



Installation, operation and maintenance manual



Outdoor cooling units for door or wall mounting



EMO

ATTENTION!

Read carefully and completely before installation. Keep the manual until unit decommissioning.



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1. Cooling unit application

The **EMO** series cooling units described in this manual are designed and built to cool the air inside electrical switchboards in order to protect components sensitive to thermal shock.

At the same time, the cooling units provide **IP54** ingress protection against contaminating and aggressive/corrosive substances.

1.1 Intended use

The **EMO** cooling unit must be used:

- For cooling electrical switchboards for external use
- With external air temperature between a minimum of -20°C and a maximum of $+50^{\circ}\text{C}$ ($+55^{\circ}\text{C}$ for units where this is expressly indicated on the data plate)
- Within the voltage supply limits indicated on the data plate of the cooling unit and also given in chapter 14 of this manual
- Away from any sources of heat or hot air
- In an environment with adequate air exchange
- On switchboards with **IP54** rating or higher. If these requirements are not respected, excessive condensation build-up may occur. As a consequence, cable entry points or any other openings in the cabinet should be well sealed.

To ensure correct operation, the specified scheduled maintenance operations (see section 10) must be performed regularly. Incorrect or careless use may cause irreparable damage to the cooling unit and may lead to hazardous situations.

1.2 Improper use

The **EMO** cooling unit must NOT be used:

- Under any condition except those described in section 1.1
 - Outdoors, with excessive concentration of solid contaminants and/or aggressive chemical contaminants
 - With the doors of the electrical switchboard open, or installed on enclosures without a minimum **IP54** rating, due to excessive condensate formation
 - With the temperature set below the dew point of the ambient air
 - In explosive atmospheres, or those with aggressive chemicals or high concentrations of dust or oil suspended in the air
 - In potentially inflammable atmospheres
 - With the condensate line closed or blocked off, or in any case in which the condensate is not allowed to run off freely
 - Without the front panel
 - With the cooling unit intake and outlet air flows obstructed by walls or objects that are too close
- To this end, check the minimum distances as regards the external air flow (figure F.02), and make sure there are no obstructions caused by the switchboard components as regards the internal air flow.

2. Supply

Inside the packaging you will find:

- 1 Cooling unit
- 1 Installation, operation and maintenance manual
- 1 CE conformity certificate
- 1 Test certificate
- 1 A4 drilling template
- 1 Installation kit containing (F.04):
 - Flanged nuts (p.1)
 - Flat washers (p.2)
 - Grub screws (p.3)
- 1 Self-adhesive sealing strip (F.04, p.4)
- Handling brackets (F.03)

3. Updates

Pavarini Components reserves the right to update its products and the corresponding manuals based on technical progress without prior notice. Please note that at the time of sale, this manual and the corresponding product may not be considered inadequate only because they are not subject to the above-mentioned updates.

4. Technical features

(figures F. 14 and F. 15)

The unit's technical features and CE marking are given on the data plate attached to the cooling unit.

5. Transport and handling

During transport and storage the cooling unit must be kept in a vertical position, as indicated on the packaging (figure F.01), and must not be exposed to temperatures above 70°C or below -30°C . Upon receipt, check that the packaging has not been damaged during shipping.

To lift the cooling unit in a safe manner, use the handling brackets installed on the top of the unit (figure F.03).

6. Installation

Installation of the unit should only be performed by qualified and authorised personnel.

The cooling unit must be installed with the enclosure air intake hole in the highest possible point.

Ensure the fixing elements and couplings will not interfere with the equipment inside the enclosure itself.

The unit must be installed in the vertical position indicated. Maximum permitted deviation from the vertical is 2° .

Disconnect power before starting any work inside the switchboard.

The cooling unit must be installed on the outside of the electrical switchboard using the standard accessory kit supplied with the unit. Drill the holes and make the cuts required in the switchboard (figure F.04) using the supplied drilling template.

Fit the sealing strip on the cooling unit on the side connected to the enclosure and follow the assembly diagram (figure F.04).

7. Condensate discharge hose

The condensate which, depending on the ambient temperature and humidity conditions, forms on the heat exchanger which cools the enclosure air, is not a malfunction but a normal phenomenon of the cooling unit.

The condensate is taken outside the cooling unit via a hose at the bottom of the unit (figure 11.B). A plastic hose must be connected to this outlet to carry the condensate to another point, allowing it to be discharged where there can be no slipping hazard for personnel.

In this case, make sure the condensate flows without any hindrance. Avoid horizontal lengths of more than 0.5 metres, uphill sections and the accidental formation of traps (figure F.05). The end of the condensate discharge hose must always be free and not underwater, so never place the end of the discharge hose inside a condensate collection container (figure F.07).

The condensate drain connection can also be taken out the side of the cooling unit by modifying the position of the internal rubber tube (figure F.11A).

If the cooling unit is used with the doors of the enclosure open, excessive quantities of conden-

sate will form and this is an unauthorised condition of use (figure F.07). We suggest using a position switch on the door connected to the cooling unit's digital input to stop the unit if the door is opened. (See section 8.2)

8. Electrical connection

8.1 Safety

Warning! Electrical connections must only be performed by specialised and authorised personnel. Switch power off to the enclosure before making the connection. Check that there is no power to the switchboard and that the supply voltage corresponds to the characteristics given on the cooling unit's data plate. The power supply must be protected using appropriate time-delay fuses (type T) or circuit breakers with K-curve, as per the indications given in table F.14. Connect the power-supply cable as shown in figure F.14. Ensure you respect the sequence R-S-T. Disconnect the cooling unit before performing testing on the enclosure.

8.2 Alarm management cable

(figure F.13)

The alarm signal output from the cooling unit can be taken from wires 80 and 81 using a two-pole cable

9. First start up and adjustment

If, prior to installation, the cooling unit was left in an incorrect position (figure F.01), wait at least 8 hours before switching it on. Otherwise, 30 minutes is more than enough time for the oil to return to the compressor, after which the cooling unit can be powered up. The enclosure air intake fan starts working immediately, making the temperature inside the enclosure even.

If this temperature exceeds the set point on the regulator thermostat, both the compressor and external air fan will turn on, causing the cooling cycle to start. This then stops when the inside temperature reaches the lower limit of the operating temperature differential, which has a fixed value of 4 K. The thermostat is factory-set to 35°C . Use the thermostat located inside the cooling unit to adjust the temperature set-point. The graduated scale allows you to set the required temperature between 20 and 46°C (figure F.10). In order to save energy and minimise the production of condensate, it is nevertheless recommended it not be set below 30°C .

10. Maintenance

Warning! Caution! Before embarking on any maintenance work, cut the current to the enclosure.

The cooling unit is the low maintenance type. The only maintenance required is for the internal components, which should be checked regularly, as indicated in the table given in this section, and cleaned with compressed air at a maximum pressure of 4 bar (figure F.08). Any repairs that may need doing must only be performed by specialised and authorised personnel.

Job	Frequency
Check, clean and, if necessary, replace the air filter	Every 2 weeks
Check the external air heat exchanger and clean if necessary.	Every 3 months
Check effectiveness of the condensate discharge.	Every 3 months
Check the fans for any overheating or excessive vibrations.	Every 6 months

11. Technical information

11.1 Operating principle

The cooling unit for electrical switchboard enclosures works on the basis of a refrigeration circuit consisting of four main components: compressor, evaporator, condenser and expansion device (figure F.09). The circuit is hermetically sealed and the refrigerant circulates inside it. The refrigerant used, depending on the cooling unit model, is R134a, R407C or R410a, all chlorine free and harmless to the ozone layer. The unit is divided into two hermetically separated sections where the ambient air and enclosure air do not come into contact with one another and are treated separately. The compressor (CP) compresses the refrigerant, taking it to a high pressure and high temperature. The compressor then pushes the refrigerant through a heat-exchanger coil, called the condenser (C), where it is cooled by ambient air, thus passing from the gas to the liquid state. In this state it then collects in the receiver (R), from which it then passes through the thermostatic expansion valve (EXP), where it vapor-

ises. It is then received by the heat exchanger coil, called the evaporator (E), by means of which it absorbs heat from the enclosure air and passes from a liquid state to gas. The enclosure is cooled down in this manner. The gaseous refrigerant is then drawn back into the compressor and this cycle is repeated.

11.2 Safety devices.

The refrigeration circuit is fitted with a high-pressure pressure switch Hp and a low-pressure pressure switch Lp (figure F.09) set to the maximum and minimum working pressures, respectively, of the cooling unit. If one of these thresholds is exceeded, the pressure switch stops the compressor's operation. They reset automatically. The fans and compressor have an (internal or external) thermal cut-out switch that stops them in the case of overheating.

11.3 Energy savings

To optimise energy savings, the cooling unit is fitted with a pressure-switch speed regulator

(RLF) which adjusts the speed of the condenser fans based on the pressure in the refrigeration circuit, which in turn depends on the ambient temperature.

11.4 Disposal

Caution! The cooling unit contains R134a, R407 or R410A refrigerant, depending on the model, as well as small quantities of lubricating oil. These are polluting substances and must not be dumped. Replacement, repairs and final disposal must be performed by experts.

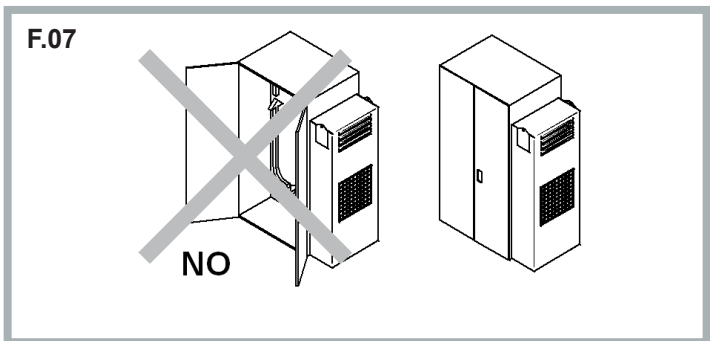
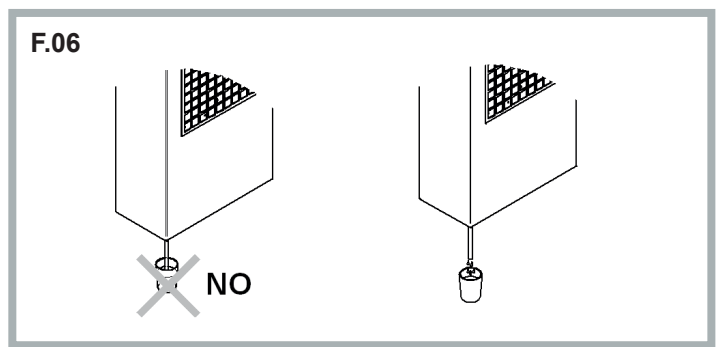
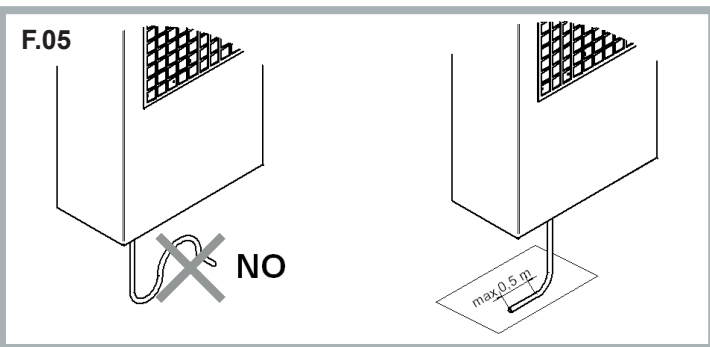
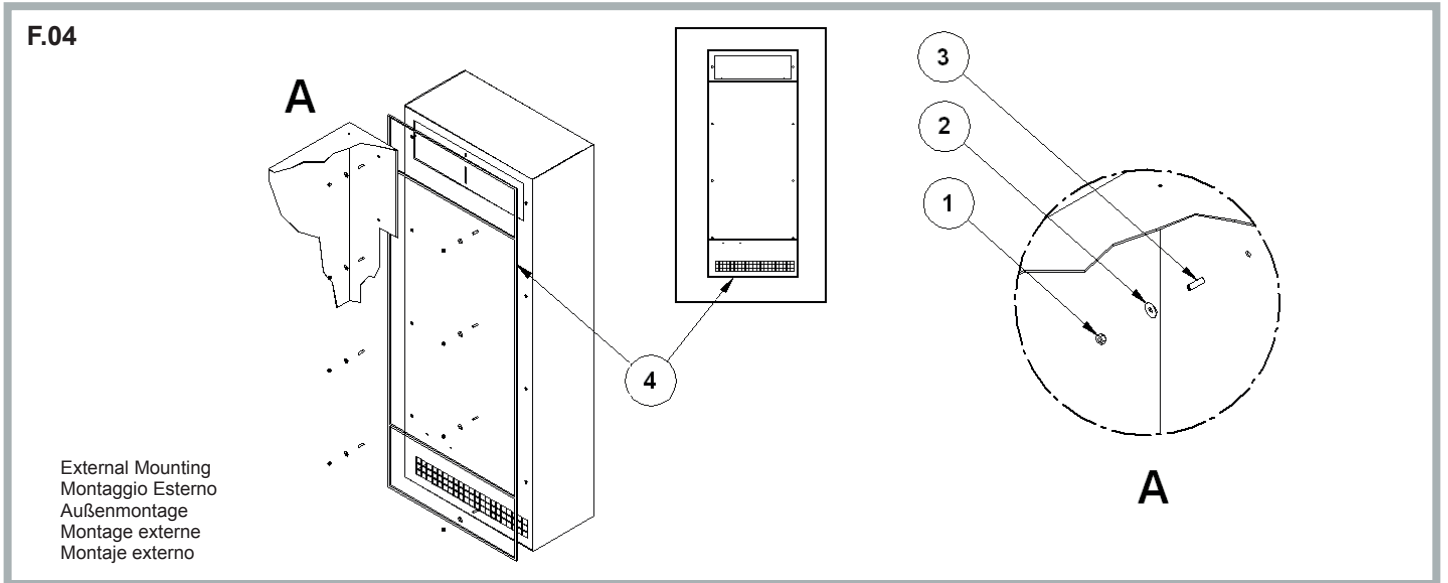
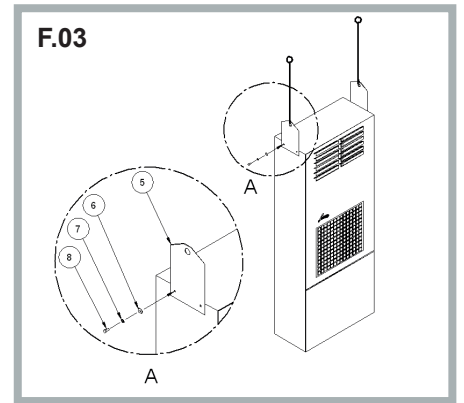
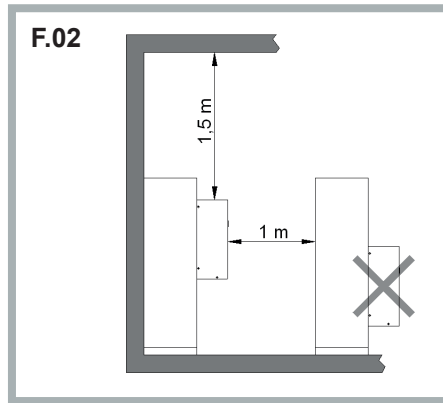
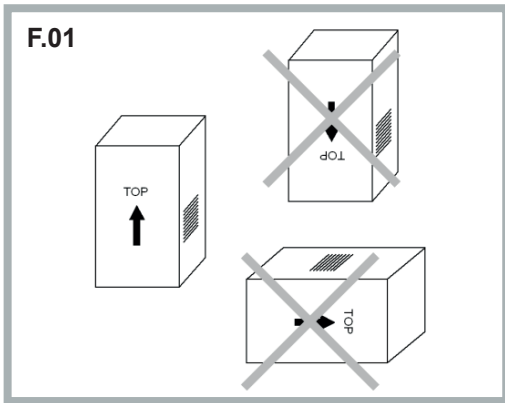
NOTE

Keep the unit's documentation in a safe, dry place.

12. Troubleshooting

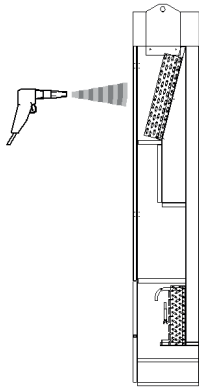
Malfunction	Conditions	Causes	Remedy
It fails to cool	The internal fan works, the external fan and compressor do not work.	The temperature inside the enclosure is lower than what is set on the adjustment thermostat.	This is not a malfunction of the cooling unit. To verify functioning when testing, lower the thermostat setting until the compressor and external fan start working and then reset the thermostat.
		The adjustment (or antifreeze) thermostat has failed	Change the adjustment (or antifreeze) thermostat
	No component works	No electricity getting to the unit.	This is not a malfunction of the cooling unit. <ul style="list-style-type: none"> Make sure the power cable has been connected well to the terminals. Check that the cubicle doors and switches are closed
	Compressor, external and internal fan work	Cooling unit empty of fluid	Call a refrigeration expert or the Manufacturer's Technical Assistance Service
		Compressor mechanical failure	Call a refrigeration expert or the Manufacturer's Technical Assistance Service
	Compressor and external fan work, internal fan does not work	Internal fan capacitor failed	Change the internal fan's capacitor
		Internal fan failed	Change the internal fan
	External and internal fan work, compressor does not work	Compressor's amperometric protector failed (external to the compressor, where present)	Change the amperometric protector
		Relay or PTC for compressor starting failed	Change the relay or PTC for compressor starting
		Capacitor for compressor starting failed (where present)	Change the capacitor for compressor starting
Compressor motor electrical failure		Call a refrigeration expert or the Manufacturer's Technical Assistance Service	
High pressure safety switch failed		Call a refrigeration expert or the Manufacturer's Technical Assistance Service	
It is not cooling enough	External and internal fans work, compressor works all the time	Compressor contactor failed (where present)	Change the contactor
		Cooling unit under sized for the heat dissipated inside the enclosure	Change the cooling unit with another of greater capacity
	Inside fan works, external fan and compressor work irregularly	Antifreeze thermostat triggered (where present)	<ul style="list-style-type: none"> Clean the evaporator coil See if there are any obstacles inside the enclosure to hinder the flow of recycling air
		Insufficient gas in the cooling unit	Call a refrigeration expert or the Manufacturer's Technical Assistance Service
		Thermostat set point incorrect	Check thermostat setpoint
	External and internal fans work, compressor works irregularly	High pressure safety switch triggered: <ul style="list-style-type: none"> Ambient temperature over the maximum working limit Heat exchanger coil (condenser) either dirty or clogged 	<ul style="list-style-type: none"> Ventilate the premises where the enclosure is installed to keep ambient temperature lower. Clean the exchanger with compressed air and detergent
		Thermal protector inside the compressor triggered: <ul style="list-style-type: none"> Ambient temperature over the maximum working limit Heat exchanger coil (condenser) either dirty or clogged 	<ul style="list-style-type: none"> Ventilate the premises where the enclosure is installed to keep ambient temperature lower. Clean the coil with compressed air and detergent
Too much condensate forming	Enclosure door open	Too much ambient air inside the enclosure	This is not a malfunction of the cooling unit. Close the enclosure door or disable the cooling unit
	Enclosure door closed	Enclosure protection level is below IP54	This is not a malfunction of the cooling unit. Seal enclosure openings, e.g. for passage and upward path of wires
		The enclosure/cooling unit connecting seal has been fitted incorrectly	Check seal and remedy

13. Pictograms

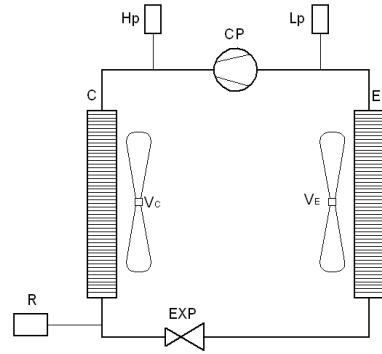


13. Pictograms

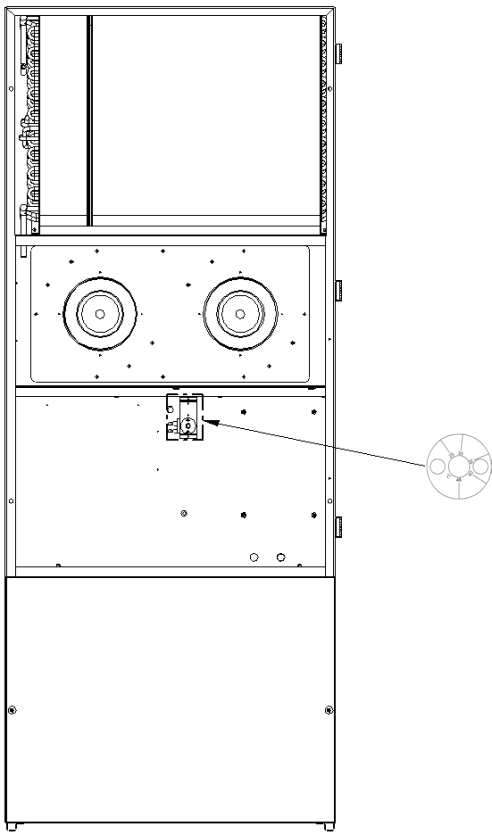
F.08



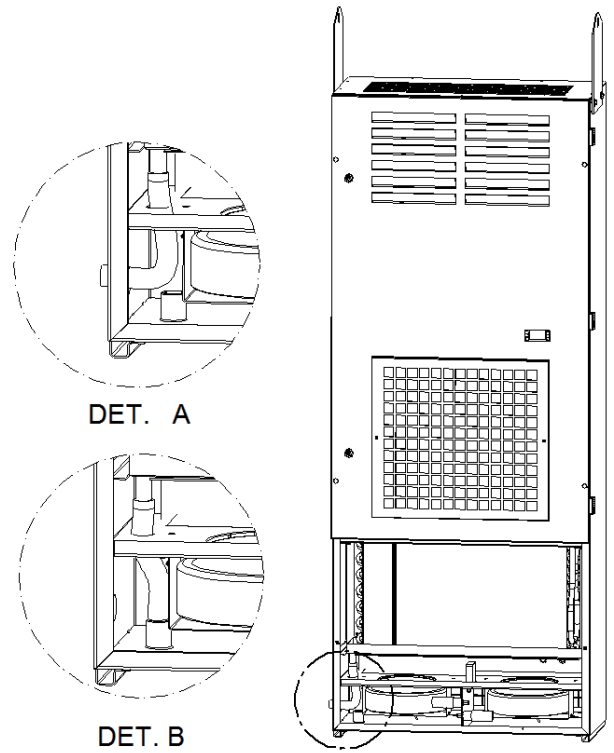
F.09



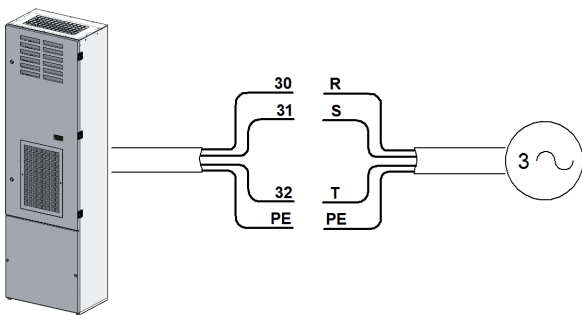
F.10



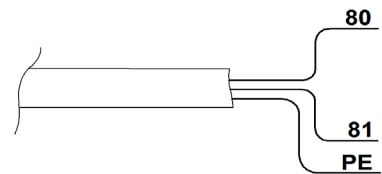
F.11



F.12

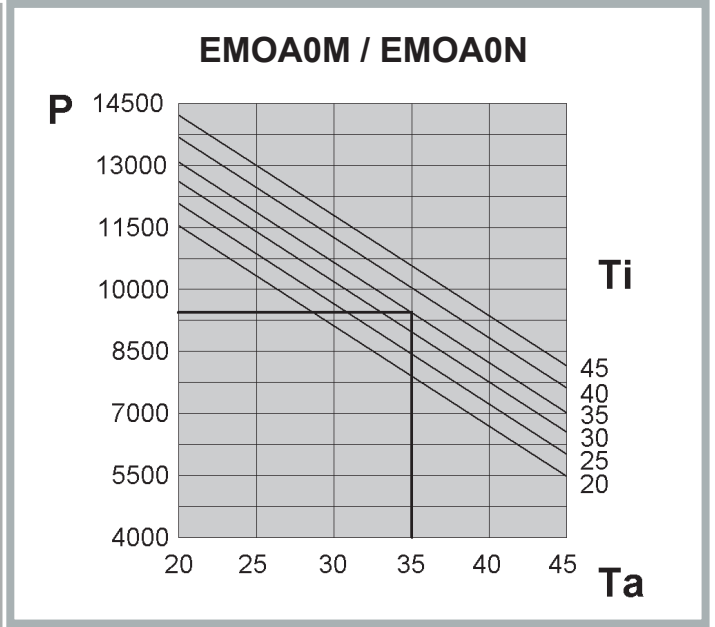
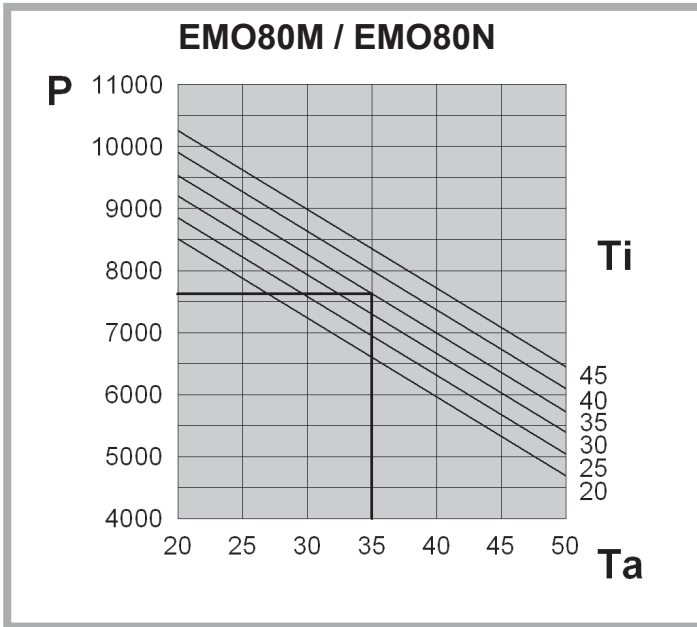


F.13



15. Performances

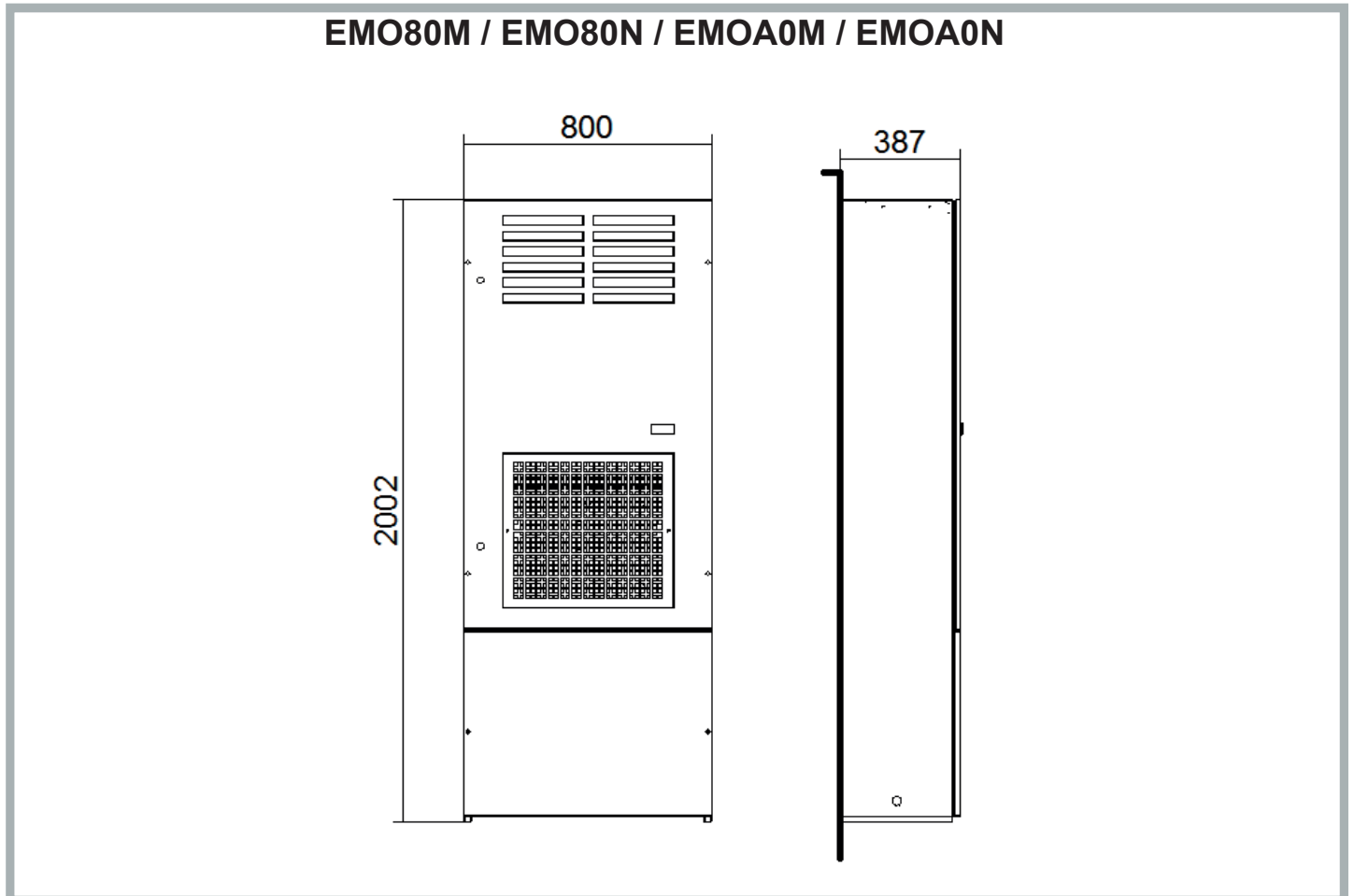
F. 15



P (W)	Ta (°C)	Ti (°C)
Useful cooling output	Ambient temperature	Enclosure internal temperature

16. Dimensions

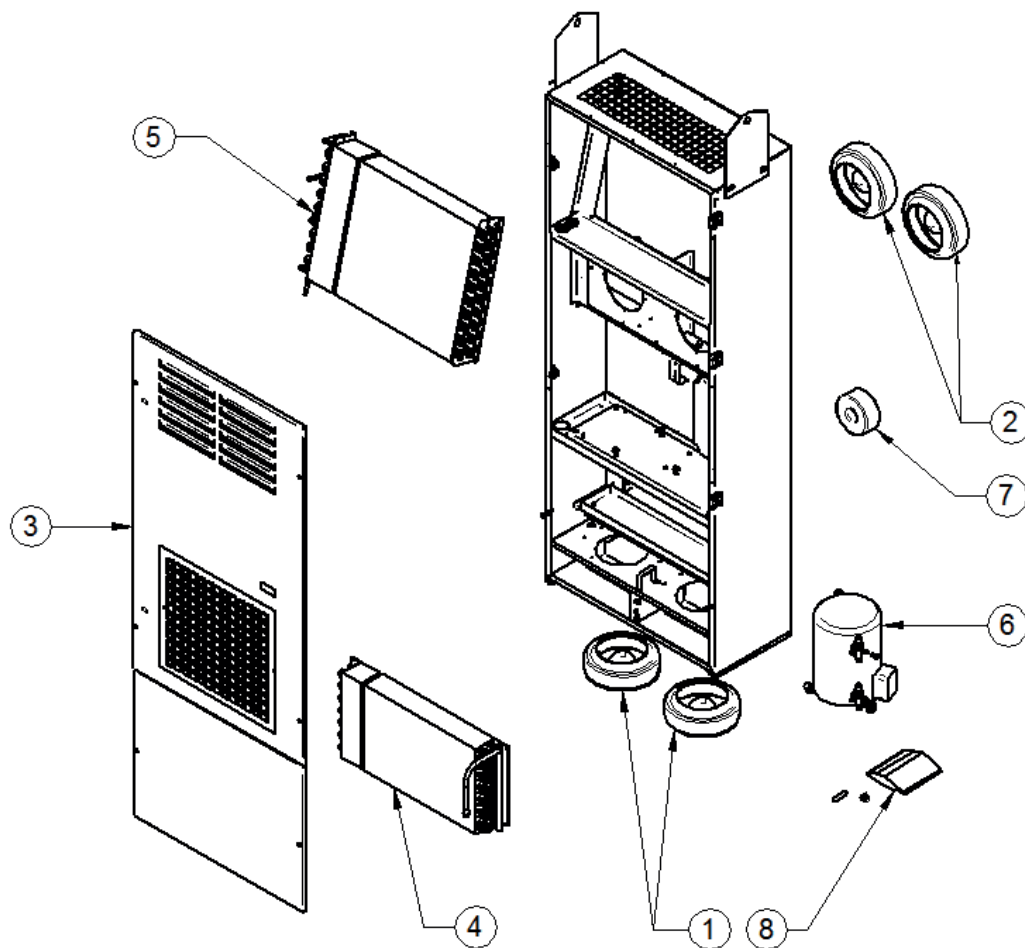
F. 16



17. Spare parts / Ricambi / Ersatzteile / Pièces détachées / Piezas de repuesto

F. 17

EMO80M / EMO80N EMOA0M / EMOA0N



- 1 Evaporator fan
- 2 Condenser fan
- 3 Front structure
- 4 Evaporator
- 5 Condenser
- 6 Compressor
- 7 Autotransformer
- 8 Assembly accessory kit