



INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS



Modular compact heat pumps

50NI 90 - 485

Nominal cooling capacity 19,1-114,9 kW
Nominal heating capacity 19,3-119,9 kW

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1 - INTRODUCTION

Air to air compact units with vertical construction for indoor use only.

- **50NI series:** Air-air reversible heat pump units.

The units are supplied in 2 modules, **outdoor module** and **indoor module** for installation on site as compact version or split version, according to the choice.

All units are tested at the factory.

Technicians who install, commission, operate and service the unit must possess the necessary training and certifications, understand the instructions given in this manual and be familiar with the specific technical characteristics of the installation site.

The units comply with European Directives:

- Machinery Directive 2006/42/EC (MD)
- Electromagnetic Compatibility Directive 2014/30/EU (EMC)
- Low Voltage Directive 2014/35/EU (LVD)
- Pressure Equipment Directive 2014/68/EU (Category 2) (PED)
- RoHS Directive 2011/65/EU (RoHS)
- Eco-design Directive 2009/125/EC (Eco-design)
- Energy Labelling Directive 2017/1369/EU (Eco-labelling)
- Harmonised Standard: EN 378-2:2012 (Refrigerating systems and heat pumps - Safety and environmental requirements).

2 - OPERATING LIMITS

Inlet air conditions		Cooling	Heating
Indoor coil	Minimum	14 °C BH	10 °C
	Maximum	22 °C BH	27 °C
Outdoor coil	Minimum	12 °C ①	-10 °C BH
	Maximum	45 °C	15 °C BH

① With a condensation pressure control operating down to -10°C.

3 - SAFETY ADVISE

To avoid any risk of accident during installation, commissioning or maintenance, it is obligatory to take into consideration the following specifications for the units: refrigerated circuits under pressure, refrigerant presence, electrical voltage presence and implantation place.

Because of all of this, only qualified and experienced personnel can perform maintenance tasks or unit repairs.



The technician who involved in indoor module, when is working in the installation as compact version, to access to components placed over 2 m high must take all necessary security measures.



It is required to follow the recommendations and instructions in this brochure, the labels, and the specific instructions.

Compliance with the norms and regulations in effect is mandatory. It is recommended to consult the competent authorities regarding the applicable regulations for users of units or components under pressure. The characteristics of these units or components are included on the plates of characteristics or in the regulatory documentation provided with the product.



Caution: Before intervening in the unit, verify that the main power to the unit is cut off. An electric shock can cause personal damage. The main disconnect switch is located in the unit's electrical panel.



The compressor and line surfaces can reach temperatures above 100°C causing burns to the body. In the same fashion, under certain conditions these surfaces can reach very cold temperatures that can cause freezing risks.



During any handling, maintenance or service operations, the technicians involved must be equipped with safety gloves, glasses, shoes, insulating clothing, etc

Refrigerant

Important: These units contain **R-410A**, a fluorinated greenhouse gas covered by the Kyoto protocol.

All interventions on the refrigerating circuit must be performed in accordance with applicable legislation.

Within the European Union, it is necessary to observe regulation (EU) No.517/2014, known F-Gas, over **specific fluorinated greenhouse gases**.

Components of the R-410A	R-32	R-125
Chemical formula	CH2F2	CHF2CF3
Weight ratio	50%	50%
Unitary global warming potential (GWP)	675	3.500
Global warming potential (GWP)	2.088	

Ensure that refrigerant is never released to the atmosphere when the equipment is installed, maintained or sent for disposal.

It is prohibited to deliberately release refrigerant into the atmosphere. The operator must ensure that any refrigerant recovered is recycled, regenerated or destroyed.

The operator is bound by the obligation to perform periodical sealing tests on the refrigerating circuit according to the regulation (EU) No.517/2014. Please, consult the frequency of tests in chapter of "Maintenance".

In case of a leak:

- Toxicity: According to EN 378-1, R-410A belongs to the A1/A1 group, i.e. with high safety both in the mix and also in the case of a leak.
- Although it is not toxic, in case of a leak to atmospheric pressure the liquid phase evaporates. The resulting vapours are still hazardous because they are heavier than air and can force the latter out of the machine rooms. If refrigerant is accidentally released, ventilate the room with fans.
- Although it is not flammable, keep them away from open flames (e.g. cigarettes) as temperatures of over 300°C cause their vapours to break down and form phosgene, hydrogen fluoride, hydrogen chloride and other toxic compounds. These compounds may produce severe physiological consequences if accidentally inhaled or swallowed.
- To detect leaks, an electronic leak detector, an ultraviolet lamp or soapy water must be used. Flame detectors do not help.
- Immediately repair any refrigerant leak, using a recovery unit specific for R-410A that avoids a possible mixture of refrigerants and/or oils.


4 - UNIT IDENTIFICATION

Check the unit for any damage or missing components upon delivery.



Check that the details on the label, the packing and the name plate match the order. If equipment has been damaged, or there is a shortfall in delivery, notify accordingly.

All units (indoor module and outdoor module) bear, legibly and indelibly, a name plate located in a prime space, as appears in the attached image: Check that this plate matches the correct model.

Año/An. Year 1	Ref/Reference 2	No Serie/serial Nbr. 3
Producto/Product/Produit 4		
Ref. Produit/Item Nbr 5	6	7
Tension/Voltage 8	Kit Elec. 9	Max. Intensidad/Intensité/Current 10
Refrigerant 11	Refrig. KG (Fábrica/Factory/Usine)/Co2 Teq. 12	
PSmax(AP/HP) 13	PSmax(BP/LP) 14	Temp. Max./ IP 15
Peso/Poids/Weight 16		NoBo 17

 CARRIER SCS
 Route de Thil
 01122 Montluel-FRANCE

Fabricante/Fabricant/Manufacturer:
 Compañía Industrial de Aplicaciones Térmicas, S.A.
 P. Ind. Llanos de Jarata s/n. 14550 Montilla-SPAIN

Contient des gaz à effet de serre fluorés \ Contains fluorinated greenhouse gases regulated by the Kyoto protocol
 Contiene gases fluorados de efecto invernadero regulados por el protocolo de Kyoto

Legend

- 1** Year of manufacture
- 2** Commercial product name
- 3** Serial number
- 4** Description of the product
- 5** Purchase order number
- 6** Sales order number
- 7** Work order number
- 8** Power supply
- 9** Power output of the auxiliary electrical heaters kit (optional) (kW)
- 10** Maximum absorbed current under full load (A) (including the electrical kit)
- 11** Type of refrigerant
- 12** Refrigerant content (kg) and Environment impact (CO₂ Teq.)
- 13** Maximum service pressure in the high pressure side (R-410A = 42 bar)
- 14** Maximum service pressure in the low pressure side (R-410A = 24 bar)
- 15** Maximum operating temperature (refer to "Operation limits")
Maximum shipment and storage temperature: +50°C
Electrical protection rating: IP54
- 16** Operation weight (kg) (empty weight + fluid + refrigerant)
- 17** Notified Body number for surveillance of the Pressure Equipment Directive



Important: The serial number must be used in all communications regarding the unit.

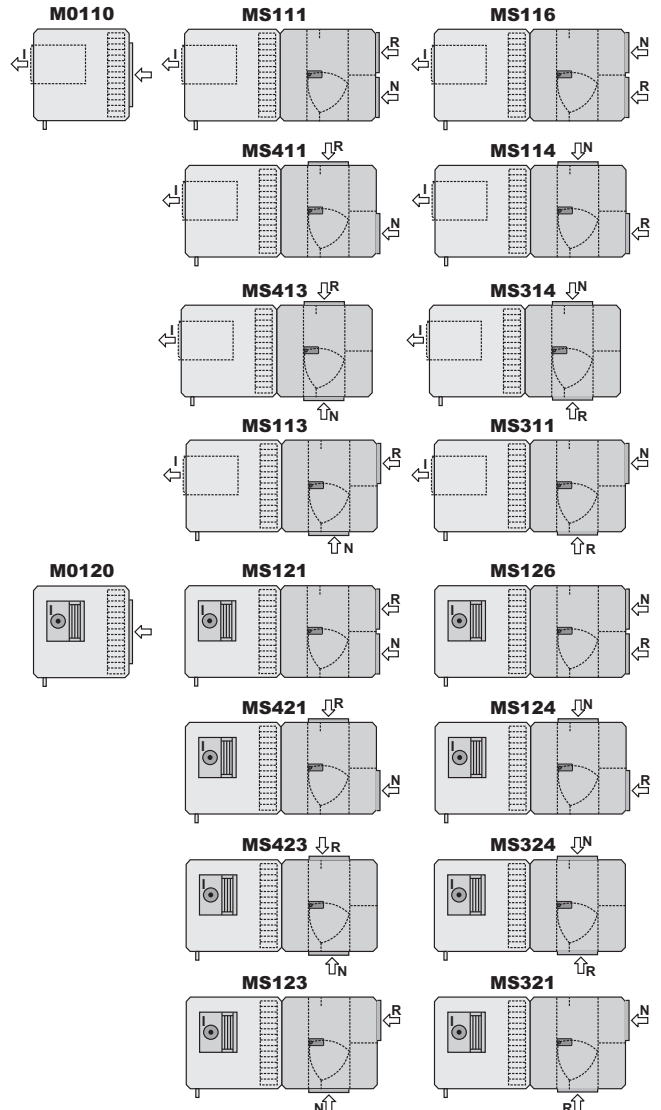
Markings (name plate, punch marks, labels) must remain visible. They must not be altered, removed or modified.

5 - AVAILABLE ASSEMBLIES

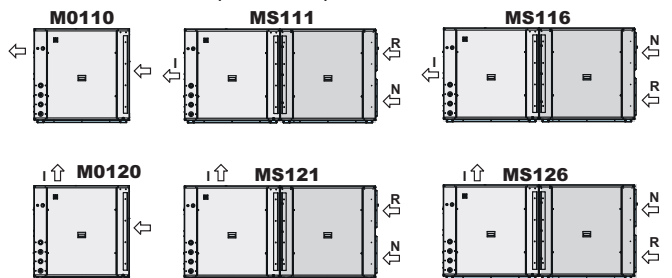
Indoor unit can be coupled with mixing box which allow the management of free-cooling and air renewal. Available assemblies are:

Assemblies with mixing box

Models 90 to 360 (plan view)



Models 420 and 485 (raised view)



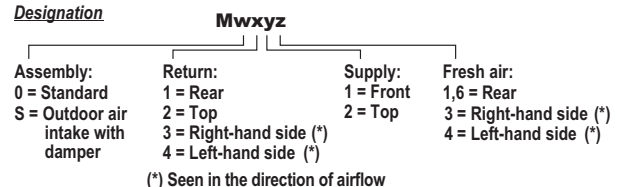
Air circulation

I = Supply
R = Return

N = Fresh air inlet
E = Air extraction

⊗ Air inlet
⊙ Air outlet

Designation



6 - TRANSPORT AND HANDLING

These machines must be unloaded and positioned by a specialist handling company using the appropriate, standardised tools

Important: the indoor module and outdoor module, as well as the mixing box (MS optional module), are supplied for building work installation as split version, and the transport for the modules must be independent, never pre-assembled.

The unit must be handled with care to avoid transport damage. Do not remove the protective packaging and the transport guards until the unit is in its final location. Models 420 and 485 of the indoor module are manipulated with skids, not with pallet. These skids are fixed with Allen M4 screws.

Important: Not store the units in the open air.

Before handling, check that:

- The path leading to the installation location is accessible and free from obstacles.
- The surface to the emplacement has to be larger than transport pallet.

It is always mandatory to grasp the unit by the points intended for that purpose, as described in this chapter.

Any handling of the unit by other means or by gripping points different from those described here may be dangerous for both the unit and the personnel who are carrying out the discharging or transport work.



Always check the weight of the set and verify that the discharging method used is approved for handling that weight.

Weight (kg)	90	120	160	180	200	240	280	320	360	420	485
Outdoor module	316	454	471	471	611	737	782	789	793	1043	1052
Indoor module	175	175	203	203	317	303	389	389	389	536	536
Module MS (opt.)	98	98	118	118	152	152	200	200	200	383	383

6.1 - Discharge via crane

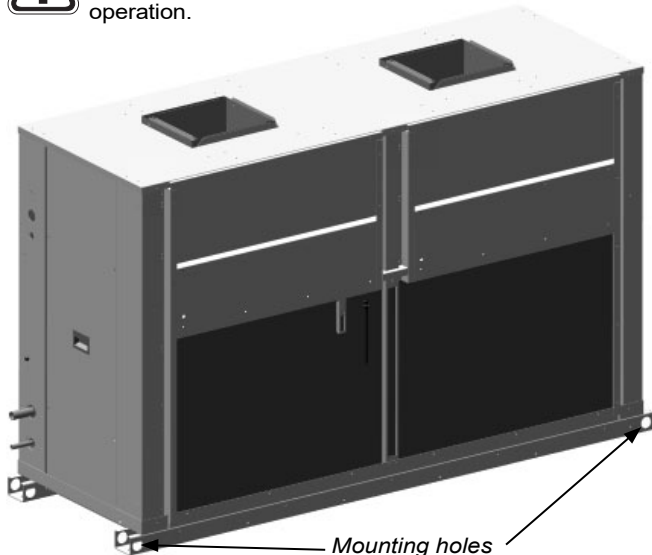
The outdoor module can be lifted up by a crane. The slings will be hooked to the two mounting holes located on each crossbar.

A rocker arm, as well as approved slings, both suitable for the dimensions and weight of the unit, must be used in order to carry out the work safely. To avoid damaging the casing, use textile slings with shackles.

The centre of gravity is not necessarily in the middle of the unit and the forces applied to the slings are not always identical. Please consult the weight and the centre of gravity of each model stated in this chapter.



Raise and set down the unit carefully. Take care not to tilt it by more than 15°, as this could adversely affect its operation.



6.2 - Discharge via forklift truck

Both the outdoor module and the indoor module are designed to be transported safely by using a forklift truck.

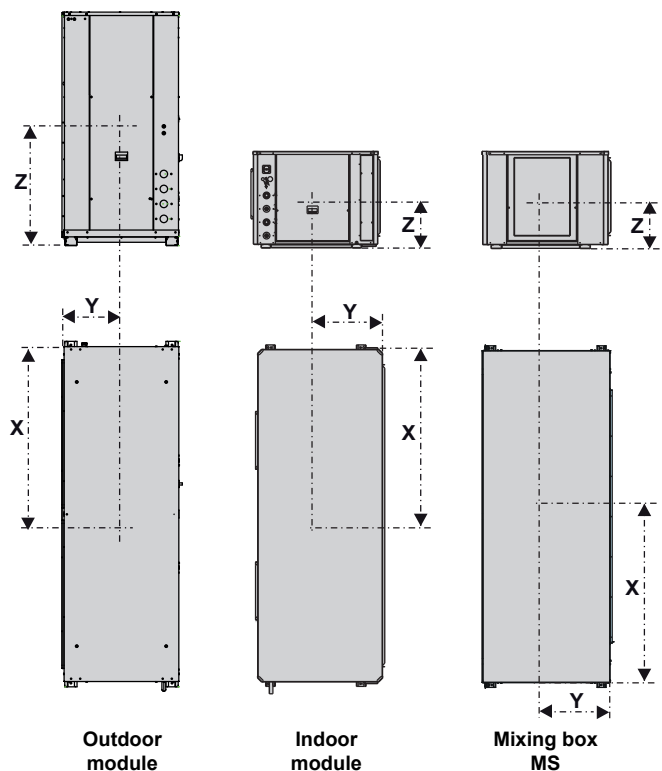
The standards and recommendations of the forklift truck must also be respected with regards to the maximum load, inclination of the fork carriage, elevation of the load for transport, and, in particular, the maximum speed.

The forks of the forklift truck must come in on the side of the unit, ensuring that the centre of gravity of the unit remains within the forks, because a balancing in the transport may cause the unit to turn over and fall from the forklift truck.

The stickers placed on the module beams indicate the recommended locations to insert the forks.

The recommended length for the forks will be bigger than the unit width, so that the entire weight-bearing structure can be supported on the forklift truck. This also prevents the possible introduction of the truck's fork into functional parts of the unit that may cause damage to the unit.

6.3 - Centres of gravity



Centre of gravity (mm)	Outdoor module			Indoor module			Mixing box MS		
	X	Y	Z	X	Y	Z	X	Y	Z
90	717	417	590	539	327	391	558	459	330
120	714	418	818	539	327	391	558	459	330
160	723	413	808	757	346	387	723	465	327
180	723	413	808	757	346	387	723	465	327
200	1048	440	597	1.048	333	390	1030	436	327
240	1345	416	695	1.048	333	390	1030	436	327
280	1346	416	716	1.384	330	416	1360	471	360
320	1345	414	715	1.384	330	416	1360	471	360
360	1345	414	722	1.384	330	416	1360	471	360
420	1695	446	666	1525	423	558	1446	693	505
485	1695	444	712	1525	423	558	1446	693	505

7 - LOCATION AND ASSEMBLING

7.1 - Choice of location

When choosing the location, whatever may be the selected fashion, the following precautions have to be taken into consideration:

- It is mandatory to comply with norm EN 378-3 on Safety and Environmental Requirements. Part 3: "In situ" installation and protection to people
- The area where the unit will be located must be perfectly accessible for cleaning and maintenance operations (check minimum free space for maintenance). Leave enough space for air circulation around the unit.
- It is necessary to check that the surface of the floor or the structure supports the weight of the unit (please, consult the weight of the unit in the previous section).
- It is necessary to ensure that the surface where the unit is going to be installed in completely flat. Any defect in the preparation of the unit support surface translates into stresses on the structure, which may result in its deformation.
- These units can be installed on the floor or on a brick frame or steel profile.
- Based on the fixing solution defined in the installation project, it will be necessary to plan the placement in the base of threaded rods in the expectation that the unit supports can be fixed later on. To do so, it is recommended that a template be made with the heights corresponding to the fixings.



Foresee appropriate damping devices in these fixings to ensure that noise and vibration transmission is avoided (refer to the section "Anchorage for silent-blocks")

- In the event of assembling directly on silent-blocks to the ground, it is recommended that a template of the unit's footprint with the anchoring points of the silent-blocks be made.
- With the help of the crane or the forklift truck, the unit will be raised to a sufficient height that the silent-blocks can be screwed into its base. The 4 silent-blocks of the corners must remain oblique and the interiors (if these exist) perpendicular to the unit.

This image shows how the silent-block option that can be supplied for this unit is fixed to the unit.



Both modules (outdoor and indoor module) have been designed to work indoors. Some specific installation norms must be followed:

- Ensure that the location of the outlet and return grilles does not generate air recirculation.
- Check that there is no obstruction in the air outlet and return due to tightly closed grille slats.

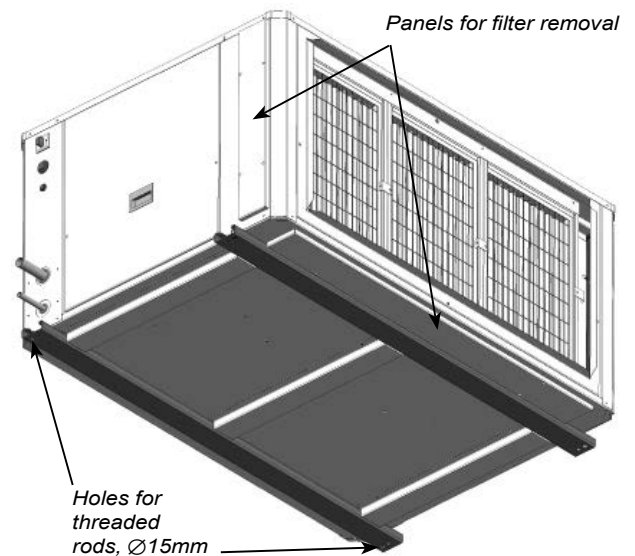
7.2 - Installation of modules in split version

In this case follow general recommendations described previously.

Models 90 to 360 of the indoor module can be attached to the ceiling using the threaded rod:

- Insert in the framework ceiling 4 threaded rods.
- Insert the rods through the holes the unit has in its base.
- Place the antivibration mounts, insert a washer and turn the nuts until the unit is well secured.
- If there is enough space between the framework and the unit, a rubber or neoprene plate can be squeezed in.
- Once these operations are finished, a false ceiling can be mounted to hide the unit, leaving a register cover to perform the maintenance and filter cleaning operations.

The filter is mounted on a rail that can be removed from the side or from the base, to replace or clean it.



- Also, in case the installation has an air return which is not conducted, appropriately-sized grids must be foreseen in the space formed by the ceiling, the framework and the walls so that the unit aspires the return air from the air conditioned spaces.

7.3 - Installation of modules in compact version

Important: All mounting parts and screws needed for the union of the modules are shipped packed with the outdoor module.

First of all, the outdoor module must be installed on the floor or on a brick frame or steel profile, following the recommendations of paragraph 7.1.

For the placement of the indoor module over the outdoor module it is necessary to fix a series of brackets and gussets to the outdoor module, that vary according to the model, and which are detailed below:

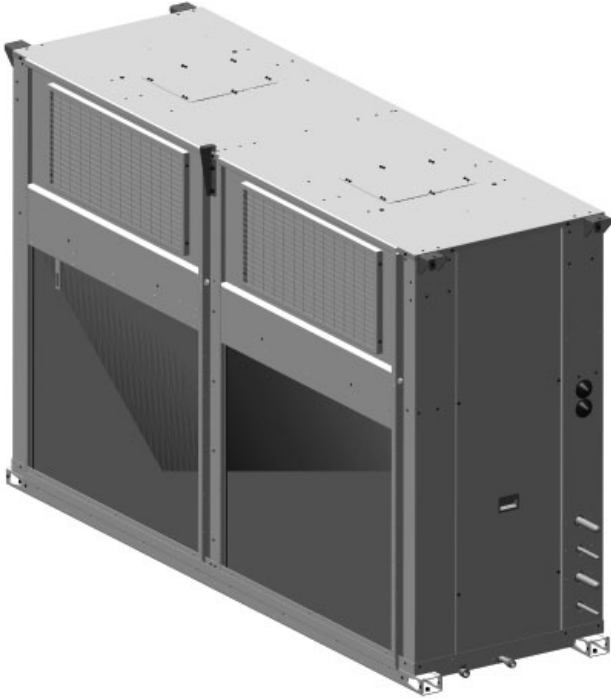
- **Models 90, 160, 180, 200:** 4 brackets fixed with 2 M8 screws each one (hex key 13).



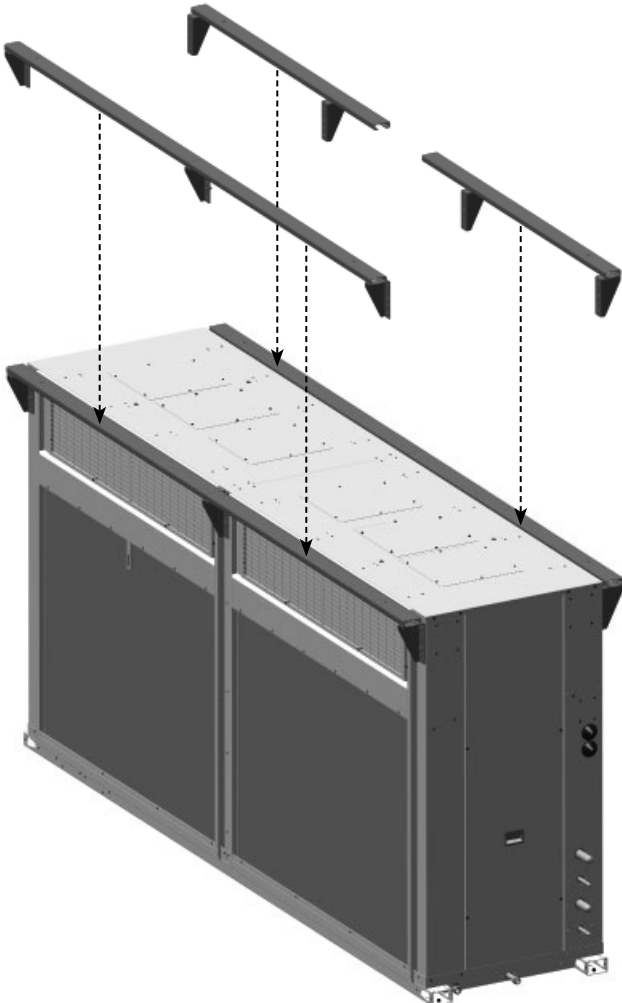
- **Models 120 and 240:** They do not mount any brackets, as the indoor module does not protrude from the cover of the indoor module.

7 - LOCATION AND ASSEMBLING

- **Models 280, 320 and 360:** 4 brackets + 1 central gusset, fixed with 2 M8 screws each one



- **Models 420 and 485:** 3 brackets are sent with the gussets attached: 2 brackets for the side of the electrical box and 1 bracket for the side of the air return. The gussets must be fixed to the outdoor module with 2 M8 screws each one.



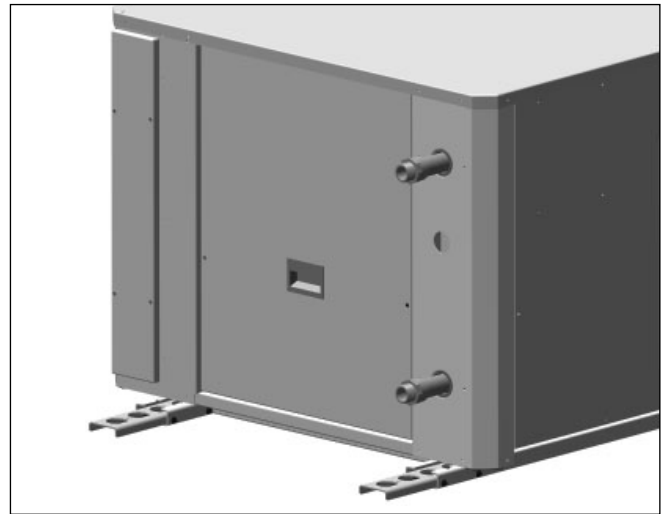
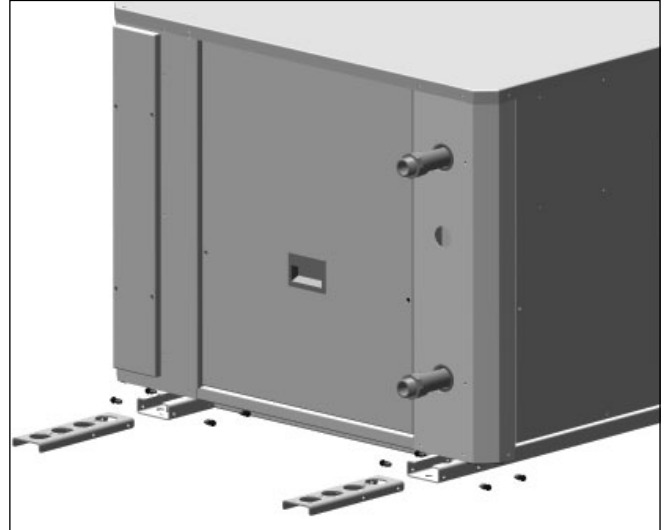
To finish with the preparation of the outdoor module it is necessary to remove the 4 M10 screws (hex key 17) from the cover on models 90, 120, 160, 180, 240, 280, 320 and 360.

After the preparation of the outdoor module, the indoor module will be placed with the help of a crane.

For the lifting of the module with the crane it is necessary to attach some lifting parts to the crossbar.

Important: the necessary lifting parts and screws are shipped packed with the outdoor module.

Place the lifting parts with the inner module located on the pallet (models 90 to 360) or skids (models 420 and 485). Fix the lifting parts to the crossbars with the Allen M4 screws.

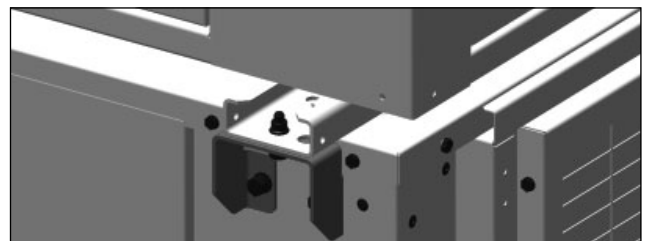


After attaching the slings to the lifting parts, the pallet or skids should be removed. For crane lifting, the recommendations given in the Transport and Handling chapter should be followed.

When the indoor module is placed over the outdoor module, the lifting parts must be removed.

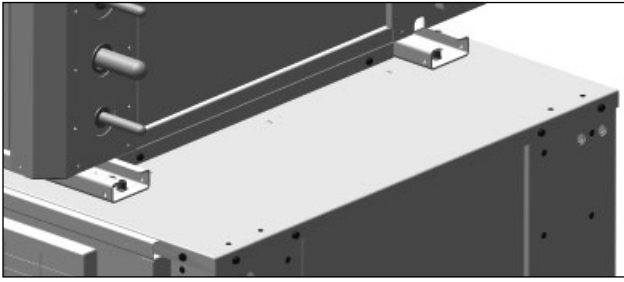
Finally, the modules will be joined:

- **Models 90, 160, 180, 200:** 1 M8 screw on each anti-vibration anchor. The position of each anchors matches the threaded insert of each brackets.

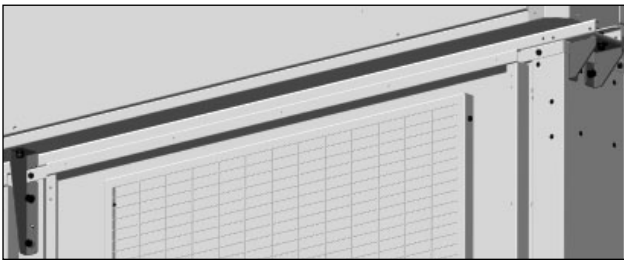


7 - LOCATION AND ASSEMBLING

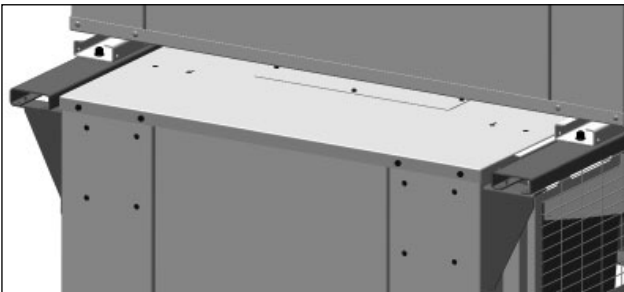
- **Models 120 and 240:** 1 M10 screw on each anti-vibration anchor. The cover of the outdoor module incorporates 4 threaded inserts whose position matches that of the anchors.



- **Models 280, 320 and 360:** 1 M8 screw on each anti-vibration anchor. The position of each anchors matches the threaded insert of each brackets. The central gusset must also be screwed.



- **Models 420 and 485:** 1 M10 screw on each anti-vibration anchor. In this case, the brackets fixed to the outdoor module incorporates 4 threaded inserts whose position matches that of the anchors.



Note: The electrical connections and refrigerating circuit in the modules are included in this chapter later.

Important: in case of handling of the unit after its initial installation, it is mandatory to separate the two modules following the above recommendations in reverse.

7.4 - Sound level

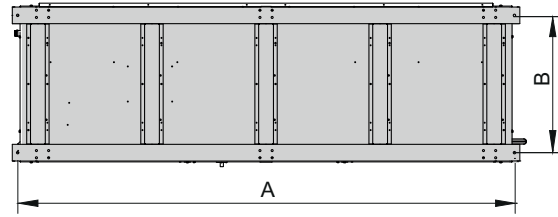
These units are designed to work with a low acoustic level. In any case, the following must be taken into account for the design of the installation: the outdoor environment for acoustic radiation, the type of building for the noise transmitted by air, the solid elements for the transmission of vibrations.

To reduce transmission through solid surfaces to the maximum, it is very advisable to install shock absorbers between the ground or structure and the unit frame. If necessary, a study must be commissioned to an acoustic technician

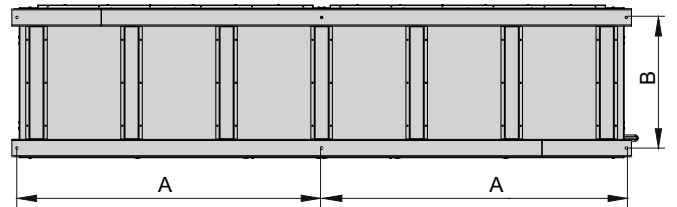
Note: Sound levels can be found in the technical brochure of this series.

7.5 - Anchorage for silent-blocks

Outdoor module - 90 to 360

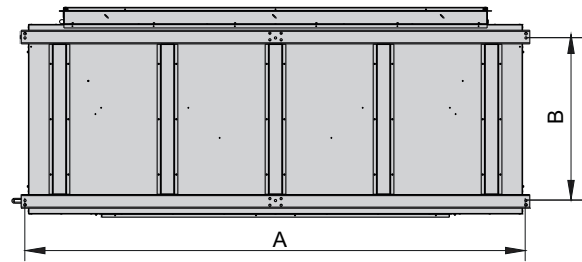


Outdoor module - 420 to 485

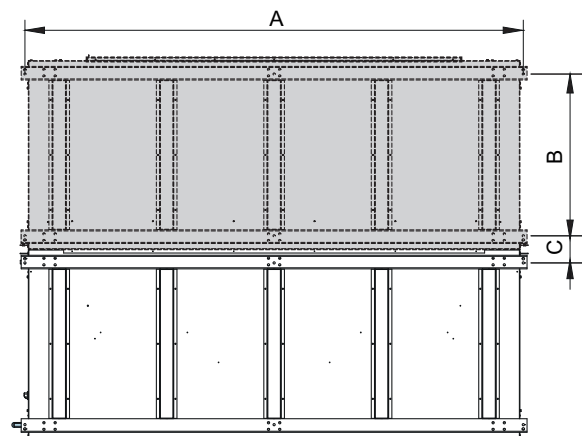


Outdoor module	A (mm)	B (mm)	Ø
90	1133	744	M10
120 to 180	1413	744	M10
200	2128	743	M10
240 to 360	2688	743	M10
420 and 485	1713	735	M10

Indoor module (for split version)



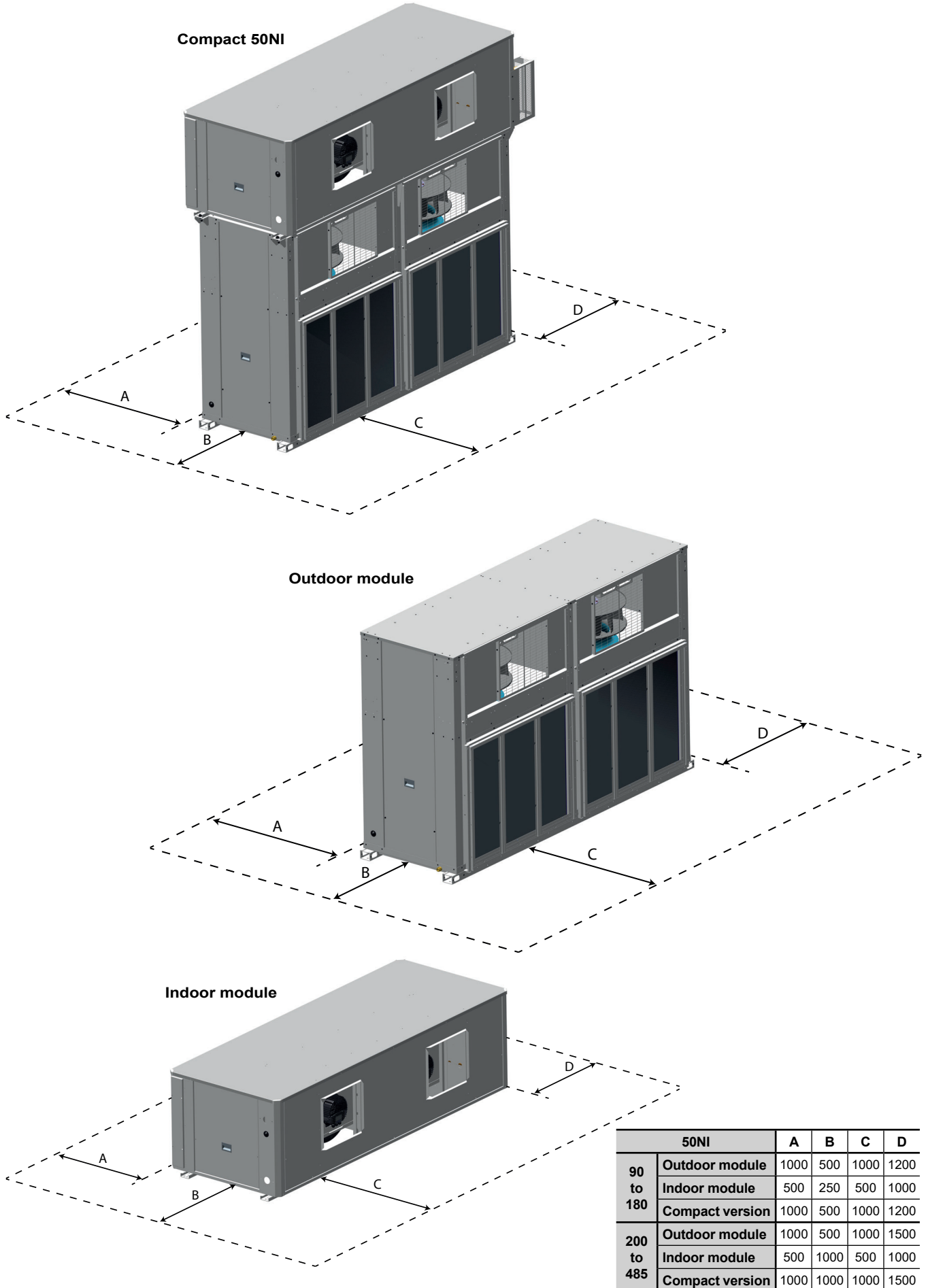
Mixing box MS (for split version)



Indoor module and MS	A (mm)	B (mm)	C (mm)	Ø
90 and 120	1146	657	243	M8
160 and 180	1476	735	243	M8
200	2120	657	243	M8
240	2100	657	243	M8
280 to 360	2760	735	243	M8
420 and 485	2930	951	159	M8

7 - LOCATION AND ASSEMBLING

7.6 - Recommended service clearance



8 - CHECKING BEFORE COMMISSIONING



NOTE: Under no circumstance should the unit be started without having read the brochure completely.

8.1 - Electrical connections

8.1.1 - Installation norms

To perform the electric installation of the unit (cable glands, conductor section and their calculations, protections, etc.), Refer to the information provided in this document (see the technical characteristic table), the electrical scheme included with the unit and norms in effect that regulate the installation of air conditioning units and electrical receivers.

The electric power supply of the unit must be sized in accordance with the maximum power input by the unit taking into account all the options it features (if necessary, refer to the technical brochure).

Verify that electrical power corresponds to the one on the data plate and that the voltage remains constant.



Check that the electrical connections are correct and tight (an electrical diagram is included with each unit, along with its legend).



Note: All connections in the site are the responsibility of the installer. These connections are always made as per the current regulation.



To prevent electrical shocks, make all electrical connections before energizing the unit. Check that the automatic switch is closed. Omitting this can cause personal damage. Make the ground connection before any other electrical connection.



The installer must fix line protection elements according to the effective legislation.

8.1.2 - CARRIERrtc electronic control

The **CARRIERrtc** control is basically composed of a μ PC MEDIUM control plate, a pGD1 graphical terminal, a TCO user terminal (optional), and sensors.

Please refer to this control brochure to obtain more detailed information about its operation.

pGD1 terminal:

This terminal, installed in the electric panel of the machine, allows for:

- The initial programming of the unit.
- The modification of the operating parameters.
- Stopping/starting the unit.
- The selection of the operating mode.
- Setting the setpoints.
- The on-screen view of the controlled variables and the values measured by the sensors.
- The on-screen view of the description of the active alarms and the alarms log.



TCO user terminal (optional):

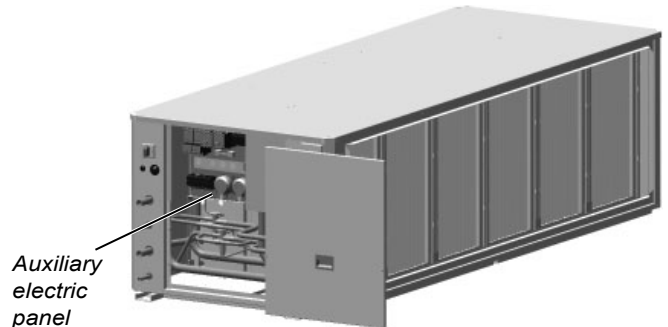
This terminal can be installed on the electric panel, instead of pGD1 terminal. In this case, the remote connection of the pGD1 terminal is possible.



Note: for more detailed information on this control, please refer to the control brochure.

8.1.3 - Connection of optional devices

Indoor modules have an auxiliary electric panel for the connection of optional elements in the indoor circuit such as the soft starter, dirty filter pressostat, etc.



8.1.4 - Connection of probes by the client

The next probes must be performed on site by the client:

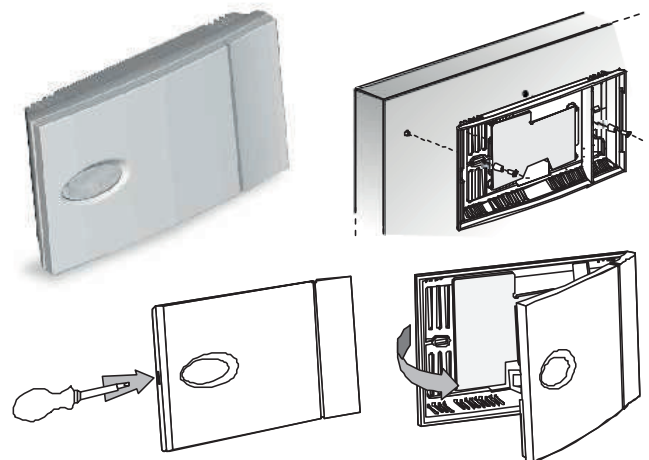
- Ambient probe NTC (standard) or RS485 (optional)
- Air quality probe (optional)
- Outdoor humidity (optional)

These probes are supplied inside the main electric panel.

Please refer to the electrical scheme and the CARRIERtc control brochure, included with 50NI unit.

Connection of the ambient probe

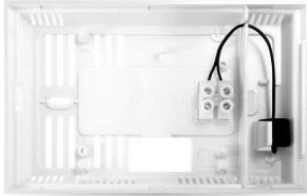
- Open the case using a flathead screwdriver in the slot, paying extra care not to damage the electronic parts.



- Fasten the rear of the sensor case to the panel or the wall (for fastening the case, use the screws supplied with the fastening kit, paying attention to use the proper spacers, to not damage the sensor's electronics).
- This probe must be fixed to the panel or the wall of the room to be conditioned, at 1.5 m height.

8 - CHECKING BEFORE COMMISSIONING

- The electrical connection must be carried out depending on the unit setting:
 - NTC (B3 - connector J3) : with 2 x 1,5 mm² section cable, within a maximum distance of 30 metres.
 - RS485 (connector J10): with AWG20 section cable, single braided pair preferably shielded with drain wire + Power supply 24 Vac (2 wires).
- Close the sensor with the top cover by pressing lightly.



Inside view, bottom shell



Inside view, top shell

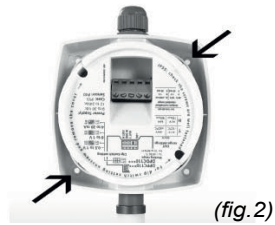
Connection of the outdoor humidity probe (optional)

The outdoor humidity probe (optional), necessary for the enthalpic and thermo-enthalpic free-cooling, must be installed on-site, on the hood of the fresh air intake.

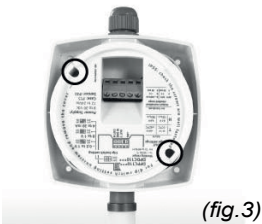
- Open the case by turning the top cover anticlockwise (fig.1).
- Fasten the rear of the sensor case to the side panel of the hood (use the screws supplied together with the probe) placing the screws in the holes provided (fig.2).
- Make sure that the screws that hold the board protective cover are fastened tightly (fig.3).
- Close the sensor by turning the cover clockwise (fig.4).



(fig.1)



(fig.2)



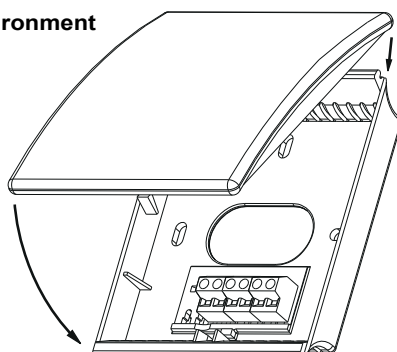
(fig.3)



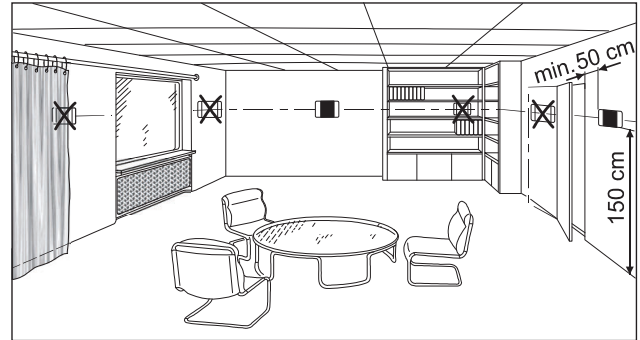
(fig.4)

Connection of the air quality probe (optional)

Installation in the environment

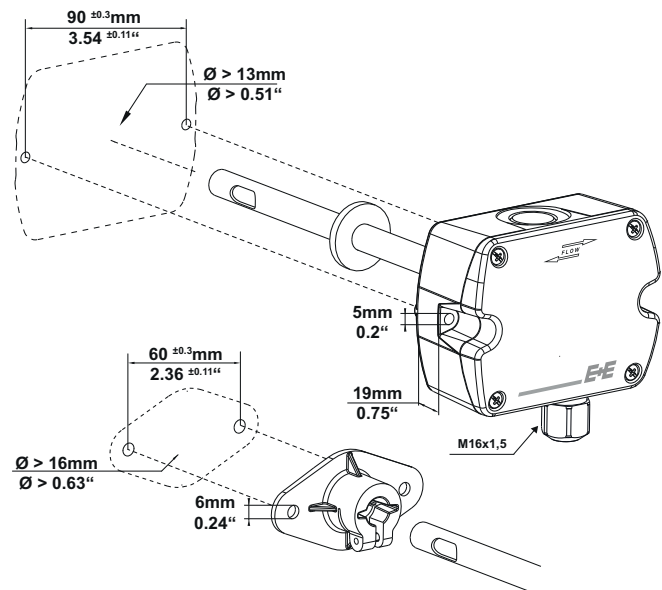


- This probe must be fixed to the interior wall of the room to be conditioned, at ca. 1.5 m height in the room and at least 50 cm from the next wall.
- It should never be mounted:
 - On outside walls.
 - In niches or behind curtains.
 - Above or near heat sources or shelves.
 - On walls covering heat sources such as a chimney.
 - In the radiation range of heat sources and lighting bodies e.g. spotlights.
 - In areas exposed to direct solar radiation.



Duct-mounted

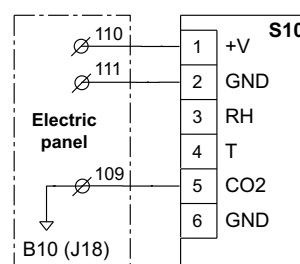
This version can be connected to the air duct in these two ways:



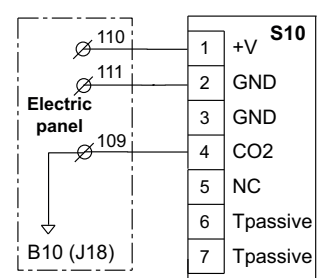
Electrical connection

This probe (S10) is configured as analogue output 4...20 mA (0..2000 ppm), in the analogue input B10 of the control board (connector J18). Recommended cable section : 1,5 mm².

Environment:



Duct-mounted:

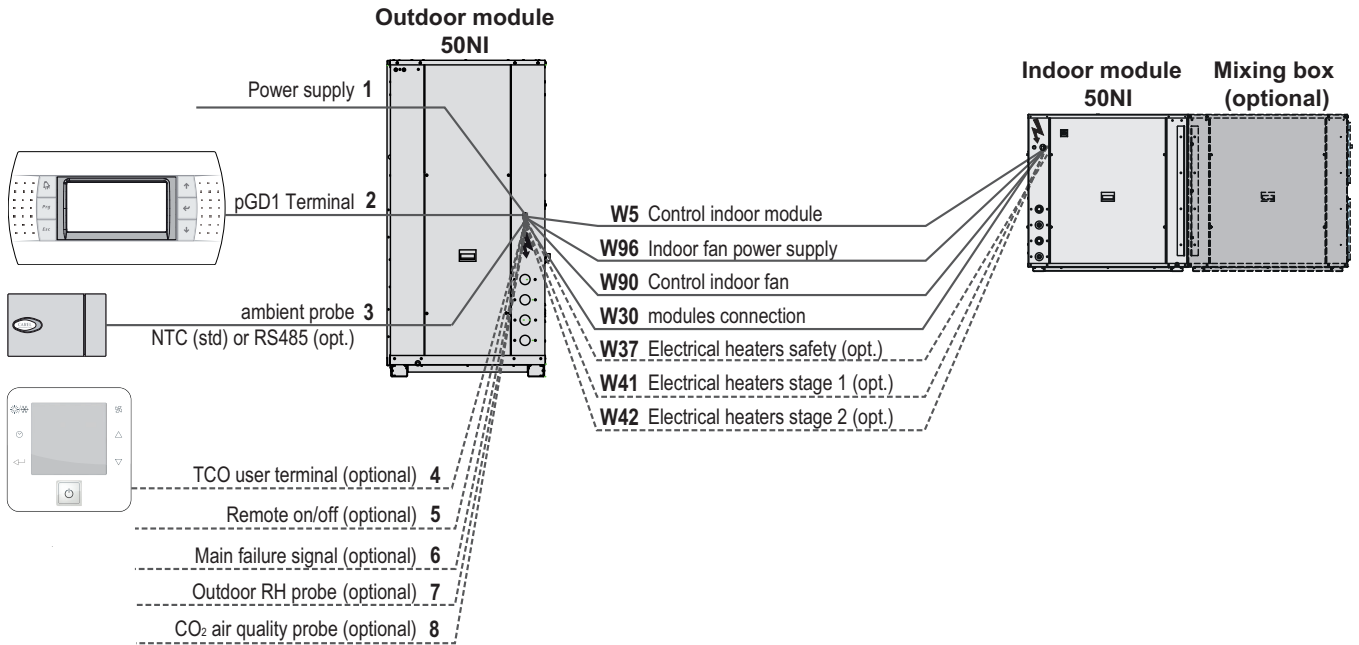


8 - CHECKING BEFORE COMMISSIONING

8.1.5 - Electrical connections

Note: To install in compact version the hose is supplied with all necessary wires to connect both modules. Pass the wires through the chute placed inside the unit, until extend to the electric panel.

CARRIERtc control



N°	50NI	90	120	160	180	200	240	280	320	360	420	485
1	Power supply	400 III ($\pm 10\%$)		3 + GND								
2	pGD1 terminal connection (standard in electrical panel)	Telephone cable 6 wires standard (RJ12 connector) (until 50 m)										
3	Ambient probe ①	NTC		2 wires								
		RS485 ②		5 wires								
4	TCO user terminal connection ③	2 wires for power supply 230V + 1 shielded cable for communication type AGW20 / 22 (1 braided pair + drainwire + shielding)										
5	Remote on/off (optional)	2 wires										
6	Main failure signal (optional)	2 wires										
7	Outdoor RH probe (optional) ①	3 wires										
8	CO ₂ air quality probe (optional) ①	3 wires										
W5 ⑤	Control indoor module	5 wires										
W96 ⑤	Indoor fan power supply	4 wires										
W90 ⑤	Control indoor fan	7 wires										
W30 ⑤	Modules connection	without free-cooling (std)		2 wires								
		free-cooling (opt.)		7 wires								
W37 ⑤	Safety thermistors of electrical heaters (optional)	2 wires										
W41 ⑤	Electrical heaters, stage 1 (optional) ④	4 wires										
W42 ⑤	Electrical heaters, stage 2 (optional) ④	4 wires										

① Connection of probes by client

② It is possible connect from 1 to 4 ambient probes RS485 in series in the Field-bus of the control board

③ If the unit is going to be installed in an industrial environment with a high level of electromagnetic interference, it is recommended to shield the cables of the thermostat control.

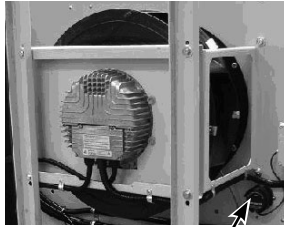
④ The power supply for the electrical heater must be protected by an automatic switch and/or fuses to be foreseen by the installer.

⑤ Connection hose to connect the modules supplied to work in compact version.

8 - CHECKING BEFORE COMMISSIONING

8.2 - Checks in the EC plug-fans

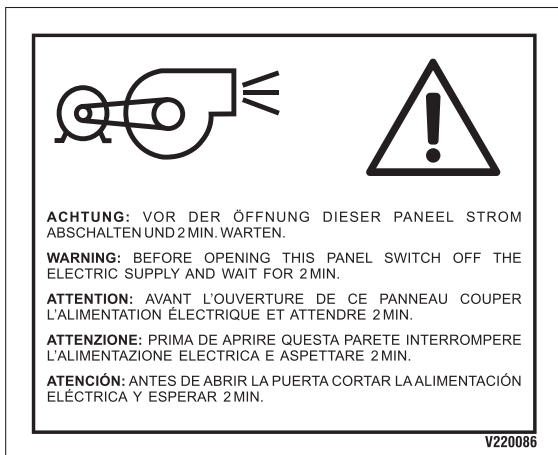
- Before commissioning, check the blade rotation direction and that the axis turns without strokes nor vibrations.
- Once running, check the operation conditions: pressures, flows and consumptions.
- The coupling of characteristic curves of the fan and the room is very important, so that the flows and pressures provided to the duct network are as required.
- The EC plug-fans of the indoor module have a flow control pressostat. This pressostat comes from the factory adjusted to the indicated flow. However, the flow for different conditions can be readjusted on site from the pGD1 terminal (please refer to the CARRIERtc control brochure *Flow control pressostat*)



8.3 - Checks in the centrifugal fans (optional)

If the unit includes centrifugal fan for indoor module:

- Before commissioning, check the blade rotation direction and that the axis turns without strokes nor vibrations.
- Once running, check the operation conditions: pressures, flows and consumptions.
- The overlapping of characteristic curves of the fan and the room is very important, so that the flows and pressures provided to the duct network are as required.

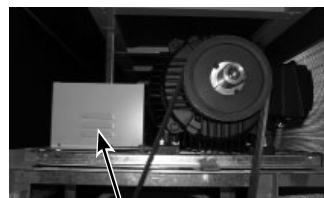


• Soft starter (optional):

Soft starter of the supply centrifugal fans which prolongs the set time mainly aimed at installations with cloth ducts. Compulsory for motors with an output of 15 kW and above.

For motors up to 15kW it is installed in the factory in the auxiliary electric panel or main electrical panel (depends on model). For larger motors it is installed next to the ventilation group.

Motor output up to 15 kW **Motor greater than 15 kW**



Starter

8.3.1 - Pulley and belt calibration



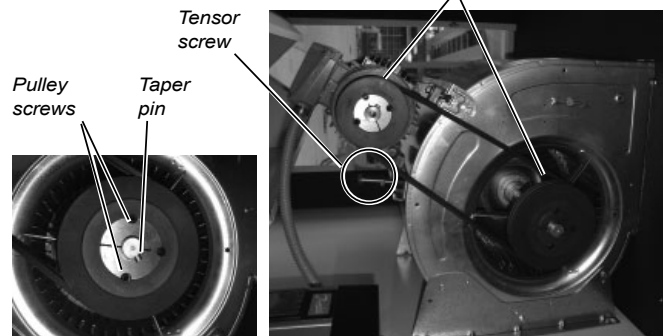
Attention: Before performing these operations, it is necessary to verify that the unit is disconnected from mains.

The centrifugal motorfans are coupled through pulleys and belts. In these fans, the following must be taken into consideration:

Pulley alignment:

- The pulleys must be on the same plane, so it is important to check them with the help of a ruler or a laser aligner.
- In case they are not aligned, remove the pulley screws, and after removing the taper pin, the set of pulley and taper can be slid over the axis (this action can be performed both in the motor as well as in the fan).

Pulleys must stay on the same plane



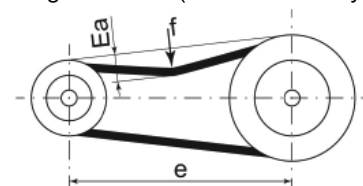
Belt tension:

After fixing the pulleys on the same plane, the belt tension is made by tightening the tensor screw.

Excessive tension on the belt can lead to premature wear on the assembly. Insufficient belt tension can cause slippage, overheating and premature wear of the belt.

It is essential to tension the belts using the "Deflection test" described below:

- The belt tension must be checked and corrected using a suitable measuring instrument (tensiometer or dynamometer).



- "Ea" calculation:

- * $Ea = (e \times E)/100$ = deformation in mm for a pulley centre distance of 100 mm
- * e = pulley centre distance in mm
- * E = see table below for the value
- * f = force applied

- At the centre of the centre distance "e", apply a force "f", as determined in the table below, to each belt. Set the belt tension to obtain the calculated deflection "Ea".

Belt type	f(N) ①	d (mm) ②	E (mm) ③
SPZ	25	56 ≤ 71	2.45
		< 71 ≤ 90	2.20
		< 90 ≤ 125	2.05
		125	1.90

① Load to be applied per belt f (N)

② Small pulley diameter (mm)

③ Belt deformation for a pulley centre distance of 100 mm - E (mm)

8 - CHECKING BEFORE COMMISSIONING



Important: During commissioning, the belt tension must be checked after 48 hours of operation.

The belt tension must be checked in all cases and before system start-up.

8.4 - Air ducts connections

The air supply and return ducts must be calculated in accordance with the nominal flow and the unit's available pressure (refer to the technical characteristics table). The duct calculation and design must be made by qualified technical personnel.

It is advisable to take into consideration the following recommendations:

- Curves in the fan supply outlet(s) must be avoided. It is recommendable to have a straight section of duct measuring approximately 1 metre. If it is not possible, they must be as smooth as possible, using indoor deflectors when the duct is of large dimensions.
- When making the ducts, direction sharp changes must be avoided since they can generate occasional pressure drops, which affect the available pressure and the flow. The location of discharge and aspiration grilles must be studied carefully to avoid the air recirculation and the transmission and generation of noises to the interior.
- Consideration should be given to the need to install filters on the return ducts, taking into account any particles in suspension existing which could settle inside the machine (e.g. textile fibres).
- Flexible connections must be made between the ducts and the unit that avoid the noise and vibration transmission.
- No matter the type of ducts used, they must be isolated and not be composed of materials that propagate fire nor expel toxic gases in the event of a fire. The internal surfaces must be smooth and should not pollute the air that circulates within them. In any case, the effective legislation about this issue must be respected.



Caution: Indoor units are designed to connect to a duct network. In the event that the outlet fan of the indoor circuit is accessible from a particular point in the duct network, the installer must install a protection mesh in the discharge as per the current regulation.

8.5 - Condensate drain connection

- The condensates pan of the outdoor module has one or two drain joint, gas threaded 3/4" M.
- The condensates pan of the indoor module has one drain joint, gas threaded 3/4" M.

Important: All water drain pipes must be provided with a siphon to avoid bad smell and water spills.

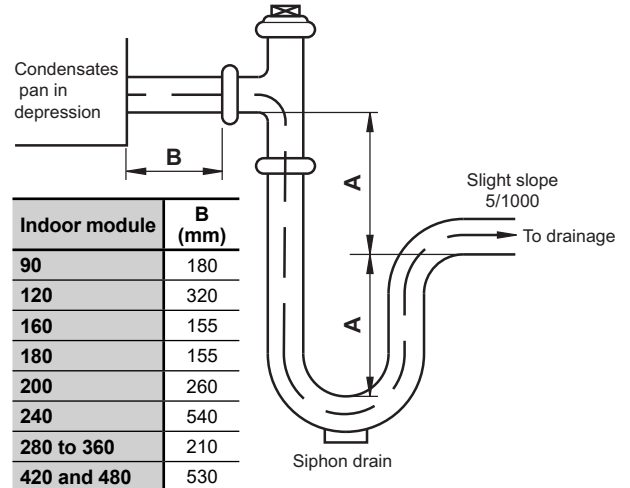
**CONNECT SIPHON
METTRE SIPHON
PONER SIFON**
V220014

8.5.1 - Siphon installation norms

Perform the assembly as per the scheme of the attached starting diagram:

- **Pan in overpressure:** It is installed to avoid the access through the drain piping of bad smells.
- **Pan in underpressure:** Besides the previous application, water must be sucked from the pan:

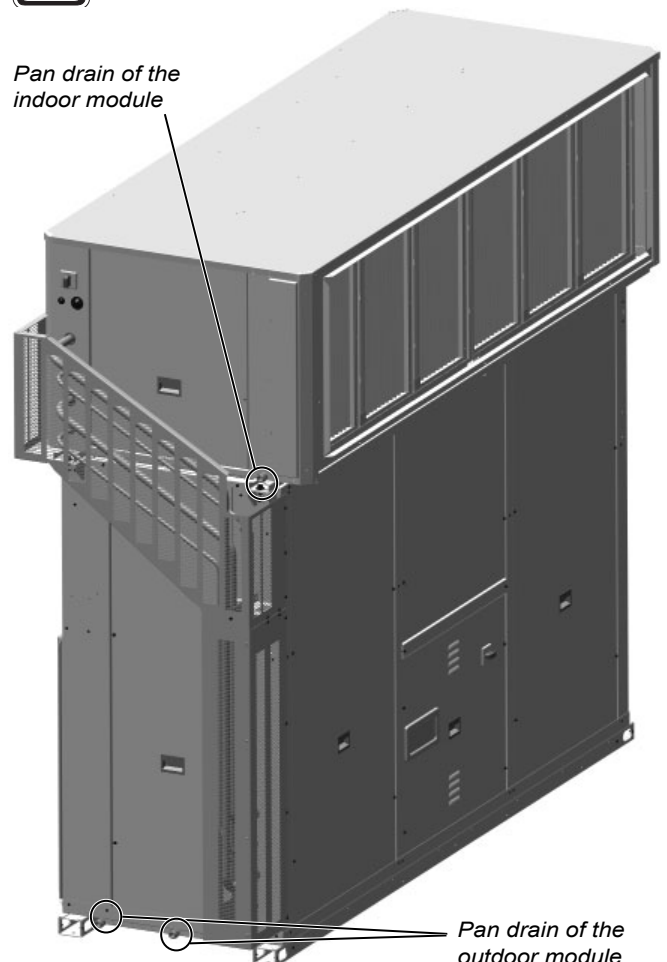
- For the correct siphon design, the "A" height must be at least twice that of the underpressure (mm.w.c) where the condensate pan is placed.
- The drain piping must be slightly sloped to ease circulation towards the drain.
- The original diameter of the piping must be respected. No reduction can be made.



In case of compact installation, to make the siphon of the indoor module, the first section must be larger than dimension "B" because it should exceed the pipes and the protector.



Check the connection watertightness.



The outdoor module of models 200 to 485 have built-in two pan drains. Do not connect these drains.

8 - CHECKING BEFORE COMMISIONING

8.6 - Cooling connections

Once installed the outdoor module and indoor module, the cooling links must be laid between them

8.6.1 - 50NI in compact version

With 50NI units in compact version, the necessary elements or the cooling connection of both modules are shipped: pipes for connections (2 sections of pipeline), clamps for hanging pipes, external thermal insulation of the pipes and sheetmetal protector.

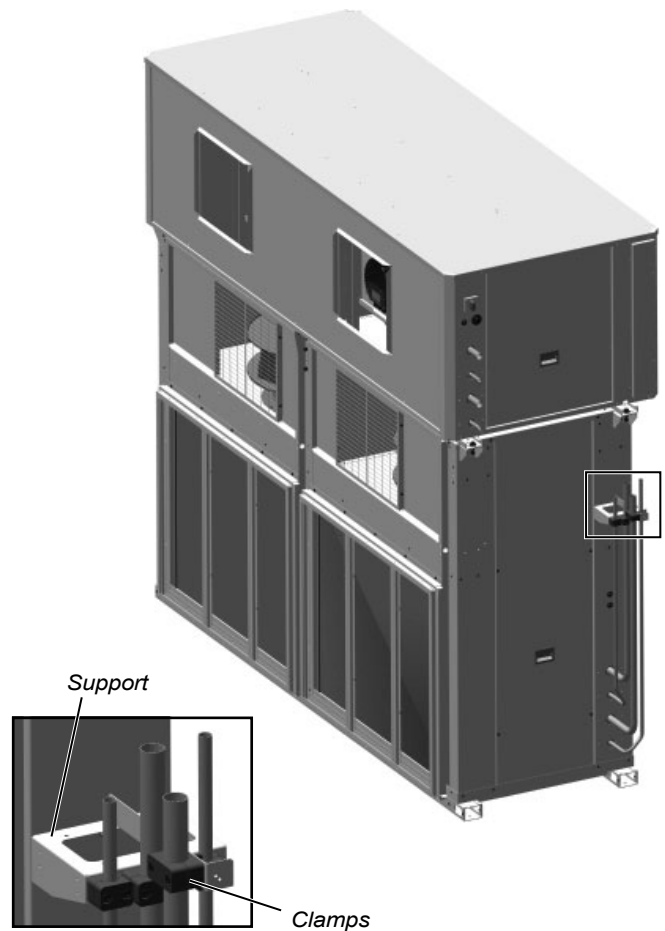
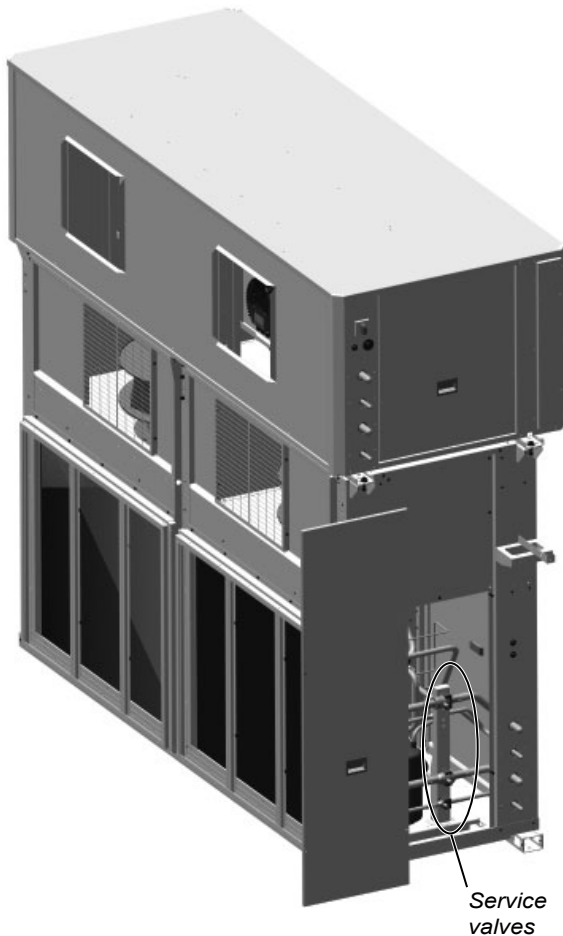
The outdoor module includes service valves and refrigerant pre-charge to work in compact version. These valves must remain closed until the cooling connection between the modules is finished.



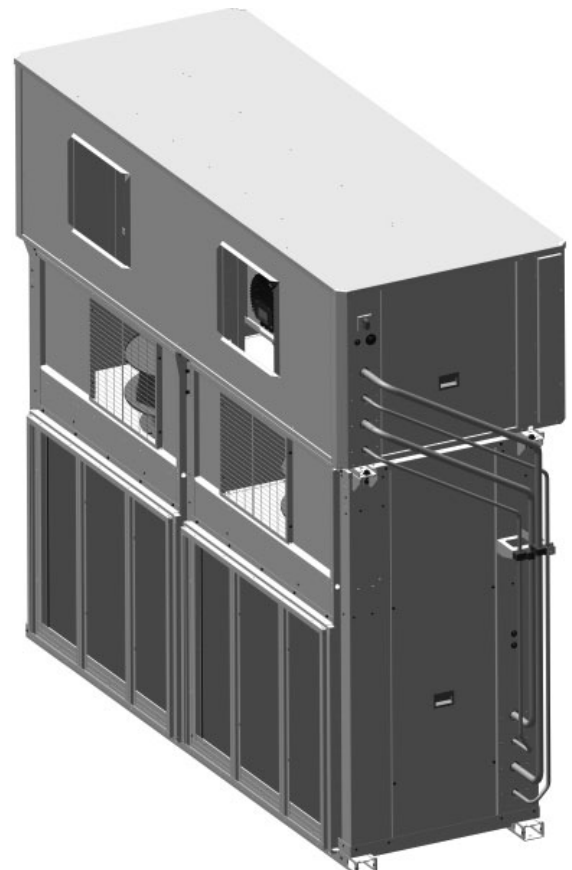
Caution: Before performing any cutting operation of pipe ends, verify that the service valves are closed and ensure that there is not pressure in the circuit by reading in the valves core.

The steps required for connecting the modules are:

- Cut the pipes ends in both modules, because they are sent closed. Make this operation just at the time of the pipes connection. Revise and clean the tube ends to eliminate the burrs from cutting them and any other impurity that could have deposited inside or on the outer surface. How clean the tubes are will dictate the sealing of the joint. Also, we will avoid the dirt formation that may collapse some spots in the cooling circuit.



- Then, welding the second pipe section, in the first section and the endings of indoor module.



- Connect the endings of outdoor module with the first pipe section. Then fix these pipes to the metal support with fixing clamps (with Allen screws M6).

8 - CHECKING BEFORE COMMISSIONING

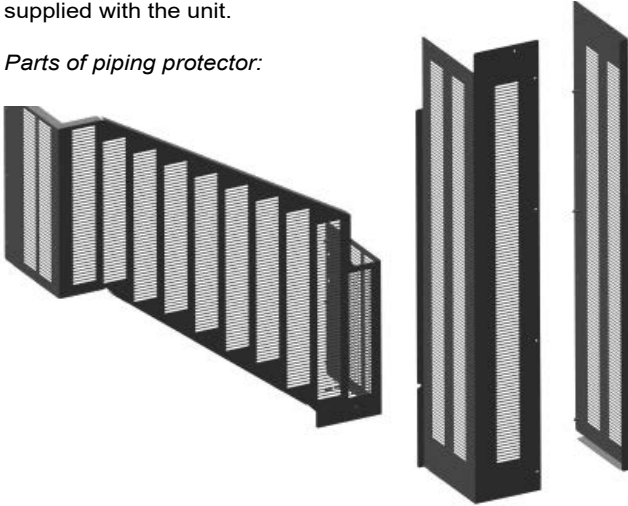
- Run a pressure test in the cooling tubes and a search for leaks to verify the cooling installation.
- Create a vacuum in the installation to eliminate humidity inside the circuit.
- Apply thermal insulation to the pipeline (included on the unit) covering it. Then fix the covering by means of an adhesive tape.



Caution: The hose to interconnect electrically the modules must not be in contact with refrigeration circuit.

- Fit the piping protector with self-tapping screws of 4,8 mm, supplied with the unit.

Parts of piping protector:



- Finally, open the check valves placed in outdoor module, to allow circulation of refrigerant. These check valves are accessible by lateral register.

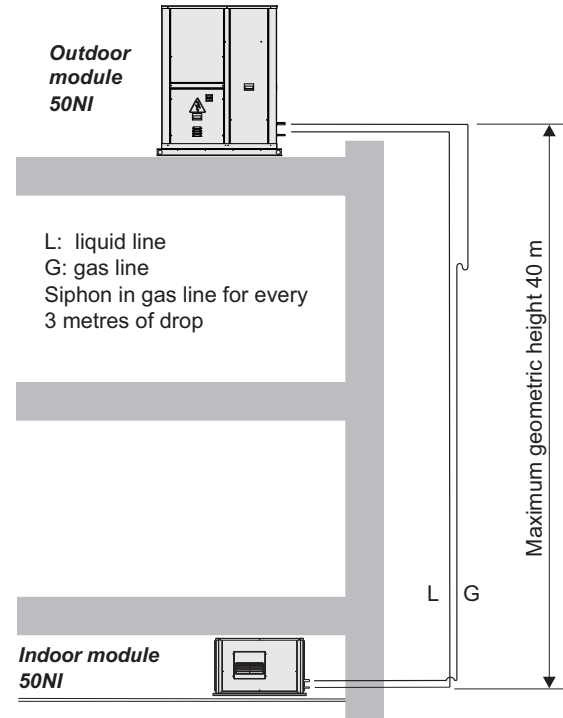


8.6.2 - Outdoor module and indoor module in split version

- The maximum equivalent length of the cooling line is 50 metres, with a maximum geometric height of 40 metres when the outdoor unit is high. For longer distances, up to 100 metres maximum, an oil separator must be used per cooling circuit.
- If it is the indoor unit which is high, the maximum equivalent length is reduced to 30 metres.

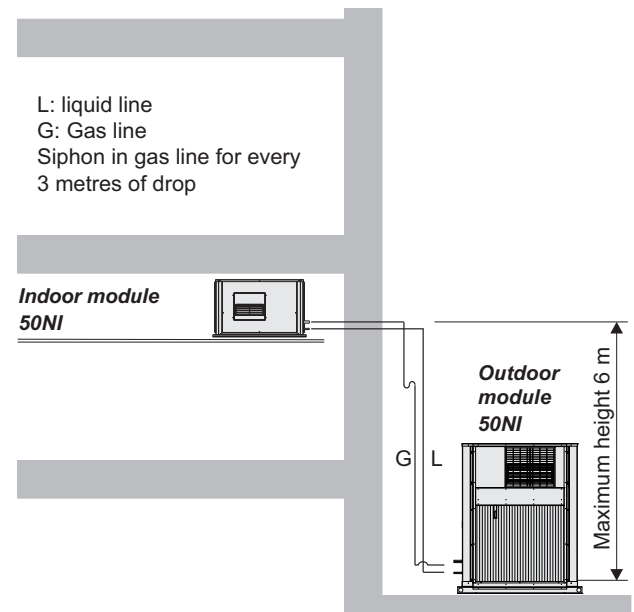
Outdoor module top

Maximum equivalent length of the cooling line: 50 metres
For longer lengths an oil separator must be used



Outdoor unit bottom

Maximum equivalent length of the cooling line 30 metres



It is recommended to place a siphon in the gas line every 3 meters of shoulder to ease the oil return to the compressor.

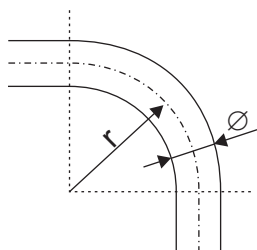
8 - CHECKING BEFORE COMMISSIONING

For connecting the modules it is recommended to follow the steps described for compact installation of the unit. In this case, no parts are supplied for the connection.

Cooling connections	90	120	160	180	200	240	280	320	360	420	485
Circuit 1: Liquid line	1/2"	5/8"	5/8"	5/8"	1/2"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"
Circuit 1: Gas line	1 1/8"	1 1/8"	1 1/8"	1 1/8"	1 1/8"	1 1/8"	1 1/8"	1 1/8"	1 1/8"	1 3/8"	1 3/8"
Circuit 2: Liquid line	-	-	-	-	1/2"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"
Circuit 2: Gas line	-	-	-	-	1 1/8"	1 1/8"	1 1/8"	1 1/8"	1 1/8"	1 3/8"	1 3/8"

In addition, the following considerations should be taken into account:

- For the refrigerant lines, use only cooling type seamless tubes. Under no circumstance use sanitary type copper pipe.
- The material used must guarantee the air tightness at operation pressure and temperature.
- To calculate equivalent length, it is necessary take into account pressure drops by accessories.
- Tube installation norms must be respected and inspect carefully the tube lay out, looking for the shortest distance and the lowest possible number of curves. Also, chokes must be avoided, using large curve radii (the curve radius must be $\geq 3,5 \times \varnothing$).



Pressure drops in the elbows expressed as equivalent lengths:

Tube diameter (inches)	1/2"	5/8"	7/8"	1 1/8"	1 3/8"
Equivalent elbow length 45° (m)	0,24	0,30	0,39	0,48	0,60
Equivalent elbow length 90° (m)	0,45	0,54	0,72	0,90	1,10
Equivalent elbow length 180° (m)	0,75	0,80	1,00	1,30	1,80

- Finished the connection of both modules, charge the unit with gas according to charge data provided in a table of the chapter on "Maintenance" and in the unit's data plate.

Add the refrigerant slowly via charging valve (schradler type) built into the liquid line of each circuit with compressors stopped, and using the appropriate tools monitoring the pressures to detect if there are any possible anomalies.

Access to charging valves from the lateral panel (check the location in chapter "Commissioning").

- If the equivalent length of the cooling lines is over 7 metres, an additional charge will be needed per meter as per the following table.

Nominal diameter	1/2"	5/8"	7/8"	1 1/8"	1 3/8"
Indoor section (cm²)	0,900	1,505	3,120	5,346	7,85
Liquid line charge (g/m)	115,0	193,5	404,1	685,7	1007,1
Gas line charge (g/m)	0,4	0,7	1,4	2,5	3,6

Optionally, in 50NI split version, It is possible to supply with filling and service valves (until 30 metres of equivalent length).

To ensure that the gas charge is correct, follow the instructions given in chapter "Commissioning".

9 - SAFETY ELEMENTS

Low pressure pressostat

When connected to the compressor suction, it will stop its operation when the pressure at that point goes down below the tare value (caused by obstructions in the circuit, excessive dirt in the filters, fan stop or ice formation in the evaporator).

This pressostat disconnects at 2 bar and is automatically reactivated.



High pressure pressostat

Connected to the compressor discharge, it will stop its operation when the pressure at that point reaches the setpoint. It disconnects at 42 bar and it is automatically reactivated.



Automatic switch in the control circuit

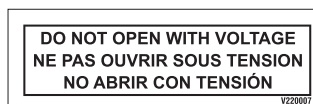
Magnetothermal switch that protects the operation circuit against continuous surges as well as against high currents of short duration (short circuits).

Magnetothermals for line protection

They are located at the beginning of the power lines for the compressor(s) and motor fan(s) to protect them.

Main door switch

By using a mechanical device, it impedes access to the electric panel when the unit is with voltage.



Safeties at the compressor

These units include a temperature probe for the discharge from the compressor to protect the unit with discharge temperatures greater than 135°C.

Protection of the electric panel (optional)

Electrical heater for protecting the components of the electric panel.

9 - SAFETY ELEMENTS

Defrost control

This safety device is intended to eliminate ice which could accumulate in the outdoor coil when the unit is working in the heating cycle.

Defrosting is carried out by the control depending on the value measured by the sensor(s) on the outdoor coil(s) and the time set between defrosting operations.

Condensation and evaporation pressure control

This safety device, integrated in the control, enables managing the outdoor fan(s) when the units are working in cooling mode with low outdoor temperatures (condensation control) or in heating mode with high outdoor temperatures (evaporation control). This aids the unit's operation in all the seasons.

With electronic axial fans, the speed control is proportional, based on the average pressure measured by the pressure transducers.

Anti-fire safety

The electronic control can activate an anti-fire safety device that detains the unit when the return air surpasses a temperature of 60°C (by default).

It cannot return to operation until the temperature has dropped to below 40°C.

Note: CARRIER_{rtc} electronic control allows to select the functioning logic for the fulfilment of the ERP French fire regulations.

Control of air flow (optional)

- For those units with centrifugal supply fans (optional), a differential pressostat can be incorporated in order to measure the variation in air flow. This pressostat allows the detection of fan belt breakages, since the fan relay only detects operating faults that have arisen in the motor. This safety device is included in units with electrical heaters. This pressostat is installed in the factory in the auxiliary electric panel of the indoor unit. The units with electrical heaters include this optional
- The supply plug-fans (standard) adapt their speed to the average flow measured by the differential pressure sensor and the value set as a setpoint in the electronic control.

Air quality probe (optional)

This probe is installed in the environment and allows for the measurement of CO₂ and/or volatile compounds.

This probe is to be connected by the client. Consult the section 8.1. "Electrical connections".

This probe is supplied inside the main electric panel.

Clogged filter detector (optional)

Differential pressostat for indication, through an automatic reset alarm, of a level of dirtiness of the filters greater than the established level. Automatic reset.

Pressure reading is done thanks to two intakes within the air flow before and after the filter, such that a comparison is made between the pressure of the inlet air to the filter (positive) and the outlet air of the same to the other side of the evaporating coil (negative).

This pressostat is installed in the factory in the auxiliary electric panel.



Smoke detector (optional)

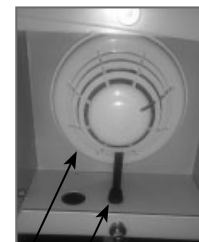
In accordance with standard NF S 61-961, this smoke detection station uses a LED to indicate the installation status, and if the probe detects the presence of smoke in the installation, it stops the operation of the unit.

The station is installed in the factory in the main electric panel 420 and 485 models, or in the auxiliary electric panel for the rest of the models.

The probe is placed next to the supply fan



Smoke detecting station



Air inlet tube
Smoke detecting probe

Refrigerant leak detector (optional)

The gas detector sensor is a device that signals leaks in refrigerant. When the loss of a certain concentration is detected, the sensor sends the alarm to the control, which stops the unit and locally activates a acoustic and visual signal.

This offers the advantage of acting immediately to gas leaks, guaranteeing the safety of persons who are in the proximity thereof. Its installation complies with European regulations F-GAS, EN378, and ASHRAE 15.

This sensor is installed next to the supply fan. In case of alarm, it is reset manually.

Remote alarm (optional)

CARRIER_{rtc} allows the management of a relay for remote alarm signalling.

10 - OPTIONS

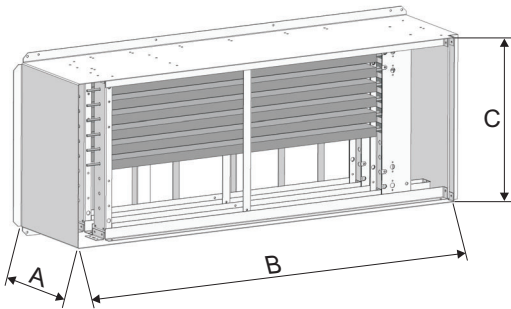


The installation of some of these options brings in pressure drops at air level therefore this must be considered when selecting fans. The pressure drop graphs in the options, can be seen in the technical brochure.

10.1 - Electrical heaters (indoor module)

- The auxiliary electrical heaters are ready for operation in two power stages.
- The electrical heaters acquired with the unit will be incorporated to it modifying the electric panel in the factory, so that it is compatible with the electronic control.
- The electrical heaters requested for units already shipped will be sent in a kit, and the installer will need to assemble the elements required for the operation of the unit and for compliance with the legal regulations that are applied to the modified unit with regard to safety.
- In these models the assembly of the auxiliary heater is placed on the supply fan outlet.
 - The output of each row will be 2 or 3 kW according to the total output.
 - In models with two supply fan outlets (two frames), as well as in the case of 1 supply outlet with 2 rails, the electrical heaters are distributed as symmetrically as possible between both frames.

Frame for assembly of the auxiliary heater in the supply fan outlet:



Indoor module 50NI	Total output	Dimensions (mm)		
		A	B	C
90 / 120 (1 frames)	6 / 9 kW (1 row)	150	482	443
	12 kW (2 rows)	262	482	443
160 / 180 (1 frames)	12 / 15 / 18 kW (1 row)	189	1.142	443
200 / 240 (1 frames)	15 / 18 kW (1 row)	189	1.142	443
	24 / 30 / 36 kW (2 rows)	297	1.142	443
280 / 320 / 360 (2 frames)	15 / 18 / 24 / 30 / 36 kW (1 row)	189	1.142	443
420 / 485 (2 frames)	36 / 45 / 54 kW (1 row)	189	1.142	443

Access for maintenance:

The frame has access designed from the right side for maintenance. In the case of 2 frames (2 supply outlets) are placed symmetrically so that the electrical heaters can be taken out without problems, that is, one will be accessed from the right and the other one from the left.

To access the electrical heaters, the 2 screws that fasten the frame side panel must be unscrewed as shown in the following image:



Access panel

In order to remove the electrical heaters the power supply cables must be disconnected from the terminal board and the hose taken out.

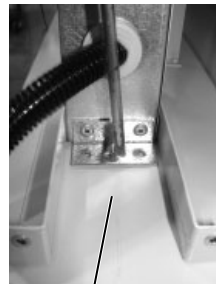
Safety thermistors

Electrical heaters

Hose



Then, unscrew the screw that fastens the electrical heaters' frame and take out by the rail, as shown in the following images.



Rail



10 - OPTIONAL

Kit assembly:

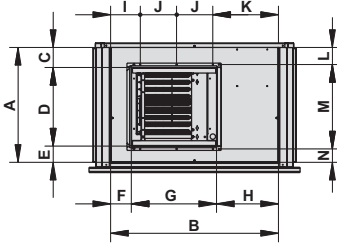
When the frame with the electrical heaters is provided in a kit, follow the steps below for connecting it:

Step 1: lay down the frame on the panel to set the hole locations that will fix said frame to the panel. Another hole must also be drilled to connect the hose to the electric power supply.

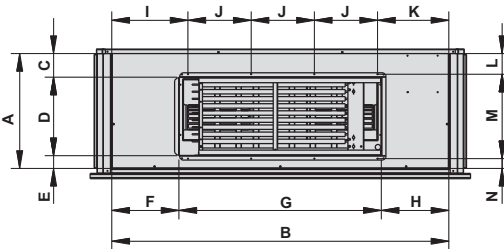


If it is not possible to perform the previous step, the distance between holes, as well as the frame dimensions, are displayed in the following schemes:

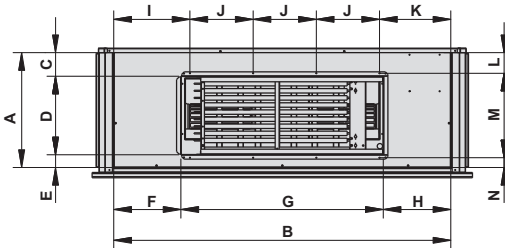
Indoor module 90 and 120



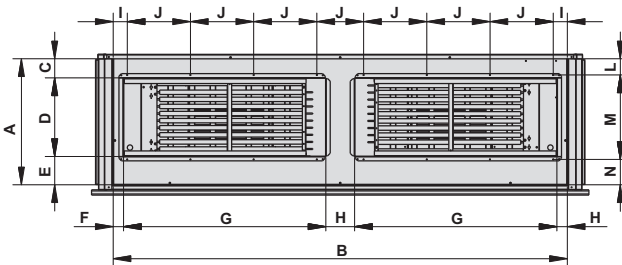
Indoor module 160 to 240



Indoor module 240



Indoor module 280 to 485



Plug-fan:

Indoor module	A	B	C	D	E	F	G	H	I	J	K	L	M	N
90	648	954	95	443	112	236	480	236	259	204	287	80	473	95
120	648	954	95	443	112	236	480	236	259	204	287	80	473	95
160 & 180	648	1276	46	443	158	81	1142	53	133	356	75	30	476	142
200	648	1900	133	443	72	379	1142	379	430	356	400	116	476	55
240	648	1900	133	443	72	379	1142	379	430	356	400	116	476	55
280 to 360	711	2560	108	443	160	58	1142	160	79	356	264	91	476	143
420 & 485	1060	2886	520	443	97	276	1142	49	300	356	-	503	476	81

Centrifugal fan

Indoor module	A	B	C	D	E	F	G	H	I	J	K	L	M	N
90	648	946	145	443	60	165	482	299	217	204	320	128	476	43
120	648	946	113	443	92	115	482	349	167	204	370	96	476	75
160 & 180	648	1276	46	443	158	81	1142	53	133	356	75	30	476	142
200	648	1900	161	443	44	379	1142	379	430	356	400	146	476	27
240	648	1900	133	443	72	379	1142	379	430	356	400	116	476	55
280 to 360	711	2560	108	443	160	58	1142	160	79	356	264	91	476	143
420 & 485	1060	2886	520	443	97	276	1142	49	300	356	-	503	476	81

Step 2: fasten the frame to the panel with self-tapping screws.

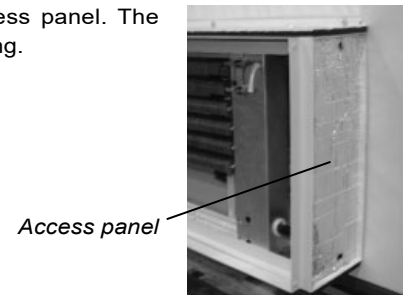


Step 3: insert the hose through the drill made for the connection to the indoor electric panel of the unit.



Note: The connection of the necessary elements for the adequacy to the handling of the unit must be performed by the installer.

Step 4: close the access panel. The outlet is ready for ducting.

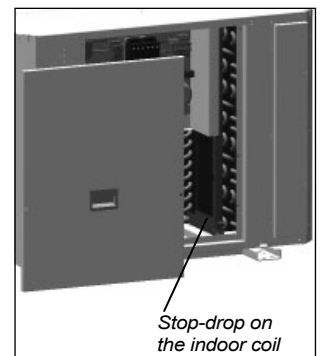
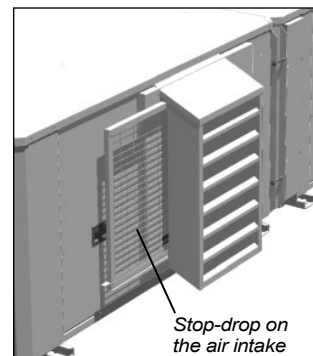


10.2 - Stop-drop (indoor module)

The indoor module can incorporate a stop-drop on:

- the fresh air intake.
- the indoor air coil.

Note: with hot water coil it is not possible to assemble the stop-drop.



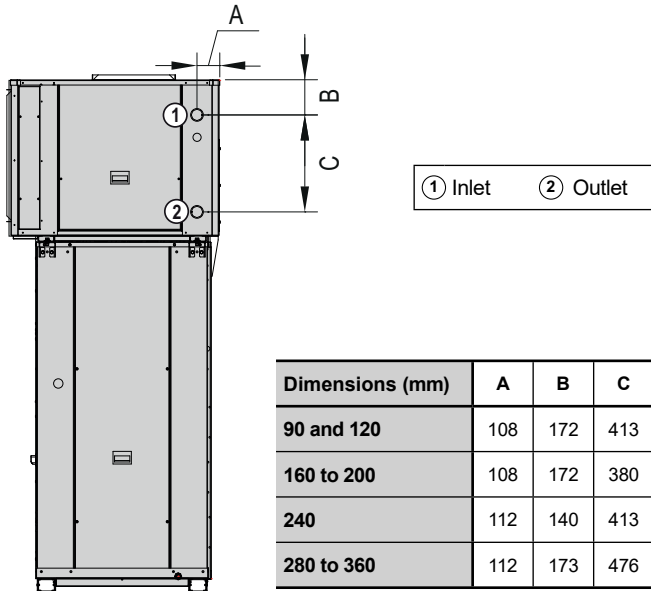
10 - OPTIONAL

10.3 - Hot water coil (indoor module)

Hot water coil for mounting inside the unit, with a 3-way valve managed by the unit's electronic control for heating backup.

Nota: with stop-drop in the indoor air coil it is not possible to assemble the hot water coil.

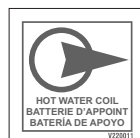
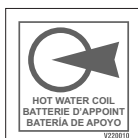
Position of hydraulic connections for auxiliary hot water coil:



Recommendations:

- Coil filling:
 - The coil filling must be made with the bleeder valve open until water runs through it, which is when it is time to close it.
 - Cut off the water supply and let the bubbles generated go up to the highest coil point, which is the same as the bleeder valve, and eliminate by opening the purger.
 - Pour more water into the circuit and repeat the previous steps.
 - Activate the water pump (to be foreseen by the installer) and repeat the previous steps until no air noises are heard in the piping, which is when the filling of the installation will have been finished successfully.
- In case of long unit stops, and forcibly if they happen in the winter season, the coil must be emptied.
- Possible water freezing must be avoided: glycoling water or by using anti-freeze thermostat that triggers the 3-way valve.

Note: this thermostat is mandatory if the unit is installed outdoors, as well as in cases in which it uses free-cooling and works outside at negative temperatures.
- The direction of the water flow must be correct and so the following indications must be observed:

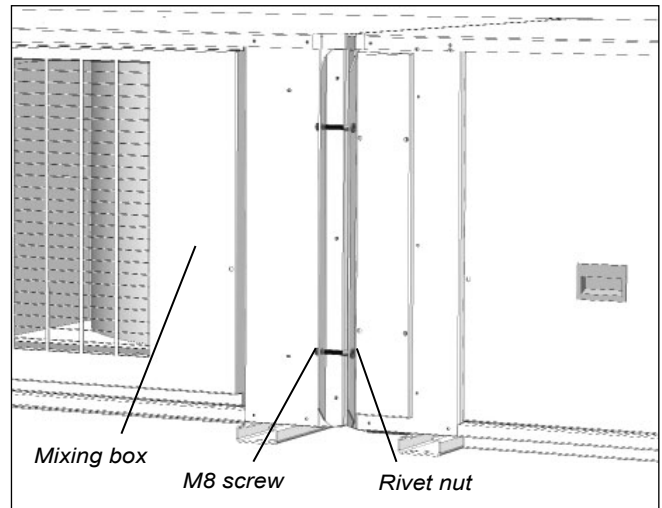


10.4 - Mixing box (MS module)

It is possible connect a mixing box with the indoor module. The link between them is made with the M8 screws and rivet nuts provided from factory.

The electrical connection of the mixing box MS is performed from the electric panel of the outdoor module. Please, refer to the section "Electrical connection".

Note: all available assemblies indoor units with mixing boxes can be found in Chapter 5. "Available Assemblies".

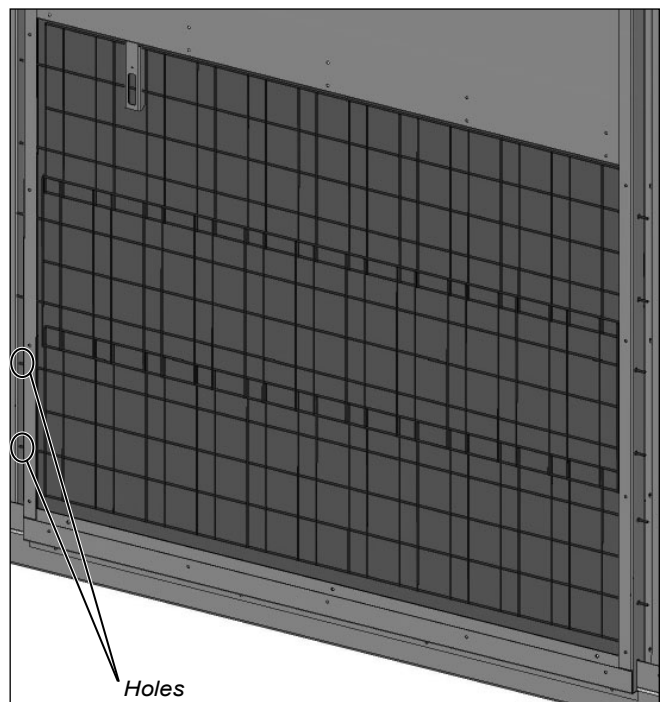


Important: In compact version, the connection of the mixing box with its structural support is under the responsibility of the installer.

10.5 - Coil protection grille (outdoor module)

The outdoor modules can include a protection grille for the coil. This grille is fixed by modules in the holes made for this purpose in the unit supports.

Note: This grille is not compatible with the air filter.



10 - OPTIONAL

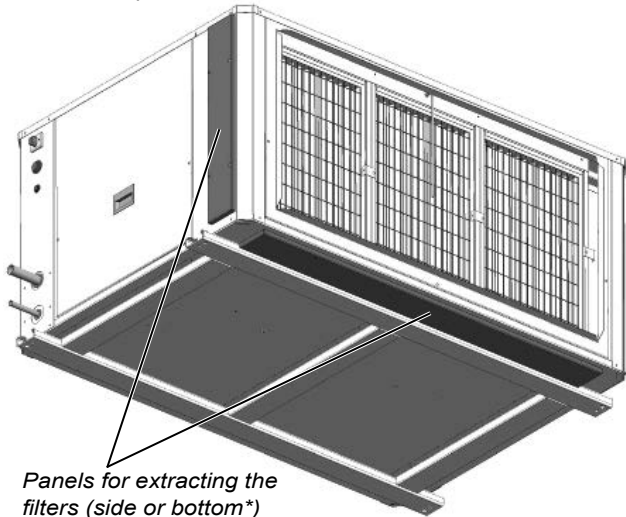
10.6 - Air filters

10.6.1 - Indoor module

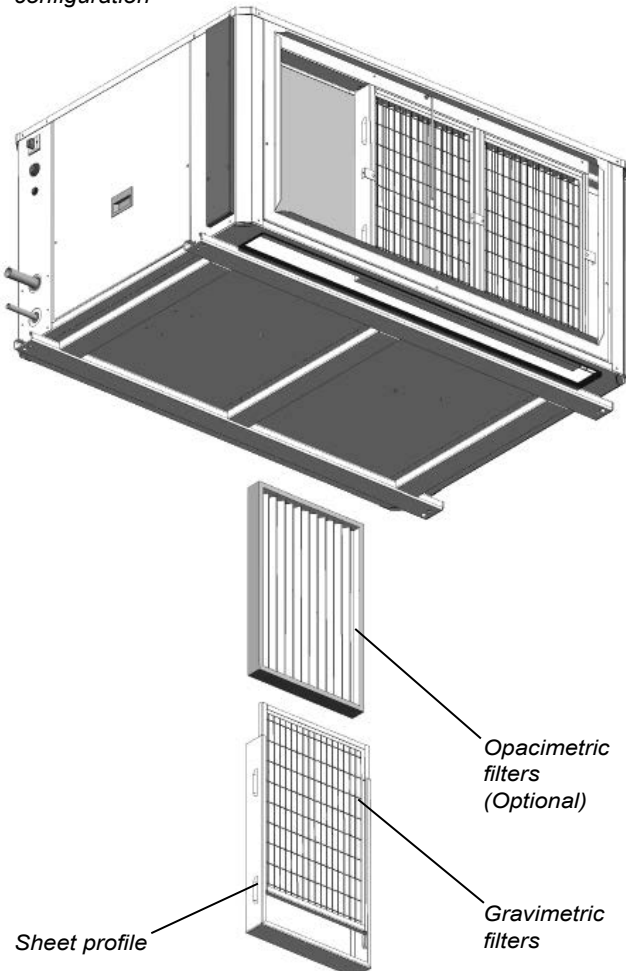
All model types can substitute the filtering mesh that the units include regularly with G4 rating, mounted on the same frames. Creased opacimetric filters classified M6 to F9 can also be added.

Models 90 to 360

- For filter extraction, both gravimetric filters and opacimetric filters (if the unit has includes them) are assembled over a sheet steel profile.

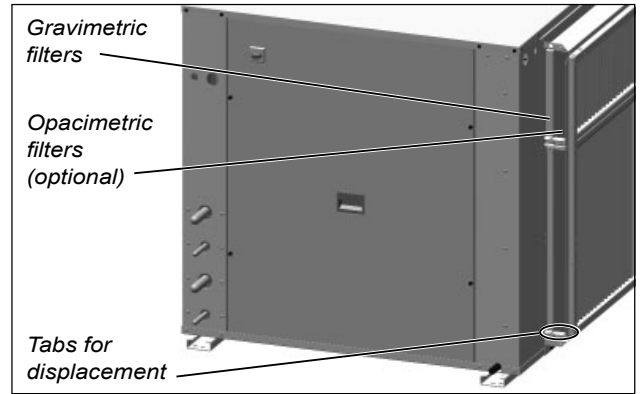


(*) Extraction from the bottom is not possible with compact configuration

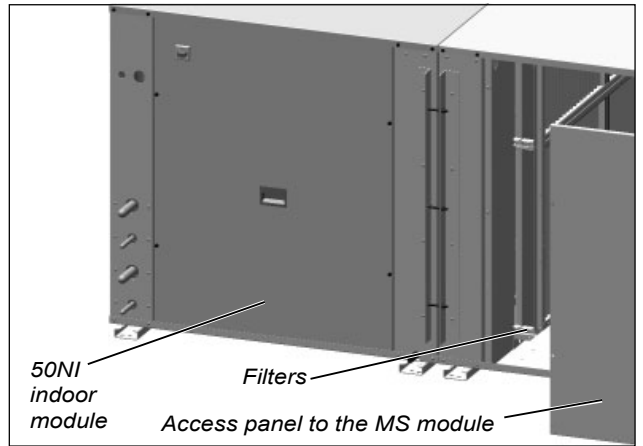


Models 420 and 485

- It is necessary to lift the tab and dragging on the rail in order to extract the frames.

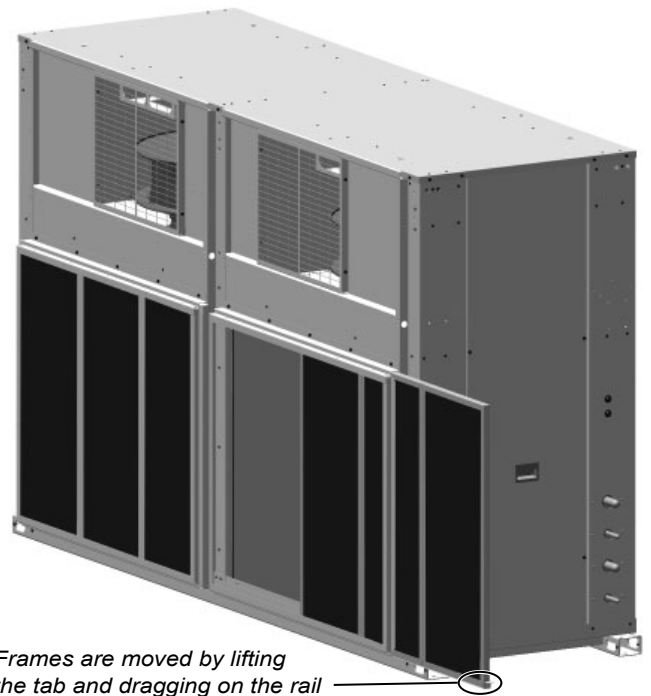


- When the unit is coupled to a MS module, the frame with filters is located inside this module



10.6.2 - Outdoor module

- The outdoor modules can include, in air return, frames with gravimetric filters. The frames are placed on sheet profile to taking out easily the filters.



11 - COMMISSIONING

11.1 - Checks prior to commissioning

- It is advisable to make a complete sketch of the installation including the location of the unit and all the components used. This will be very helpful for maintenance and repairs to the installation.
- The following must be verified:
 - That the electrical power supply remains constant and that it corresponds to that featured on the unit data plate.
 - That the electric installation has been carried out according to the electric wiring diagram provided with the unit (consult the chapter on "Checking before commissioning").
 - The correct connection of the sensors supplied with the unit.
 - That they are no wire close to heat sources.
- Once the above verifications have been carried out, the control circuit is supplied with voltage by the automatic control switch.

Attention: It is necessary to leave the compressor crankcase heater with voltage for 24 hours before starting the compressor.

WICHTIG: WIEDERBEHEIZUNG DER OLWANNE

BEIDER ERSTEN INBETRIEBSETRUNZ ORDER NACH EINER LANGEN STROMUNTER-BRECHUNG BRINGEN SIE DIE MASCHINE UNTER SPANNUNG 24 STRUNDERLANG BEVOR SIE DEN(DIE) KOMPRESSOR(EN) EINSCHALTEN KOENNEN.

IMPORTANT: CRANKCASE HEATING

FOR THE FIRSTSTART OR AFTER ALONG TIME OUT OF VOLTAGE PUT THE MACHINE ON LIVE 24 HOURS BEFORE TO ALLOW THE COMPRESSOR(S) STARTING

IMPORTANT: SURCHAUFFE CARTER D'HUILE

AU PREMIER DÉMARRAGE OU APRÈS UNE ABSCEANCE DE COURANT PROLONGÉE, METTRE LA MACHINE SOUS TENSION 24 HEURES AVANT D'AUTORISER LE DÉMARRAGE DU(DES) COMPRESSEUR(S).

IMPORTANTE: RISCALDARE IL CARTER DELL'OLIO

AL PRIMO AVVIAMENTO U DOPO UNA INTERRUZIONE PROLUNGATA DELLA ALIMENTAZIONE ELETTRICA, LASCIARE LA MACCINA SOTTO TENSIONE PER 24 ORE PRIMA DI AUTORIZZARE L'AVVIAMENTO DEL(DEI) COMPRESSORE(I).

IMPORTANTE: RECALENTAMIENTO DE ACEITE DEL CÁRTER

ANTES DEL PRIMER ARRANQUE O DESPUÉS DE UNA AUSENCIA DE CORRIENTE POR UN LARGO PERIODO DE TIEMPO, CONVIENE QUE LA UNIDAD ESTÉ CONECTADA UN MÍNIMO DE 24 HORAS.

V220084

Important: As a safety feature to ensure heating of the crankcase heater, if there is a power cut lasting over 2 hours, the compressors will be locked. The unit must be powered for 8 hours to unlock them. The pGD1 terminal unit display will shows the time remaining until they can be unlocked.

- All the units are equipped with scroll type compressors and a phase control relay. Verify that they rotate in the correct sense and, if not, reverse the power wires.

SCROLL COMPRESSOR.
CHECK SENSE OF ROTATION
COMPRESSEUR SCROLL.
VÉRIFIER LE SENS DE ROTATION
COMPRESOR SCROLL.
COMPROBAR SENTIDO DE GIRO

V220045

Control of the refrigerant charge

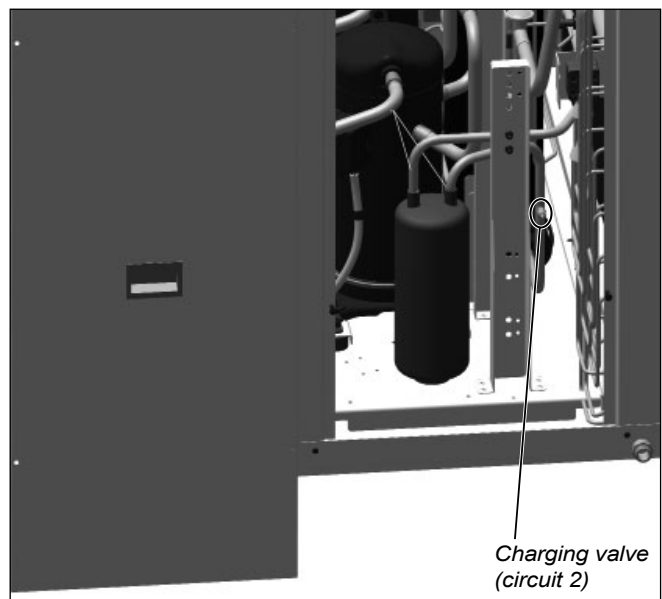
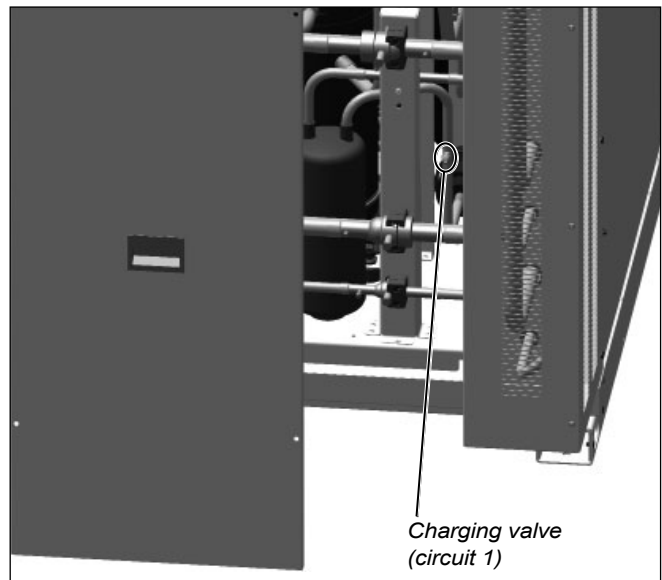
- The units in compact version are shipped with an exact charge of refrigerant for proper operation to work in this version. In case of split version it is necessary charge of refrigerant following the recommendations in "Cooling connections".

R 410A

- To make sure that the unit is filled with the correct charge of refrigerant, check the values of overheating and subcooling, circuit by circuit, with the system running at full capacity.

If the refrigerant charge is lower than required, the suction pressure will drop and overheating on the compressor inlets will be high. This can cause an interruption in operation due to activation of the refrigerant charge safety device.

To adjust the refrigerant charge, a schrader type valve is built into the unit on the liquid line for each circuit. Access from lateral panel of outdoor module.



11 - COMMISSIONING

- Verify the absence of any leaks of the refrigerant. In case of a leak:
 - Completely drain the refrigerant charge using a specific recovery machine for R-410A and repair the leak.
 - Next, reload the refrigerant into the unit according to charge data provided in a table of the chapter on "Maintenance" and in the unit's data plate.
 - Add the refrigerant via the charging valve using the appropriate equipment and tools, with the compressors stopped, monitoring the pressures to control any anomaly.

11.2 - Possible problems at commissioning

All indications given in this brochure must be respected and complied with to guarantee a correct operation of the units.

Next, several possible operation problems are stated which could happen if the conditions of the commissioning are not appropriate.

- Air flow lack: very high differences between inlet and outlet temperatures, originated by a high pressure drop in the ducts, or by other causes that impede the correct circulation.
- Air recirculation in the unit, originated by some obstacle in the air aspiration or outlet.
- Noise problems because of excessive air flow in the grille.
- Water overflowing to the pan problems, originated by an excessive flow, an incorrect siphon installation or because a defective unit level.
- Refrigerant circuit humidity problem, because of an incorrect vacuum realization.

11.3 - Operational checks

Check the unit operation by verifying the electronic control and the safety devices.

It is also recommendable to create a report, taking note of the date, which includes the following information:

- The nominal power,
- Current absorbed by the compressors, fans, and other electric components,
- The significant temperatures of the cooling circuit (see attached table),
- And other aspects that are considered interesting, such as, for example, alarms detected by the electronic control of the unit.

The recording of these parameters whilst the unit is running allows controlling the installation performance and it is the best possible way to avoid breakdowns since the analysis of these data makes early detection of anomalies possible or the provision of the necessary means available to ensure that they do not take place.

Operating readings

Cooling MODE		
Compressor	Suction pressure	bar
	Suction temperature (1)	°C
	Condensation pressure	bar
	Condensation temperature (2)	°C
Air condenser	Gas inlet temperature	°C
	Liquid outlet temperature (3)	°C
	Air inlet temperature	°C
	Outdoor temperature	°C
	Air outlet temperature	°C
Air evaporator	Air inlet temperature	°C
	Air outlet temperature	°C
	Liquid inlet temperature	°C
	Evaporation outlet temperature (4)	°C
Subcooling (2) - (3)		°C
Overheating (4) - (1)		°C

Heating MODE		
Compressor	Suction pressure	bar
	Suction temperature (1)	°C
	Condensation pressure	bar
	Condensation temperature (2)	°C
Air evaporator	Liquid inlet temperature	°C
	Gas outlet temperature (4)	°C
	Air inlet temperature	°C
	Outdoor temperature	°C
	Air outlet temperature	°C
Air condenser	Air inlet temperature	°C
	Air outlet temperature	°C
	Gas inlet temperature	°C
	Liquid outlet temperature (3)	°C
Subcooling (2) - (3)		°C
Overheating (4) - (1)		°C

12 - MAINTENANCE

The minimal maintenance operations and their periodicity will be made according to the national regulations.

All work on the unit's electrical or refrigerant systems must be carried out by a qualified authorised technician. See the standard EN 378-4.

It is advisable to sign a maintenance contract with the installer or an approved maintenance company.

12.1 - General recommendations:

12.1.1 - Safety instructions

- Technicians working on the unit must wear the necessary safety gear (e.g. gloves, eye protection, insulating clothing, safety shoes).
- Similarly, it is recommended that personnel working close to sources of high noise emission wear ear defenders. The ear defenders should in no way impede the wearing of other protective equipment.
- The surfaces of the compressor and pipes may reach temperatures of over 100°C and cause burns if touched. Likewise, the surfaces of the compressor may in some cases drop to freezing temperatures which can cause frostbite. It is therefore important to take special care when carrying out maintenance work.
- Do not climb on the machine; use a platform to work at the necessary height.
- Do not climb on the copper refrigerant pipes.



Caution: Do not work on any electrical components without first turning off the main door switch in the electric panel.

12.1.1 - Preliminary advise

- Keep the unit clean.
- Keep the space surrounding the unit clean and cleared in order to avoid accidents and ensure the proper ventilation of the coil.
- Perform a visual (remains of water or oil below or around the unit) and auditory inspection of the entire installation.
- In general, a corrosion control must be performed on the metallic parts of the unit (frame, bodywork, exchangers, electric panel, etc.).
- Check that the insulation foam is not unstuck or torn.
- All the electric connection states must be checked as well, as well as the air tightness of the different circuits.
- Check whether the safety devices and the expansion valve(s) operate correctly.
- Check all the values listed in the table "Operating readings" on chapter 11.

12.2 - Access to main elements

12.2.1 - Air coil

- Check that the coil is free from dust and grease.
- Cleaning the accumulated dust on the coil can be performed with a vacuum cleaner perpendicular to the fins or with a low-pressure water cleaner. Grease can be removed with water with degreaser. Do not put stress on the fins as they could deform.



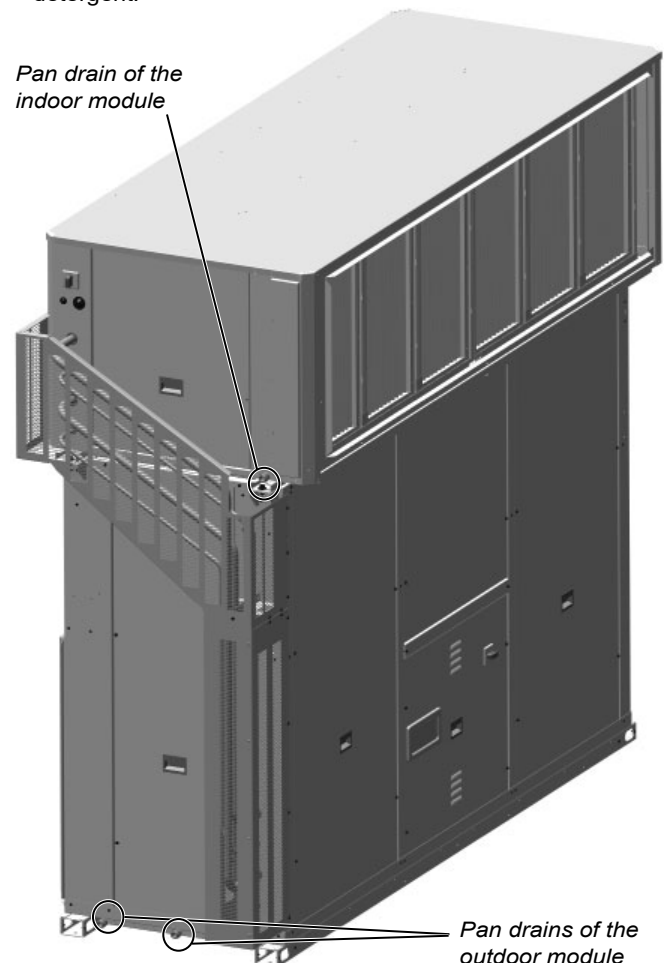
Use safety gloves for this task. Take care with the sharp parts of the coil.

Coil protection grille in outdoor module (optional)

The outdoor modules can include a protection grille for the coil (optional). This grille is fixed by modules in the holes made for this purpose in the unit supports. Remove the grille to clean the coil.

12.2.2 - Condensate drain pan

- Check that the condensate pan is clean. There should be no stagnant water.
- Check that the drain is not clogged.
- Cleaning of the pan can be done with water and non-abrasive detergent.

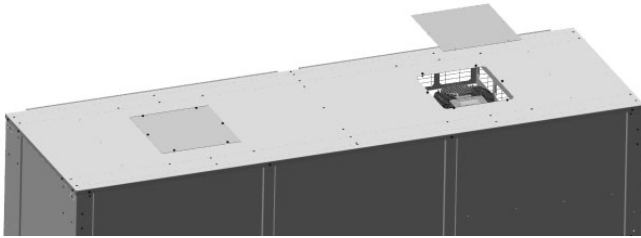


The outdoor module of models 200 to 485 have built-in two pan drains. Do not connect these drains.

12 - MAINTENANCE

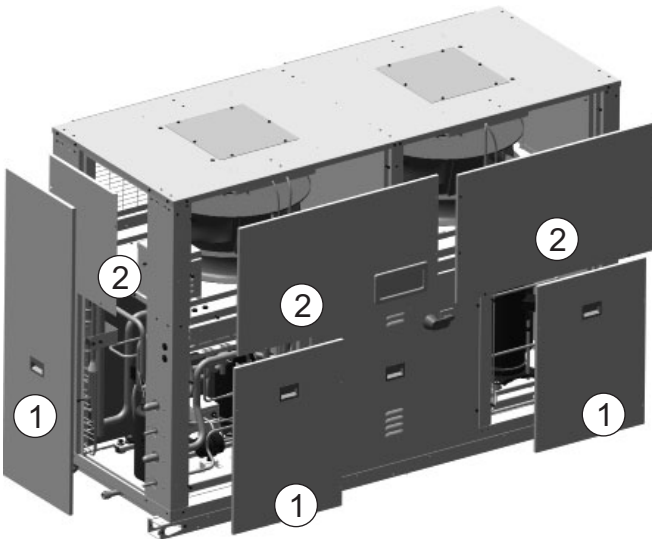
12.2.3 - Fans in the outdoor module

The outdoor module fans can be accessed through the registers located on the top cover, unscrewing the M4 screws.

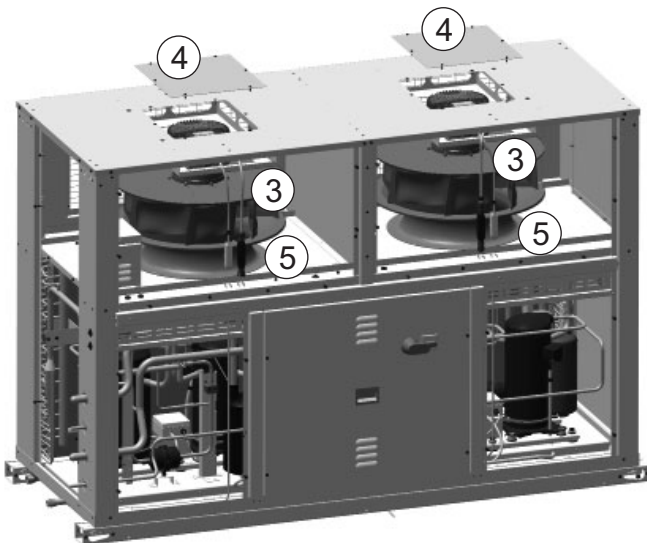


Removing the fans from the outdoor module

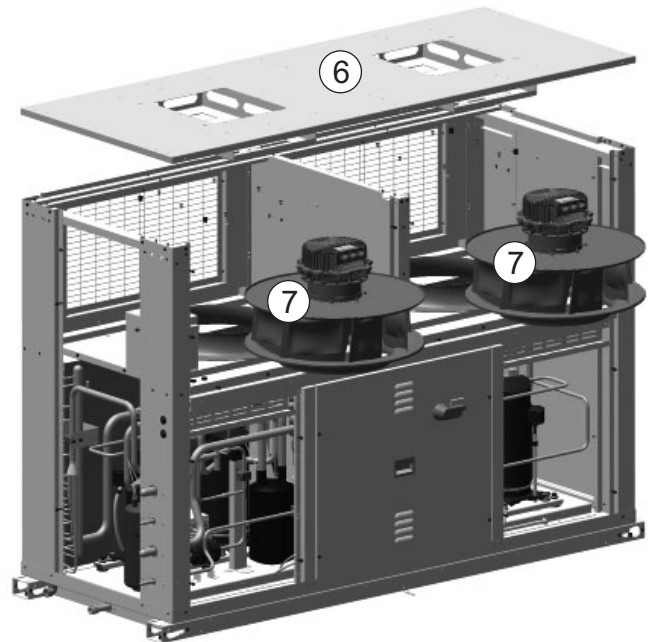
- Remove the side panels and the registers of the cooling motors (1) and then, remove the sealing covers (2).



- Disconnect the wires from the fan motors (3). Then remove the access registers to the fans (4) located on the top of the module (M4 screws).
- Wedge the fans, with the help of some support elements, on the fan support tray (5). Remove the M10 screws securing the fans.



- Unscrew the top cover (6) and slide it towards the electrical panel in order to remove it. Lift the fans (7) and move them to center with the holes of the registers of the cooling motors. After this, remove them in the direction of the electric panel.



- To re-assemble the fans, perform the reverse procedure.

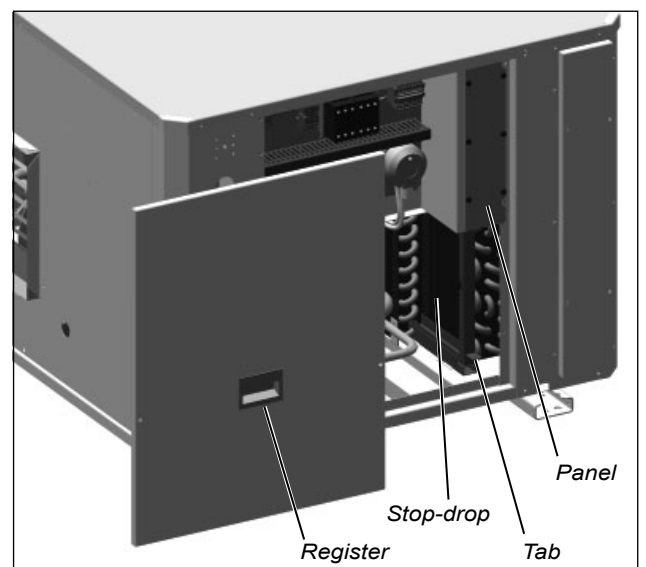
12.2.4 - Centrifugal fan in the indoor module (optional)

- Verify that the turbine and the motor remain clean.
- Foresee having a spare belt set for the fans.
- The motors and the fans have bearings that have been lubricated and sealed and, thus, do not need further lubrication (except in the case of fans with a reinforced shaft).

12.2.5 - Stop-drop in the indoor module (optional)

A stop-drop can be installed on the indoor air coil.

- Models 90 to 180 are accessed through the register on the side of the cooling connections (right). Then it is necessary to remove a panel, fixed with 4.8 self-tapping hex screws.
- In the rest of the models it is accessed through the opposite register (left) and it is not necessary to remove any panels.



- Stop-drop frames are easily removed, lifting the tab and dragging on the rail.

12 - MAINTENANCE

12.2.6 - Air filters

- Depending on the installation conditions, the filter aspect must be examined to define the cleaning or replacing periodicity. Spare parts should be planned for.

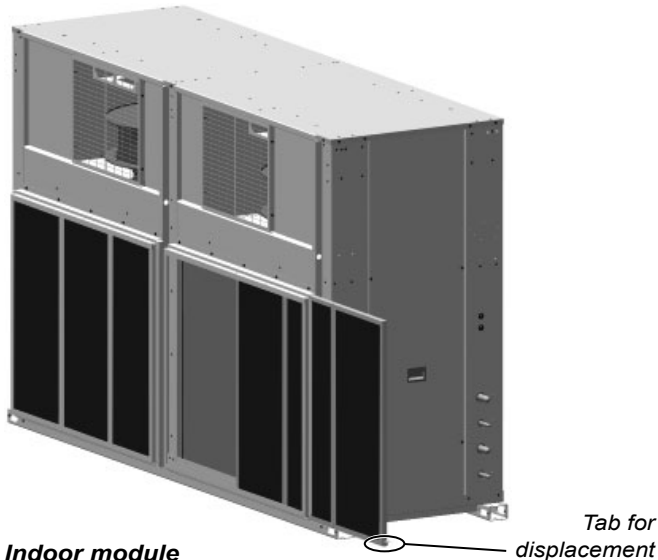
Cleaning the filters is very important to maintain the required available pressure of the unit.

On units with a clogged filter differential pressure switch, an alarm is triggered on the electronic control when the factory-set clogging threshold is exceeded depending on the combination of filters selected.

- Gravimetric filters (G4). Cleaning can be done with a household vacuum cleaner. Replace them regularly.
- Creased opacimetric filters (M6, F7, F8 and F9). It is necessary to replace them.

Outdoor module

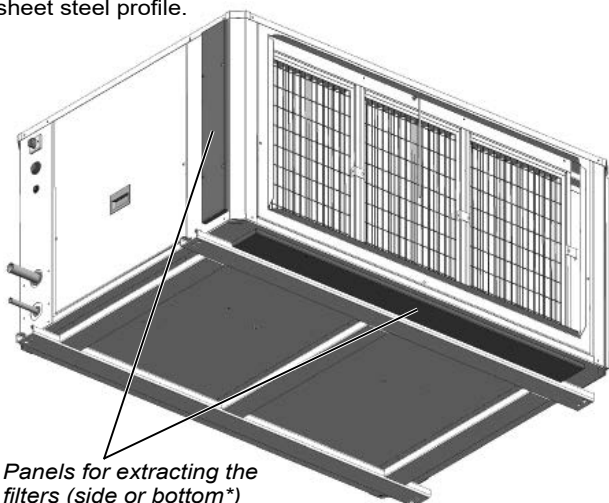
The outdoor modules can include, in air return, frames with gravimetric filters. The frames are placed on sheet profile. It is necessary to lift the tab and dragging on the rail in order to extract the frames.



Indoor module

Models 090 to 360

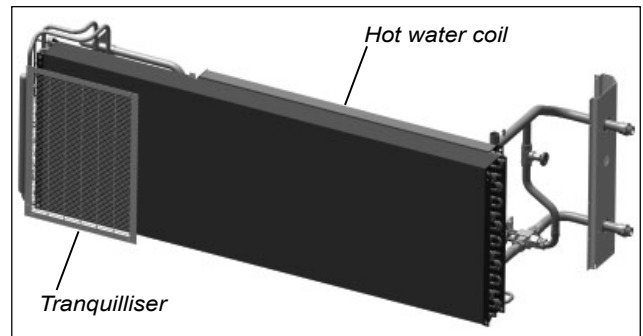
- For filter extraction, both gravimetric filters and opacimetric filters (if the unit has includes them) are assembled over a sheet steel profile.



Panels for extracting the filters (side or bottom*)

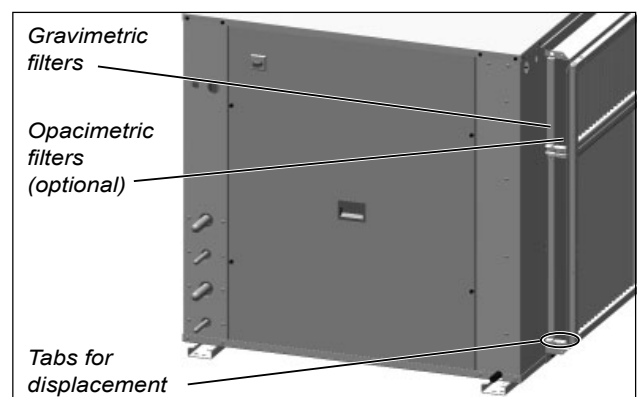
(* Extraction from the bottom is not possible with compact configuration.

Note: with the optional of hot water coil, the leftmost frame with filter incorporates a tranquilliser. It is important to placed back in exactly the same position after removal of filters.

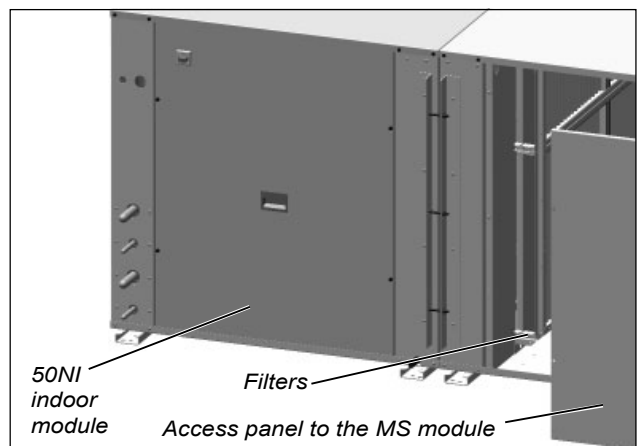


Models 420 and 485

- The frames are assembled over two profiles, which can be removed from the two sides of the unit. It is necessary to lift the tab and dragging on the rail in order to extract the frames.



- When the unit is coupled to a MS module, the frame with filters is located inside this module



12.2.7 - Compressor

In the case of compressor replacement:

- Disconnect the unit from power supply.
- Completely empty the load of refrigerant using a specific recovery unit for R-410A
- Disconnect electrically the compressor.
- Carefully unscrew the suction and discharge piping.
- The compressor is fixed onto the platform with 4 screws. Unscrew the fixings.
- Place the new compressor and check that it has a sufficient oil charge.

Warning: when tightening the compressor screws, please consult the maximum torque that can be applied.

12 - MAINTENANCE

If a torque wrench is not available, tighten them until noticing resistance, then tighten the screws by turning them 3/4 of a revolution.

- Screw the suction and discharge piping.
- Connect the compressor in accordance with the circuit diagram.
- Make vacuum and next, reload the gas into the unit according to load data provided in the table of paragraph "Refrigerant" and in the unit's data plate.

12.2.8 - Filter drier

- The filter function is to keep the cooling circuit clean and without humidity, neutralising the acids that can be found in the cooling circuit.
- Verify dirt measuring the difference in temperature at the piping level, at the inlet and at the outlet of the filter.
- If necessary, replace.

12.2.9 - Refrigerant

Only qualified personnel must perform a periodic leak testing, in accordance with the regulation (EC) **No. 517/2014**.

- The frequency of checks is no longer related to the refrigerant charge but to its global warming potential:

$$\text{Charge kg} \times \text{GWP} = \text{t CO}_2\text{e}$$

Carbon dioxide equivalency (t CO₂e) is a quantity that describes, for a given mixture and amount of greenhouse gas, the amount in tonnes of CO₂ that would have the same global warming potential (GWP).

The number of tonnes of CO₂ equivalent (t CO₂e) can be consulted in the following table:

50NI		90	120	160	180	200	240	280	320	360	420	485
Compact version	Charge (kg)	8,4	10,5	12	13,2	15,3	17,1	22,9	23,9	24,4	36,7	37,3
	Environm. impact (tCO ₂ eq)	17,5	21,9	25,1	27,6	31,9	35,7	47,8	49,9	50,9	76,6	77,9
Split version (up to 7,5 m)	Charge (kg)	9,0	11,1	13,0	14,2	17,3	19,1	24,9	25,9	26,4	38,7	39,3
	Environm. impact (tCO ₂ eq)	18,8	23,2	27,1	29,6	36,1	39,9	52,0	54,1	55,1	80,8	82,1

- Operators shall ensure that the unit is checked for leaks ad minima according to the following frequency:
 - t CO₂e < 5 not subjected
 - t CO₂e 5 to 50 ... every year
 - t CO₂e 50 to 500 every 6 months
 - t CO₂e > 500 every 3 months
- Where a leakage detection system has been installed the frequency of checks is halved.

Note: These machines use R410A. It is essential that technicians use equipment which is compatible with R410A with a working pressure which is approximately 1,5 times higher than that of units using R407C.

- All necessary precautions must be taken during the partial opening of the cooling circuit. This opening entails the discharge of a certain amount of refrigerant to the atmosphere. It is essential to limit this quantity of lost refrigerant to a minimum by pumping and isolating the charge in some other part of the circuit.
- The refrigerant fluid at low temperature can cause inflammatory injuries similar to burns when contacting the skin or eyes. Always use safety goggles, gloves, etc. when opening ducts that may contain liquids.

- The refrigerant in excess must be stored in appropriate containers and the amount of refrigerant stored at the technical rooms must be limited.
- Refrigerant barrels and deposits must be handled with precaution and visible warning signs must be placed to attract attention over the risks of intoxication, fire and explosion linked to the refrigerant.
- At the end of its useful life, the refrigerant must be retrieved and recycled as per the current regulations.

12.2.10 - Refrigerant leak detector (optional)

Maintenance:

- Annual testing: it is necessary to carry out testing every year to comply with the EN378 and F-GAS regulations
- Every 3 years: a taring test is recommended.
- Every 5/6 years: it is recommended that the gas detection element be replaced and calibration performed.



Note: Check the documentation attached to the leak detector for taring and calibration testing.

12.2.11 - Oil

Oils for refrigeration units do not pose any health risks if they are used in compliance with the precautions for use:

- Avoid unnecessary handling of components lubricated with oil. Use protective creams.
- Oils are flammable and must be stored and handled with care. Disposable rags or cloths used in cleaning must be kept away from open flames and disposed of in the appropriate manner.
- Containers must be stored with their caps on. Avoid using oil from an opened container stored under incorrect conditions.
- Check the oil level and aspect. In case of a colour change, check the oil quality using a contamination test.
- In the case of the presence of acid, water or metallic particles, replace the affected circuit oil, as well as the filter drier.
- If all the oil must be emptied, replace it imperatively with new oil of the same grade as the original oil which has been stored in a hermetically sealed container until its time of use.

The oil type recommended for these units is:

Copeland 3MAF 32cST, Danfoss POE 160SZ, ICI Emkarate RL 32CF, Mobil EAL Artic 22CC.

The following table indicates the required volume:

50NI	90	120	160	180	200	240	280	320	360	420	485
Volume (l)	2,5	2,5	3,5	3,5	5,0	4,8	6,8	7,1	7,2	13,2	13,2

12.2.12 - Oil separator (optional)

When the maximum equivalent length of the cooling line is greater than 50 metres, up to 100 metres maximum, an oil separator must be fitted.

During the first few days of operation check the oil level in the compressor sight glass. If there is not enough, oil can be added (via the compressor schrader valve or the unit low pressure).

12.2.13 - Servomotors (optional)

It is advisable to check the condition of the servomotors in units with motorized mixing boxes.

Note: all available assemblies indoor units with mixing boxes can be found in Chapter 5 "Available Assemblies".

13 - CONTROL AND ANALYSIS OF BREAKDOWNS

Symptom	Cause	Solution
Evaporation pressure very high in relation with the air inlet	<ul style="list-style-type: none"> a) Charge excess b) High air temperature c) Compressor suction not air tight d) Cycle reversing valve in middle position 	<ul style="list-style-type: none"> a) Collect refrigerant b) Verify overheating c) Verify compressor state and replace d) Check that the valve is not clogged. Replace if necessary
Very low condensation pressure	<ul style="list-style-type: none"> a) Gas lack b) Compressor suction not air tight c) Cycle reversing valve in middle position d) Liquid circuit plugging 	<ul style="list-style-type: none"> a) Search for leaks, complete charge b) Verify compressor state and replace c) Check that the valve is not clogged. Replace if necessary d) Verify the dehydrating filter and expansion valve
Condensation pressure very high in relation to the air outlet, high pressostat cutoff	<ul style="list-style-type: none"> a) Insufficient air flow b) Air inlet temperature very high c) Dirty condenser (does not exchange) d) Much refrigerant load (flooded condenser) e) The condenser fan is broken down f) Air in the cooling circuit 	<ul style="list-style-type: none"> a) Verify the air circuits (flow, filter cleanliness...) b) Verify the control thermostat readjustment c) Clean it d) Collect refrigerant e) Repair f) Make vacuum and load
Evaporation pressure too low (low pressostat cut-off)	<ul style="list-style-type: none"> a) Low flow in evaporator. Air recirculation b) Frozen evaporator c) Liquid line as different temperatures at filter inlet and outlet d) Gas lack e) Very low condensation pressure f) Evaporator fan broken down 	<ul style="list-style-type: none"> a) Verify the air circuits (flow, filter cleanliness...) b) Verify defrost c) Replace filter d) Search for leaks, complete charge e) Temperature of air or water in condenser very low (air or water flow very high), adjust flow f) Repair
Compressor does not start, does not make noise (humming)	<ul style="list-style-type: none"> a) No power b) The contacts of a control element are open c) Timing of anti cycle short does not allow the starting d) Open contact e) Contactor coil burnt f) Indoor klixon open 	<ul style="list-style-type: none"> a) Check differential, fuses b) Verify the safety chain of the electronic control c) Verify electronic control d) Replace e) Replace f) Wait for reactivation, verify current absorbed
Compressor does not start, motor sounds intermittently	<ul style="list-style-type: none"> a) Electrical power supply very low b) Power cable disconnected 	<ul style="list-style-type: none"> a) Control line voltage and locate voltage drop b) Verify connections
Repeated compressor starts and stops	<ul style="list-style-type: none"> a) Because of high pressure b) Control differential too short (short cycle) c) Insufficient gas, cut-off because of low pressure d) Dirty or frosted evaporator e) The evaporator fan does not work, cuts off the low pressostat f) Expansion valve damaged or clogged by impurities (cuts off low pressostat) g) Dehydrating filter clogged (cuts off low safety) 	<ul style="list-style-type: none"> a) Verify charge b) Increase differential c) Search for leak, reload unit d) Clean, verify evaporator air circuit e) Replace or repair f) Replace, as well as filter g) Replace
The compressor makes a noise	<ul style="list-style-type: none"> a) Loose attachment b) Oil lack c) Compressor noise 	<ul style="list-style-type: none"> a) Fix b) Add oil to recommended level c) Replace
Noisy operation	<ul style="list-style-type: none"> a) Unit installed without antivibration protection 	<ul style="list-style-type: none"> a) Place base over shock absorbers
Cycle reversing is not carried out: - No defrosting - Does not change winter - summer cycles	<ul style="list-style-type: none"> a) Electrical fault b) Inversion valve coil defective c) Defrost method not working d) Cycle reversing valve in middle position e) Control fault 	<ul style="list-style-type: none"> a) Locate and repair b) Replace c) Verify parameters d) Tap with running compressor. Replace if necessary e) Locate and repair
Alarm or reading error in the humidity probe (with CARRIERtc enthalpic electronic control)	<ul style="list-style-type: none"> a) Dirt in the humidity sensor 	<ul style="list-style-type: none"> a) Disassembly the probe capsule b) Proceed to clean the sensor with some soft cotton element and non-abrasive fluid, without pressing it c) Reassemble the casing, checking that the cable is in contact externally with the metallic mesh

14 - FINAL SHUTDOWN

14.1 - Shutting down

Separate the units from their energy sources, allow them to cool then drain them completely.

14.2 - Recommendations for disassembly

Use the original lifting equipment.

Sort the components according to their material for recycling or disposal, in accordance with regulations in force.

Check whether any part of the unit can be recycled for another purpose.

14.3 - Fluids to be recovered for treatment

- Refrigerant
- Energy transfer fluid: depending on the installation, water, glycol/water mix.
- Compressor oil

14.4 - Materials to be recovered for recycling

- Steel
- Copper
- Aluminium
- Plastics
- Polyurethane foam (insulation)

14.5 - Waste electrical and electronic equipment (WEEE)

At the end of its life, this equipment must be disassembled and contaminated fluids removed by professionals and processed via approved channels for electrical and electronic equipment (WEEE).



Important: In order to recycle these units follow the stipulations of Directive 2012/19/EU on *Waste electrical and electronic equipment* (WEEE).



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Manufacturer reserves the right to change any product specifications without notice.



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