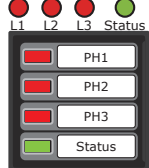
As soon as the power is turned on and during the entire operating period, the system checks the presence and direction of phase rotation.

- If the detected direction is anti-clockwise (known as reverse rotation): the relay will be immediately deactivated in order to prevent incorrect rotation of the motors. The display of LEDs 1/2/3 will be in running light effect, LED 4 will be red steady. The relay will only be activated after checking the correct rotation and after carrying out the other checks.

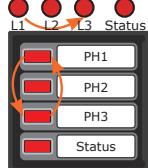
- If the detected direction is clockwise: the rest of the complete control cycle will be carried out.

The output relay will only be activated when the entire control cycle remains correct.

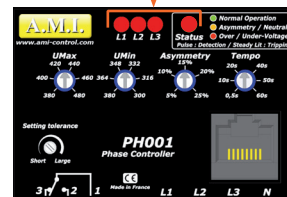
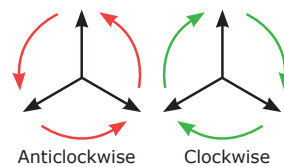
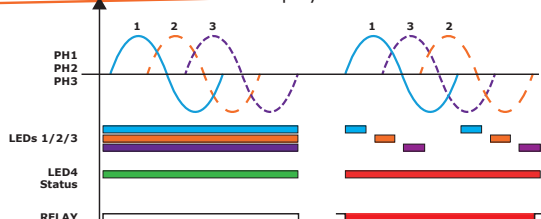
Display on the PH001 DIN box inside the cabinet



with correct rotation

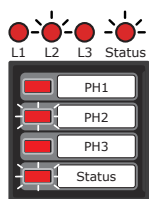


with reverse rotation display will be in running light effect on PH1, PH2, PH3. The relay is instantly deactivated.



ADDITIONAL CHECK WHEN ROTATION IS CORRECT:

In the following cases, phase 2 is taken as an example, but this remains valid for phase 1 and 3.



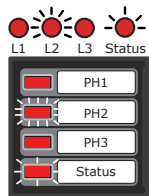
Undervoltage detection (300V to 380V):

As soon as the phase rotation is correct, the voltage on each phase is compared with the setpoint displayed on the Umin front potentiometer.

If a phase has a voltage lower than this setpoint:

- The corresponding LED will be displayed by blinking slowly.
- LED 4 will be displayed in RED, blinking slowly.

If the fault is still present and after the end of the time delay, the output relay will be deactivated and LED 4 will turn RED steady.



Overvoltage detection (380V to 480V):

The voltage on each phase is compared with the setpoint displayed on the Umax front potentiometer.

If a phase has a voltage higher than this setpoint:

- The corresponding LED will be display by rapid blinking.
- LED 4 will be displayed in RED, blinking slowly.

If the fault is still present and after the end of the time delay, the output relay will be deactivated and LED 4 will turn red steady.

If the voltage exceeds 10% of the Umax setting value, the relay will be deactivated immediately.

If the voltage of a phase is between the «undervoltage» setpoint and the «overvoltage» setpoint, the corresponding LED will be displayed steady. (LED 1 and LED 3 in the example). As a result, it is possible to see a display with the 3 states on the LEDs 1,2,3, namely: one LED steady, one LED blinking slowly and one LED blinking fast.

Loss of neutral / phase asymmetry (5% to 25%):

Risks such as undervoltage and overvoltage can cause destruction of the equipment.

The PH001 makes it possible to constantly check that the voltages remain within acceptable limits. But while remaining within the minimum / maximum limits, the voltage of one phase can become too high and another too low. This can be caused by:

- **loss of neutral in «Three-phase + neutral» mode:** Neutral allows the same Phase / neutral voltage to be maintained whatever the consumption, even unbalanced. In the event of neutral cut-off and if the installation remains balanced, the phase / neutral voltage remains stable. But in the event of loss of neutral and unbalanced installation, the neutral seen by the user is re-supplied through the other consumers present. In this case, the voltage of one phase relative to the neutral decreases while the voltage of another phase increases relative to neutral. This situation can be detrimental or even destructive for single-phase consumers. The loss of the neutral is only prejudicial from the moment when the single-phase voltage becomes abnormal (outside the defined thresholds).

- **Phase loss:** the loss of a phase is difficult to detect because the other consumers present return a voltage by induction or by voltage return on the missing phase.

As a result, the voltage of the missing phase is not zero.

In any case, the damage is caused by the voltage difference between each of the phases.

- The PH001 controls the voltage difference between each of the phases compared to an internal dummy neutral.

This voltage difference must remain below the setpoint displayed on the «Asymmetry» front potentiometer.

When all the phase voltages are correct, (i.e. between the under and overvoltage thresholds), the PH001 compares the voltage of each phase with respect to the others in %. If the voltage of one phase compared to another, goes outside the limits defined in «asymmetry»: LED 4 will be displayed in yellow, blinking slowly. If the fault is still present and after the end of the time delay, the output relay will be deactivated and LED 4 will turn yellow steady.

Note that a general voltage drop over the three phases (following a three-phase start-up by a large consumer) will have no impact as long as this drop remains within the limits of the undervoltage setting.

In addition, if the voltage of one of the phases goes beyond the under or overvoltage limits, the corresponding LED (L1, L2 or L3) will be displayed blinking slowly or fast.

Instant trigger:

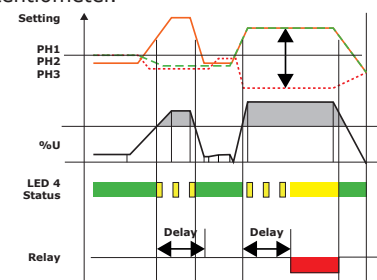
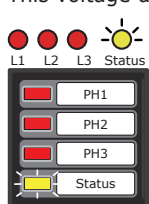
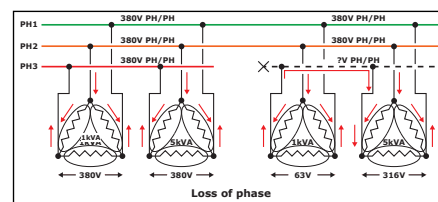
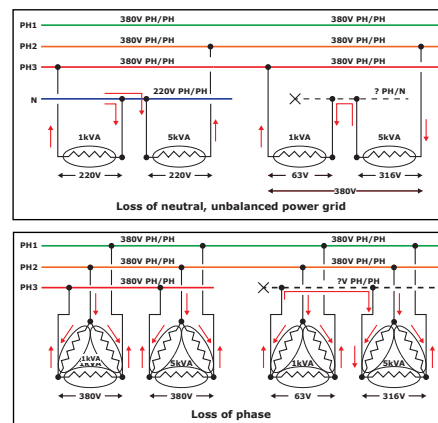
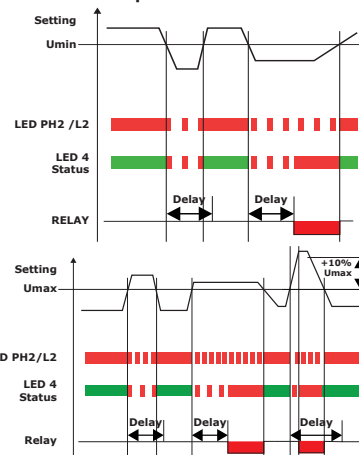
The output relay is deactivated instantly in the event of:

- loss of phase rotation.
- exceeding the overvoltage setting by more than 10%.
- exceeding the maximum of the asymmetry / loss of neutral, i.e. +25%.
- voltage higher than 277v PH/N or 480v PH/PH.

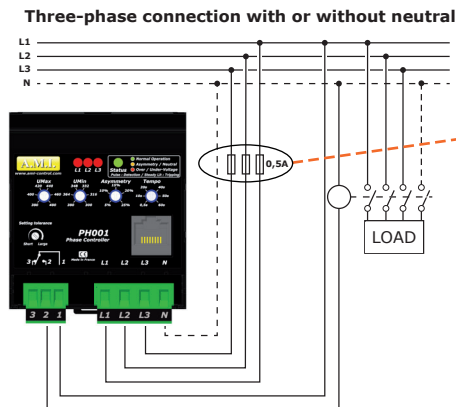
Time delay (0,5s to 60s):

The output delay is deactivated after a delay in the event of:

- exceeding the overvoltage / under voltage setting between 0 and 10%.
- exceeding the asymmetry setting or loss of neutral less than 25%.



CONNECTIONS:

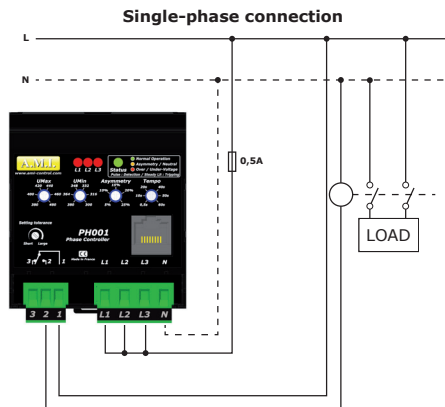


Protection by 3 fuses is compulsory.

Crossing neutral with a phase can destroy the device.

If the neutral is used in the installation protected by the PH001, connection of the neutral is **compulsory**.

The voltage indication is indicated PH / PH

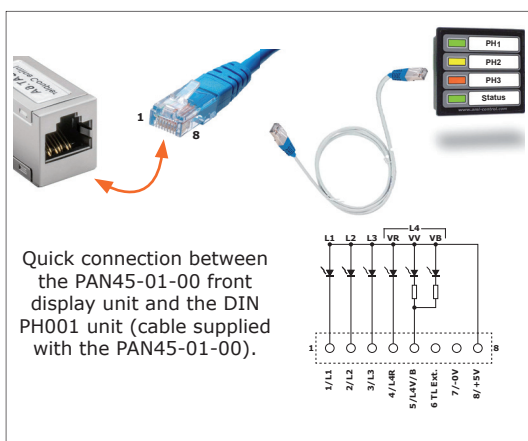
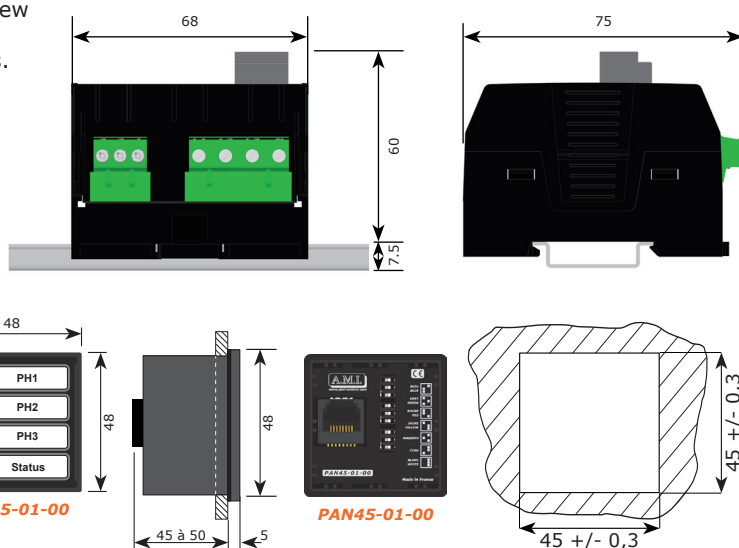


Commissioning:

- Position the settings by turning all potentiometers fully clockwise.
- Apply the voltage setting and check the phase rotation display.
- Since this is correct, reduce the U_{max} detection threshold by turning the potentiometer anti-clockwise.
- As soon as the detection is displayed, bring the setting a few degrees clockwise.
- Do the same for the other U_{min} and asymmetry settings.
- Adjust the timing as needed.

In single-phase, the «overvoltage» and «undervoltage» as well as «time delay» detections are active. Phase rotation and asymmetry / loss of neutral are inactive.

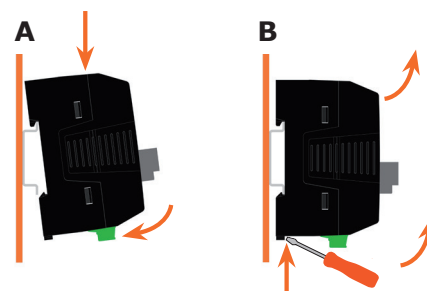
DIMENSIONS:



CARACTERISTICS:

	PH001		PAN45-01-00
	Three phase PH / PH	Single phase PH / N	
Supply			
Nominal :	150V - 480V	150V-280V	Powered by the PH001 box in 5V through the RJ45 cable
Minimum :	150V	150V	
Consumed strength :			
Frequency :			
	2VA 45-55Hz		
Settings :			
Under pressure :	300V - 380V	173V - 220V	
On voltage :	380V - 480V	220V - 277V	
Asymmetry % :	5% - 25%		
Time delay :	1s		
Start-up times :	<1s		
Instant protection			
Loss of rotation :	Yes	No	
On voltage :	U _{max} > +10% of the setting or > 277v PH/N or 480v PH/PH		
Asymmetry % :	Asymmetry > +25%	No	
Time delay :	0,5s		
Output contact :			
Rated / Max intensity :	1RT 8A / 10A		
Rated / Max cut-off voltage :	250Vac / 400Vac		
Max cut-off power :	2500VA / 300W		
Number of operations :	1x10 ⁷		
Contact material :	AgSnO ₂		
Insulation between power supply and contacts :	5KV / 1mn		
Enclosures			
Protection :	IP20		
Material :			
Resistance to flame :	UL94 V2 class		
Humidity in use / storage :	90% non-condensing / 70%		
Operating temperature :	-20°C / +60°C		
Storage temperature :	-20°C / +70°C		
Surface insulation :	10 ¹⁵ Ohms/cm		
			IP65 on front polyamide PA66 30gf UL94 V2 class 90% non-condensing / 70% -20°C / +60°C -20°C / +70°C 10 ¹⁵ Ohms/cm

ASSEMBLY / DISASSEMBLY:



Assembly (A) of the housing on the profile and disassembly (B)

COMMANDE:

- **PH001**: Phase rotation controller in 380V or 220v single phase, DIN box.

- **PAN45-01-00**: 4 LEDs display, 48x48, 5V voltage, mounting on the front of the cabinet, supplied with RJ45 cable L = 2.00m (other length on request).