

A.M.I.

THREE-PHASE GRID

DISPLAY AND PROTECTION

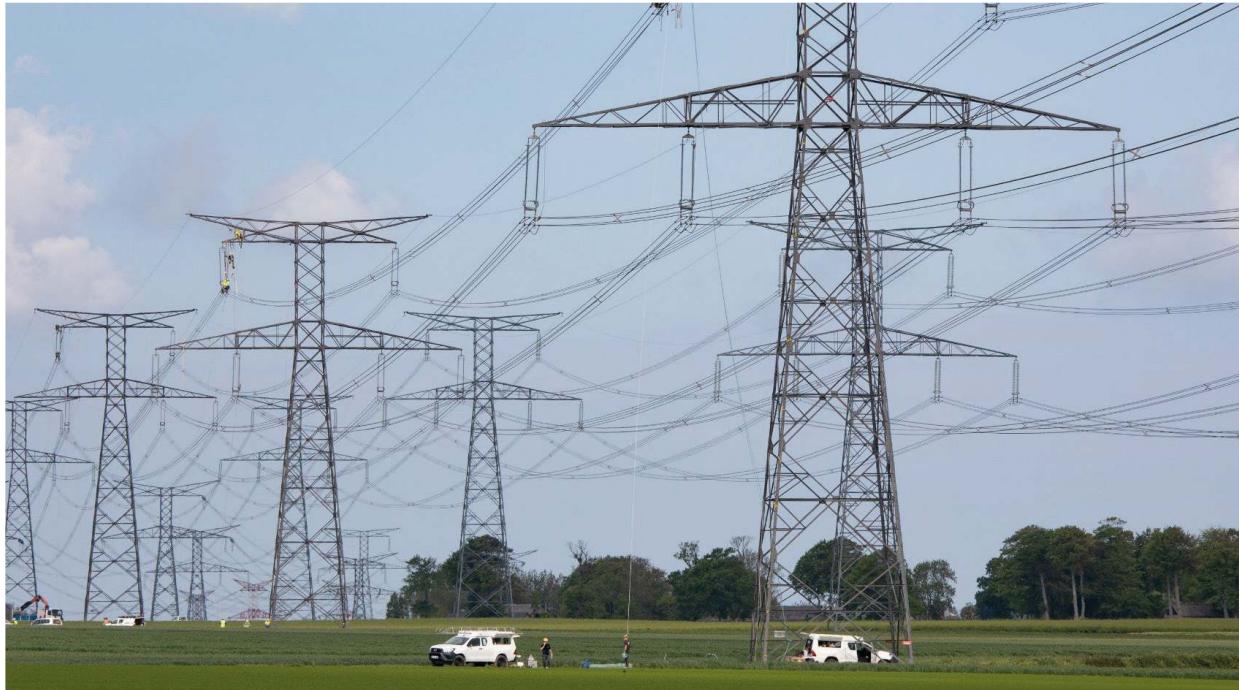
www.ami-control.com



MADE IN
FRANCE



Each piece
is tested
one by one



PAN35-55-13

**Phase presence display
for three-phase**



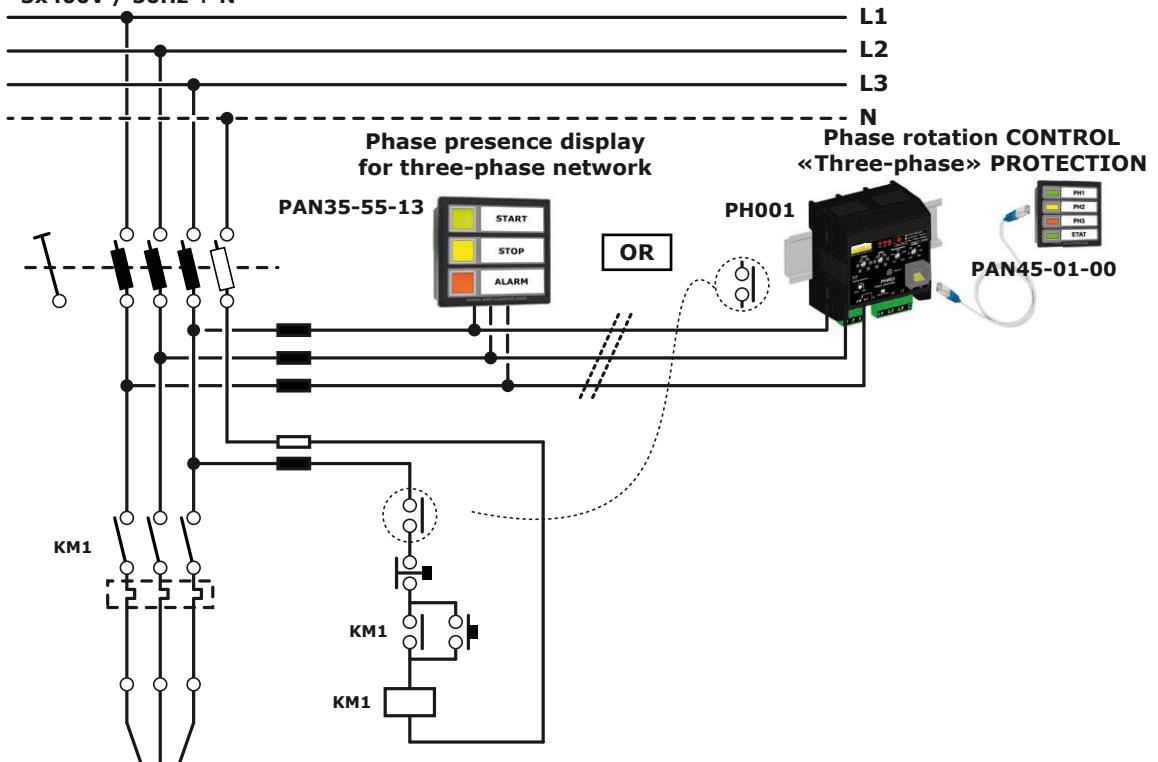
PH001 + PAN45-01-00

**Phase rotation CONTROL
«Three-phase» PROTECTION**



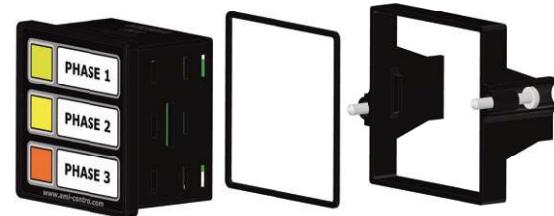


Three-phase network
3x400V / 50Hz + N





PHASE PRESENCE DISPLAY FOR THREE-PHASE



PHASE PRESENCE DISPLAY FOR THREE-PHASE PAN35-55-13 :

The PAN35-55-13 is used to indicate the presence of the 3 phases on three-phase network. In DIN 48x48 format, with bracket mounting, it is equipped with 3 high-luminosity LEDs.

- Possibility to select one color among 7 for each of the LEDs to comply with local habits.
- Removable front label that can be easily created by the user.

OPERATION :

The PAN35-55-13 is a "capacitor" technology version. This concept of energy transformation associated with long-life LEDs, ensures high luminosity with practically zero heating. In order to avoid electrocution during an intervention (due to the residual voltage in the capacitors), each capacitor is equipped with fast discharge resistors.

The purpose of an LED (or a light) is to indicate whether information is present or not.

- If voltage is present, the LED must be on.
 - If the voltage is absent, the LED must be off.
- But what if the voltage is too low?

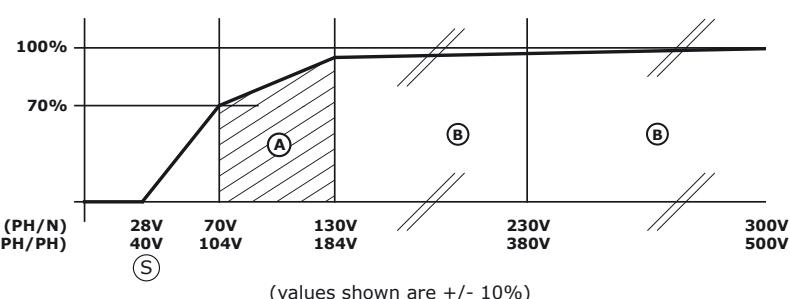
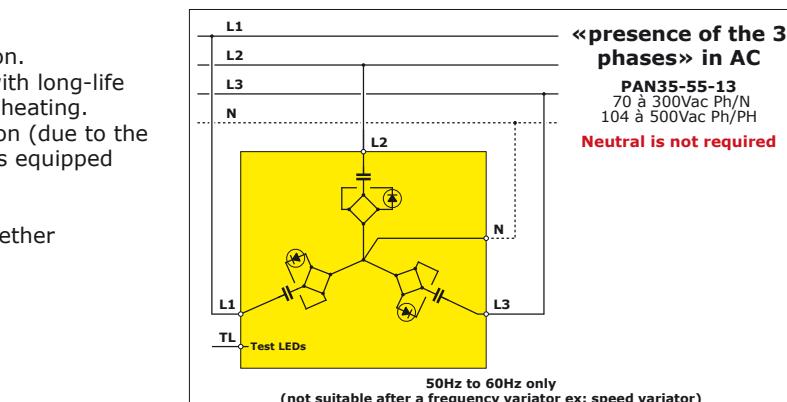
LEDs have undeniable qualities: longevity, very low consumption, high brightness. But, on the other hand, they can bring inconvenience.

Their very high sensitivity added to their low consumption allow them to light up under a very low voltage that can mislead an operator.

It often happens that a leak or a return voltage is present on the installation, generating a residual voltage of a few volts when it should be zero.

A minimum ignition threshold (S) is integrated in order to avoid untimely ignition of the LEDs (low glow) in the presence of residual voltage. The LEDs only light up if the voltage present is greater than this threshold.

On request, this threshold can be modified.



On the diagram, the correct brightness (70%) will be reached at the minimum operating voltage.

- In the ignition start area (A), the white color may be pink. Normal luminosity is reached from 50% of the nominal voltage.
 - In the area (B) the luminosity will be constant.
- In «LED test» use and in order to limit general consumption in the case of many displays, the brightness is reduced.

PRODUCING LABELS :

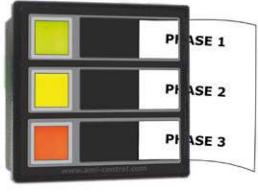
Labels are ordinary paper sheets that can be slid into a transparent pocket included in the thickness of the front face.

A blank label is supplied with each unit.

Labels can be handmade, or draw on the screen of the PC and produced with a colour printer (laser or ink-jet).

The PC software allows to create labels including images, allows to save and duplicate the achievements. This PC software is FREE. It is possible to load it on our website :

www.ami-control.com



For high humidity countries, the printing on plastic sheets is recommended.

LEDS COLOR SETTING :

PAN35

A display choice of 7 colors per LEDs is possible. This choice is selectable using switches on the panel front face.

You have a choice of the following colours :

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



	OFF	ON
Bleu Blue	1 2 3	[]
Vert Green	1 2 3	[]
Rouge Red	1 2 3	[]
Jaune Yellow	1 2 3	[]
Magenta	1 2 3	[]
Cyan	1 2 3	[]
Blanc White	1 2 3	[]
Eteint Off	1 2 3	[X]

- For safety reasons on models powered by high voltages such as the **PAN35-55-13**, the connection cables must be fitted with insulating end caps covering the cable insulation.

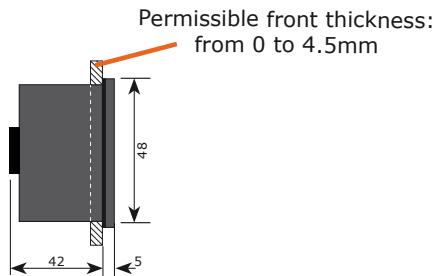
- For safety, the switches are located at the front of the box. To reach them, it is necessary to remove the "printed circuit" block. Lift the screw (A) and extract the block from the rear.

- The «Test Leds» function will only be active if the phase supplying the «Test Leds» button is present.

Supply	70V - 300V PH/N 104V - 500V PH/PH
Power consumed	2VA
Frequency	50/60 Hz
Enclosure	Front in polycarbonate, housing in polyamide PA66 30gf
Color	Black
Sealing	front IP65
Flame resistance	UL94 class V2
Surface insulation	10 ¹⁵ Ohms/cm
Temperature in use / storage	-20°C / +60°C / -20°C / +70°C
Humidity in use / storage	90% non-condensing / 70%
Weight	60g

AC use: 50 Hz to 60 Hz only
(not suitable after a variable frequency drive ex: variable speed drive)

DIMENSIONS :



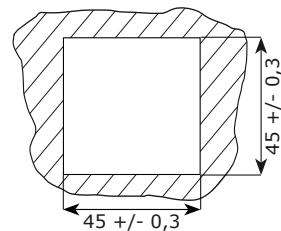
Connections :

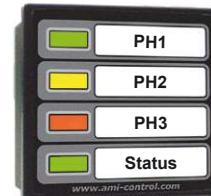
This product is powered by high voltage.

The greatest care must be taken in the connection.

The use of ferrules with insulation on each of the wires, is essential.

CUT-OUT :



MADE IN
FRANCEWith last trip
memoryQuick connect cable
providedDisplay 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.

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).

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).

PH001 PART :

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

Power supply : the box is self-powered by the inputs to be controlled (C). It checks the network as soon as any phase and neutral or any two phases are present. In the event of loss of power or insufficient power, the output relay is deactivated (positive safety).

It includes an isolated 1KV switching power supply, intended to supply the remote light box, the PAN45-01-00.

It includes :

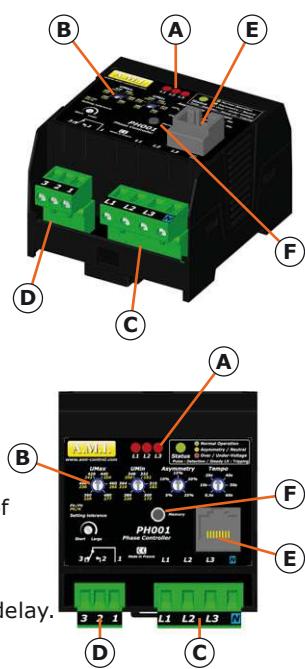
- (A) - 4 LEDs for signaling the operation.
- (B) - 4 potentiometers for setting the limits.
- (C) - 1 removable 4-points terminal block for connecting the 3 phases and the optional neutral.
- (D) - 1 removable 3-points terminal block for connection of the positive safety relay output contact with 1RT contact.
- (E) - 1 RJ45 connector powered by 3kV isolated optocouplers, for connecting the LEDs to the remote PAN45-01-00.
- (F) - A push button to display the last trigger.

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.
- A push button to display the last trigger.



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.

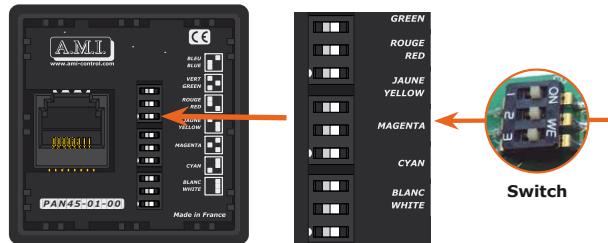
The first 3 LEDs are used to display the state of each phase, as well as to indicate the direction of rotation. The 4th LED displays whether the power grid is usable or not, as well as the type of fault found. (see on the next page, the different possible displays).

- 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 which can be easily created by the user.

LEDS COLOR SETTING :

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



	OFF	ON
Bleu Blue	2 3	1
Vert Green	1 3	2
Rouge Red	2 3	1
Jaune Yellow	1 3	2
Magenta	2 3	1
Cyan	1 3	2
Blanc White	2 3	1
Eteint Off	1 2 3	X

ACHIEVEMENT OF LABELS :

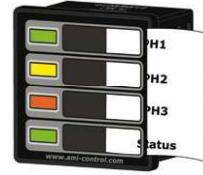
The labels are simple sheets of paper which slip into a transparent pocket included in the thickness of the facade. A blank label is provided with each device.

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 :

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).



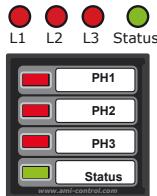
The box is operational as soon as :

- 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.



Use	
Three-phase without neutral	The neutral terminal is not used. The PH001 uses its fictitious internal neutral.
Three-phase with Neutral	When supplying single-phase elements, the connection of Neutral is necessary. In three-phase, the connected neutral allows display in all situations, including when 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. Only the «safe» and «undervoltage» checks will be active

If only one phase is present and the neutral is absent, the display is off.

If only one phase and neutral are present, the display is chased.

If one or two phases, with or without neutral, are present, the display is chased.

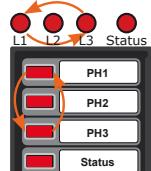
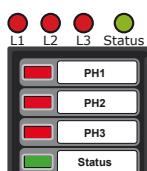
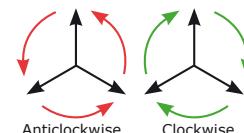
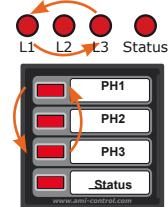
A «voltage return» presence will display an undervoltage.

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.

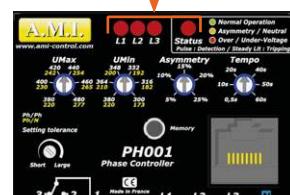
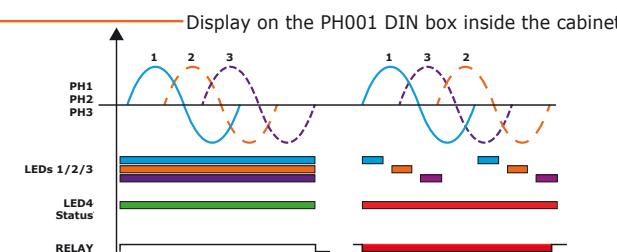
- If the detected direction is clockwise: the rest of the complete control cycle will be carried out.

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



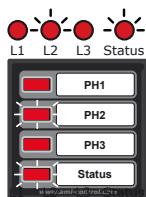
with correct rotation

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.

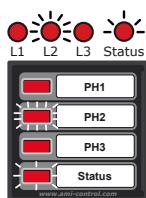
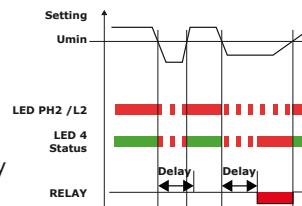


Undervoltage detection (300V to 380V) :

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.

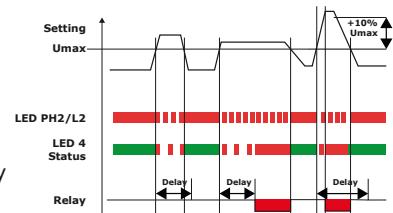


Oversupply detection (380V to 480V) :

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 displayed 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.

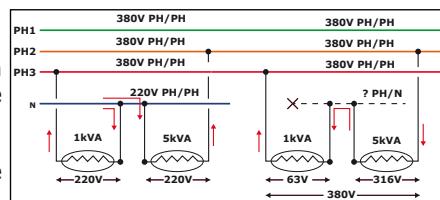
If the voltage of a phase is between the «undervoltage» setpoint and the «oversupply» setpoint, the corresponding LED will be displayed steady. (LED 1 and LED 3 in the example). As a result, it is possible to see a display with the 3 states on the LEDs 1,2,3, namely: one LED steady, one LED blinking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

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

Risks such as undervoltage and oversupply 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.

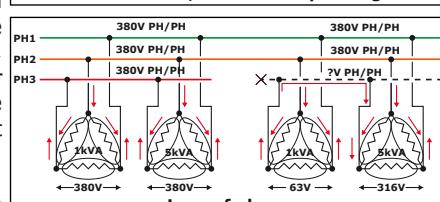
In any case, the damage is caused by the voltage difference between each of the phases.

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

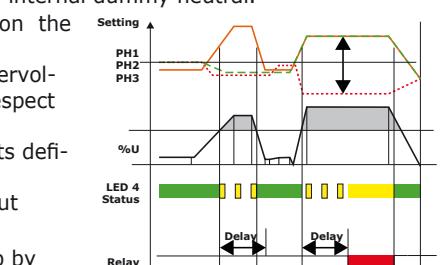
This voltage difference must remain below the setpoint displayed on the «Asymmetry» front potentiometer.

When all the phase voltages are correct, (i.e. between the under and oversupply 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 oversupply 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 oversupply 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 oversupply / under voltage setting between 0 and 10%.
- exceeding the asymmetry setting or loss of neutral less than 25%.

Trip memory operation :

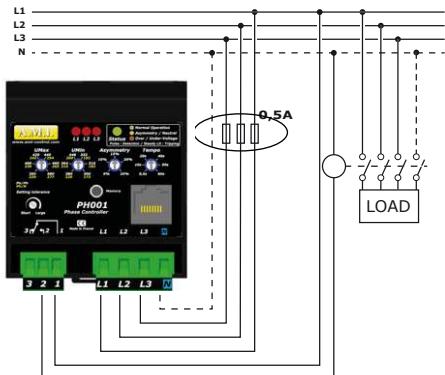
When triggered, the PH001 memorizes the display status of each indicator.

- Pressing the front panel button will display this status again.
- Releasing the button within the next 10s returns to normal function without deletion.
- Pressing for more than 10s causes a warning by rapid flashing of the LEDs, indicating that the memory will be erased.

After clearing, the flashing changes to slow, indicating the possibility of releasing the button.

CONNECTIONS :

Three-phase connection with or without neutral



Protection by 3 fuses is compulsory.

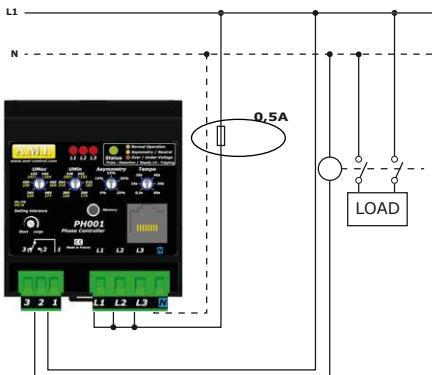
Crossing neutral with a phase can destroy the device.

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

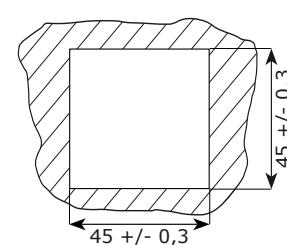
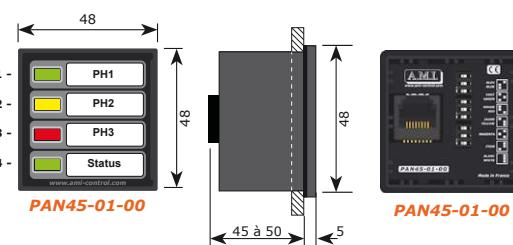
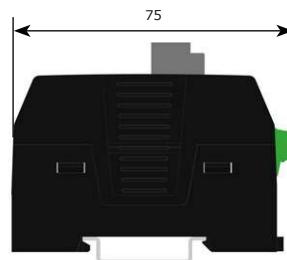
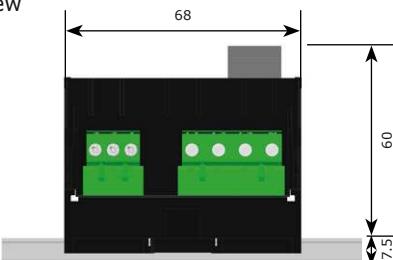
Can be used with a switch or circuit breaker equipped with an undervoltage trip coil.

Single-phase connection



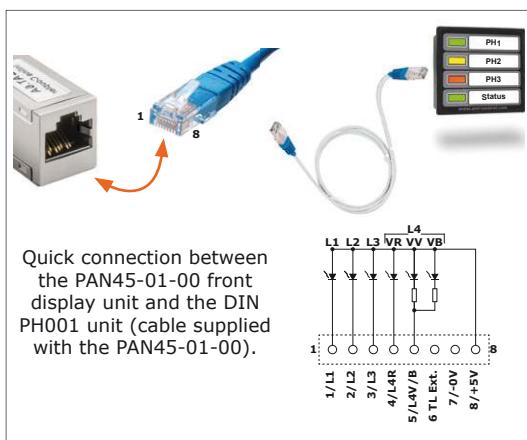
In single-phase, the «overvoltage» and «undervoltage» as well as «time delay» detections are active. Phase rotation and asymmetry / loss of neutral are inactive.

DIMENSIONS :



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 Umax 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 Umin and asymmetry settings.
- Adjust the timing as needed.

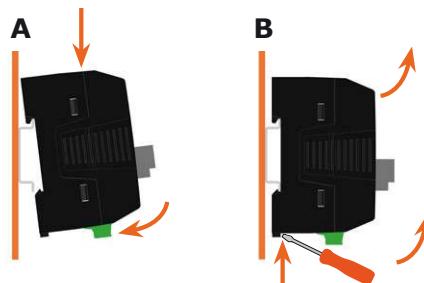


Quick connection between the PAN45-01-00 front display unit and the DIN PH001 unit (cable supplied with the PAN45-01-00).

CARACTERISTICS :

	PH001	PAN45-01-00
	Three phase PH / PH	Single phase PH / N
Supply		
Nominal :		
Minimum :		
Consumed strength :		
Frequency :		
Settings :		
Under pressure :		
On voltage :		
Asymmetry % :	300V - 380V 380V - 480V 5% - 25%	173V - 220V 220V - 277V
Time delay :	1s <1s	
Start-up times :		
Instant protection		
Loss of rotation :	Yes	No
On voltage :	Umax > +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	
Rated / Max cut-off voltage :	8A / 10A	
Max cut-off power :	250Vac / 400Vac	
Number of operations :	2500VA / 300W	
Contact material :	1x10 ⁷	
Insulation between power supply and contacts :	AgSnO ₂	
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	

ASSEMBLY / DISASSEMBLY :



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

ORDER :

- **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).