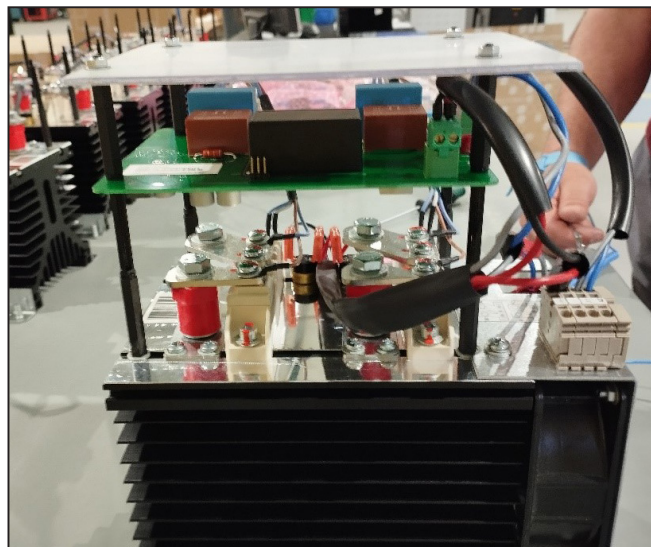




INSTALLATION OF THE STATIC CONTROL MODULE EMB-M-2PH-80-400



ASSEMBLY GUIDE

(M373I01-03-24A)





SAFETY PRECAUTIONS

Follow the warnings described in this manual with the symbols shown below.

**DANGER**

Warns of a risk, which could result in personal injury or material damage.

**ATTENTION**

Indicates that special attention should be paid to a specific point.

If you must handle the unit for its installation, start-up or maintenance, the following should be taken into consideration:



Incorrect handling or installation of the device may result in injury to personnel as well as damage to the device. In particular, handling with voltages applied may result in electric shock, which may cause death or serious injury to personnel. Defective installation or maintenance may also lead to the risk of fire.

Read the manual carefully prior to connecting the device. Follow all installation and maintenance instructions throughout the device's working life. Pay special attention to the installation standards of the National Electrical Code.

**Refer to the instruction manual before using the device**

In this manual, if the instructions marked with this symbol are not respected or carried out correctly, it can result in injury or damage to the device and /or installations.

CIRCUTOR S.A.U. reserves the right to modify features or the product manual without prior notification.

DISCLAIMER

CIRCUTOR S.A.U. reserves the right to make modifications to the device or the unit specifications set out in this instruction manual without prior notice.

CIRCUTOR S.A.U. on its web site, supplies its customers with the latest versions of the device specifications and the most updated manuals.

www.circutor.com



CIRCUTOR S.A.U. recommends using the original cables and accessories that are supplied with the device.

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REVISION LOG

Table 1: Revision log.

Date	Revision	Description
06/24	M373I01-03-24A	First Version

SYMBOLS

Table 2: Symbols.

Symbol	Description
CE	In accordance with the relevant European directive.
	Device covered by European Directive 2012/19/EC. At the end of its useful life, do not discard of the device in a household refuse bin. Follow local regulations on electronic equipment recycling.
— — —	Direct current.
~	Alternating current.

Note: The images of the devices are for illustrative purposes only and may differ from the original device.

1.- VERIFICATION UPON RECEPTION

Upon receipt of the device, check the following points:

- a) The device meets the specifications described in your order.
- b) The device has not sustained any damage during transport.
- c) Perform an external visual inspection of the device prior to switching it on.
- d) Check that it has been delivered with the following:
 - 1 PCB.
 - 4 M4 nuts.
 - 4 M4 washers
 - 4 rods of 30 mm.
 - 4 rods of 80 mm.
 - 1 thyristor module.
 - 1 polycarbonate board.



If any problem is noticed upon reception, immediately contact the transport company and/or **CIRCUTOR's** after-sales service.



Carefully extract the module from the package, avoiding contact with the bottom of the PCB.

2.- INSTALLING THE MODULE

2.1.- PRELIMINARY RECOMMENDATIONS



In order to use the device safely, it is critical that individuals who handle it follow the safety measures set out in the standards of the country where it is being used, employ the personal protective equipment necessary, and pay attention to the various warnings provided in this instruction manual.

The **EMB-M-2PH-80-400** module must be installed by authorized and qualified personnel.

The power supply plug must be disconnected and measurement systems switched off before handling, altering the connections or replacing the device. It is dangerous to handle the device while it is powered.

Cables must always be kept in perfect condition to avoid accidents or injury to personnel or installations.

The manufacturer of the device is not responsible for any damage resulting from failure by the user or installer to heed the warnings and/or recommendations set out in this manual, nor for damage resulting from the use of non-original products or accessories or those made by other manufacturers.



Before carrying out maintenance or repairs, or handling any of the device's connections, the device must be disconnected from all power sources, both from the device's own power supply and the measurement's.

Contact the after-sales service if you notice that the device is not working properly.

2.2.- INSTALLATION



When the device is on, its terminals, opening covers or removing elements may expose the user to parts that are hazardous to touch. Do not use the device until it is fully installed.



Install the control module with the capacitor bank without voltage and after disconnecting the power supply to the bank. Wait 5 minutes to allow the capacitors to discharge.



Handle the bottom of the PCB carefully to avoid damaging the components.

The steps for installing the **EMB-M-2PH-80-400** control module are:

- 1.- Place the thyristor module on a flat surface, install the 4 washers and the 4 rods of 80 mm, **Figure 1**.

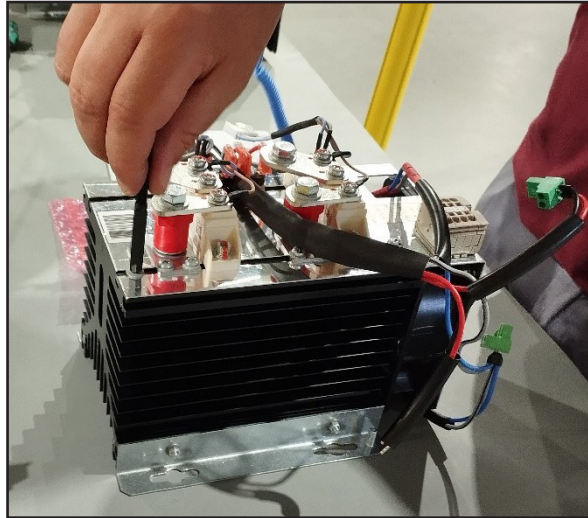


Figure 1: Step 1.

- 2.- Install the PCB on the rods, **Figure 2**.

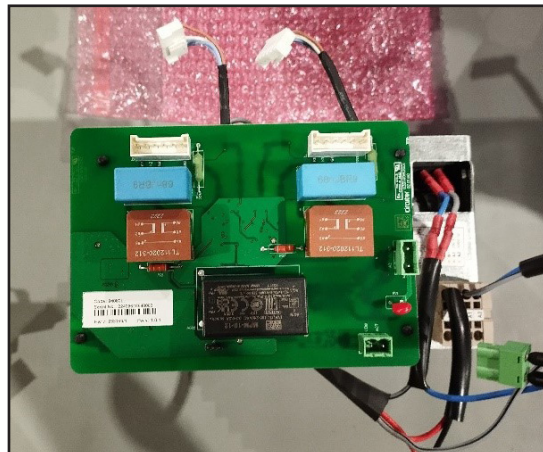


Figure 2: Step 2.

- 3.- Connect connectors **A** and **B** to the PCB, **Figure 3**.

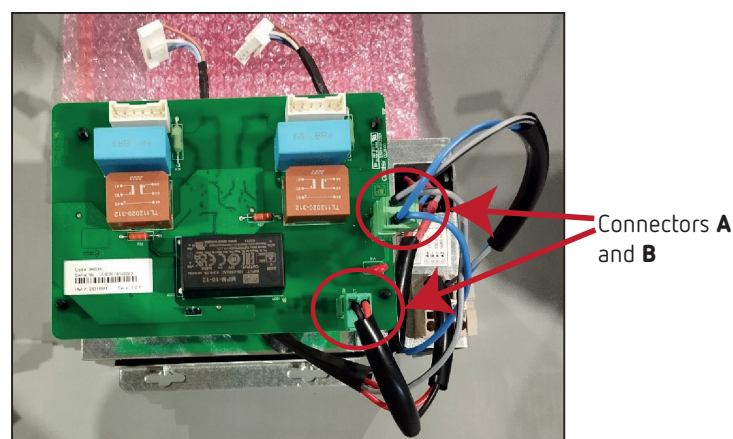


Figure 3: Step 3.

4.- Connect the connectors on the thyristors to the PCB, Figure 4.

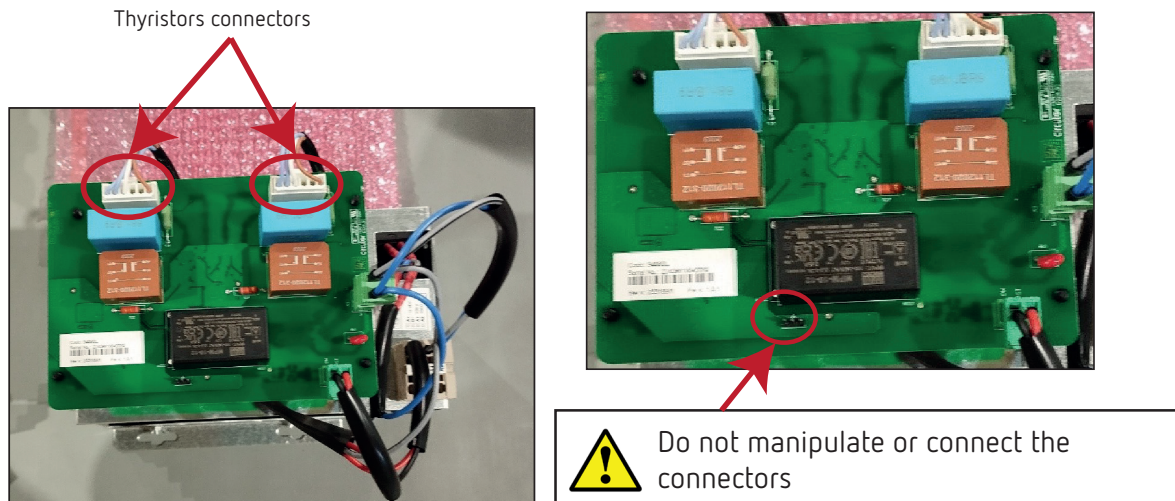


Figure 4: Step 4.

5.- Install the 4 rods of 30 mm on the PCB, Figure 5.

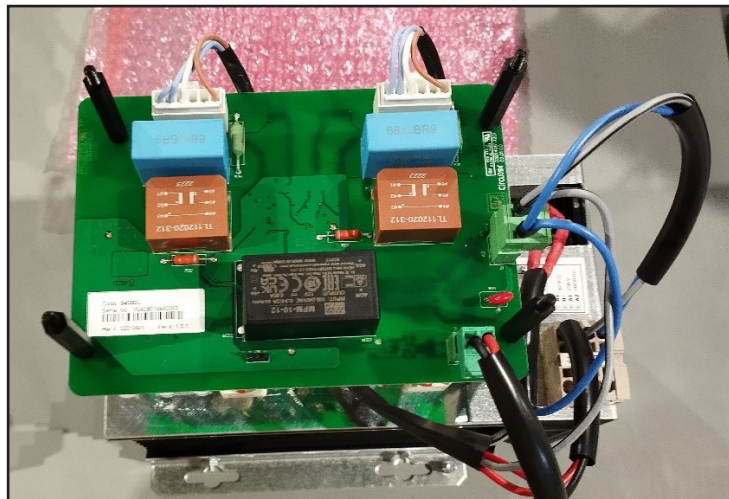


Figure 5: Step 5.

6.- Place the polycarbonate board on the 30 mm rods, Figure 6.

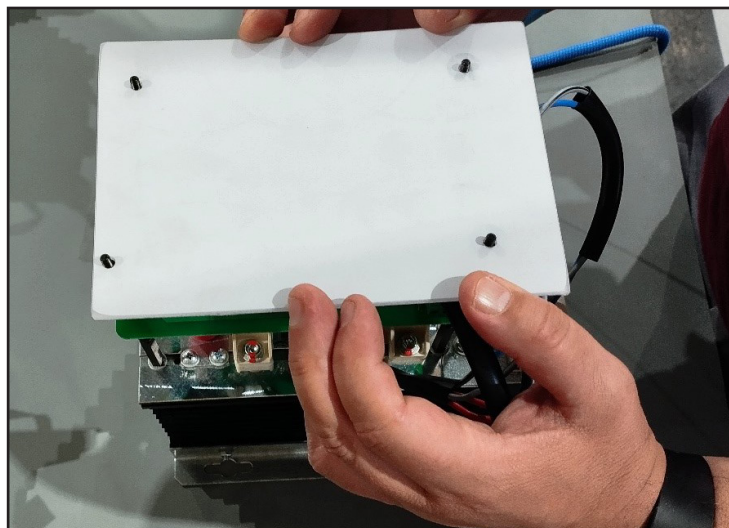


Figure 6: Step 6.

7.- Fit the 4 nuts and tighten to attach the polycarbonate board, **Figure 7**.

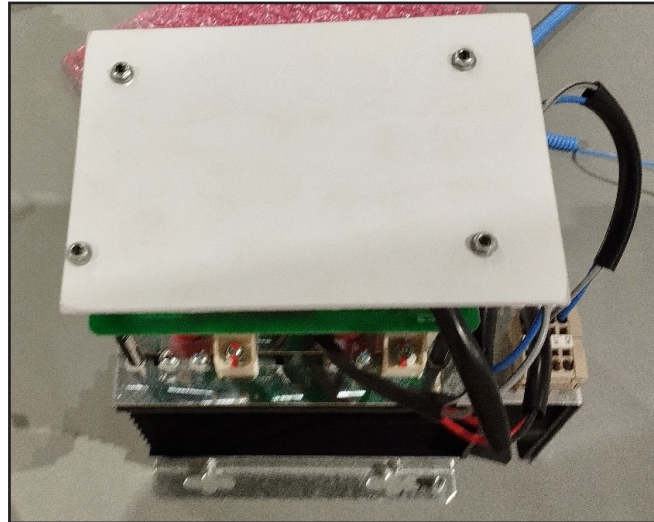


Figure 7: Step 7.

8.- The installation of the **EMB-M-2PH-80-400** control module is now complete, **Figure 8**.

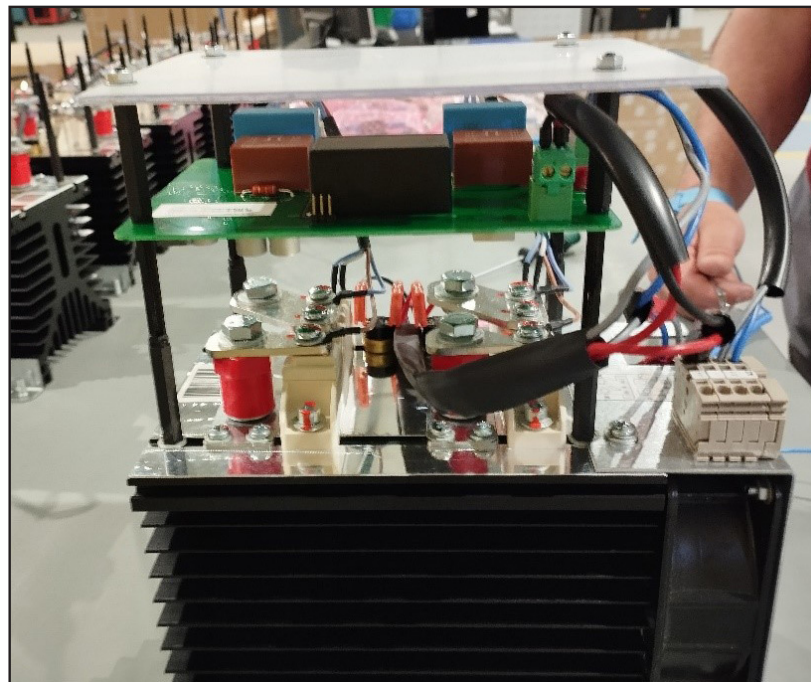


Figure 8: Step 8.

3.- CONNECTING THE CPC-2M BOARD

The **EMB-M-2PH-80-400** module comes with a **CPC-2M** electronic board and two thyristor-diode (Th-D) modules, which connect and disconnect a three-phase capacitor to the mains, as shown in Figure 9.

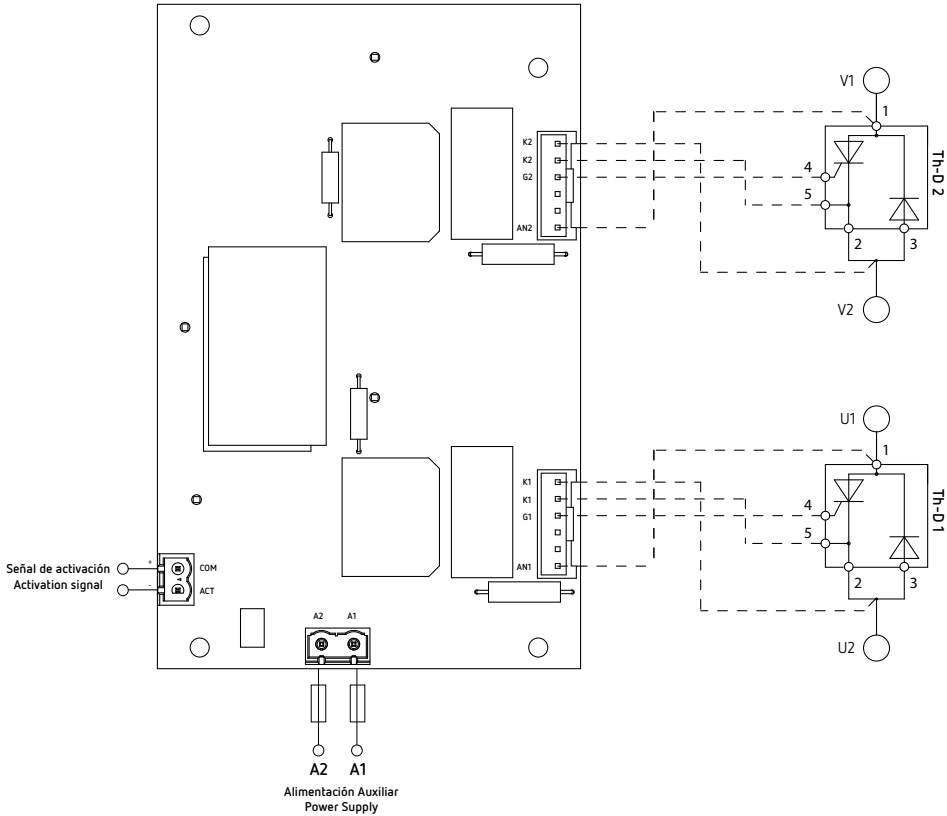


Figure 9: CPC-2M connection diagram.

The function of the **CPC-2M** board is to control the connection of the thyristor-diode modules at the zero-voltage crossing between the capacitor and the mains, avoiding connection current transients, and allowing minimum response times during connection and disconnection of 5 ms.

It is important to note that the connection time (delay between the activation signal and the capacitor connection to the mains) may vary depending on the mains voltage and/or the use of reactive components to protect against harmonics in the mains (rejection filters). In some cases, additional discharge resistances have to be installed to reduce response times.

The **CPC-2M** board is activated by a **12 V $\pm$ 10 %** signal, with a consumption of 10 mA. This signal must be connected to terminals **A+** and **B-** on the terminal block of module **EMB-M-2PH-80-400** (Table 3, Figure 10 and Table 4).

Table 3: CPC-2M-EMB-M-2PH-80-400 board connection.

CPC-2M Board	EMB-M-2PH-80-400
A+	+12V $\pm$ 10 %
B+	-12V $\pm$ 10 %

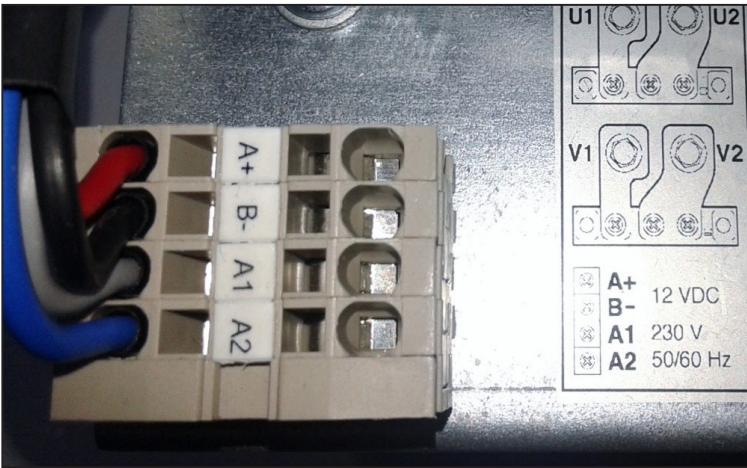


Figure 10: EMB-M-2PH-80-400 terminals.

Table 4: Mechanical characteristics of terminals EMB-M-2PH-80-400 (Table 1).

Mechanical characteristics		
Terminals		
A+, B-, A1, A2	0.2 ... 2.5 mm ²	 M3

The activation signal must be provided by an external **12 V** DC source, with adequate power, or directly provided by the outputs of the **CIRCUTOR** power factor regulators, **Computer Smart III FAST-12VDC+** models.



The **12 V** DC source, whether external or from the output of a **Computer Smart III FAST-12VDC+**, must be installed in the same enclosure where the **EMB-M-2PH-80-400** static switching modules are installed to avoid the risk of electrical shock.

The standard **CPC-2M** is designed for **three-phase mains** where $U_{\text{max}} = 440 \text{ V} \sim$ (in the case of capacitors that **do not have reactive components** in series to reject harmonics); and for **three-phase mains** with $U_{\text{max}} = 415 \text{ V} \sim$. (in the case of capacitors that **do have reactive components** in series to reject harmonics).

4.- FORCED VENTILATION COMPONENTS

The **EMB-M-2PH-80-400** module is equipped with a black anodized 125 x 125 mm aluminium radiator, with a fan coupled at the bottom of it, to force ventilation across the semiconductors.

The fan requires a **230 V ~** (50-60 Hz) auxiliary power supply, and consumes 17.5 W (0.14 A). This auxiliary power supply must have adequate overload and overcurrent protection.

The auxiliary power supply must be connected using terminals **A1** and **A2** on the terminal block of module **EMB-M-2PH-80-400** (Figure 10 and Table 4).

Fan activation is controlled by a NO (normally open) thermal relay, with a closing setpoint of 75 °C.

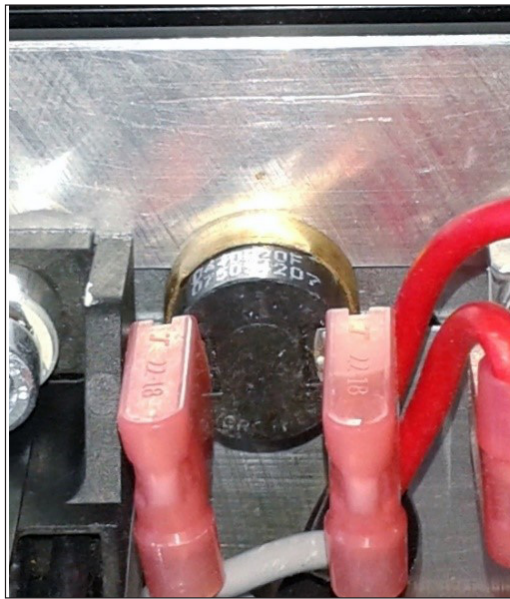


Figure 11: 75°C thermal relay.

4.1.- PROTECTIVE ELEMENTS

The **EMB-M-2PH-80-400** module is equipped with a NO thermal relay (Figure 12), with an activation temperature of +90 °C, which controls the radiator's surface temperature.

Connected to the relay in series is the cable with the **+12 V ===** activation signal (red cable), such that if its trip temperature of +90 °C is exceeded, the activation signal of the **CPC-2M** control board is disconnected until the temperature of the radiator drops below this value (with a hysteresis of approximately 10%).

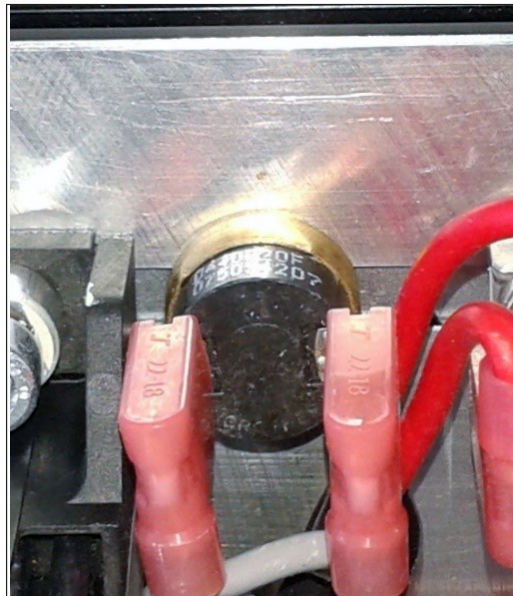


Figure 12: 90°C thermal relay.

5.- CONNECTING THE EMB-M-2PH-80-400 MODULES

The **EMB-M-2PH-80-400** module is connected to the three-phase mains and the three-phase capacitor (3 terminals) that will control its connection by using 4 tinned-copper terminals (**U1-U2, V1-V2**), with an iron fixing screw (**Figure 13**).

There is also an iron grounding terminal for connecting the module’s metal chassis to the grounding conductor (PE) of the mains where it is installed. This grounding terminal is located at the bottom right of the module (**Figure 14**).

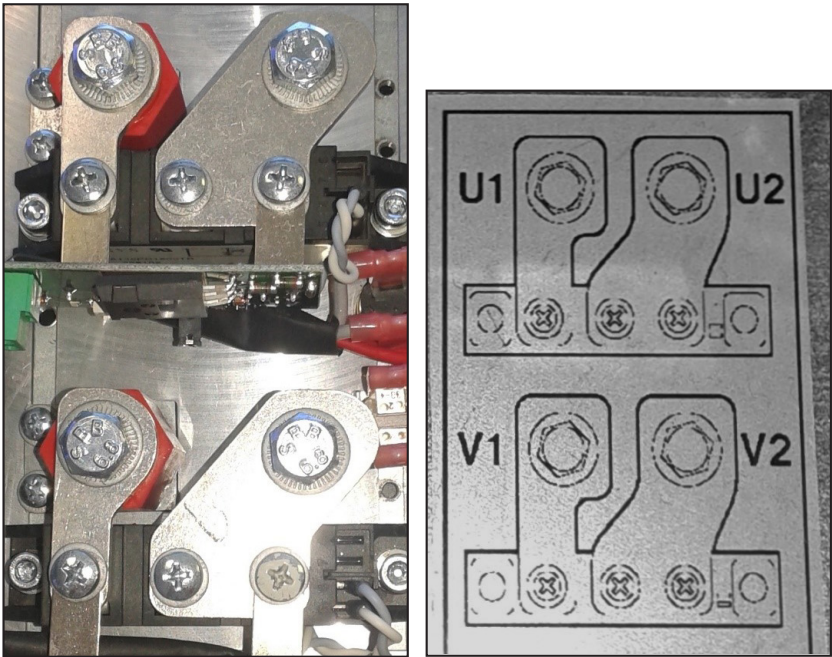


Figure 13: Terminals U1, U2, V1 and V2.



Figure 14: Grounding Terminal.

Table 5: Mechanical characteristics of terminals EMB-M-2PH-80-400 (Table 2).

Mechanical characteristics			
Terminals			
U1, U2, V1, V2	6 ... 95 mm ²	0.5 ... 0.6 Nm	M10
Ground	6 ... 16 mm ²	2.2 ... 2.4 Nm	M6

6.- ASSEMBLING THE EMB-M-2PH-80-400 MODULES

To attach the **EMB-M-2PH-80-400** module to a wall using a mounting plate, the 4 mounting holes located on the side supports of the module must be used, **Figure 15**.

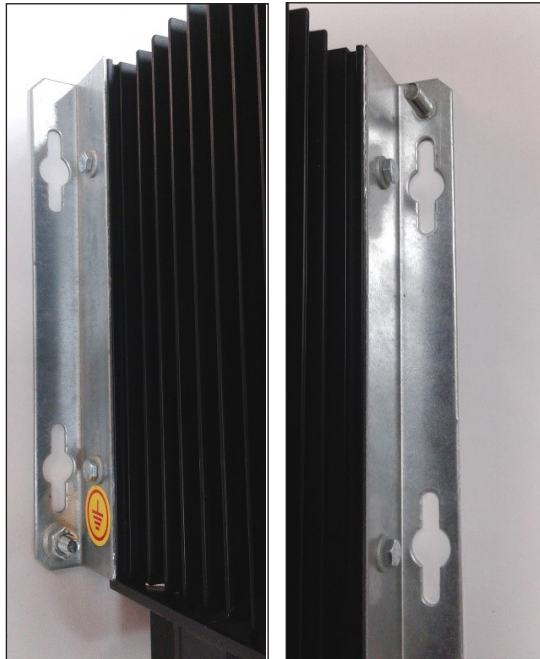


Figure 15: Mounting holes.

The holes accept **M4** screws to support the weight, and provide a solid attachment for the **EMB-M-2PH-80-400** module that keeps it from moving.

7.- MAINTENANCE AND TECHNICAL SERVICE

In the case of any query in relation to device operation or malfunction, please contact the **CIRCUTOR S.A.U.** Technical Support Service.

Technical Assistance Service

Vial Sant Jordi, s/n, 08232 - Viladecavalls (Barcelona)

Tel: 902 449 459 (Spain) / +34 937 452 919 (outside of Spain)

email: sat@circutor.com

8.- GUARANTEE

CIRCUTOR guarantees its products against any manufacturing defect for two years after the delivery of the units.

CIRCUTOR will repair or replace any defective factory product returned during the guarantee period.



- No returns will be accepted and no unit will be repaired or replaced if it is not accompanied by a report indicating the defect detected or the reason for the return.
- The guarantee will be void if the units has been improperly used or the storage, installation and maintenance instructions listed in this manual have not been followed. "Improper usage" is defined as any operating or storage condition contrary to the national electrical code or that surpasses the limits indicated in the technical and environmental features of this manual.
- **CIRCUTOR** accepts no liability due to the possible damage to the unit or other parts of the installation, nor will it cover any possible sanctions derived from a possible failure, improper installation or "improper usage" of the unit. Consequently, this guarantee does not apply to failures occurring in the following cases:
 - Overvoltages and/or electrical disturbances in the supply;
 - Water, if the product does not have the appropriate IP classification;
 - Poor ventilation and/or excessive temperatures;
 - Improper installation and/or lack of maintenance;
 - Buyer repairs or modifications without the manufacturer's authorisation.

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