BROCHURE

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VECTIOS POWER TM PJ

Instruction manual

CONTENTS

ORIGINAL TEXT: SPANISH VERSION

1 - INTRODUCTION

The **VECTIOS$^{POWER\ TM}$ range** consist of autonomous and compact air-air units of horizontal design, rooftop type. They include inside all the components required for providing the proper air conditioning to the installation.

- **IPJ series:** Units for **reversible heat pump** operation.

The range of capacities of these units allows the air conditioning of medium and large surface areas used for business or industry.

The unit is connected directly to an air distribution ductwork without additional elements or equipment, pipes, cables, etc. taking no floor space at all. This design reduces the cost of installation, facilitates a quick connection and ensures reliable operation.

After manufacturing, all units are charged with refrigerant and are tested at the factory, verifying the correct operation of all their components within the operating range for which they are intended.

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).

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.

2 - 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.

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 cabinet.

The compressor and line surfaces can reach temperatures above 100ºC 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 as F-Gas, over **Certain greenhouse effect fluoride 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:

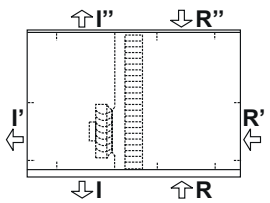
- Toxicity: According to EN 378-1, R-410A belongs to the A1/A1 group, i.e. with high safety both in the mix and also in the case of a leak.
- Although it is not toxic, in case of a leak to atmospheric pressure the liquid phase evaporates. The resulting vapours are still hazardous because they are heavier 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.

3 - POSSIBLE TYPES OF ASSEMBLIES

Depending on the indoor airflow direction

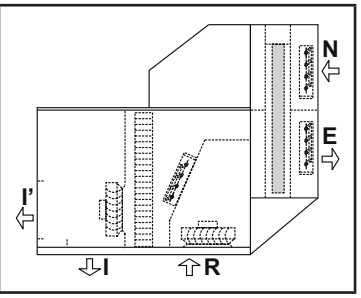
C0 assembly

Standard



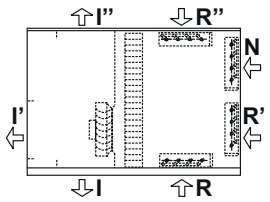
CW assembly

Lower return plug-fan
+
Rotary heat exchanger
(passive recovery)



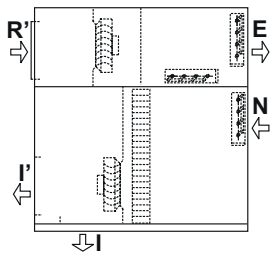
CS assembly

2 dampers mixing box:
fresh air damper interlocked
with return damper



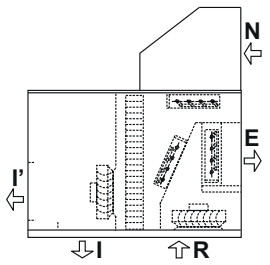
CQ assembly

Return plug-fan or
centrifugal fan in top box



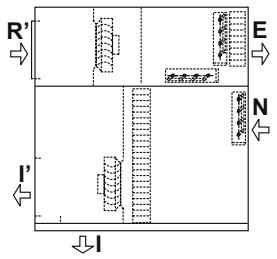
CP assembly

Lower return plug-fan



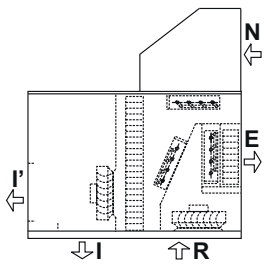
CT assembly

Return plug-fan or
centrifugal fan in top box
+
Cooling recovery circuit
(active recovery)



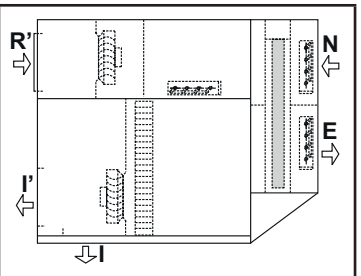
CR assembly

Lower return plug-fan
+
Cooling recovery circuit
(active recovery)



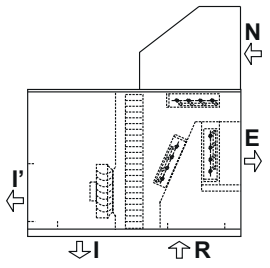
CL assembly (upon request)

Return plug-fan or
centrifugal fan in top box
+
Rotary heat exchanger
(passive recovery)



CK assembly (upon request)

3 dampers mixing box:
fresh air damper and
exhaust air damper



Legend

I	Lower air supply	**R**	Lower air return
I’	Lateral air supply	**R’**	Lateral air return
I”	Upper air supply	**R”**	Upper air return
N	Fresh air intake	**E**	Exhaust air outlet

Note: only one of the three possible options (lower, lateral or upper) can be selected for both, supply and return.

The airflow direction selected for supply and return (lower or lateral) is easily interchangeable on site.

Indoor airflow direction (Group 25)

0	Lower supply and lower return	**3**	Lateral supply and lateral return	**6**	Upper supply and lateral return
1	Lateral supply and lower return	**4**	Upper supply and lower return	**7**	Lower supply and upper return
2	Lower supply and lateral return	**5**	Lateral supply and upper return	**8**	Upper supply and upper return

4 - OPERATION LIMITS

Inlet air conditions		Cooling	Heating
Indoor coil	Minimum	9,7ºC WB	10ºC
	Maximum	24ºC WB	27ºC
Outdoor coil	Minimum	12ºC ①	-15ºC WB ②
	Maximum	48ºC	15ºC WB

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

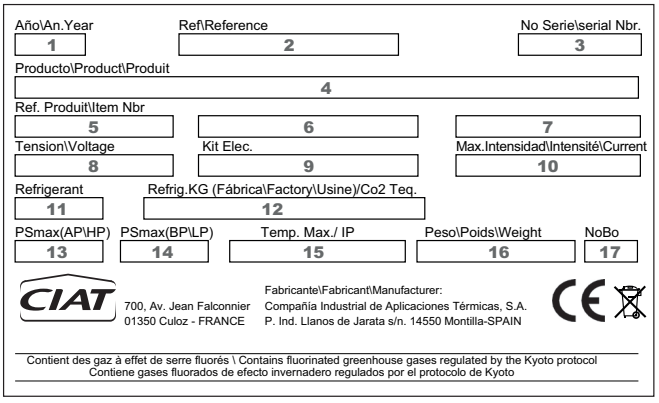
② When the outdoor temperature is usually below 5ºC WB it is recommended installing a support element.

5 - 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 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.



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

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

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 (CO_2 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 “Opration limits”)
Maximum shipment and storage temperature: +50ºC
Electrical protection rating: IP54
16 Operation weight (kg) (empty weight + fluid + refrigerant)
17 Notified Body number for surveillance of the Pressure Equipment Directive

6 - TRANSPORT AND HANDLING

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

The unit must be handled with care to avoid transport damage.

Do not remove the protective packaging and the transport supports until the unit is in its final location.

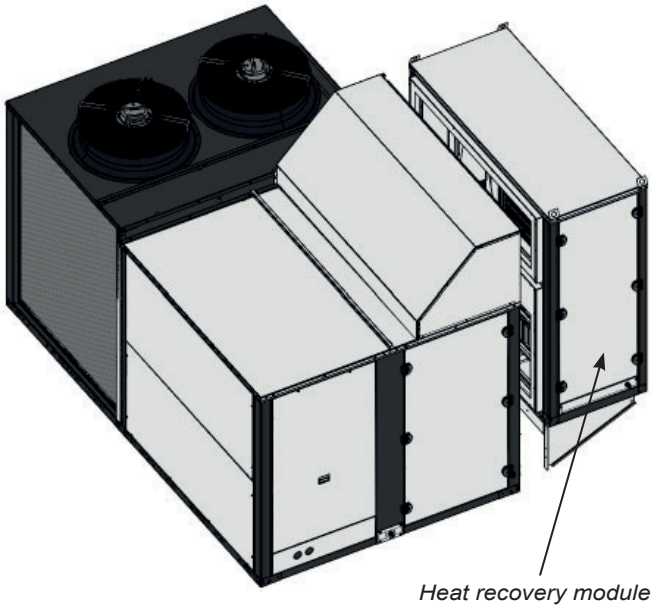
Before handling, check that the path leading to the installation location is accessible and free from obstacles.

Important: the rotary heat exchanger (CW assembly) is supplied disassembled with the unit, for installation on site.

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.

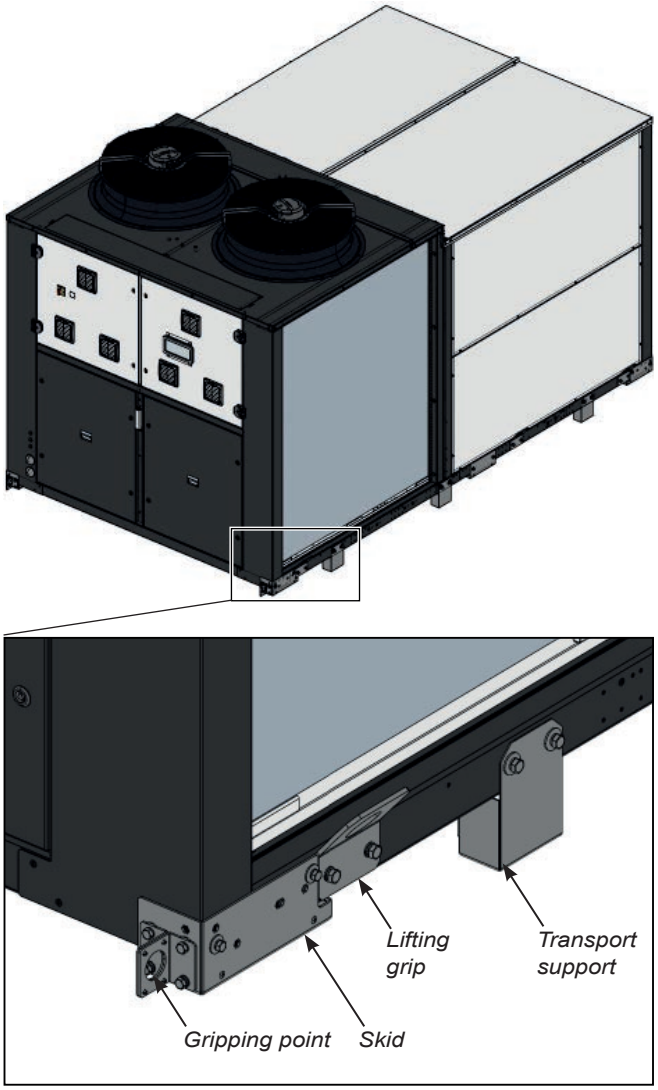
Always check the weight of the unit and verify that the discharging method used is approved for handling that weight.



Heat recovery module

The unit's bars are fitted with the following elements to allow handling:

- Lifting grips to attach the slings of the crane.
- Transport supports for easier insertion of the forklift truck's forks.
- Skids in case of transport in a container.



Crane with a rocker arm

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.

Only attach the slings to the lifting grips located on each bar.

In models with 4 or 5 grips an H-shaped rocker must be used, which has a main beam and two secondary beams that allow elevation over four or five lifting points.

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

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 paragraph 7.5.

After the placing of the unit, it is recommended to remove the grips as they can be a hindrance for maintenance. Put the grips back in case of unit transport. The grips are fixed to the bars using M10 screws (hex. key 17).

Forklift truck

The unit is designed to be transported safely by using a forklift truck. The transport supports make it easy to insert the forks.

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

Note: the module with the rotary heat exchanger (CW assembly) includes two guides in its base frame to accommodate the forks.

The recommended length for the forks will be bigger than the unit width (refer to the following table), so that the entire weight-bearing structure of the unit can be supported on the 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 transport elements must be removed before starting the installation of the unit. They are secured to the unit by means of Allen M10 screws.

Important: The transport supports are not designed to drag the unit.

Units dimensions for transportation (*):

IPJ	C0, CS assemblies			CP, CR, CW assemblies			CQ, CT assemblies		
	Length (mm)	Width (mm)	Height (mm)	Length (mm)	Width (mm)	Height (mm)	Length (mm)	Width (mm)	Height (mm)
0420	3820	2257	2293	3820	2257	2555	3825	2268	2555
0450	3820	2257	2293	3820	2257	2555	3825	2268	2555
0500	3820	2257	2293	3820	2257	2555	3825	2268	2555
0560	4224	2257	2340	4224	2257	2555	4229	2268	2555
0620	4224	2257	2340	4224	2257	2555	4229	2268	2555
0680	4224	2257	2340	4224	2257	2555	4229	2268	2555
0720	4224	2257	2340	4224	2257	2555	4229	2268	2555
0760	5300	2257	2421	5300	2257	2555	5306	2268	2555
0840	5300	2257	2421	5300	2257	2555	5306	2268	2555
0960	5300	2257	2421	5300	2257	2555	5306	2268	2555
1050	6350	2257	2494	6350	2257	2555	6356	2268	2555
1200	6350	2257	2494	6350	2257	2555	6356	2268	2555

(*) Consult the overall dimensions of the available assemblies in paragraph 7.6 "Recommended service clearance".

Container discharge

In case of container transport, the unit incorporates skids that facilitate the unloading. This method will be used only when it is possible to place the transport box (trailer, maritime container, etc.) at the same height as the unloading platform (for example, a dock).

To do so, there are two gripping point that have to be used for the drag of the unit from the box.

After unloading, if a forklift is to be used, the transport supports (always supplied with the unit) have to be mounted.

The skids must be removed before starting the installation of the unit. They are secured to the unit by means of Allen M8 screws (hex. key 13).

7 - POSITIONING AND INSTALLATION

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.
- Important: The unit performance is not guaranteed in case of installation at an altitude of more than 1000 meters.
- It is necessary to check that the structure supports the unit’s weigh (please consult the weight in paragraph 7.5).
- The area where the unit will be located must be perfectly accessible for cleaning and maintenance operations (please consult the “Recommended service clearance” in paragraph 7.6).
- Leave enough space around the unit to ensure adequate air circulation, especially with non-ducted air inlets and outlets.
- Since the unit is designed to work outdoors, some specific installation norms must be followed:
  - The unit will be located on the roof of the premises. If it is foreseen that it will work more on heating than on cooling, it is preferable to direct the coil towards the sun. If little work on heating is foreseen, choose North direction.
  - Avoid placing obstacles in the air supply or return. No obstacle may impede the air aspiration into the coils. Do not fix the outdoor coil side in the predominant wind direction.
  - Do not install the unit in a closed enclosure or in conditions that originate air recirculation.
  - The chosen location must not flood and must be above the average height the snow reaches in that region.

Preparation of the ground

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. The unit must be perfectly level when installed.

These units can be installed on the floor or on a brick curb 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 (consult the reactions in the support in paragraph 7.5).

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.

7.2 Antivibrators assembly (silent-blocks)

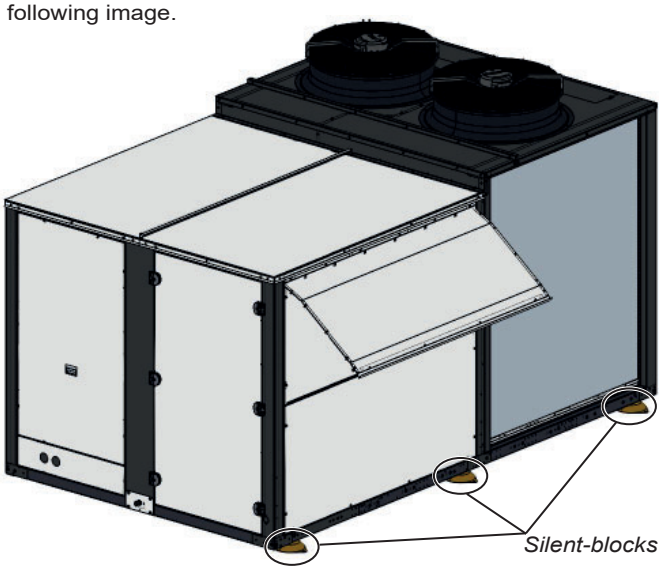
Although the installer is the one who must decide on a case-by-case basis the best way to place the unit in the ultimate location, always in observation of the handling standards that have been described, below is a proposed assembly sequence that may facilitate the operation, keeping in mind that the sequence performed in the installation shall be the one most suitable to the solution chosen for each particular case based on the existence (or lack thereof) of brick curb, type of silent-blocks used, etc.

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, as described in the paragraph “Preparation of the ground”.

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.

M12 metric threads have been provided for their placement in the supports (consult the fixing for antivibrators in paragraph 7.5). All models will use M12 screws with a maximum length of 60 mm. A hex key 19 or Allen wrench 10 will be used for this operation based on the type of screw used.

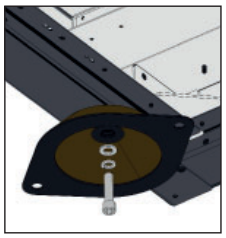
The optional silent-blocks that can be supplied for these units must be placed perpendicular to the unit, as shown in the following image.

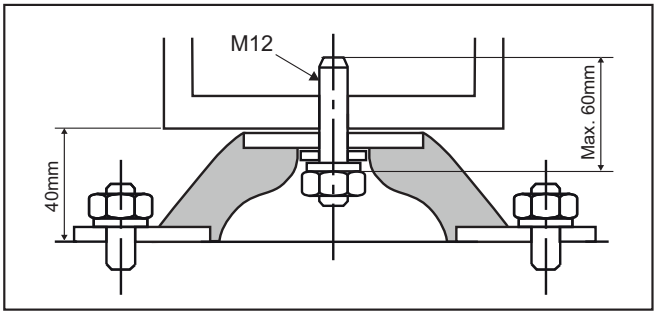


The screws required for the installation of the silent-blocks are **not supplied** from the factory.

These screws must have an adequate quality to withstand the stresses to which they will be subjected, and they must be adapted to the installation site, either on a brick curb or a steel profile.

Note: If the silent-block hole has a diameter greater than M12, a washer can be used to adjust the size.

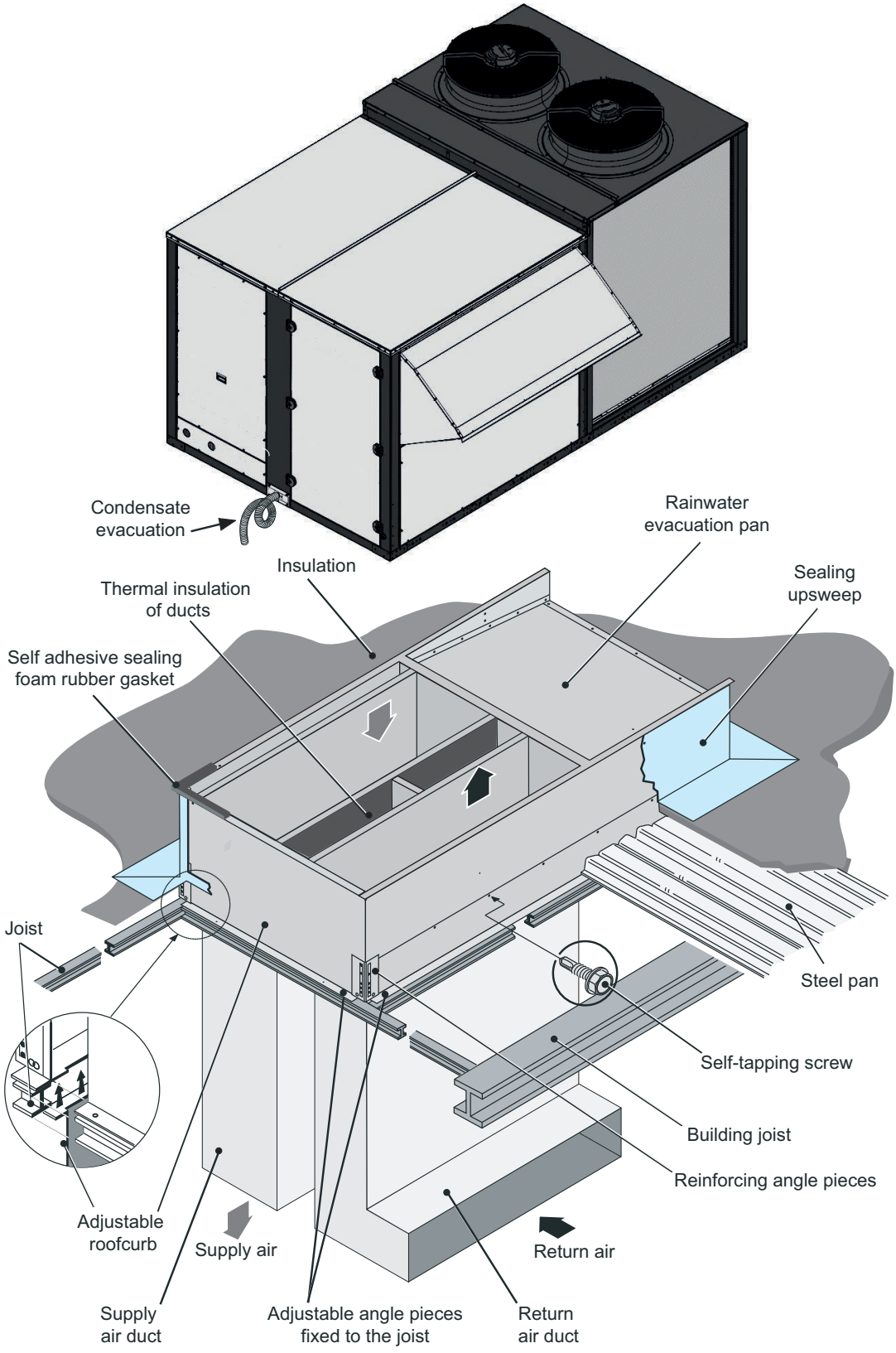




7.3 Pre-assembly roofcurb (optional)

These units can rest on standardised pre-assembly roofcurbs with adjustable height, built in galvanised steel panelling with polyester paint and thermal insulation.

The levelling system uses angle pieces that allow adjustments in the X and Y axes. As a result, the unit will be perfectly levelled on a sloping roof.



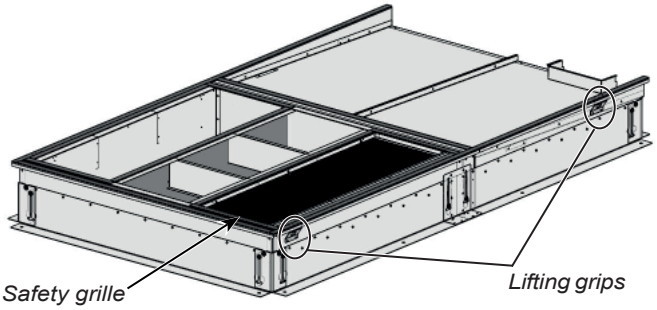
These roofcurbs can also incorporate a gas burner. For more information consult the paragraph 12.9 “Gas burner”.

Note:There are a wide range of adaptation roofcurbs that are ready for direct replacement on site of units from different manufacturers (upon request).

7 - POSITIONING AND INSTALLATION

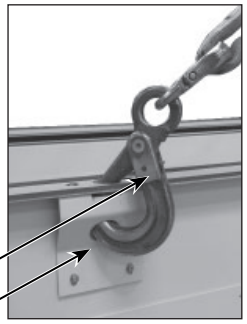
Handling

For transport and lifting up to the roof using a crane, a rocker arm as well as approved slings, both suitable for the dimensions and weight of the roofcurb, must be used. These slings will be hooked on the lifting grips fitted to the roofcurb.



Check that the grips are perfectly screwed in before attaching the slings.

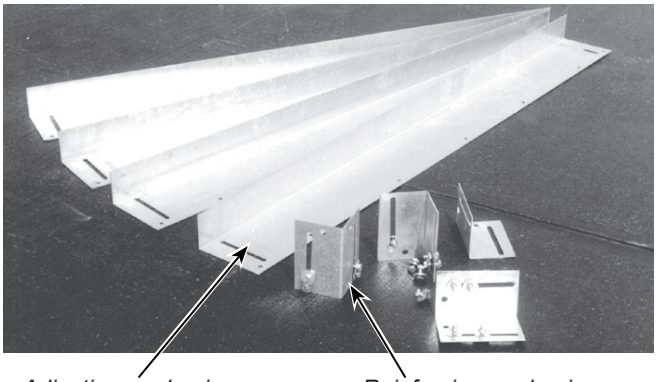
After the placing of the roofcurb, it is recommended to remove the grips as they can be a hindrance for sealing upsweep. Each grip is fixed to the crossbar using 4 M4 screws. Put the grips back in case of transport.



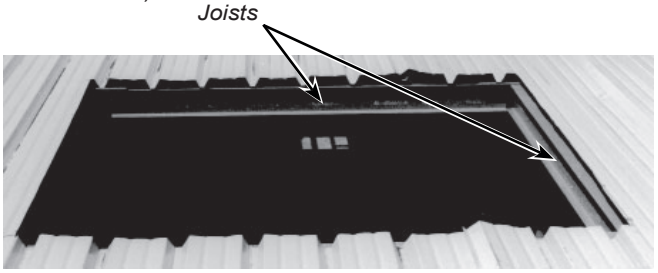
Note: All roofcurb are supplied with a return safety grille intended for plenum installations. For installations with ducted return, the grille must be removed prior to place the machine on the roofcurb.

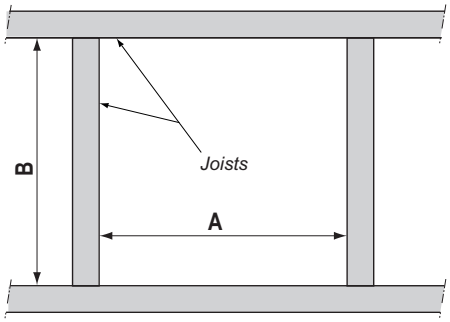
Installation on the roof

The following picture shows the roofcurb elements that enable adjusting and levelling it. They are supplied assembled on the roofcurb. They must be disassembled to make adjustment when the steel pan is mounted.



The roofcurb will be supported on some joists placed for this purpose in the roof (check the location of ducts for the air supply and air return).

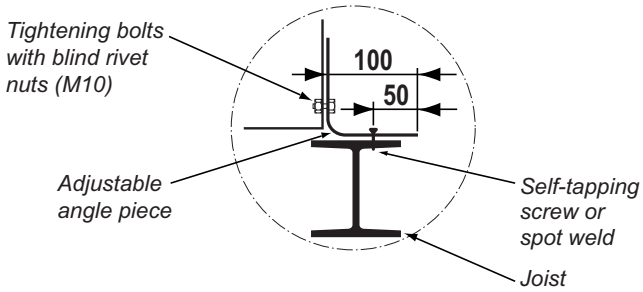




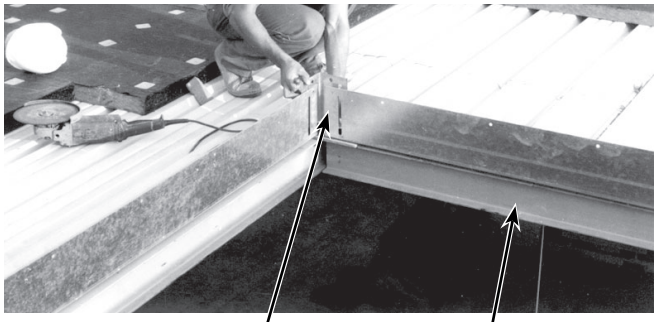
IPJ Roofcurb	Standard		With burner	
	A (mm)	B (mm)	A (mm)	B (mm)
0420 to 0500	3.569	1.998	3.572	1.993
0560 to 0720	3.973	1.998	3.978	1.993
0760 to 0960	5.053	1.998	5.058	1.993
1050 to 1200	6.096	1.998	6.102	1.993

Slide the four adjustable angle pieces below the steel pan on top of the joists.

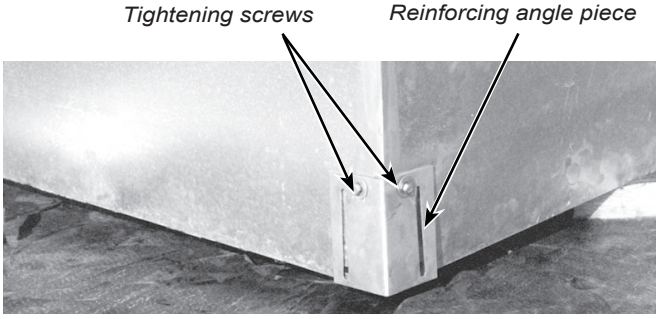
The adjustable angle pieces are fixed to the joists using self-tapping screws or electric spot welding.



Check that the adjustable angle pieces are in the correct position on the joists before the roofcurb is fitted. Next, provisionally attach the adjustable angle pieces to the joists with one or two self-tapping screws per angle part.



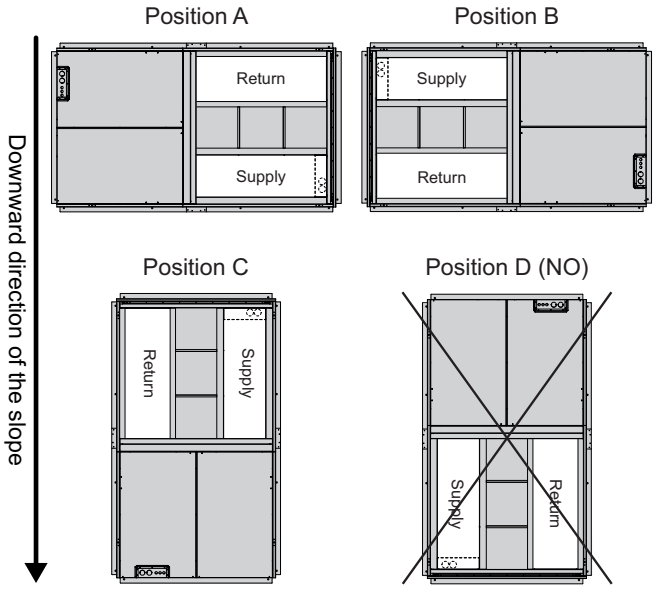
After the above operation remove the four reinforcing angle pieces to position them in the roofcurb. Attach them to the roofcurb with two screws without screwing them completely.



7 - POSITIONING AND INSTALLATION

Lay the roofcurb. The reinforcing angles prevent the roofcurb from moving. The roofcurb should slide into the 4 adjusting angle pieces.

Important: Check that the roofcurb is installed in the right direction.



Note: Position A is best suited for gas burner roofcurb. In this position it is easier to access the burner register. It is also the most optimal solution in areas where snow can accumulate.

Position the remaining screws on the four corners of the roofcurb. Use a screwdriver to line up the roofcurb, adjustable angle pieces and reinforcing angle piece holes opposite each other. Do not tighten the screws fully.

After levelling the roofcurb perfectly, secure the adjustable angle piece to the roofcurb using self-tapping screws or spot welds.

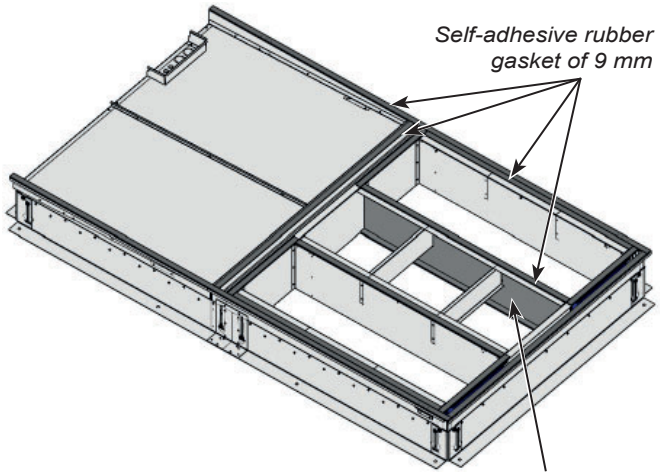
Tighten the reinforcing angle pieces down onto the joists.

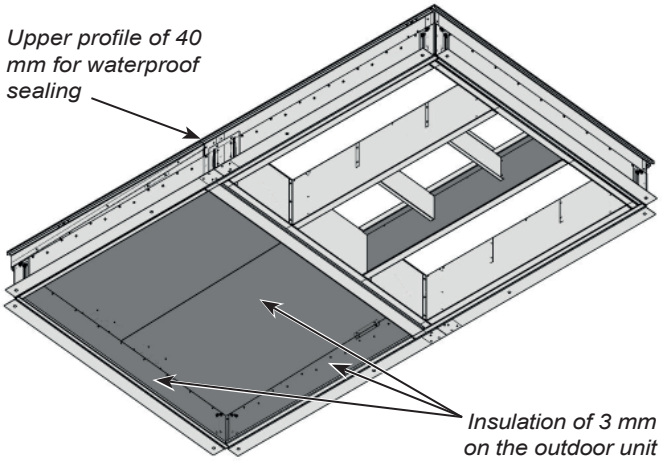
Insulation and waterproof sealing

Following insulation is standard for the roofcurb:

- Self-adhesive rubber gasket of 9 mm around its entire perimeter and the crossbeams.
- Thermal insulation of 9 mm on the outer faces of the ducts of supply and return.
- Insulation of 3 mm on the panels that support the outdoor unit to prevent condensation build-up.

  Note: Acoustic and thermal insulation in this part of the roofcurb is recommended.





Important: It's the responsibility of the installer the insulation and sealing upsweep around the roofcurb to ensure that water does not penetrate the roof (see images on the next page).

The recommendations given on the following sticker should also be followed:

PARA GARANTIZAR LA ESTANQUEIDAD DE LA BANCADA DESPUÉS DE LA INSTALACIÓN, HAY QUE REVISAR QUE TODAS LAS JUNTAS Y UNIONES ESTÉN EN PERFECTO ESTADO. ES NECESARIO ASEGURAR LA ESTANQUEIDAD Y LA SUJECIÓN DEL EQUIPO Y LA BANCADA DESPUÉS DE MONTAR EL CONJUNTO

IN ORDER TO GUARANTEE THE ROOFCURB TIGHTNESS AFTER THE INSTALLATION, THE PERFECT CONDITION OF ALL SEAMS AND JOINTS SHOULD BE REVISED. IT IS NECESSARY TO ENSURE THE TIGHTNESS AND FASTENING OF THE UNIT AND THE ROOFCURB AFTER MOUNTING THE ASSEMBLY.

POUR GARANTIR L'ÉTANCHÉITÉ DE L'EMBASE APRÈS L'INSTALLATION, IL FAUT RÉVISER QUE TOUS LES RACCORDS ET JOINTS SOIENT EN PARFAIT ÉTAT. IL EST NÉCESSAIRE DE S'ASSURER DE L'ÉTANCHÉITÉ ET LA FIXATION DE L'UNITÉ ET L'EMBASE APRÈS LE MONTAGE.

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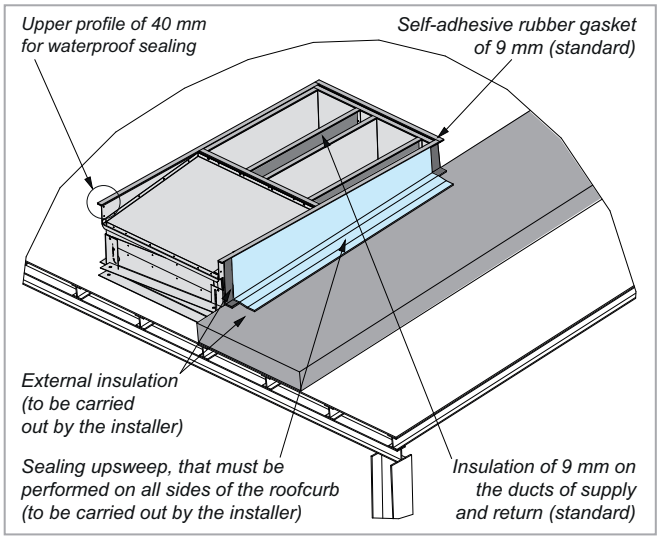
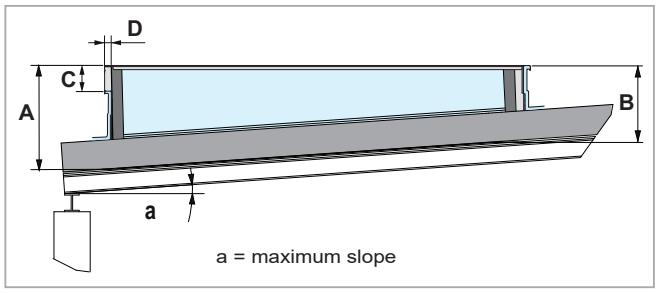
7 - POSITIONING AND INSTALLATION

Detail of the roofcurb installed on the roof (position C):



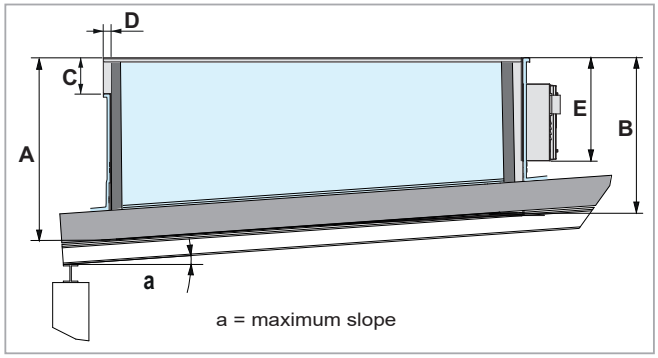
Side view after installation on roof (position C):

Standard roofcurb



Dimensions (mm)		A	B	C	D	a
Standard roofcurb	0420 to 0500	538	400	133	33	2,3º (4,0%)
	0560 to 0960	538	400	133	33	2,0º (3,5%)
	1050 to 1200	538	400	133	33	1,3º (2,3%)

Burner roofcurb



Dimensions (mm)			A	B	C	D	E	a
Burner roofcurb	0420 to 0500		1259	1121	109	33	855	2,3º (4,0%)
	0560 to 0720	PCH130	1259	1121	109	33	855	2,0º (3,5%)
		PCH160	1259	1121	109	33	814	2,0º (3,5%)
	0760 a 0960		1259	1121	109	33	814	1,6º (2,8%)
	1050 to 1200		1259	1121	109	33	814	1,3º (2,3%)

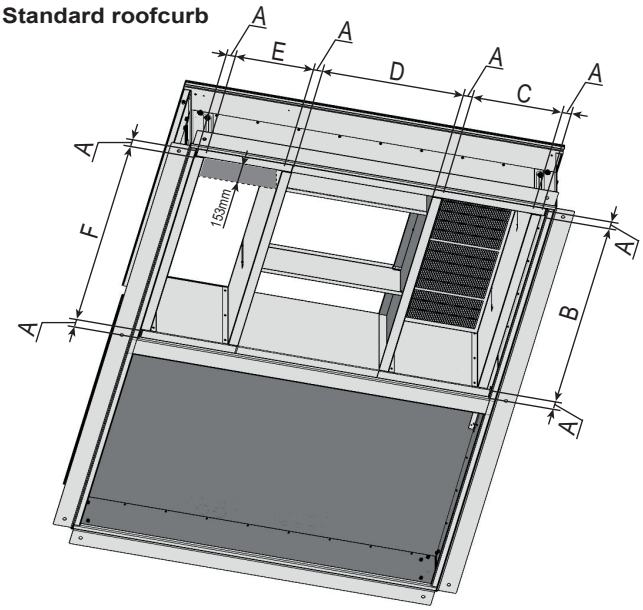
Air ducts connections

For units with vertical airflow, the ducts must be connected to the profiles from underneath the roofcurb.

In order to carry out the air ducts follow the recommendations in the paragraph 9.4 “Air ducts connections”.

The thickness of the sheet metal profiles to connect the discharge and/or return ducts to the roofcurb are shown in the following tables:

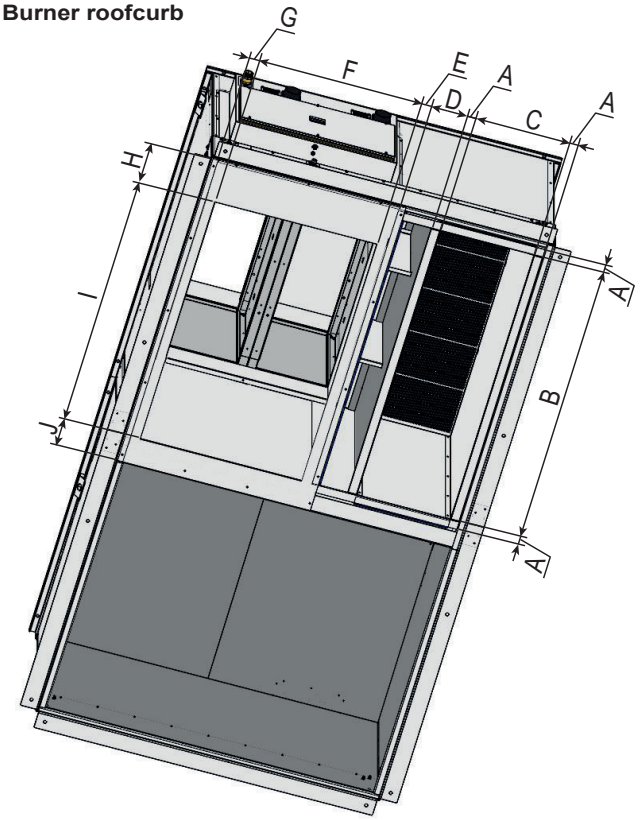
Standard roofcurb



Dimensions (mm)		A	B	C	D	E	F
Standard roofcurb	0420 to 0500	51	1699	547	612	547	1699 (*)
	0560 to 0720	51	2005	547	612	547	2005 (*)
	0760 to 0960	51	2200	547	612	547	2200 (*)
	1050 to 1200	51	2596	547	612	547	2596 (*)

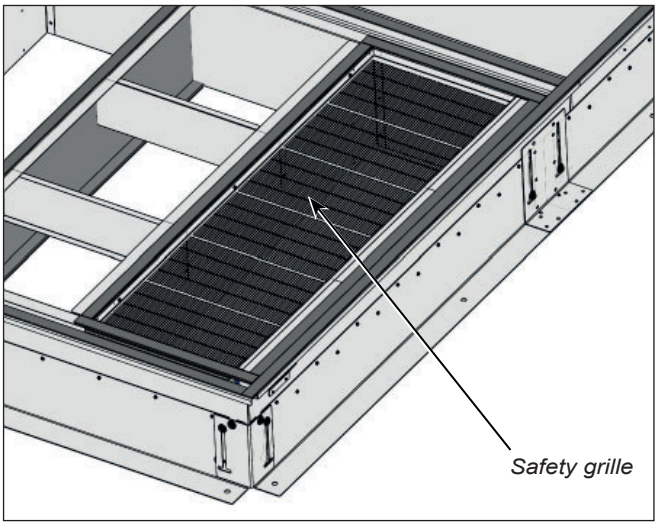
Note: If the unit incorporates a hot water coil (optional), the length of the supply duct is reduced by 153 mm.

Burner roofcurb



Dimensions (mm)			A	B	C	D	E	F	G	H	I	J
Burner roofcurb	0420 to 0500	PCH080	50	1698	546	568	95	418	220	264	1522	164
		PCH130	50	1698	546	171	95	943	92	264	1522	164
	0560 to 0720		50	2004	546	171	95	943	92	264	1827	164
	0760 to 0960		50	2200	546	171	95	943	92	264	2022	164
	1050 to 1200		50	2597	546	171	95	943	92	264	2419	164

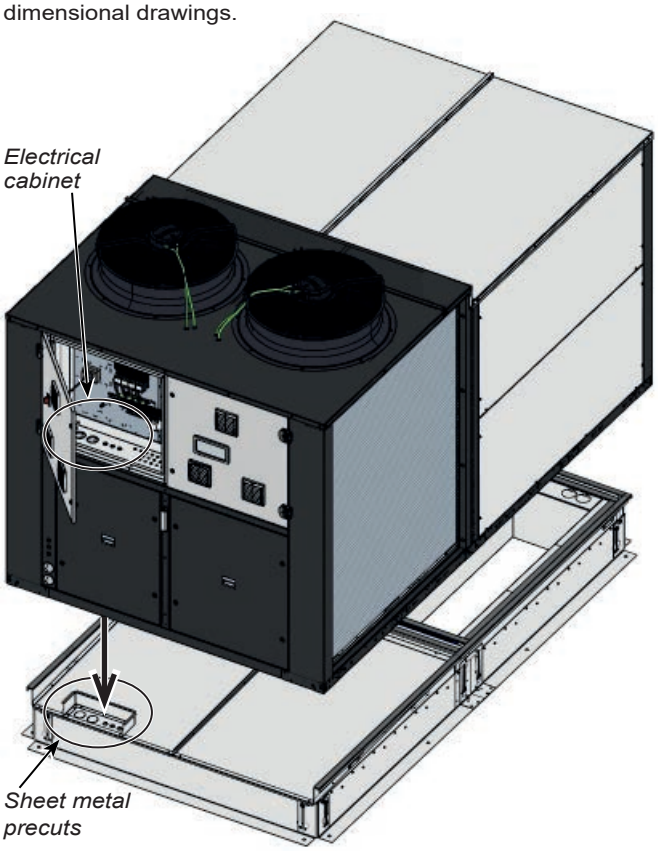
Important: All roofcurb are supplied with a return safety grille intended for plenum installations. For installations with ducted return, the grille must be removed prior to place the machine on the roofcurb. This grille is fastened using 4.8 self-tapping hex screws.



Electric power supply

If the connection of the power cables is to be carried out via the machine base they will have to go through the roofcurb using the sheet metal precuts for this purpose.

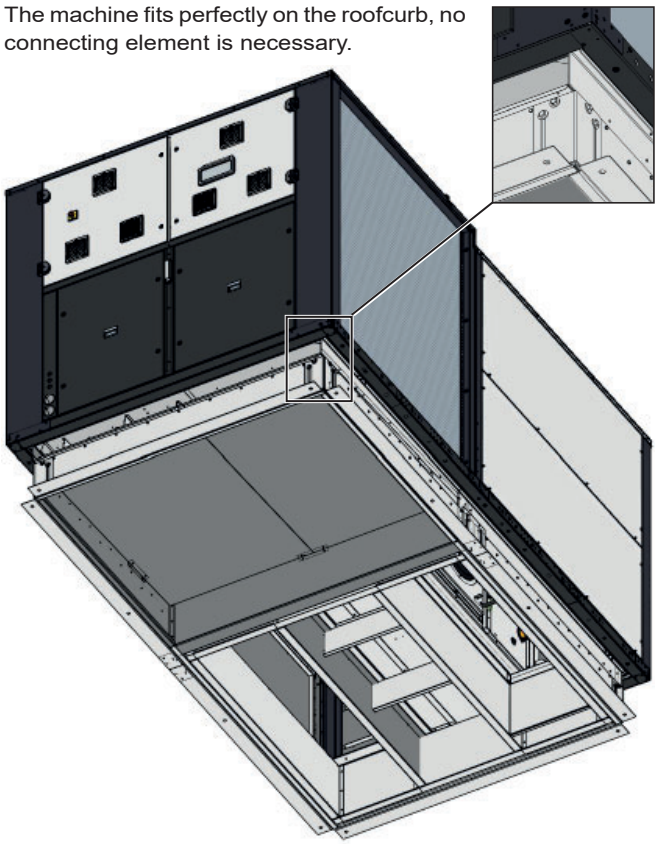
These precuts are located in the roofcurb area below the electrical cabinet. Its position can be consulted in the dimensional drawings.



Positioning the unit on the roofcurb

Once the previous work has been carried out, the machine can be mounted on the roofcurb.

The machine fits perfectly on the roofcurb, no connecting element is necessary.



Important: It's the responsibility of the installer the insulation and sealing upsweep around the roofcurb, as explained above.

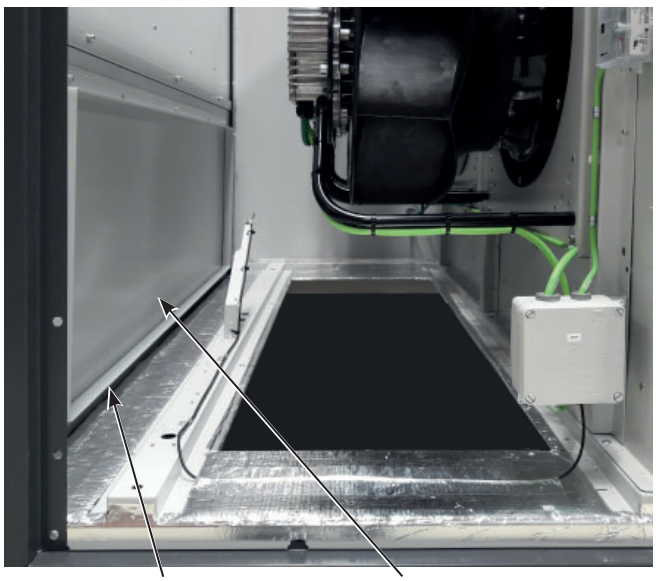
7.4 Change in the airflow direction

Depending on the unit assembly, it is possible to exchange the lateral and lower airflow on-site.

- Supply: all assemblies, except when it incorporates the option of gas burner.
- Return: in C0 and CS assemblies.

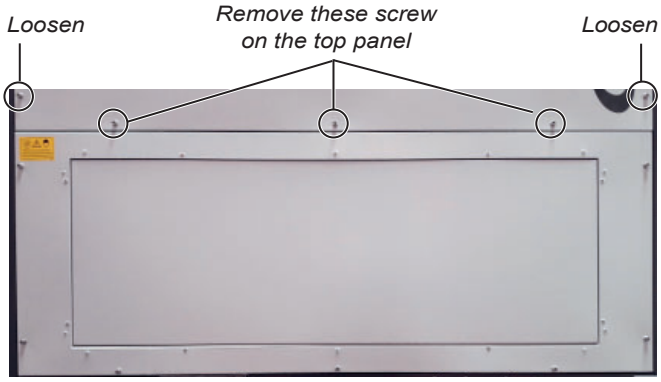
Supply

The side panel for supply air is supplied closed. The two parts required to change direction are connected to the inside of this panel: the locking part and the profile for the outlet.



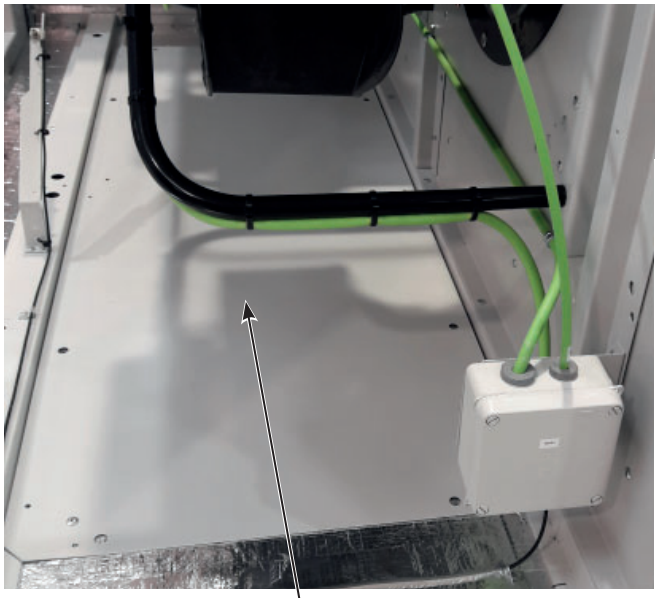
Note: the screws securing this structure are used to fix the locking part to the base of the unit. The screws required to secure the profile for the outlet are supplied in a bag.

Step 1: Remove the lateral panel completely. To do this it is necessary to remove the screws that attach the panel to the pillars (2 per side) as well as those which join the top panel. Also, it is necessary to loosen other two screws on the top panel (indicated in the picture). All screws are M6 Allen type.



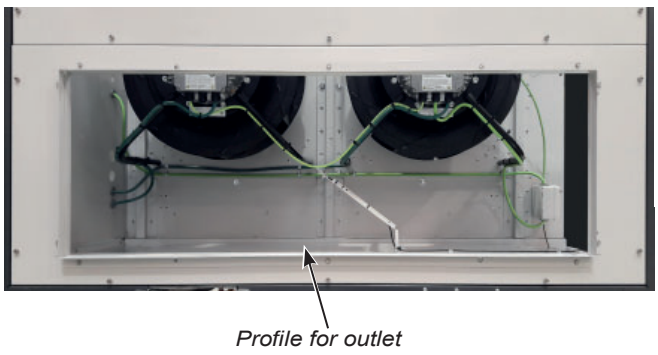
Step 2: Then the outlet profile and the closing plate must be dismantled from this panel.

Step 3: Place the interchangeable closing plate at the base of the unit. For this, the screws used to fasten it to the lateral panel must be reused.



Step 4: Replace the lateral supply panel.

Step 5: Assemble the outlet profile (2 L-shaped brackets), using the 4 screws supplied in a bag (self-tapping screws M4.8).



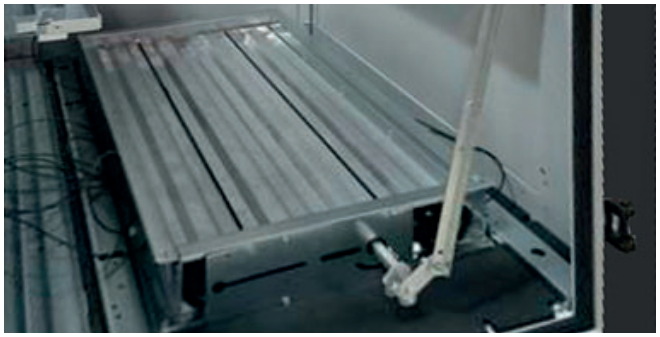
Return

The access panel to the return outlet features dual locks which can serve as a hinge or can be used to remove the panel.

Check that the locks are not blocked. Open the locks with a 4 mm Allen key (in an anticlockwise direction).

The procedure is the same as that used for supply, except with the CS assembly (*), in which it's also required to change the position of the damper.

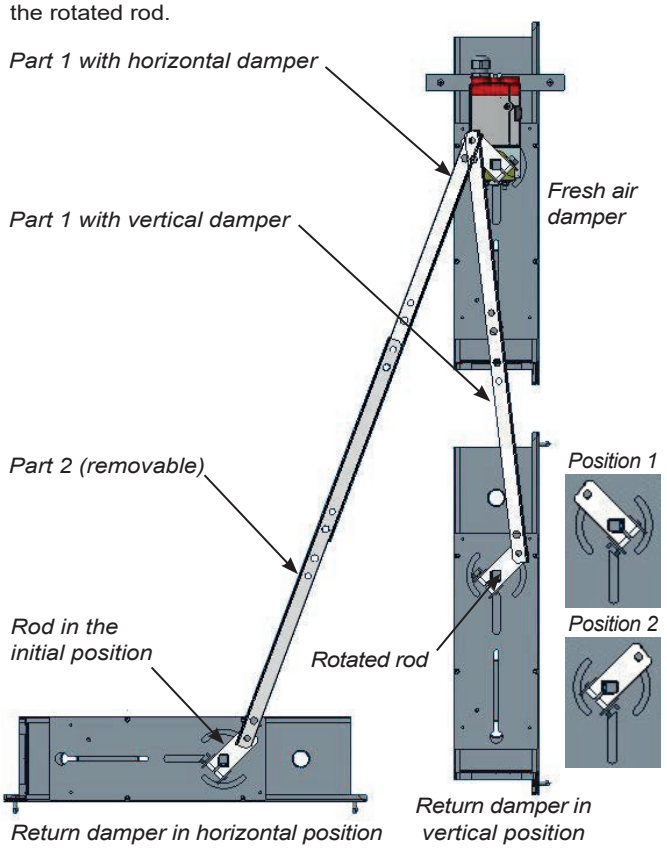
Step 1: Remove the screws (M6 Allen) connecting the rod of the return damper to the drive. Then disassemble the return damper.



Step 2: Fit the damper on the panel, placing the panel on the side of the unit, followed by the profile for the outlet.

Step 3: Rotate the rod on the axis so that the drive crosses between the return and fresh air dampers (see image below).

Step 4: The drive of the damper for the horizontal position is composed of two parts (1 and 2). Disassembly the lower part (2) secured with M6 Allen screws. The upper part (1) is the drive necessary for the vertical position. Screw the part (1) to the rotated rod.



(*) If the unit includes "Antifreeze protective kit + dampers with spring for automatic closing" **(optional upon request)**, it is not necessary to change the transmission, since the return damper incorporates a servomotor.

7.5 Centres of gravity, weight and reactions in the supports

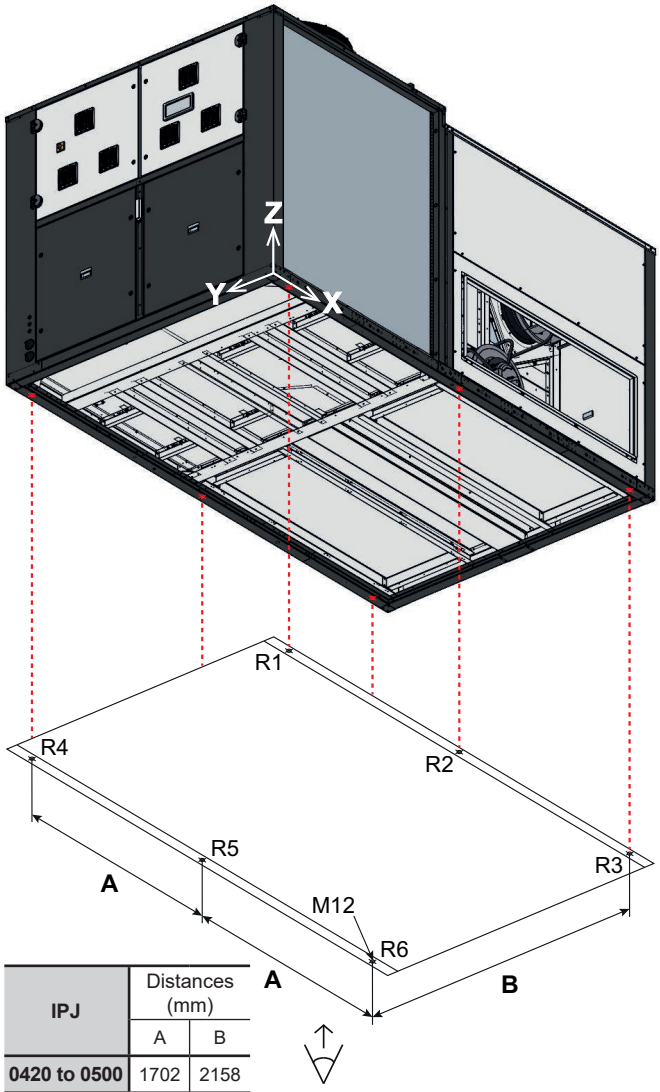
IPJ	C0 assembly									
	Centre of gravity (mm)			Weight (kg)	Reactions in the supports (kg)					
	X	Y	Z		R1	R2	R3	R4	R5	R6
0420	1566	1046	845	1420	272	361	125	240	324	98
0450	1566	1046	845	1435	274	365	126	243	328	99
0500	1566	1046	845	1450	277	369	127	245	331	101
0560	1840	1042	855	1630	276	428	165	243	381	137
0620	1840	1042	855	1665	281	437	169	249	389	140
0680	1840	1042	855	1670	282	438	169	249	391	140
0720	1840	1042	855	1675	283	440	170	250	392	141

IPJ	CS assembly									
	Centre of gravity (mm)			Weight (kg)	Reactions in the supports (kg)					
	X	Y	Z		R1	R2	R3	R4	R5	R6
0420	1595	1074	849	1465	269	362	131	246	342	114
0450	1595	1074	849	1480	272	366	132	249	346	115
0500	1595	1074	849	1495	274	370	134	251	349	117
0560	1866	1066	857	1670	272	437	163	244	399	153
0620	1866	1066	857	1705	278	446	167	250	408	157
0680	1866	1066	857	1710	279	447	167	250	409	157
0720	1866	1066	857	1715	280	449	168	251	410	158

IPJ	CP assembly									
	Centre of gravity (mm)			Weight (kg)	Reactions in the supports (kg)					
	X	Y	Z		R1	R2	R3	R4	R5	R6
0420	1743	1167	868	1669	263	384	179	275	423	200
0450	1743	1167	868	1684	256	378	171	268	418	193
0500	1743	1167	868	1699	258	381	173	270	422	194
0560	2018	1168	847	1935	262	450	215	273	499	236
0620	2018	1168	847	1970	267	460	218	278	508	241
0680	2018	1168	847	1975	267	460	219	279	509	241
0720	2018	1168	847	1980	268	461	220	280	510	242

IPJ	CR assembly									
	Centre of gravity (mm)			Weight (kg)	Reactions in the supports (kg)					
	X	Y	Z		R1	R2	R3	R4	R5	R6
0420	1723	1210	853	1780	276	361	178	312	434	218
0450	1723	1210	853	1795	279	364	179	315	438	220
0500	1723	1210	853	1810	281	367	181	317	442	222
0560	1989	1204	835	2085	291	448	228	323	528	266
0620	1989	1204	835	2120	295	457	230	328	540	270
0680	1989	1204	835	2125	296	458	231	329	541	270
0720	1989	1204	835	2130	296	459	231	330	542	271

IPJ	CQ assembly									
	Centre of gravity (mm)			Weight (kg)	Reactions in the supports (kg)					
	X	Y	Z		R1	R2	R3	R4	R5	R6
0420	1775	1055	1071	1765	283	435	215	252	392	189
0450	1775	1055	1071	1780	285	439	217	254	396	190
0500	1775	1055	1071	1795	286	441	217	254	397	190
0560	2024	1053	1038	2025	297	515	256	264	467	226
0620	2024	1053	1038	2030	297	522	254	262	473	223
0680	2024	1053	1038	2035	298	523	254	263	474	224
0720	2024	1053	1038	2040	298	525	255	263	475	224



IPJ	Distances (mm)	
	A	B
0420 to 0500	1702	2158
0560 to 0720	1904	2158

IPJ	CT assembly									
	Centre of gravity (mm)			Weight (kg)	Reactions in the supports (kg)					
	X	Y	Z		R1	R2	R3	R4	R5	R6
0420	1752	1102	1057	1875	309	420	222	295	412	216
0450	1752	1102	1057	1890	312	424	224	298	416	217
0500	1752	1102	1057	1905	314	427	226	300	419	219
0560	1996	1095	1030	2175	331	515	269	311	502	257
0620	1996	1095	1030	2180	329	519	265	309	505	253
0680	1996	1095	1030	2185	329	520	265	310	507	254
0720	1996	1095	1030	2190	330	522	266	310	508	254

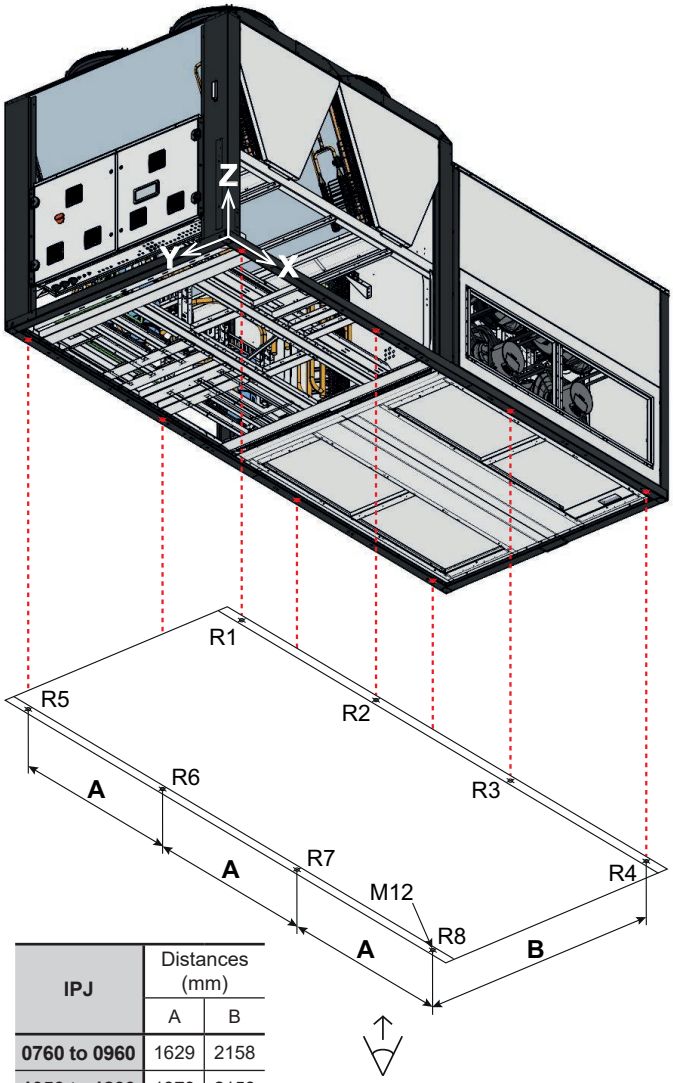
IPJ	CW assembly (smaller diameter wheel)									
	Centre of gravity (mm)			Weight (kg)	Reactions in the supports (kg)					
	X	Y	Z		R1	R2	R3	R4	R5	R6
0420	1979	1539	983	2170	168	311	202	363	702	425
0450	1979	1539	983	2185	164	308	199	361	702	423
0500	1979	1539	983	2200	165	310	200	363	707	426
0560	2227	1503	937	2445	182	387	247	368	799	461
0620	2227	1503	937	2480	178	393	249	374	817	469
0680	2227	1503	937	2485	178	394	250	375	818	470
0720	2227	1503	937	2490	180	397	252	378	822	473

7.5 Centres of gravity, weight and reactions in the supports:

IPJ	C0 assembly											
	Centre of gravity (mm)			Weight (kg)	Reactions in the supports (kg)							
	X	Y	Z		R1	R2	R3	R4	R5	R6	R7	R8
0760	2356	1121	965	2255	257	410	264	190	267	435	252	181
0840	2338	1135	947	2355	269	423	271	193	289	453	270	188
0960	2304	1165	919	2455	282	434	270	185	314	487	288	195
1050	2718	1158	979	2785	306	539	296	203	349	581	305	206
1200	2718	1158	979	2845	313	552	302	207	356	595	311	210

IPJ	CS assembly											
	Centre of gravity (mm)			Weight (kg)	Reactions in the supports (kg)							
	X	Y	Z		R1	R2	R3	R4	R5	R6	R7	R8
0760	2387	1140	966	2355	257	420	261	183	289	474	279	193
0840	2367	1155	949	2425	268	425	275	201	295	468	286	206
0960	2333	1183	921	2525	281	436	275	194	320	502	304	213
1050	2740	1168	977	2895	313	550	307	216	360	600	323	225
1200	2740	1168	977	2955	319	562	313	220	368	614	330	229

IPJ	CP assembly											
	Centre of gravity (mm)			Weight (kg)	Reactions in the supports (kg)							
	X	Y	Z		R1	R2	R3	R4	R5	R6	R7	R8
0760	2563	1213	979	2745	249	439	307	258	295	538	358	301
0840	2543	1226	964	2815	256	447	310	257	314	553	374	304
0960	2504	1247	937	2915	266	460	309	249	331	608	386	306
1050	2947	1233	983	3235	286	564	336	264	372	685	410	317
1200	2947	1233	983	3295	291	575	342	269	379	699	418	323



IPJ	Distances (mm)	
	A	B
0760 to 0960	1629	2158
1050 to 1200	1979	2158

IPJ	CR assembly											
	Centre of gravity (mm)			Weight (kg)	Reactions in the supports (kg)							
	X	Y	Z		R1	R2	R3	R4	R5	R6	R7	R8
0760	2561	1200	960	2935	270	475	333	280	313	569	378	317
0840	2543	1211	946	3005	277	483	336	279	332	584	394	321
0960	2537	1246	920	3105	276	485	332	275	342	642	413	335
1050	2968	1225	969	3435	302	600	363	289	388	720	435	340
1200	2968	1225	969	3495	307	610	369	294	394	733	442	346

IPJ	CT assembly											
	Centre of gravity (mm)			Weight (kg)	Reactions in the supports (kg)							
	X	Y	Z		R1	R2	R3	R4	R5	R6	R7	R8
0760	2583	1105	1114	3005	293	521	379	322	295	539	355	302
0840	2564	1119	1098	3075	300	529	381	320	314	554	371	306
0960	2557	1138	1092	3175	303	541	386	323	321	602	384	315
1050	2983	1138	1110	3485	328	651	408	327	365	682	405	319
1200	2983	1138	1110	3545	333	662	415	332	372	695	412	324

IPJ	CQ assembly											
	Centre of gravity (mm)			Weight (kg)	Reactions in the supports (kg)							
	X	Y	Z		R1	R2	R3	R4	R5	R6	R7	R8
0760	2585	1112	1128	2855	275	489	356	303	281	511	339	290
0840	2565	1127	1110	2925	284	498	360	304	301	527	356	295
0960	2558	1147	1103	3025	288	510	365	306	309	575	369	304
1050	2963	1142	1127	3285	312	614	381	302	350	649	381	297
1200	2963	1142	1127	3345	317	626	387	307	356	661	388	302

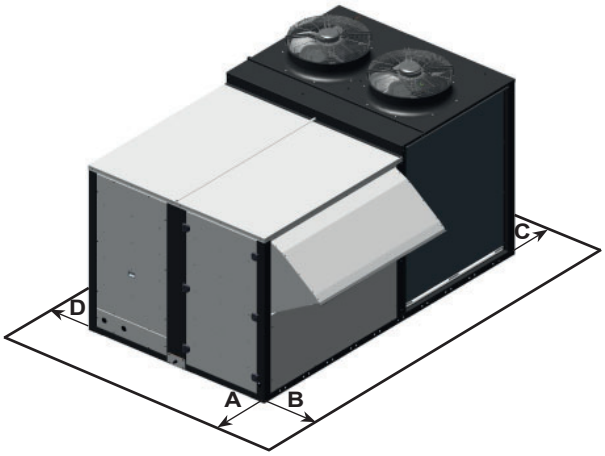
IPJ	CW assembly (smaller diameter wheel)											
	Centre of gravity (mm)			Weight (kg)	Reactions in the supports (kg)							
	X	Y	Z		R1	R2	R3	R4	R5	R6	R7	R8
0760	2793	1473	1001	3410	191	396	301	307	365	745	575	530
0840	2772	1477	987	3480	198	403	304	307	384	760	591	534
0960	2756	1493	1493	3580	196	407	302	305	393	823	607	547
1050	3195	1439	1010	3850	221	514	335	313	439	883	616	528
1200	3195	1439	1010	3910	224	522	340	317	446	897	626	537

7.6 Recommended service clearance

Important: This is the **minimum** space required for maintenance operations and access inside the unit. Depending on the assembly selected for the unit and the characteristics of the installation site, a larger space around it may be required to ensure proper air circulation and therefore the correct operation of the unit.

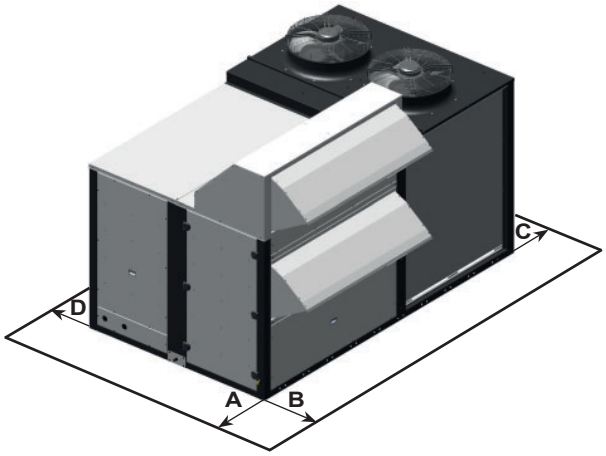
IPJ - 0420 to 0720

C0 and CS assemblies



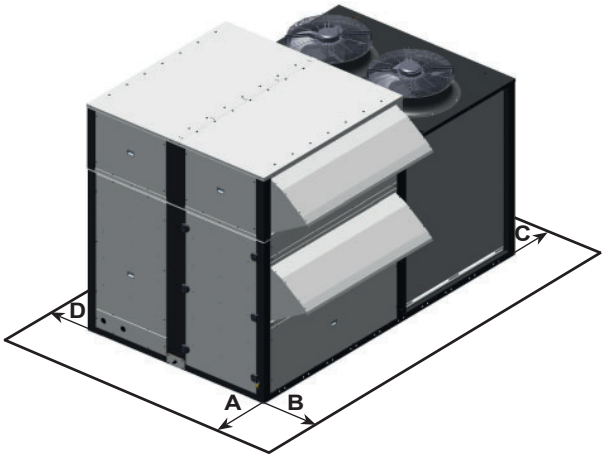
IPJ	Overall dimensions (mm)			Service clearance (mm)			
	Length	Width	Height	A	B	C	D
0420 to 0500	3.820	2.257	2.293	2.200	1.000	1.200	1.000
0560 to 0720	4.224	2.257	2.340	2.400	1.000	1.200	1.000

CP and CR assemblies



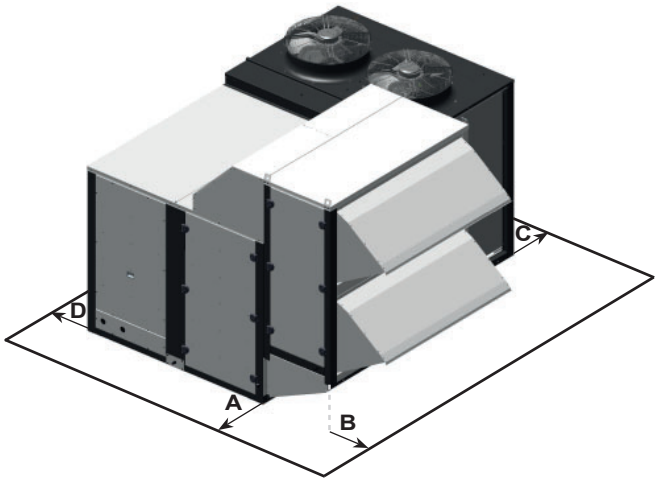
IPJ	Overall dimensions (mm)			Service clearance (mm)			
	Length	Width	Height	A	B	C	D
0420 to 0500	3.820	2.257	2.555	2.200	1.000	1.200	1.000
0560 to 0720	4.224	2.257	2.555	2.400	1.000	1.200	1.000

CQ and CT assemblies



IPJ	Overall dimensions (mm)			Service clearance (mm)			
	Length	Width	Height	A	B	C	D
0420 to 0500	3.825	2.268	2.555	2.200	1.000	1.200	1.000
0560 to 0720	4.229	2.268	2.555	2.400	1.000	1.200	1.000

CW assembly



IPJ	Overall dimensions (mm)			Service clearance (mm)			
	Length	Width	Height	A	B	C	D
0420 to 0500	3.820	3.112	2.255	2.200	1.000	1.200	1.000
0560 to 0720	4.224	3.112	2.555	2.400	1.000	1.200	1.000

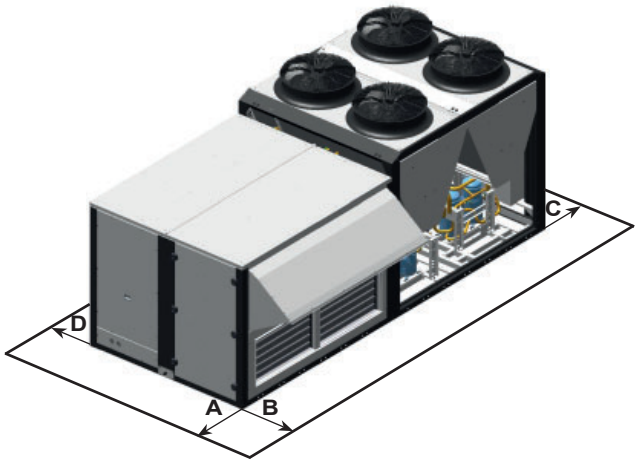
Unit not designed to have overhead obstruction.

7.6 Recommended service clearance

Important: This is the **minimum** space required for maintenance operations and access inside the unit. Depending on the assembly selected for the unit and the characteristics of the installation site, a larger space around it may be required to ensure proper air circulation and therefore the correct operation of the unit.

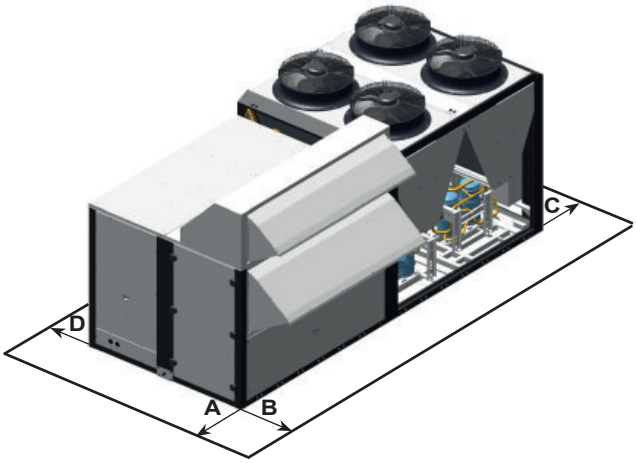
IPJ - 0760 to 1200

C0 and CS assemblies



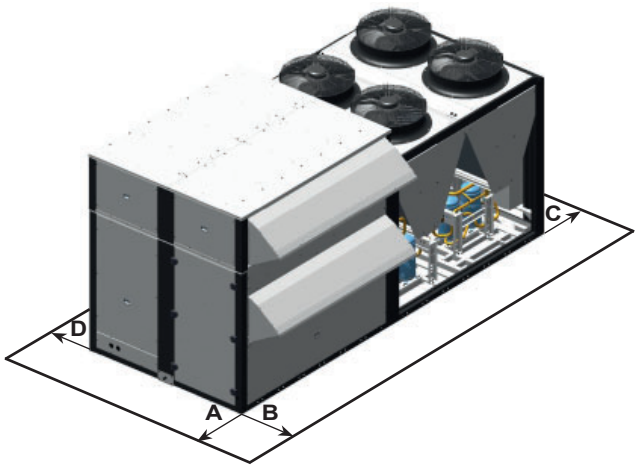
IPJ	Overall dimensions (mm)			Service clearance (mm)			
	Length	Width	Height	A	B	C	D
0760 to 0960	5.300	2.257	2.421	2.600	2.500	1.200	1.000
1050 to 1200	6.350	2.257	2.494	3.000	2.500	1.200	1.000

CP and CR assemblies



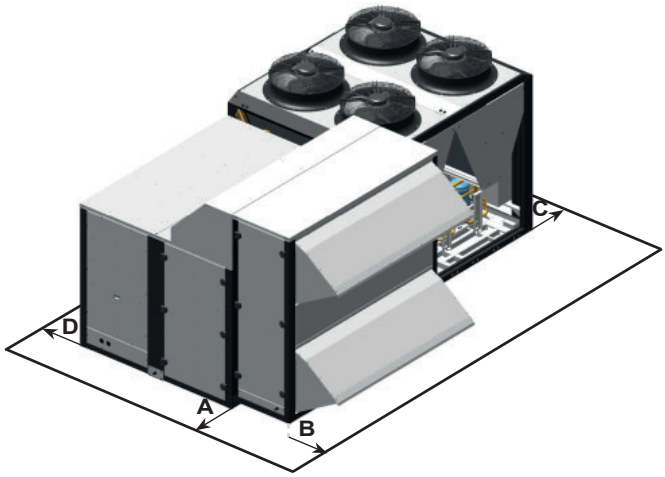
IPJ	Overall dimensions (mm)			Service clearance (mm)			
	Length	Width	Height	A	B	C	D
0760 to 0960	5.300	2.257	2.555	2.600	2.500	1.200	1.000
1050 to 1200	6.350	2.257	2.555	3.000	2.500	1.200	1.000

CQ and CT assemblies



IPJ	Overall dimensions (mm)			Service clearance (mm)			
	Length	Width	Height	A	B	C	D
0760 to 0960	5.306	2.268	2.555	2.600	2.500	1.200	1.000
1050 to 1200	6.356	2.268	2.555	3.000	2.500	1.200	1.000

CW assembly



IPJ	Overall dimensions (mm)			Service clearance (mm)			
	Length	Width	Height	A	B	C	D
0760 to 0960	5.300	3.112	2.555	2.600	1.700	1.200	1.000
1050 to 1200	6.350	3.112	2.555	3.000	2.500	1.200	1.000

Unit not designed to have overhead obstruction.

8.1 Installation norms

Important: All connections in the site are the responsibility of the installer. These connections are always made as per the current regulation. Always refer to the wiring diagram provided with the unit.

The installer must provide electrical circuit protections according to the effective legislation.

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.

8.2 Power supply

Verify that power supply agrees with the unit name plate and that the voltage remains constant.

Warning: Operation of the unit with an incorrect supply voltage or excessive phase imbalance constitutes misuse which will invalidate the manufacturer's warranty. If the phase imbalance exceeds 2% for voltage, or 10% for current, contact your local electricity supplier at once and ensure that the unit is not switched on until corrective measures have been taken.

Voltage phase imbalance (%)

$$\% \text{ imbalance} = \frac{100 \times \text{max. deviation from average voltage}}{\text{average voltage}}$$

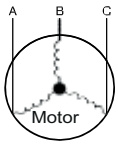
Example:

On a 400 V - 3 ph - 50 Hz power supply, the individual phase voltages were measured with the following values:

AB = 406 V; BC = 399 V; AC = 394 V

Average voltage = (406+399+394)/3=1199/3 = 399.7 i.e. 400 V

Calculate the maximum deviation from the 400 V average:



(AB) = 406 - 400 = 6 -> % = 100 x 6 / 400=1.5

(BC) = 400 - 399 = 1 -> % = 100 x 1 / 400=0.25

(CA) = 400 - 394 = 6 -> % = 100 x 6 / 400=1.5

Important: It is the responsibility of the installer to protect the unit from overvoltage coming from the mains or voltage spikes caused by lightning. Depending on the geographic location and the type of mains network (buried or overhead), a lightning rod needs to be installed. Check the local electrical codes and regulations. Failure to comply with the requirements of standards in force in the country of installation will void the warranty.

8.3 Wire sizing

Wire sizing is the responsibility of the installer to suit the characteristics of the installation site and comply with applicable regulations.

To perform the electric installation of the unit (cable glands, wire sizing and their calculations, protections, etc.), refer to the information provided in:

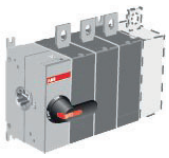
- The technical brochure of this series.
- The name plate data.
- The wiring diagram included with the unit.
- Norms in effect that regulate the installation of air conditioning units and electrical receivers in the country of installation.

Wiring must be selected based on:

- The maximum absorbed current, taking into account all the options it features (refer to the technical brochure and the name plate).
- The distance between the unit and its power source.
- The protection to be placed at the power source.
- Neutral operating conditions.
- The electrical connections (refer to the wiring diagram provided with the unit).
- The temperature the wiring is exposed to;
- The fitting method.

After wire sizing has been completed, the installer must verify the appropriate means of connection and define any modifications necessary on site.

Maximun wire sizing depending on the main door switch:

OT125	70 mm²	wire size for flange clamp		
OT160EV_	M8x25	metric thread diameter x length mm		
OT200E_	M8x25			
OT250_	M8x25			
OT315_	M10x30			
OT400_	M10x30			
OT630_	M12x40			

Note: If an adapter to increase this wire sizing is needed, please consult.

Power cable access routing

The power cables can be routed into the electrical box via the wall bushings located:

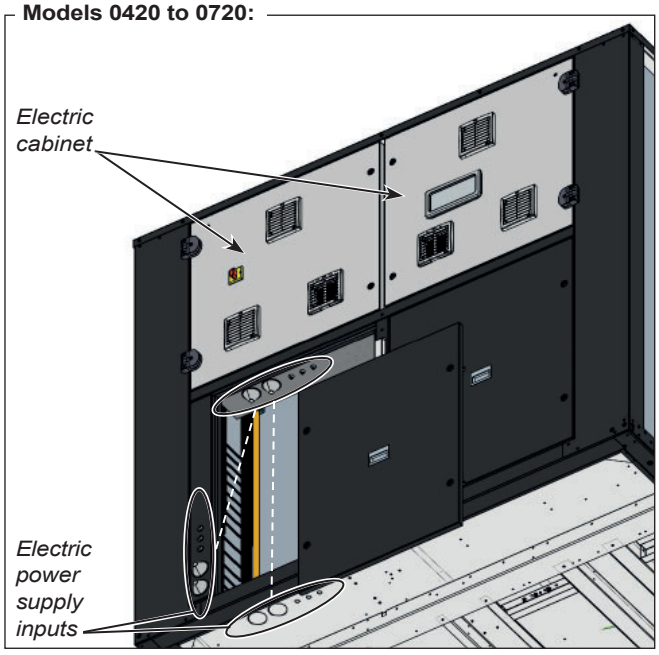
- In models 0420 to 0720: in a left panel below the electrical cabinet or in the machine base.
- In models 0760 to 1200: below the electrical cabinet (left door).

It is important to check that the power cable bend radius is compatible with the connection space available inside the electrical cabinet.

8.4 Electrical cabinet

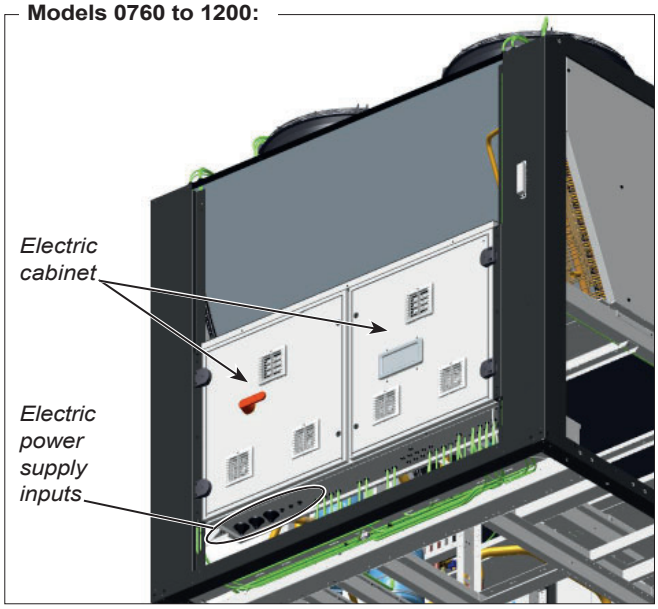
All units include a fully wired electrical cabinet, with forced ventilation. The access doors are insulated to prevent condensation.

Models 0420 to 0720:



8 - ELECTRICAL CONNECTION

Models 0760 to 1200:



The fan for cooling the electrical cabinet, the VecticGD terminal and the ground connector, all located on the doors, must be disconnected before removing the doors.

These doors have hinges + quarter-turn latches.

These latches of stainless steel have triangular insert 8 mm (supplied wrench). The closing is done by rotating 90º (anti-clockwise): it brings the latch to the locked position.

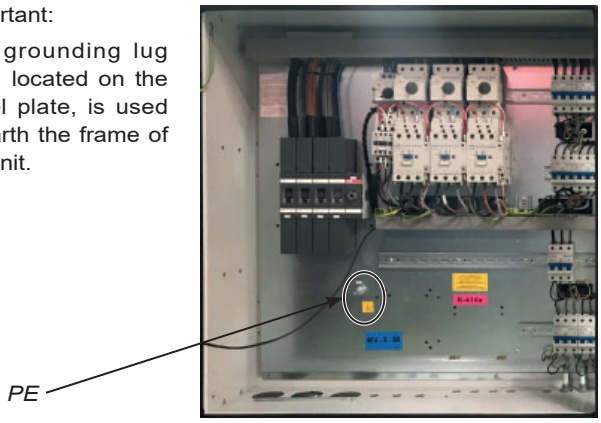
Dual locks can function as hinges or can be used to remove the door. Check that the locks are not blocked. Open them with a 4 mm Allen wrench (in an anti-clockwise direction).

Electrical components are identified and all wires are numbered. It permits easy tracing and diagnostics.

Power cables are identified with the colors: black (L1) - Brown (L2) - grey (L3) - yellow/green (Ground).

Important:

The grounding lug (PE), located on the panel plate, is used to earth the frame of the unit.

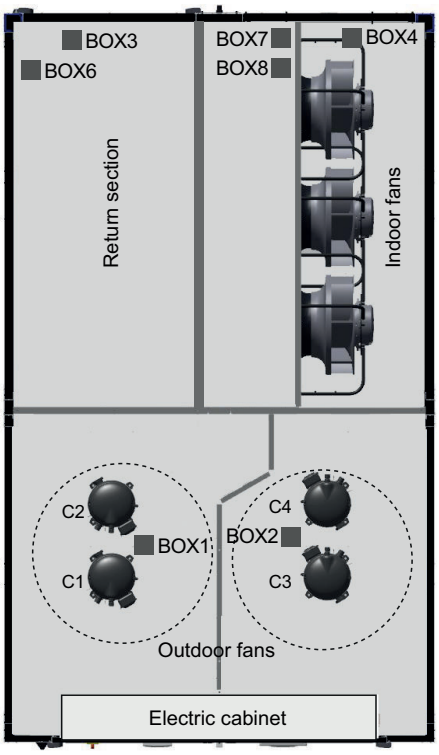


The main components of the unit are connected in intermediate boxes located next to these components.

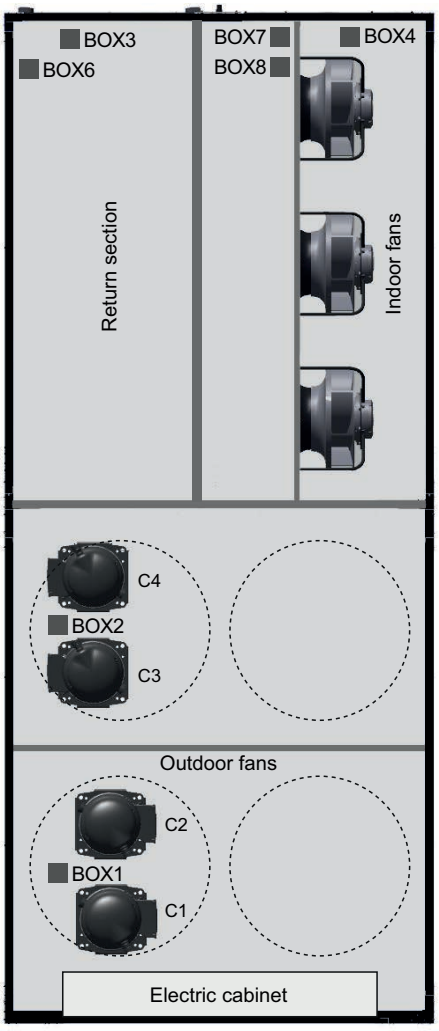
- BOX1: Motor-compressor circuit 1
- BOX2: Motor-compressor circuit 2
- BOX3: Mixing box
- BOX4: Indoor unit
- BOX5: Rotary heat exchanger (optional). In this case the box is located in the wheel module.
- BOX6: Return box (optional)
- BOX7: Electrical heaters (optional)
- BOX8: Hot water coil or heat recovery coil or gas burner (optionals)

The following images show the location of these boxes:

Models 0420 to 0720:



Models 0760 to 1200:



8.5 Vectic electronic control

Vectic electronic control is basically comprised of a control board, sensors, a VecticGD graphic terminal, a TCO user terminal (optional) and a BMS card (optional).

Vectic graphic terminal

TCO user terminal

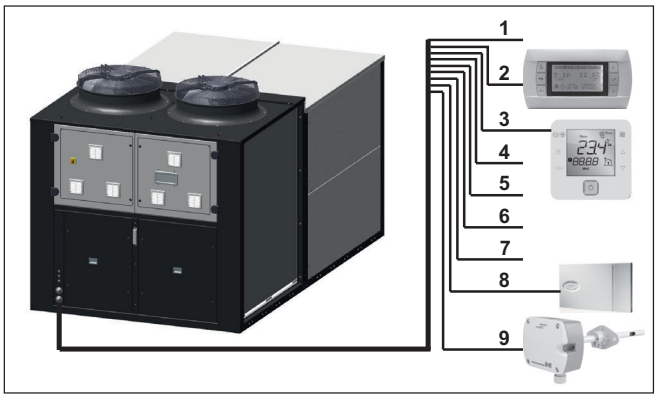
By default, this control is supplied with a VecticGD graphic terminal, installed on the unit's electrical cabinet, but it can also be remotely connected:

- Up to 50 m, it can be connected directly with telephone wire.
- From 50 to 200 m, it is necessary to use the TCONN bypass cards and AWG 20/22 shielded cable with 2 twisted pairs.

The TCO user terminal (optional) can be installed in the electrical cabinet when the graphic terminal is remotely connected.

Note: Refer to the Vectic control brochure to obtain more detailed information on its operation.

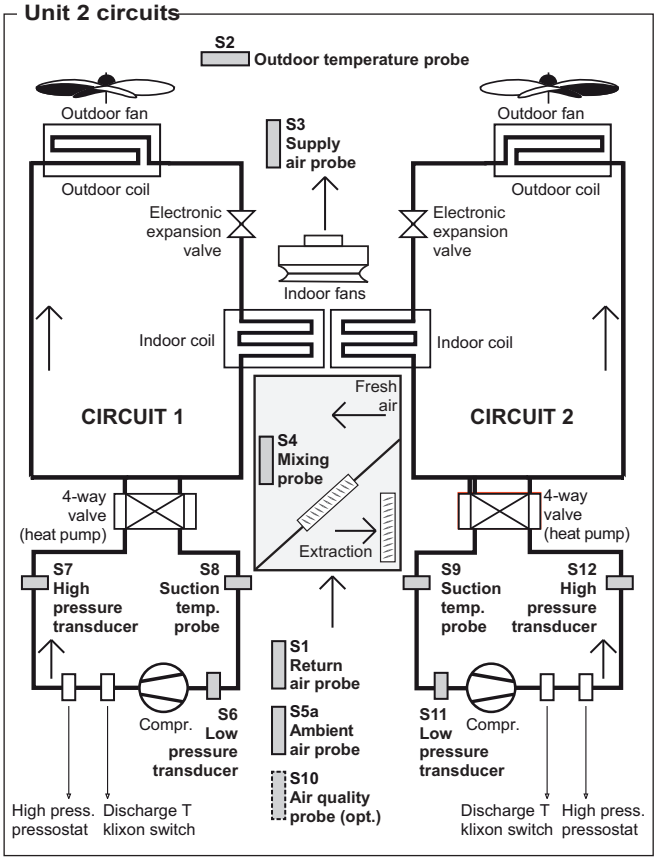
Customer connection



No.	IPJ		0420 to 1200
1	Main power supply	400 III (±10%)	3 Wires + Ground + Neutral
2	Remote connection of graphic terminal (by default installed on the electrical cabinet) ①		telephone cable 6 wires standard (RJ12 connector)
3	Connection of TCO user terminal (optional) ②		2 wires for power supply 230V + 1 shielded cable for communication type AGW20 / 22 (1 braided pair + drainwire + shielding)
4	Remote off/on (optional)		2 wires
5	General alarm signal (optional) ③		2 wires
6	Remote Cooling/Heating (opt.)		2 wires
7	Circulation pump signal for HWC (antifreeze sec.) (opt.)		1 wire
8	Ambient probe	NTC	2 wires
		RS485	5 wires ④
9	Air quality probe (optional)		3 wires

① In this case, it´s possible to install the user terminal on the electrical cabinet.
② It's necessary that the terminal uses the same power supply that the control board.
③ The output for general alarm signal is not compatible with the following options: hot water coil, heat recovery coil, rotary heat exchanger and on/off signal for external humidifier. With these options, possibility of general alarm upon request.
④ Up to four RS485 ambient sensors can be connected in series on the field-bus of the control board.

8.6 Location of sensors on the machine



Note: If the unit needs the outdoor humidity probe, used with enthalpic or thermoenthalpic free-cooling, this one (S5h) will be connected in the place of the ambient probe (S5a). In this case it is necessary to use a RS485 ambient temperature probe connected on the Field-bus.

8.7 Sensors connection by the costumer

The client must connect on-site the following probes:

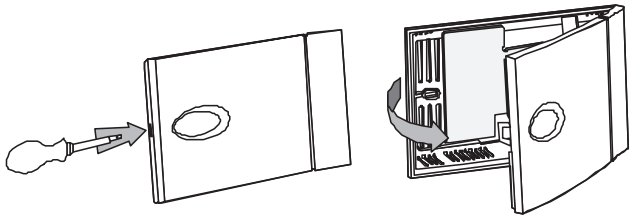
- Ambient NTC (standard) or RS485 (optional).
- Air quality (optional).
- Outdoor humidity (optional).

These probes are supplied inside the electrical cabinet.

Please refer to the wiring diagram and the Vectic control brochure, both provided with the 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.



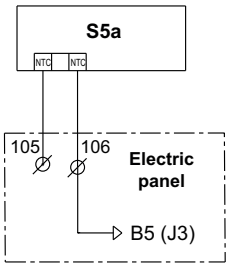
- Fasten the rear of the sensor case to the panel or the wall (for fastening the case, use the screws supplied with the fastening kit, paying attention to use the proper spacers, to not damage the sensor's electronics).

8 - ELECTRICAL CONNECTION

- This probe must be fastened to the panel or the wall of the room to be conditioned, at ca. 1.5 m height.

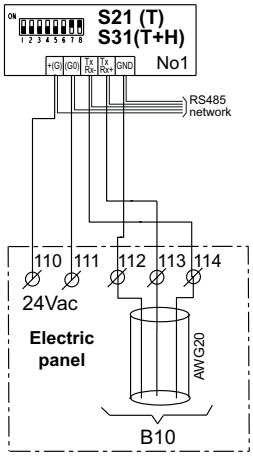
Electrical connection

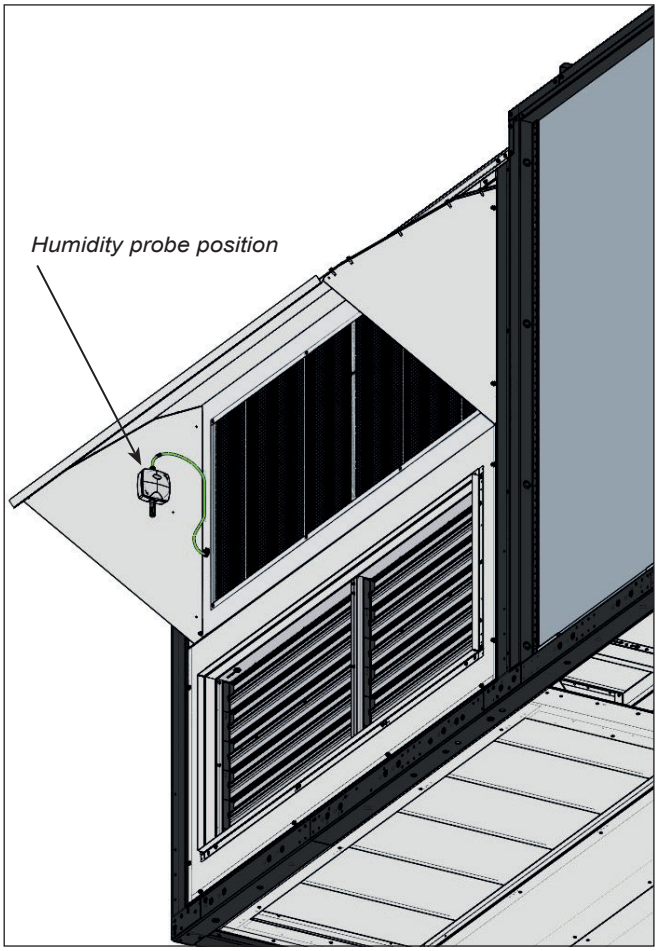
- Make the electrical connection according to the unit configuration:
  - NTC Probe S5a: B5 (connector J3): with 2 x 1,5 mm² section cable, within a maximum distance of 30 meters.



  - 1 to 4 RS485 probes (connector J10): with AWG20 section cable, single braided pair preferably shielded with drain wire + Power supply 24 Vac (2 wires).
    * Temperature:
      S21 to S24.
    * Temperature + humidity:
      S31 to S34.

    Note: in the case of more than one probe, connection of the probes in series, in the RS485 network. Please, refer to the control manual.

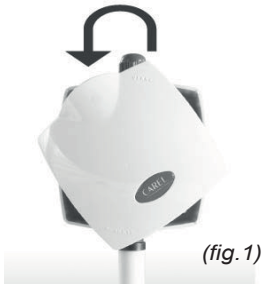


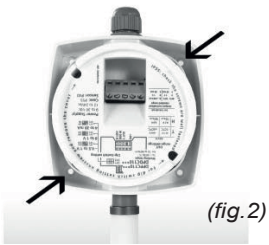


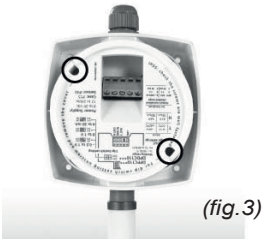
Connection of the outdoor humidity probe (optional)

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 (fig1).
- 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)

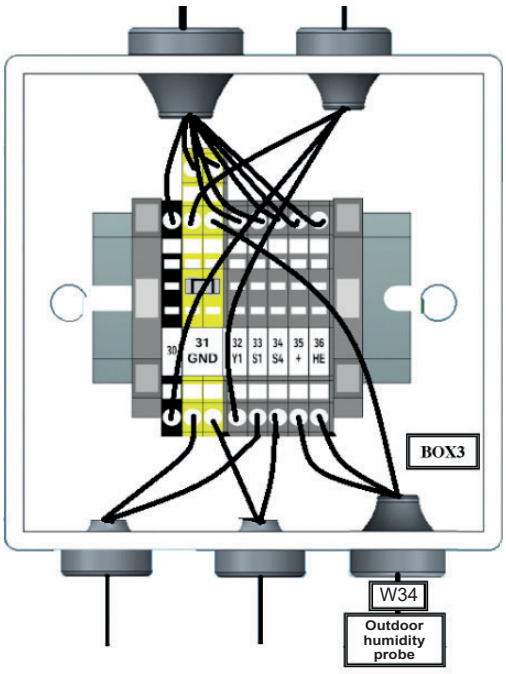

(fig.2)

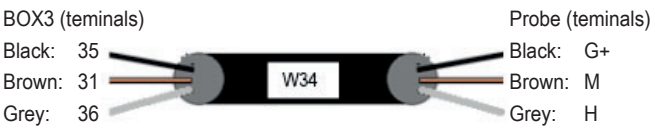

(fig.3)


(fig.4)

The installer must feed the W34 cable through the M16 feedthrough to connect it in the BOX3, located inside the unit, behind the side access panel.

Electrical connection





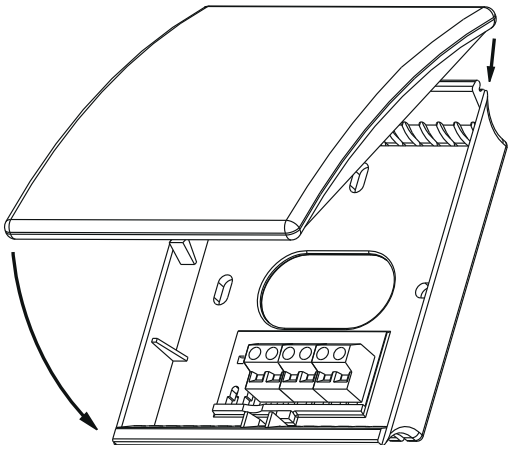
Connection of the CO_2 air quality probe

There are different options:

- Ambient air quality probe.
- Return air quality probe (duct-mounted).
- Probe installed on the master unit of the local network (pLAN).
- Double quality probe:
  - two ambient air probes;
  - one ambient air probe and one outdoor air probe;
  - one return air probe (duct-mounted) and one outdoor air probe.

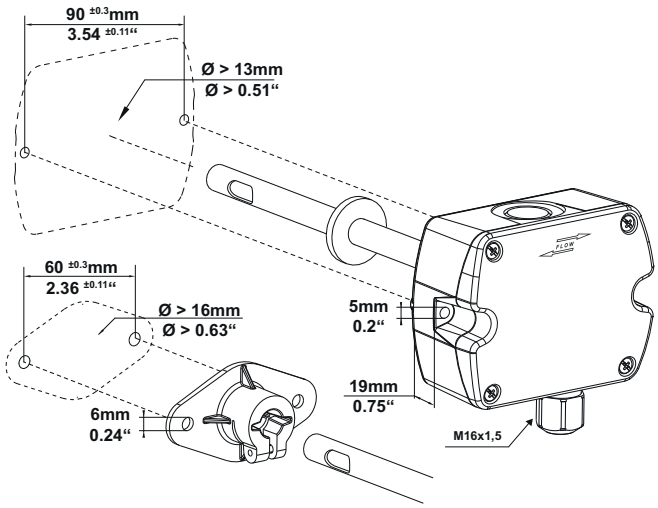
Installation in the environment

- 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.

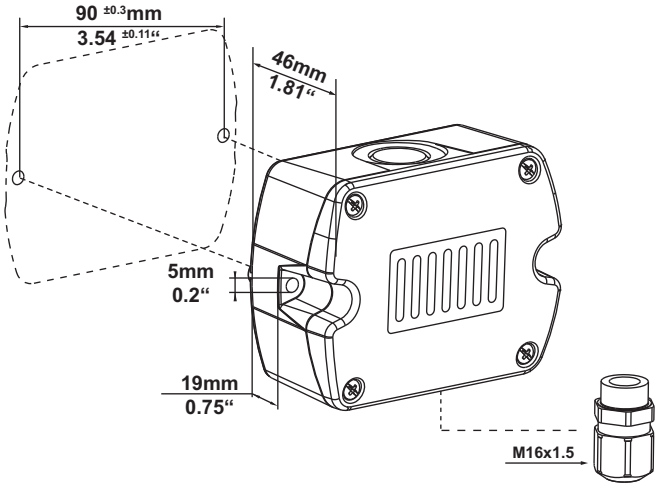


Duct-mounted

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



Outdoor installation



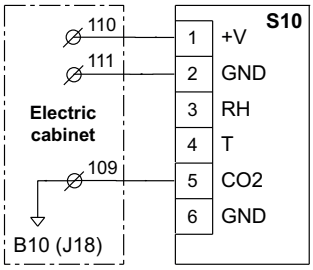
Note: This probe must be located outdoors but under cover.

Electrical connection

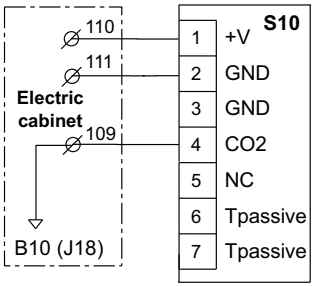
This probe (S10) is configured as analogue output 4…20 mA (0..2000 ppm), in the analogue input B10 of the control board (connector J18).

Recommended cable section : 1,5 mm^2.

Ambient probe



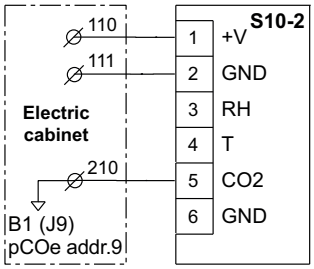
Return probe



The second probe (S10-2) is configured as analogue output 4…20 mA (0..2000 ppm for ambient probe or 0..5000 ppp for outdoor probe), in the analogue input B1 of the expansion card pCOe with address 9 (connector J9).

Recommended cable section : 1,5 mm^2.

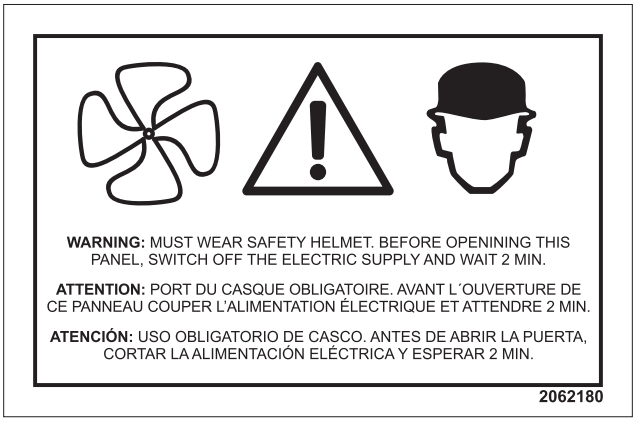
Ambient or outdoor probe:



9.1 Checks in the axial 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.
- With electronic fans (standard), check that they adapt their rotational speed based on the condensation or evaporation pressure.

  Note: Optionally these units can be supplied with two-speed fans.



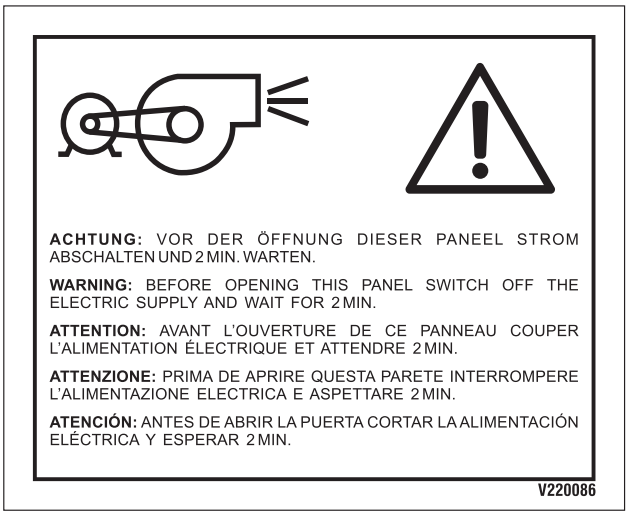
9.2 Checks in the EC plug-fans

- 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 variable-speed plug-fans, both supply and return, 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 VecticGD graphic terminal (please refer to the Vectic control brochure).

9.3. Checks in the centrifugal fans (optional)

If the unit is equipped with centrifugal return fans (available in CQ and CT assemblies):

- 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.



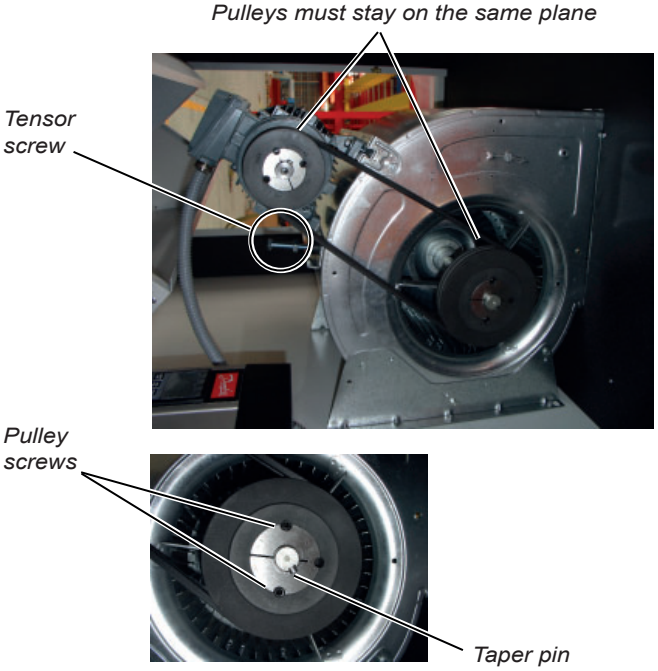
Pulley and belt calibration

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 slided over the axis (this action can be performed both in the motor as well as in the fan).



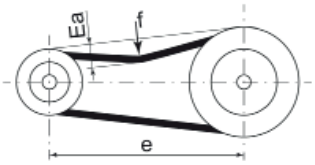
Belt tension:

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 x 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)

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.

9.4 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 fans supply outlet 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.

10 - CONDENSATE DRAIN

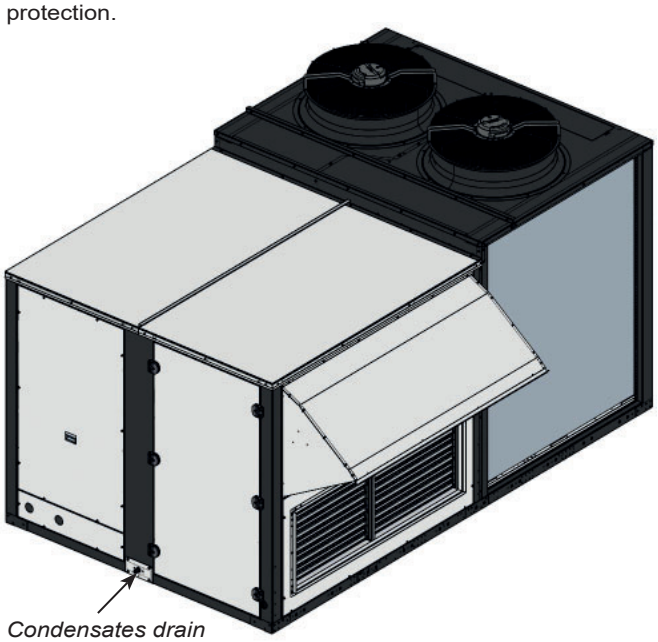
These units are equipped with a condensate drainage pan in the indoor circuit, with a 3/4" M gas threaded plastic drain connection.

The pan is sloped towards the drain, but it is important to check the levelling of the unit. A defective unit level can cause water overflowing.

It is important to check that the drain is not clogged.

This drain pan is removable in models 100 to 170. It is secured to the unit using 4 M 6 Allen screws

Optionally, this pan can be made of stainless steel for corrosion protection.



Condensates drain

Some options are equipped with a separate drain, 1/2" M gas threaded plastic:

- Cooling recovery circuit (CR and CT assemblies).
- Rotary heat exchanger (CW assembly).
- Gas burner (roofcurb).

With outdoor temperatures which are lower than 0ºC the necessary precautions must be taken to prevent the water in the drain ducts from freezing.

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

CONNECT SIPHON
METTRE SIPHON
PONER SIFON
V220014

Siphon installation norms

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

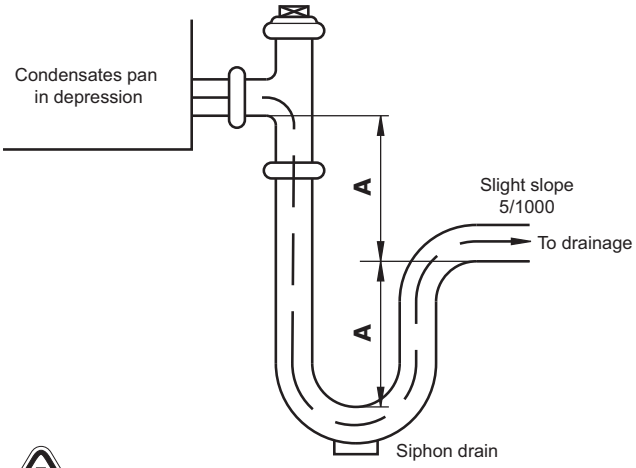
- **Pan in overpressure:**

  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.



Check the connection watertightness.

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.

Safety valve

All models include a safety valve in the high pressure line. Valve tare value at 45 bar.

Caution: Avoid the valve triggering direction

Low pressure safety

The low pressure safety is done by the Vectic electronic control via the measure of the low pressure transducer.

Protection for power lines

Protection for power lines of compressors with manual motor starters and power lines of fan motors with magnetothermic switches.

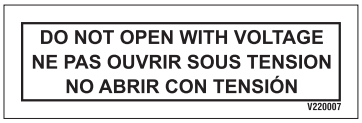
These devices provide protection against overload, short circuit, phase failure and undervoltage.

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).

Main door switch

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



Defrost control

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

Defrosting is carried out by the control depending on the outdoor temperature and the value measured by the low pressure transducer.

Safeties at the compressors

- These units have a klixon switch on the compressor discharge which stops the operation of the motor when there is excessive heating.
- Compressor lock: In the event of a power cut-off for a period longer than 2 hours, the compressors will be locked. The unit must remain 8 hours consecutively with voltage to unlock the compressors. A warning screen on the VecticGD shows the remaining time until the end of the locking.
- High temperature safety in tandem compressors (optional): Working in COOLING mode, when the outdoor coil pressure of a circuit overcomes a limit value one of the two compressors will be stopped, thereby avoiding the stop of both compressors due to the high pressure. This compressor will start working again if the pressure drops below a safety value.

Control of air flow

The supply plug-fans adapt their speed to the average flow measured by the differential pressure sensor and the value set as a setpoint in the electronic control.

Clogged filter detector (optional)

Differential pressostat for detection of the filter clogging level.

This pressostat is installed in the factory in the electrical cabinet.

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

The electronic control allows the settings selection for the clogged filter alarm: only indication (by default) or unit stoppage. Manual reset.

The pressostat set value for alarm signalling is configured in factory, depending on the filters selected for the unit, according to the following criterion (Standard EN 13053):

- Unit filter: the set value is the pressure drop for the filter classification, according to the attached table.
- Serial filters: the set value is the pressure drop of the highest efficiency filter + half of the pressure drop of the other filter, according to the attached table.

Filter classification	Pressure drop (Pa)
G4	150
M6 / F7	250
F9	350

Note: all filter frames have a sticker indicating the filter classification.

Important: This safety device is particularly recommended with gas burner.

Condensation and evaporation pressure control

This safety, integrated in the control, enables managing the outdoor fans 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 40ºC.

Note: Vectic electronic control allows to select the functioning logic for the fulfillment of the ERP French fire regulations.

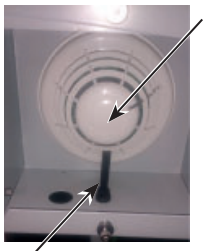
Smoke detector (optional)

Smoke detecting station in accordance with the NF S 61-961 standard, 961, that 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 and gives the order to open or close the outdoor damper (configured by parameter).

To ensure compliance with the French regulations on Fire safety (ERP), it's possible to configure the opening of the fresh air damperand the exhaust air damper to 100% (return air damper closed).

The station is installed in the factory on a panel next to the electrical cabinet. To reset the station it is necessary to disassemble the protection box. The probe is placed on a pillar next to the supply fans.

Smoke detecting station



Smoke detecting probe

Air inlet tube

Refrigerant leak control

Possible refrigerant leakage in case of low pressure alarm. Although sometimes the alarm has other reasons, the control allows to detect possible leakage, improving the protection of the environment.

Refrigerant leak detector (optional)

The gas detector sensor is a device that signals leaks in refrigerant (in ppm). 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 allows prompt identification of gas leaks, guaranteeing the safety of any people in the vicinity.

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

Anti-freeze protection for low outdoor temperatures (optional)

- Electrical heater for protecting the components of the electrical cabinet. This safety device is mandatory for an outdoor temperature lower than -10°C WB.
  A reinforced electrical heater is mandatory for a temperature lower than -14°C WB.
  The electrical heater(s) is(are) activated when the thermostat installed inside the electrical cabinet detects that the temperature drops below 5°C.
- Compressor with low-temperature protection using an additional crankcase heater: mandatory for an outdoor temperature lower than -10ºC WB.
  Activation temperature: -10ºC WB.
- Electrical heater for antifreeze protection of dampers of the mixing box: mandatory for an outdoor temperature lower than -14ºC WB **(upon request)**.
  Activation temperature: -14ºC WB.
- Electrical heater for protection of the gas burner housing (optional): mandatory for an outdoor temperature lower than -14ºC WB **(upon request).**
  Housing temperature for activation: +1ºC.
- Dampers of the mixing box with springs for automatic closing in the case of a cut in power **(upon request).**

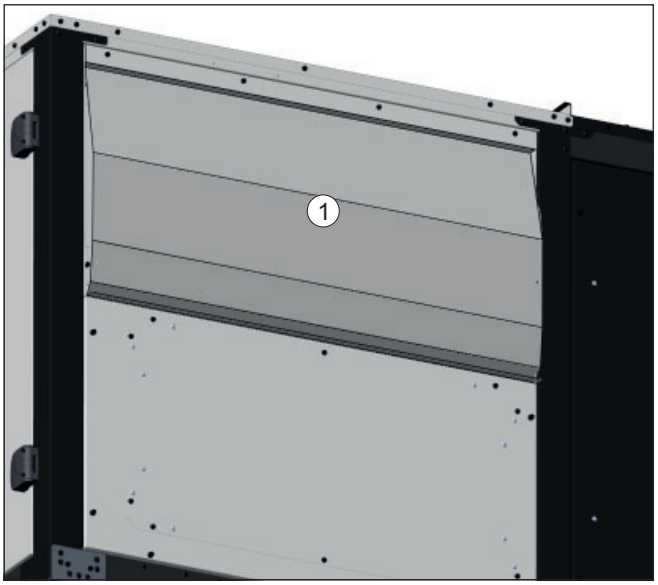
Remote alarm (optional)

Vectic control allows the management of a relay for remote alarm signalling.

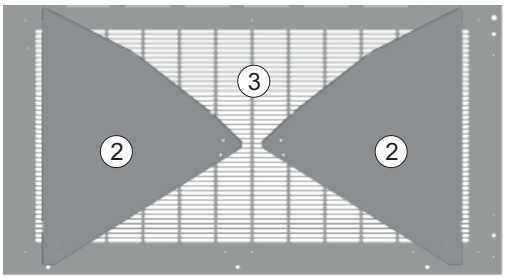
Note: The output for general alarm signal is not compatible with the following options: hot water coil, heat recovery coil, rotary heat exchanger and on/off signal for external humidifier. With these options, possibility of general alarm upon request.

12.1 Dampers hoods

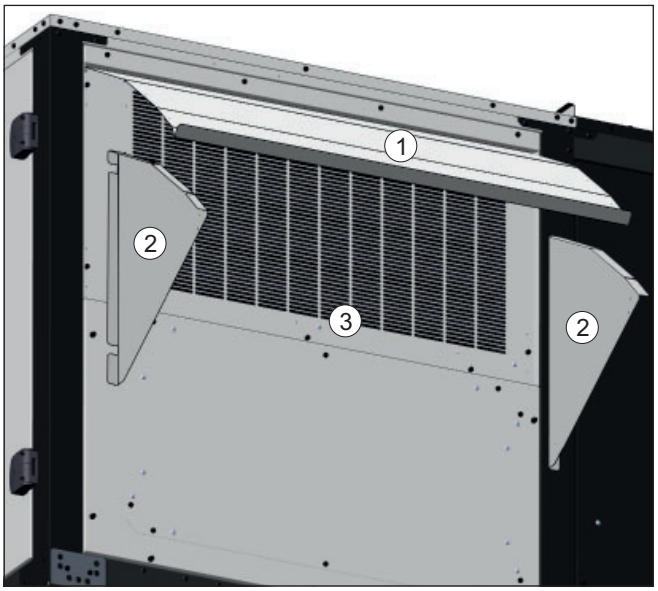
Depending on the assembly chosen, the fresh air and exhaust air damper hoods are supplied folded down, to be fitted on site by the installer.



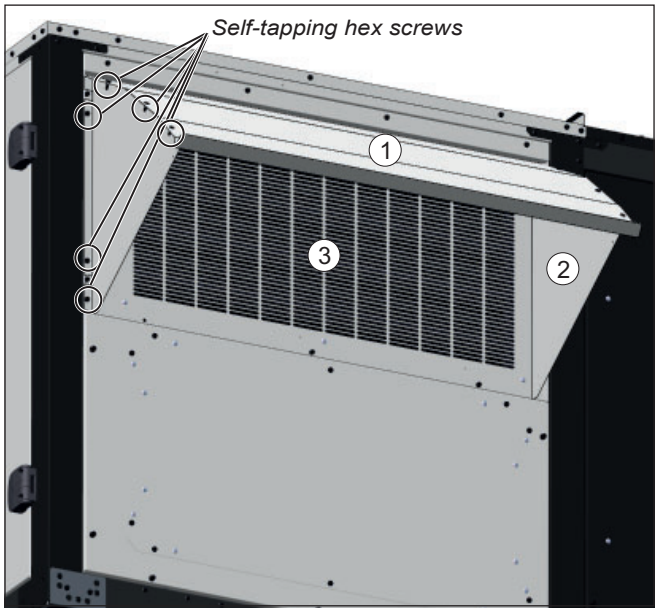
The side parts (2) are supplied screwed to the inside panel (3).



Each part (2) will be screwed to the panel (3) using 3 screws and to the hood (1) using another 3 screws. These screws are 4.8 self-tapping hex screws and are supplied with the unit.



Important: Always check that the union of two panels using self-tapping screws is properly secured. The self-tapping screws must not be unscrewed frequently to prevent any clearance on the threading.



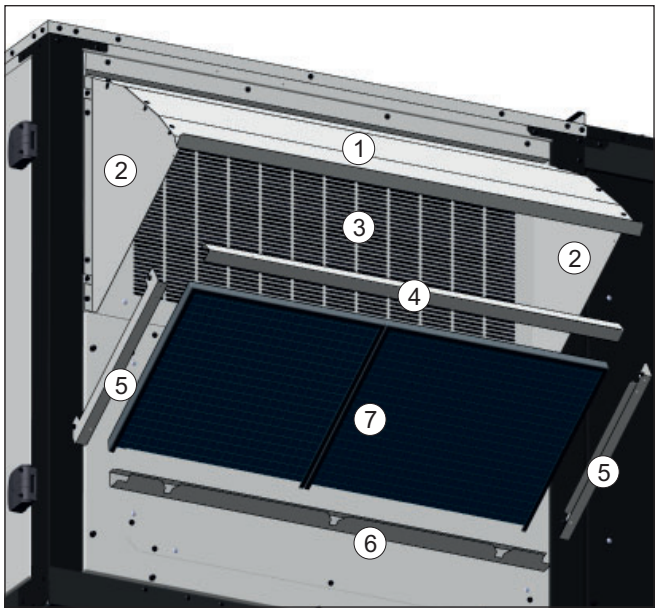
Caution: the detachment of the hood due to wrong implementation of the above steps may cause personal injury and property damage.

12.2 Stop-drop on the fresh air intake

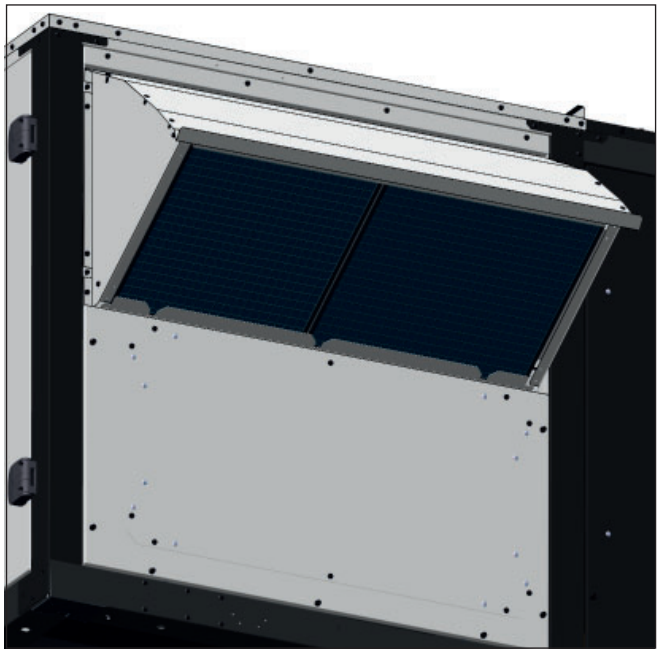
The stop-drop can be installed on the fresh air intake. It is recommended in cases where a high moisture content in the air is foreseen.

The stop-drop (7) is placed after the hood:

- First, the part (4) is placed inside the hood (1), using 4.8 self-tapping hex screws. If the stop-drop has been ordered together with the unit, this part will be installed in the factory.
- Next, the side profiles (5) are fitted onto the side parts of the hood (2), each with 2 of the 4.8 self-drilling hex screws.
- Finally, the profile (6) is fitted onto the panel (3). To do this, unscrew the lower screws on the panel (M6 Allen) and screw them back on, attaching the profile.



The following image shows the stop-drop placed:



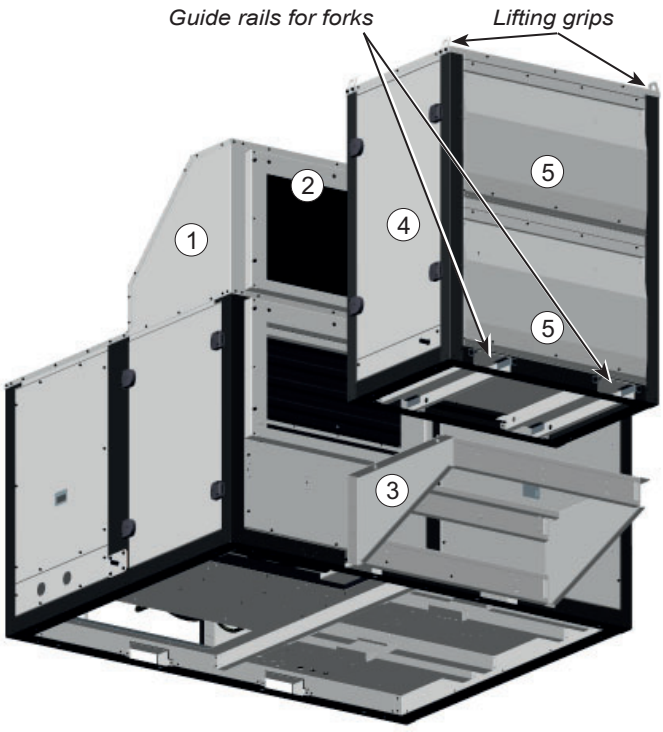
All the screws required for this assembly are supplied in a bag.

12.3 Passive recovery (CW assembly)

Transport and handling

The module with the rotary heat exchanger and its support bed are supplied disassembled with the unit, for installation on site.

- The module can be handled safely by using a forklift truck. The base frame features guide rails to accommodate the forks of the fork-lift truck. These guide rails avoid any slippage.
- For transport and lifting up to the roof using a crane, a rocker arm as well as approved slings must be used. These slings are attached on the grips fitted to the cover of the module.



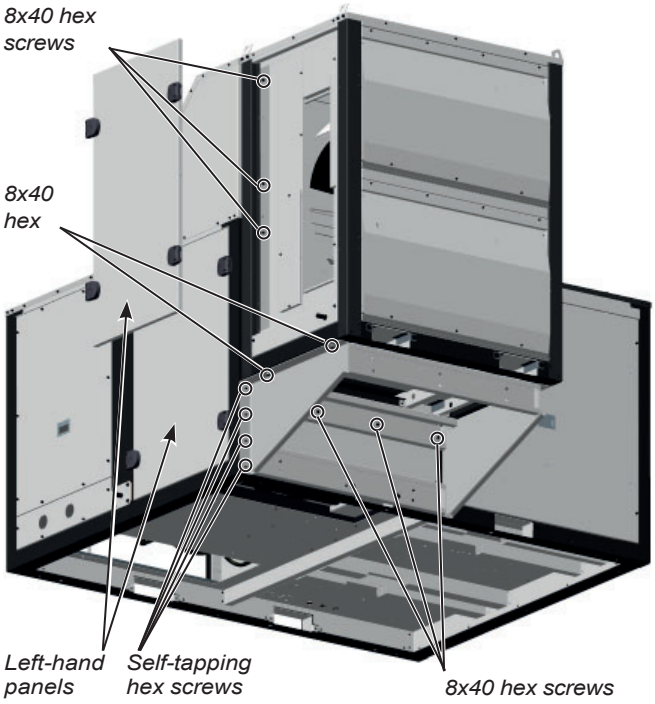
Installation

- The fresh air housing (1) is factory-installed.
- First, the front panel (2) is secured using 8x40 hex screws.
- Then, in models 0420 to 0720 the support bed (3) is fitted. This is fixed to the panel using 4.8 self-tapping hex screws on the sides and 8x40 hex screws on the front. The recovery module is positioned on the support bed but without efforts on it.

  Note: On models 0760 to 1200 there is no such support bed.
- Next, the module is coupled to the unit. Do not remove the fork-lift truck until the module is not secured to the unit.
- The module is secured to the unit using 8x40 hex screws. To do this, the side panels must be removed from the module. The right-hand panel (front view) is secured using M6 Allen screws, while the left-hand panel (4) incorporates dual locks.

  Note: Check that the locks are not blocked. Open the locks with a 4 mm Allen key (anticlockwise).
- In models 0420 to 0720, the module is screwed to rest on the support bed using 8x40 hex screws on both sides.
- Finally, raise the hoods (5) and secure the side parts. Follow the steps detailed in the preceding paragraph.

Note: All the screws required for this assembly are supplied secured on the module and the support bed.

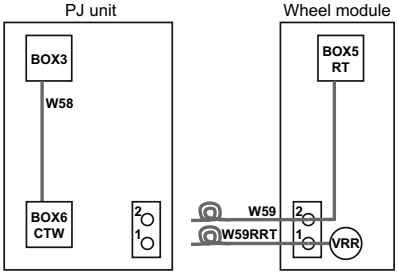


Electrical connection to be made by the costumer:

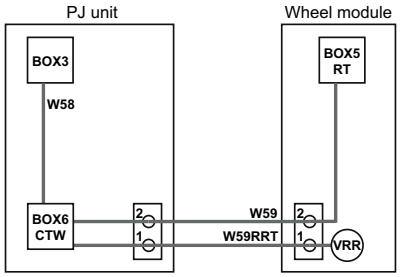
Note: see the wiring diagram included with the unit for a more detailed information about the wiring.

The connection is done trought the left-hand panels (front view).

Initial location of the cables for connection:



Connection to be made by the customer:

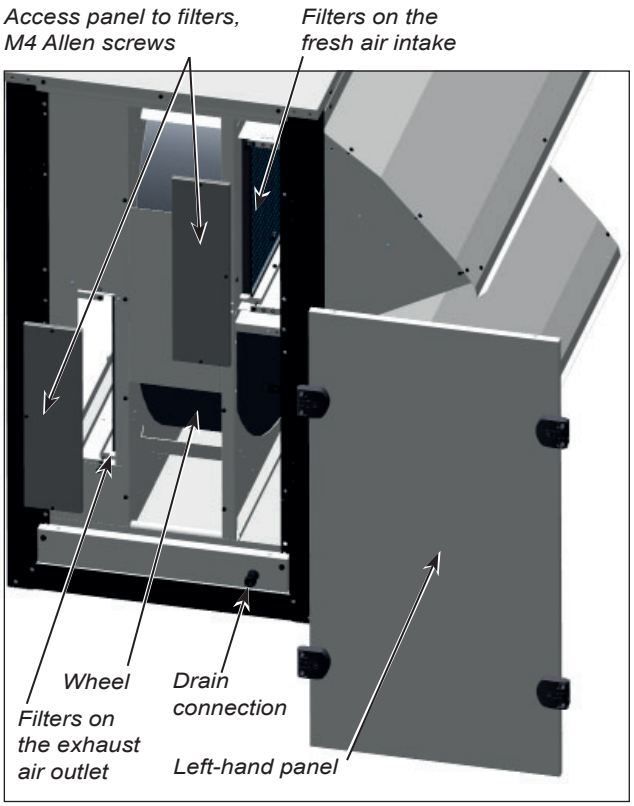


Access to the inside of the recovery module

- The inside of the heat recovery unit module is accessed via the left-hand panel (front view), for maintenance tasks concerning the filters and the condensate pan (3/4" M gas threaded plastic drain connection). This panel features dual locks. Check that the locks are not blocked. Open the locks with a 4 mm Allen key (in an anticlockwise direction).

  The access panels to the filters are secured using M4 Allen screws.

  Note: The general procedure for removing and cleaning the filters is described in chapter "Maintenance".



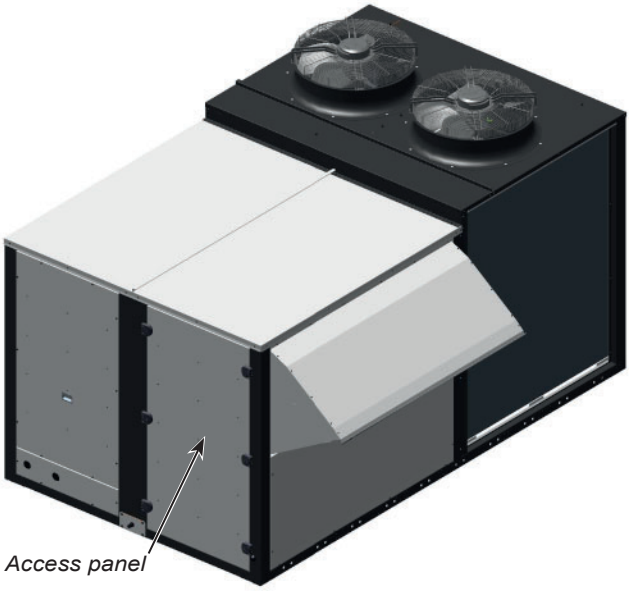
- The wheel motor can be accessed via the right-hand panel (front view). This panel is secured using M6 Allen screws.

12.4 Air filters

- These units include G4 gravimetric filters standard type, which can be replaced by:
  - Gravimetric filters G4 with low pressure drop.
  - Gravimetric filters G4 standard type + folded opacimetric filters F7.
  - Gravimetric filters G4 with low pressure drop + folded opacimetric filters F7.
  - Dual-stage of folded opacimetric filters: M6+F7 or F7+F9.

- The access panel to the filters incorporates dual locks, they can function as hinges or can be used to remove the panel.

  Note: Check that the locks are not blocked. Open them with a 4 mm Allen wrench (in an anti-clockwise direction).



- The thickness of the frames is 25 mm for the G4 standard type and 50 mm for the G4 low pressure drop and all opacimetric filters.

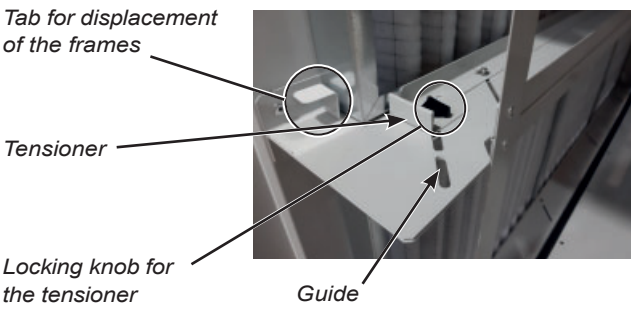
  Filters supplied from the factory can be replaced on site by other types of filters with different thickness.

  The filter holder structure supports the following filter combinations: 25 mm, 25 mm + 50 mm, 50 mm + 50 mm.

  The filter holder structure incorporates a tensioner that can be moved along a guide to adjust the width according to the chosen combination. With the help of a locking knob, the position of the frames is locked after placement.

  To extract the frames from each row, simply slide the tab.

  Note: the filters cleaning procedure is explained in the chapter of "Maintenance".



12.5 Heat recovery coil

This option is compatible with C0, CS, CQ and CT assemblies.

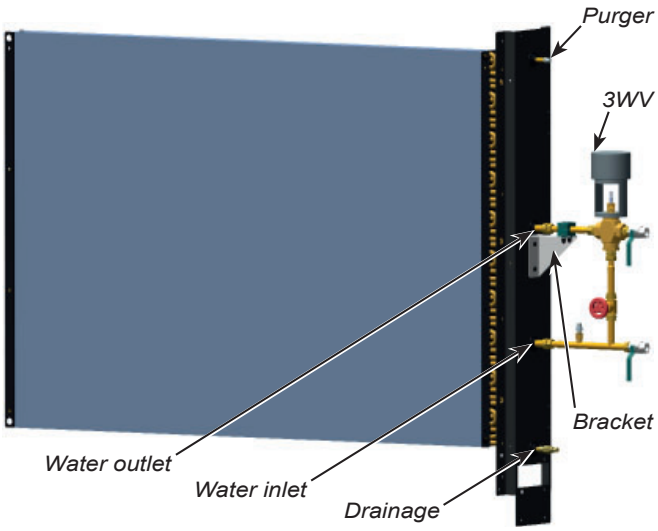
- The heat recovery coil (HRC) is placed between the main indoor coil and the air filters. The function of the heat recovery coil is to pre-heat the air that will pass through the main indoor coil. For this, it uses the temperature of an outdoor water installation.

  It is recommended to install an external thermostat that cuts off the water supply in cases where the water temperature may be lower than the required value for heating.

- The coil is supplied with a 3-way valve kit (3WV) for installation on-site, outside the unit.

  Parts of this kit are shipped separate for installation by the installer: threaded pipe sections, purger, 3-way valve and actuator, ball valves, gate valve, bracket and clamp.

  First, it is advisable to place the bracket of the kit, using 2 of 4.8 self-tapping hex screws.

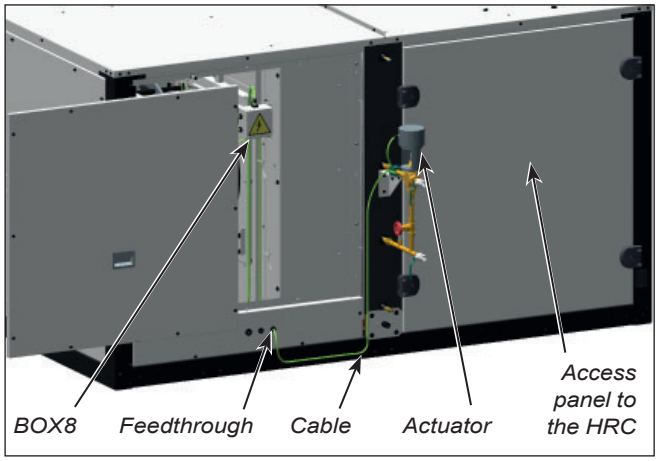


It is recommended to insulate all piping located on the outside of the unit.

- The unit's electronic control manages both the heat recovery coil and the 3-way valve.

  The cable with the wires for the electrical connection of the actuator is connected in BOX8.

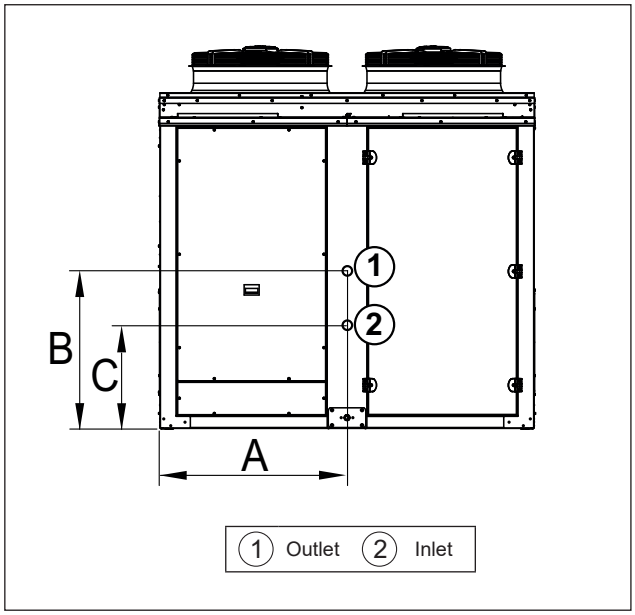
  The installer must feed the W143 cable through the M16 feedthrough located in the bottom panel of the PJ unit, and next, connect the valve actuator.



W143 (BOX8)		Actuator
40	→	COM
41	→	24V
42	→	Y1

Note: see the wiring diagram included with the unit for a more detailed information about the wiring.

- The inlet/outlet connections of the coil are located on a side pillar of the unit. The position is shown in the following diagram.



Dimensions (mm)	A	B	C	Ø I/O
0420 to 1200	1.122	777	427	1"

- Coil filling:
  - The coil filling must be made with the purger 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 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.
- To prevent the water from freezing, with this option the unit always has an anti-freezing thermostat. Add glycol to the water if necessary.
- The direction of the water flow must be correct and so the following indications must be observed:

Note: the heat recovery coil is not compatible with the hot water coil or the gas burner.

12.6 Electrical heaters

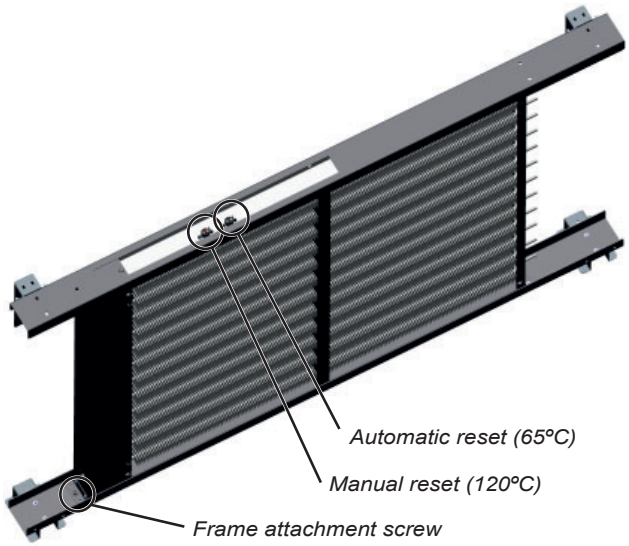
- The auxiliary electrical heaters are ready for operation in two power stages. This heaters are managed by the electronic control of the unit that can activate them in the following cases:
  - As a backup in HEATING mode, following the input of all the available compressors.
  - In HEATING mode, instead of compressors.
  - During the defrosting operation if selected as support.
  - As a backup in COOLING mode in accordance with the return and supply temperatures.
- Up to 3 values of total power available for each model:

IPJ	E0L (Low)	E0N (Nominal)	E0H (High)
0420 to 0500	27 kW	36 kW	54 kW
0560 to 0720	36 kW	54 kW	72 kW
0760 to 0960	45 kW	72 kW	90 kW
1050 to 1200	54 kW	72 kW	108 kW

- The electrical heaters are assembled and connected inside the unit. They can be accessed by the same panel that the supply fan.

  These heaters are accessed by removing the panels (1) and (2), and then the inside panel (3), all of them fixed with M6 Allen screws.

- To remove the frame with the electrical heaters it is necessary to disconnect the safety thermistors from the connection box and unscrew the frame attachment screw (M4 Allen).
- The electrical heaters incorporate safety thermistors for protection of the unit against excess temperature. One of them has automatic reset and tare value at 65ºC, the other one has manual reset and tare value at 120ºC.

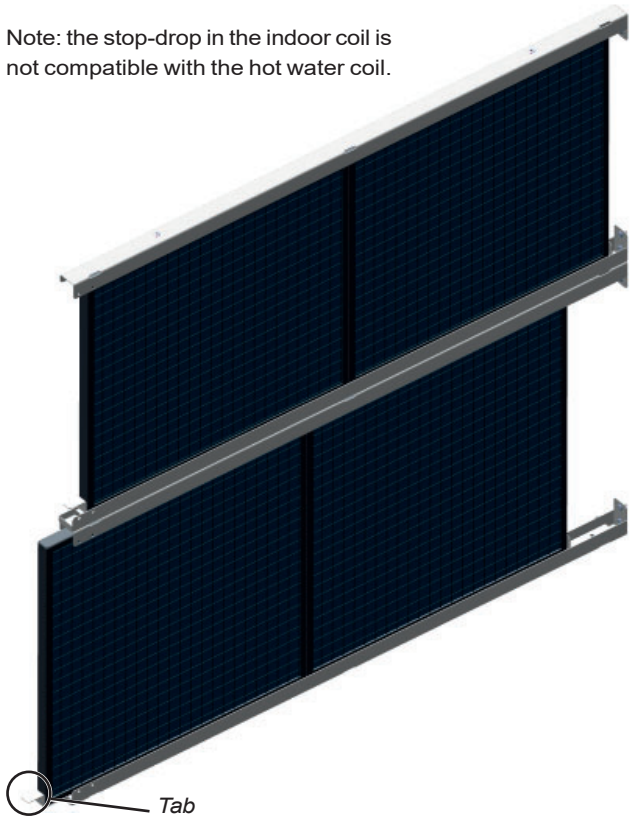


12.7 Stop-drop in the indoor coil

- The stop-drop can be installed in the indoor coil. It's recommended in cases where a high moisture content in the air is foreseen or when the air flow is high.
- The stop-drop is accessed by that same panels of electrical heaters, since it is placed between the indoor coil and the electrical heaters (see previous image).

  It's accessed by removing the panels (1) and (2), and then the inside panel (3).
- The stop-drop frames are easily removable. They can be moved by rail by lifting the tab.

Note: the stop-drop in the indoor coil is not compatible with the hot water coil.



12.8 Hot water coil

- Hot water coil with a three-way valve managed by the electronic control of the unit. The water coil could be activated in the following cases:
  - As a backup in HEATING mode, following the input of all the available compressors (by default) or as first control stage.
  - As a backup in HEATING mode in accordance with the supply temperature.
  - During the defrosting operation if selected as backup.
  - With the unit running or shut down if an anti-freeze alarm is triggered.
  - With the unit stopped when the outdoor temperature drops below 4ºC. In this case the circulation pump of the water circuit is connected.
  - As a backup in COOLING mode in accordance with the return and the outlet temperatures.

  Note: the hot water coil is not compatible with the stop-drop in the indoor coil or the heat recovery coil.

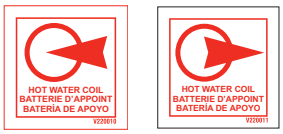
- This option always incorporates an anti-freeze thermostat as safety system. This thermostat is accessed via the same panel used for the electrical heaters, if necessary to reset the safety. Consult the images on the previous paragraph.
  - Great Cold option **(upon request)**: with additional anti-freeze technology based on the water temperature. This protection is made up of a circulation pump as well as two probes inserted in the input and the output of the coil.

    Important: this option is mandatory for an outdoor temperature lower than -20ºC WB. Consult for percentages of glycol water above 20%.

- The pump of the water circuit has to be activated whenever the 3-way valve is switched on. It is the installer's responsibility to connect the pump to the electronic control, except with the factory-installed GREAT COLD option. Please refer to the wiring diagram provided with the unit.

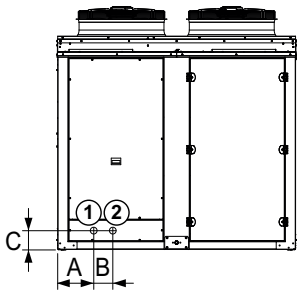
  Operation of the pump with the GREAT COLD option **(upon request**:
  - Antifreeze protection: if the water temperature in the coil drops below 4ºC, the control activates the pump and the 3-way valve opens to 100%. The pump stops when 7°C are reached.
  - Safety of minimum outdoor temperature: if the outdoor temperature drops below 4ºC, the control activates the pump and the 3-way valve opens to maintain, in the water coil, a water outlet temperature of 10ºC in ON operating mode and 15ºC in OFF operating mode.

- 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, except with the GREAT COLD option) 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.
- To prevent the water from freezing, with this option the unit always has an anti-freezing thermostat. Add glycol to the water if necessary.
- The direction of the water flow must be correct and so the following indications must be observed:



- The inlet/outlet connections of the hot water coil are located inside the unit and the connection is made via the side panel.

  The position of the sheet metal precuts on the side panel are shown in the following diagram.

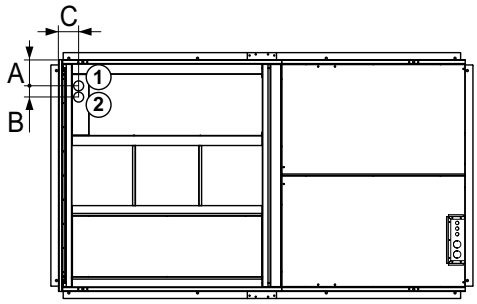


IPJ	Dimensions (mm)			
	A	B	C	Ø
0420 to 1200	322	100	184	2"

① Outlet ② Inlet

These connections can also be made via the base of the unit using flexible piping (for installation with pre-assembly roofcurb).

The position of the sheet metal precuts on the pre-assembly roofcurb are shown in the following diagram.



IPJ	Dimensions (mm)		
	A	B	C
0420 to 1200	333	100	179

① Outlet ② Inlet

Note: With hot water coil (optional), the length of the supply duct is reduced by 153 mm.

12.9 Gas burner

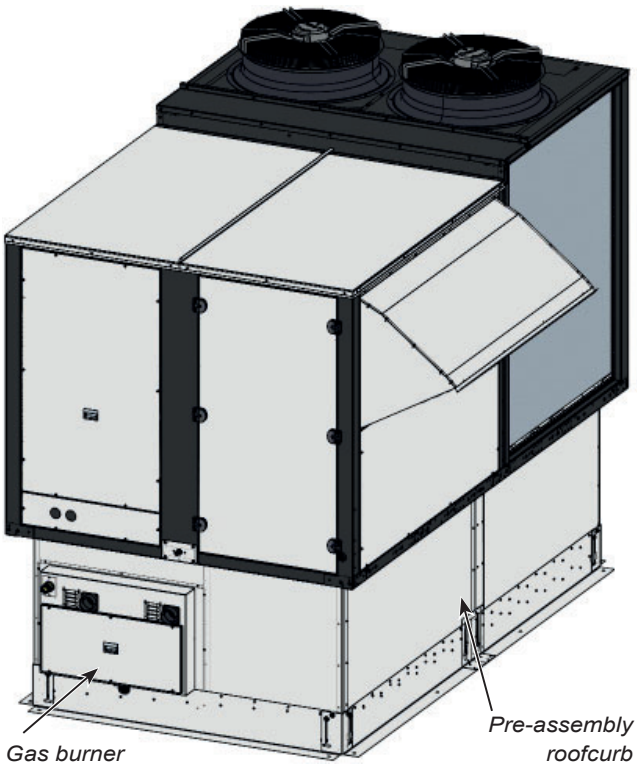
Natural or propane gas burner with modulating actuator, in accordance with the Gas Directive 2009/142/EC, installed inside a pre-assembly roofcurb. The IPJ unit with lower supply will be placed on this roofcurb.

EC certification: 0476CQ0451.

Note: the gas burner is not compatible with the heat recovery coil.

- Two powers available for each model:

IPJ	0420 to 0500	0560 to 0720	0760 to 1200
G0N (Nominal)	PCH080	PCH130	PCH160
G0H (High)	PCH130	PCH160	PCH210



Important: The staff responsible for the installation, operation and maintenance of this burner must always strictly follow the instructions given in this manual, as well as in the manufacturer's (APENGROUP) installation and maintenance brochure for the burners in the PCH series, supplied with the unit.

Characteristics of the gas burner

- Air is heated by contact with the surfaces of the combustion chamber and the heat exchanger pipes.
  - The heat exchanger complies with construction requirements set by EN1196 regulations for equipment where combustion gases produce condensate.
  - The combustion chamber is entirely made of stainless steel whilst surfaces of components where condensation occurs (such as pipe bundle and exhaust hood), are made of AISI 441, in order to provide high resistance to condensation.

    The following table illustrates the types of stainless steels used:

USA-AIS	EN-No	COMPOSITION
AISI 430	1.4016	X6 Cr17
AISI 441	1.4509	X2 CrTiNb 18

  - The burner is entirely made of stainless steel with special mechanical solutions to ensure optimal reliability and performance levels, as well as high thermal and mechanical resistance.
- The PCH heater is a modulating type; the thermal power output and, therefore, the thermal capacity (fuel consumption) vary according to the demand for heat. When the demand for heat from the environment drops, the heater uses less gas, increasing its performance up to 109% (performance on Hi).
- Inherent safety:
  - The performance increase at minimum power is achieved by using a sophisticated air/gas mixing technique and by adjusting at the same time the combustion air and the fuel gas.
  - This technology increase the heater safety as the gas valve supplies the fuel according to the air flow. The CO_2 content, unlike atmospheric burners, remains the same throughout the heater operating range, allowing it to increase its performance when the thermal power drops.
  - If there is no combustion air, the valve will not supply gas; if the combustion air flow drops, the valve will automatically reduce the gas flow yet will keep its combustion parameters at optimal levels.
- Lowest polluting emissions. The premixed burner, in combination with the air/gas valve, ensures a "clean" combustion by emitting a very low level of pollutants. Low NOx emissions < 70 mg/kWh HCV (class 5, according to standard EN 297).

  Note: Burners must not exceed NOx:70mg/kWh HCV emission values from January 1st, 2021 (according to European Regulations 2016/2281).
- The control located inside the burner housing allows the service centre to check and view the working phases and identify any faults that may have occurred.
- The electronic control of the unit will only manage the burner connection as heating support depending on the ambient conditions.

Note: the main technical characteristics of the burner can be found in the technical brochure.

Safety instructions

Safety instructions to be followed by the staff responsible for work with this burner are described below.

- **General cautions**

  This burner module must be used only for the applications it was designed for. Any other wrong or unreasonable use must be regarded as improper and therefore hazardous.

  During the installation, operation and maintenance of the burner described in this manual, the use must always strictly follow the instructions given in all the chapters of this operating and maintenance manual.

  The condensing warm air heater must be installed in compliance with current regulations, according the manufacturer's instructions and by qualified staff, technically specialised in the heating field.

  When first switched on, conversion between different types of gas and maintenance operations must be carried out only by staff provided by Service Centres authorised by current and older regulations. For more information, please contact us.

  The warranty conditions are specified on the warranty certificate supplied with this burner module.

The manufacturer declares that the unit has been manufactured in compliance with UNI, UNI-CIG, CEI technical standards and with all relevant legislation, as well as with the 90/396/EEC gas directive and the later 2009/142/EC Directive.

Attention: In compliance with the requirements of the Gas Directive 90/396 EEC it is strictly prohibited to alter the burner or the electronic control unit.

- **Fuel**

Before starting up the heater, make sure that:

- the gas mains supply data is compatible with the data stated on the nameplate;
- the combustion air intake ducts (when fitted) and the fume exhaust pipes are those specified by the manufacturer;
- the combustion air is supplied in such a way as to avoid even partial obstructions of the intake grille (caused by leaves etc.);
- the fuel intake internal and external seal is checked during the testing stage, as required by applicable standards;
- the burner is supplied with the same type of fuel it has been designed for;
- the system is correctly sized for such flow rate and is fitted with all safety and monitoring devices required by applicable standards;
- the inside of the gas pipes and air distribution ducts for ducted heaters has been thoroughly cleaned;
- the fuel flow rate is suitable for suitable for the power required by the burner;
- the fuel supply pressure is between the range specified on the nameplate.

If the burner is not going to be used over a prolonged period the gas supply valve must be closed.

- **Gas leaks**

If there is gas smell:

- do not operate electrical switches, telephones or any other object or device that could produce sparks;
- immediately open doors and windows to create an air flow to vent the gas out of the room;
- close the gas valves;
- call for **qualified staff**.

Supplying the gas circuit with pressure higher than 60 mbar is strictly prohibited. Such pressures could cause the valve to break.

- **Operation**

Do not allow children or inexperienced people to use any electrically powered equipment.

The following instructions must be followed:

- do not touch the equipment with wet or damp parts of your body and/or with bare feet;
- do not leave the equipment exposed to the elements (rain, sun etc....) unless it is adequately protected;
- do not use the gas pipes to earth electrical equipment;
- do not touch the hot parts of the heater, such as the fume exhaust duct;
- do not wet the heater with water or other fluids;
- do not place any object over the burner;
- do not touch the moving parts of the burner.

- **Maintenance**

Maintenance operations and combustion inspections must be carried out in compliance with current standards.

Before carrying out any cleaning and maintenance operations, isolate the heater from the mains power supply from the switch located on the electrical system and/or on the shut-out devices.

If the heater is faulty and/or incorrectly operating, switch it off and do not attempt to repair it yourself, but contact our local Technical Service.

All repairs must be carried out by using genuine spare parts.

Failure to comply with the above instructions could compromise the safety of the equipment and invalidate the warranty.

If the equipment is not used for long periods, shut the gas supply off through the gas stopcock and disconnect it from the power supply.

If the heater is to be put out of service, in addition to the above operations, potential sources of hazard on the unit must be removed.

It is strictly forbidden to obstruct the Venturi pipe inlet, located on the burner-fan unit, with your hands or with any other objects.

Any obstruction could cause a backfire from the premixed burner.

General recommendations

- **Location**

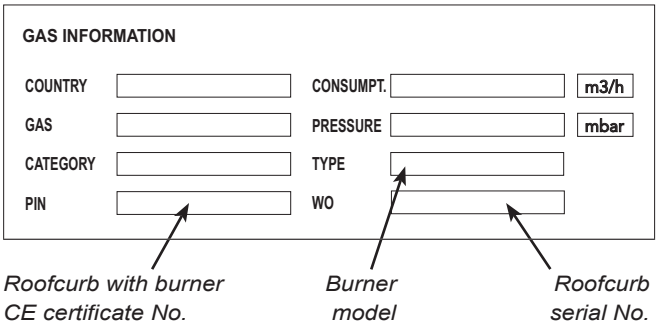
These roofcurb with integrated burner are designed to be coupled with an PJ unit (roof-top installation). Make sure they are not fitted near areas where there is a risk of fire (flammable dust) or explosion, or in areas where aggressive products are kept, e.g. trichloroethylene, perchloric acid, etc.

- **Delivery of the roofcurb with gas burner**

Check the condition of the equipment 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.

- **Burner identification**

The roofcurb with the burner includes a name plate featuring the main gas characteristics as well as the roofcurb serial number.



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

Transport and installation

Follow the recommendations given in section 7.4 which details how to handle and fit the adjustable roffcurb, and how to fit the IPJ unit onto this roffcurb.

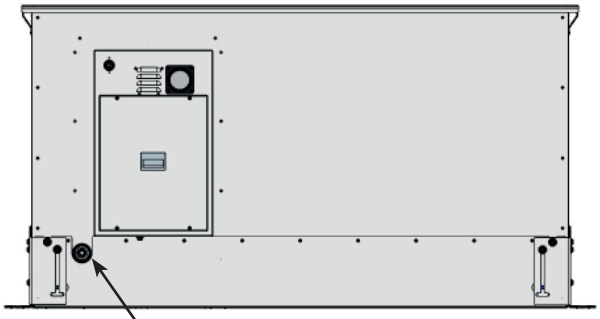
Connection of the burner condensate drain

These units are equipped with a junction for draining the burner condensates drain pan. Threaded connector 1/2" M in PVC.

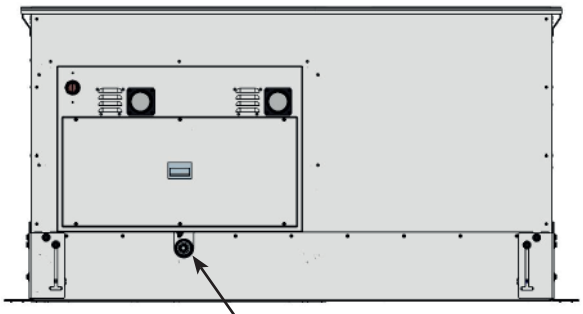
To facilitate drainage, the structure of the group of generator pipes slopes slightly towards the discharge.

If the unit is going to be installed outdoors in a location where there are never low temperatures, the drain junction does not have to be connected to any pipe. It must simply be ensured that the water does not stagnate.

If the condensates are going to be discharged into a pipe do not seal it directly at the condensate outlet. If the water were to freeze in the pipe this could block the discharge of condensates and cause the water to accumulate inside the exchanger.



Condensate drain in PCH080

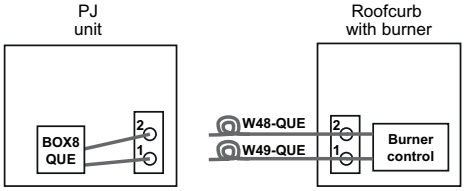


Condensate drain in PCH130, PCH160 and PCH210

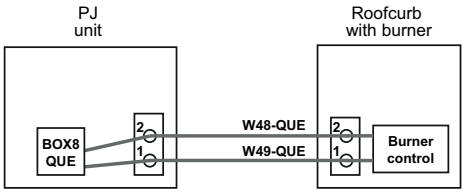
Electrical connection of the burner

It is necessary to communicate the burner control with the electrical cabinet of the PJ unit. The costumer must connect the cables coming from the burner to the connection box "BOX8-QUE" that is located inside of the PJ unit. This box is accessed via the same panel that the supply fans.

Initial location of the cables for connection:

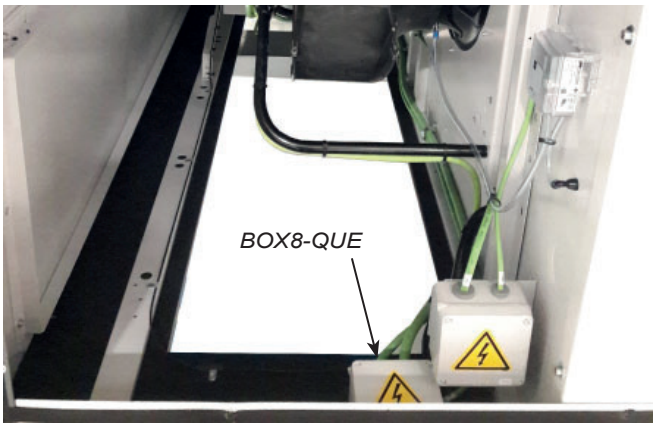


Connection to be made by the customer:



Note: see the wiring diagram included with the unit for a more detailed information about the wiring.

The following image shows the location of the connection box "BOX8-QUE".



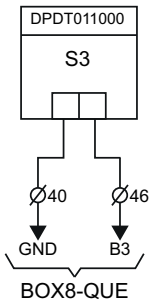
Connection of the outlet probe

The connection of the outlet temperature probes must be performed on-site. This probe is supplied inside the electrical cabinet of the PJ unit.

Make the electrical connection of the probe (S3) to the connection box "BOX8-QUE" that is located inside of the PJ unit, using 2 x 1mm² section cable.

Note: this cable is **not** supplied with the probe.

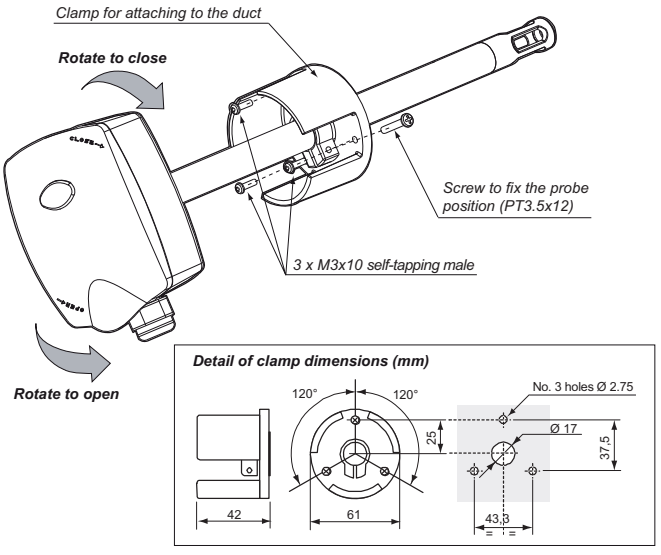
Please refer to the wiring diagram and the Vectic electronic control brochure, included with the unit.



For the electrical connections, remove the top cover of the sensor. Remove the cover by rotating it anticlockwise.

In order to guarantee the correct measurement of the outlet air temperature this probe will be positioned at 1.5 metres as a minimum from the outlet mouth at the bottom of the duct and as near to the middle as possible inside this duct. The probe is connected to the air duct using the special fastening bracket.

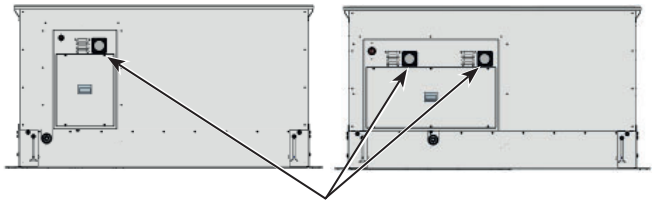
- Fasten the bracket to the air duct;
- Insert the rod on the bracket to the required depth;
- Tighten the screw on the bracket to fasten.



Connections at the flue

Important: The flue of the gas burner is not supplied with the unit. Its design and installation is the responsibility of the installer and must comply with all the directives and regulations in force in the installation location.

PCH080 **PCH130, PCH160 & PCH210**



Fumes exhaust: internal ∅ 80mm

This PCH burner module is fitted with a watertight combustion circuit and with the burner fan located upstream of the heat exchanger.

Connection to the flue, according to how the heater is installed, can be made as “C” type, with combustion air being drawn from outside, or as “B” type with combustion air being drawn from the heater installation site.

If the heater is installed outdoor, a “B” type installation is also a “C” type.

More specifically, the heater is certified for the following exhausts: B23P-C13-C33-C43-C53-C63; for more information on the flue types, please refer to current regulations.

To fit the fume exhausts, certified pipes and terminals must be used, taking into account that the modules are of a condensing type; the following material must be used:

- aluminium with a thickness of at least 1.5 mm;
- stainless steel with a thickness of at least 0.6 mm; the steel must have a carbon content of at least 0,2 %.

Use sealed pipe to prevent condensation from leaking from the pipes; the seal must be adequate to withstand a fume temperature ranging between 25°C and 120°C.

The flue does not need to be insulated to prevent the build-up of water in the pipes, as this does is not detrimental to the heater, which is fitted with a water trap. Insulate the pipe if required to protect the flue from accidental contact.

For the air intake, use:

- aluminium with a thickness of at least 1.0 mm;
- stainless steel with a thickness of at least 0.4 mm;

Important: The horizontal sections of flue, which make up the fume exhaust, must be installed with a slightly incline (1°- 3°) towards the heater, in order to prevent the build of condensation in the exhaust.

Common exhausts (PCH130, PCH160 and PCH210)

Where possible, it is always preferable to use independent exhausts; PCH module exhausts are pressurised, therefore in this way it is possible to prevent incorrect sizing from causing a system malfunction.

When common exhausts are fitted, they must be designed by providing some anti-reflux valves at the outlet of each flue, before the connection with the common flue, preventing a module from discharging it own combustion gases inside another module.

Terminal configuration

- **Type B23P**

  Open combustion circuit: the gases produced by the combustion are discharged outside, on a wall or on the roof, and the combustion air is directly drawn from the site where the equipment is installed.

  In this case, the standards UNI-CIG 7129 and UNI-CIG 7131 require the provision of suitable vents on the walls.

  Note: It is compulsory to fit an IP20 safety mesh to prevent solids with a diameter higher than 12mm from entering the combustion air intake; at the same time, the mesh opening must not be lager than 8mm.

- **Type C13**

  Sealed combustion circuit (type “C”) connected to a horizontal terminal on the wall by means of its own ducting.

- **Type C33**

  Sealed combustion circuit (type “C”) connected to a vertically installed terminal (on the roof) by means of its own ducting.

- **Type C53**

  Sealed combustion circuit (type “C”) connected by means of its own ducting split in two terminals which could end up in areas with different pressure (such as a ducting connected to the roof and a second one connected to the wall).

- **Type C63**

  Sealed combustion circuit (type “C”) connected to an approved and separately sold combustion air supply and combustion products exhaust system.

Selection Guide

If the terminal is not directly connected to the heater and, therefore, extra routing is required, according to the length of the ducting, the diameter of the selected terminals, extensions and bends must be checked.

After establishing the routing, the pressure drop must be calculated for each component; each component has a different pressure drop value as the glue gases flow rate is different.

The pressure drops of each component identified must be added, checking that the result is no higher than the value available for the PCH heater module used; if a combustion air supply pipe is fitted, the pressure losses must be added to the fume exhaust pressure drop.

If the sum of pressure drops caused by the fittings are higher than the pressure available at the exhaust, ducting with higher diameter must be used, rechecking the calculation; a pressure drop higher than the pressure available at the fume exhaust reduces the heater module thermal output.

If the duct routing requires the use of bends, the length required must be subtracted from the available length:

- Ø 80 wide radius bend at 90° EqL = 2.1m
- Ø 80 wide radius bend at 45° EqL = 1.1m
- Ø 100 wide radius bend at 90° EqL = 3.5m
- Ø 100 wide radius bend at 45° EqL = 1.6m

Pressure drop for terminals and exhaust ducting:

PCH model	080	105	130 (2 x 065)	160 (2 x 080)	210 (2 x 105)
Pressure avail. at the exhaust (Pa)	120	120	120	120	120
Component	*Pressure drop (Pa)*				
Ø 80 pipe (1 metre)	7,3	11,0	4,6	7,3	11,0
Ø 100 pipe (1 metre)	2,2	3,5	1,3	2,2	3,5
Ø 80 wide radius bend at 90°	15,0	22,2	9,5	15,0	22,2
Ø 100 wide radius bend at 90°	8,2	12,0	5,1	8,2	12,0
Ø 80 wide radius bend at 45°	7,3	11,0	4,6	7,3	11,0
Ø 100 wide radius bend at 45°	3,5	5,5	2,2	3,5	5,5
Ø 80 - 100 adaptor	1,8	2,7	1,2	1,8	2,7
Ø 80 hooded terminal	16,0	20,0	14,0	16,0	20,0
Ø 100 hooded terminal	12,0	15,0	10,5	12,0	15,0

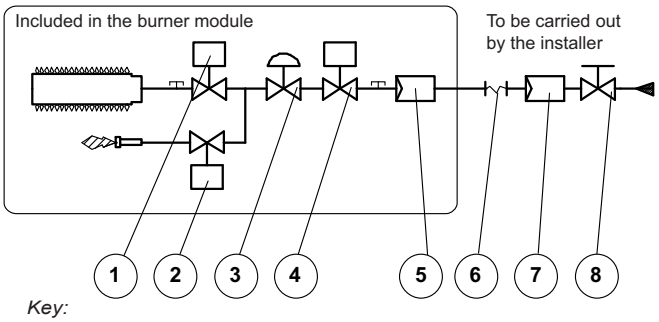
Gas connection

Use the gas line connections only with EC certified components.

The PCH module is supplied complete with a dual gas valve, gas stabiliser and filter. All components are fitted inside the burner housing.

To complete the installation, as required by current standards, an anti-vibration joint and a gas valve must be fitted.

Note: A EN216 certified gas filter with filtration level lower or equal to 50 micron must be used, with no pressure stabiliser, a wide range gas filter must be used since the filter supplied as standard, upstream of the gas valve, has a limited area.



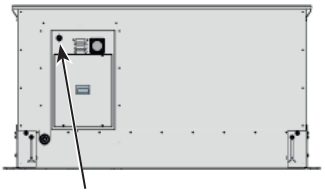
Key:

1. Main burner gas solenoid valve
2. Pilot burner gas solenoid valve
3. Pressure stabiliser:
4. Safety gas solenoid valve
5. Gas filter (small section)
6. Anti-vibration joint
7. Gas filter (large section)
8. Gas valve

Important: For a correct maintenance, connect the PCH module by means of a seal and swivel gasket. Avoid using threaded connected directly on the gas connection.

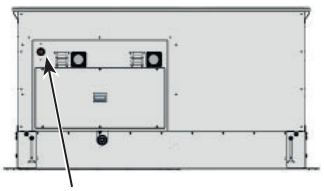
During the installation, tighten the external gas supply pipe but without exceeding the tightening torque of 200 Nm (PCH080) or 300Nm (PCH130, PCH160 and PCH210).

PCH080



Gas supply: Ø 3/4"

PCH130, PCH160 & PCH210



Gas supply: Ø 1 1/2'

Important: It is strictly prohibited to supply gas to the circuit with pressure higher than 60 mbar. Such pressures could cause the valve to break.

If pressure are higher than 60 mbar, a pressure reducer must be installed at least 10 m away and no pressure stabiliser must be fitted between the pressure reducer and the heater, but leaving the gas filter.

If the burner is not going to be used over a prolonged period the gas supply valve must be closed.

Gas type	Gas settings		PCH080		PCH130 (2 x PCH65)		PCH160 (2 x PCH80)		PCH210 (2 x PCH105)	
			Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
G20 Cat. E-H	Air supply pressure	mbar	20 [min 17-max 25]							
	Ø pilot nozzle	mm	0,7							
	Gas consumption (15°C-1013mbar)	m3/h	1,74	8,68	2 x 1,31	2 x 6,88	2 x 1,74	2 x 8,68	2 x 2,22	2 x 10,58
	Carbon dioxide - CO_2 content	%	8,7	9,1	8,7	9,1	8,7	9,1	8,5	9,1
	Fumes temperature	ºC	26,5	70	31	86	26,5	70	28	80
	Fume mass flow rate (max.)	kg/h	135		2 x 107		2 x 135		2 x 165	
	Gas butterfly valve	mm	12,2		11,0		12,2		15,8	
G25 Cat. L-LL	Air supply pressure	mbar	25 [min 17-max 30] (20 for Germany)							
	Ø pilot nozzle	mm	0,7 (0,75 for Germany)							
	Gas consumption (15°C-1013mbar)	m3/h	2,02	10,1	2 x 1,53	2 x 8,00	2 x 2,02	2 x 10,1	2 x 2,21	2 x 12,30
	Carbon dioxide - CO_2 content	%	8,6	8,9	8,8	9,2	8,6	8,9	8,8	9,0
	Fumes temperature	ºC	26	70	31	86	26	70	28	80
	Fume mass flow rate (max.)	kg/h	--							
	Gas butterfly valve	mm	Not necessary							
G30 Cat. 3B-P	Air supply pressure	mbar	30 [min 25-max 35] - 50 [min 42,5-max 57,5]							
	Ø pilot nozzle	mm	0,51							
	Gas consumption (15°C-1013mbar)	m3/h	1,49	6,80	2 x 1,03	2 x 5,39	2 x 1,49	2 x 6,80	2 x 1,70	2 x 8,30
	Carbon dioxide - CO_2 content	%	10,1	10,3	10,7	11,3	10,1	10,3	10,4	10,6
	Fumes temperature	ºC	26,5	70	31	86	26,5	70	28	80
	Fume mass flow rate (max.)	kg/h	--							
	Gas butterfly valve	mm	7,0		6,5		7,0		9,3	
G31 Cat. 3P	Air supply pressure	mbar	30 [min 25-max 35] - 37 [min 25-max 45] - 50 [min 42,5-max 57,5]							
	Ø pilot nozzle	mm	0,51							
	Gas consumption (15°C-1013mbar)	m3/h	1,34	6,70	2 x 1,01	2 x 5,31	2 x 1,34	2 x 6,70	2 x 1,47	2 x 8,18
	Carbon dioxide - CO_2 content	%	9,3	9,6	9,4	9,6	9,3	9,6	9,5	9,8
	Fumes temperature	ºC	26,5	70	31	86	26,5	70	28	80
	Fume mass flow rate (max.)	kg/h	107		2 x 84		2 x 107		2 x 130	
	Gas butterfly valve	mm	7,0		6,5		7,0		9,3	

Gas settings data for GAS G25.3 - Cat. K (Netherlands), G25.1 - Cat. S (Hungary), G2.350 - Cat. Ls (Poland) and G27 - Cat. Lw [ex GZ41.5] (Poland) can be found in the manufacturer's installation and maintenance manual (APENGROUP), supplied with the unit.

Country table - gas category:

Country	Category	Gas	Pressure (mbar)	Gas	Pressure (mbar)
Austria, Switzerland	II2H3B/P	G20	20	G30/G31	50
Belgium<70kW	I2E(S)B,I3P	G20/G25	20/25	G31	37
Belgium>70kW	I2E(R)B,I3P	G20/G25	20/25	G31	37
Germany	II2ELL3B/P	G20/G25	20	G30/G31	50
Denmark, Finland, Greece, Sweden, Norway, Italy, Czech Rep., Estonia, Lithuania, Slovenia, Albania, Macedonia, Bulgaria, Romania, Croatia, Turkey, Azerbaijan	II2H3B/P	G20	20	G30/G31	30
Spain, United Kingdom, Ireland, Portugal, Slovakia	II2H3P	G20	20	G31	37
France	II2Esi3P	G20/G25	20/25	G31	37
Luxembourg	II2E3P	G20/G25	20	G31	37/50
Netherlands	II2EK3B/P	G20/G25.3	20/25	G30/G31	30
Hungary	II2HS3B/P	G20/G25.1	25	G30/G31	30
Cyprus, Malta	I3B/P	--	--	G30/G31	30
Latvia	I2H	G20	20		
Iceland	I3P	--	--	G31	37
Poland	II2ELwLs-3B/P	G20/G27/ G2.350 (*)	20/13	G30/G31	37
Russia	II2H3B/P	G20	20	G30/G31	30

(*) Consult the available burners with G2.350.

Conversion of burner gas type

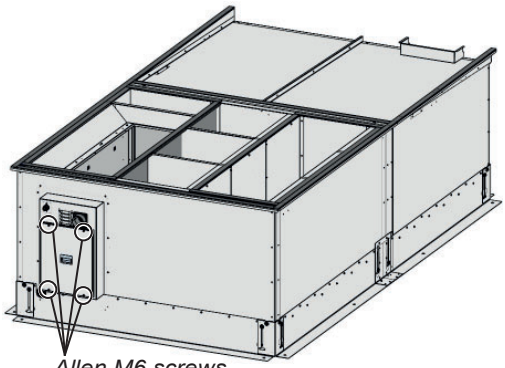
Conversion to LPG

The gas burner is supplied already set for natural gas and with the kit for conversion to LPG, including: calibrated gas orifice plate; pilot nozzle; adhesive plate “Equipment converted...”.

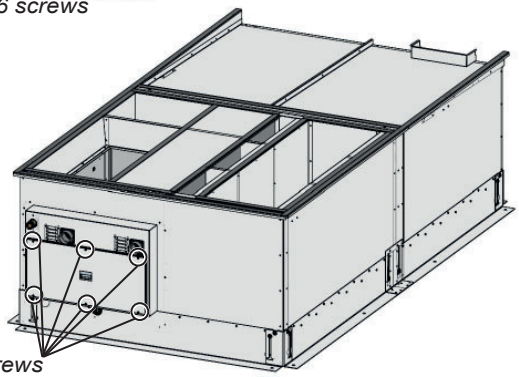
The kit is not supplied in countries where conversion is prohibited.

To convert the unit, follow these instructions:

- disconnect from power supply;
- access the inside of the burner module by removing the 4 Allen M6 screws that secure the front panel;

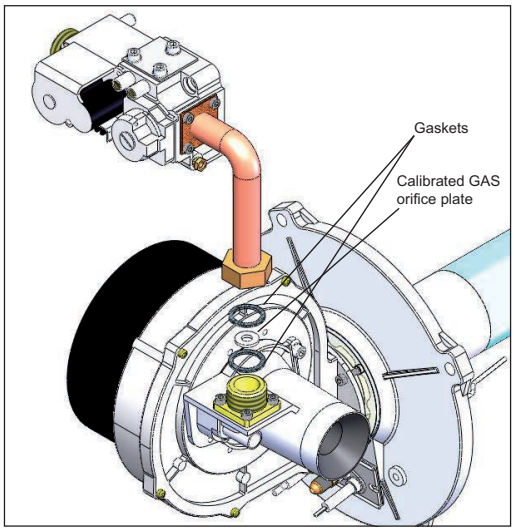


Allen M6 screws



Allen M6 screws

- between the gas pipe and the Venturi, replace the gas orifice plate fitted (natural gas) with the one supplied with the kit (for LPG);
- replace the pilot nozzle (natural gas) with the one in the kit (LPG);
- restore power supply and set the heater up for ignition;
- while the start-up electrode is sparking, make sure there are no gas leaks.



When the burner is lit and working at maximum capacity, verify that:

- the valve intake pressure corresponds to the value required for the type of gas that you are using;
- the combustion analysis procedure is performed as described in paragraph “Analysis of combustion”;
- the level of CO_2 is within the limits indicated for the type of gas being used (tables in Paragraph “GAS connection”). If a different value is detected, change it by turning the adjustment screw: screwing it down decreases the CO_2 level, loosening it increases the level.

  Note: The heater with LPG is set up for G31 gas. If the unit runs on G30 instead, it is necessary to verify and possibly adjust settings for CO_2 as shown in the table in paragraph “Gas connection”.
- that the gas valve Venturi pipe connector does not leak.

After converting and regulating the unit, replace the nameplate indicating “Equipment regulated for natural gas” with the one in the kit that indicates “Equipment converted ...”.

Conversion to gas G25 - G25.1 - G25.3 - G27

Conversion for gasses from G20 to G25 or G25.1 or G25.3 or G27 is allowed only in countries of category II2ELL3B/P [Germany], II2Esi3P [France], II2E3P [Luxembourg] and category II2HS3B/P [Hungary] and category II2ELwLs3B/P [Poland].

For countries in category II2EK3B/P [Netherlands] the unit is supplied already set up and regulated for G20 or G25.3.

Conversion from one type of gas to another can only be performed by authorised service centres.

Note: The conversion kit to G25 , G25.1 and G27 is only supplied on request. The conversion kit to G25 is included in the standard supply for France, Germany and Luxembourg.

Conversion to G25 and/or G25.1, G25.3, G27 where possible, consists in:

- insertion of orifice plate (according to the gas type and the equipment model).

After the conversion, relight the burner and follow the steps explained for the conversion to LPG.

Finally, stick the nameplate “Equipment converted for gas G25....”

Analysis of combustion

Wait until the heater is switched on. Check that the heater is running at maximum power by using one of the two methods below:

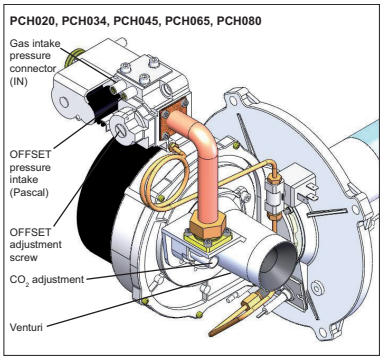
- check that Tin input signal is equal to 10 V;
- from the LCD display, access the REG menu, then use the Hi and Lo controls to force operation at maximum or minimum output (refer to the paragraph “Control of the gas burner”).

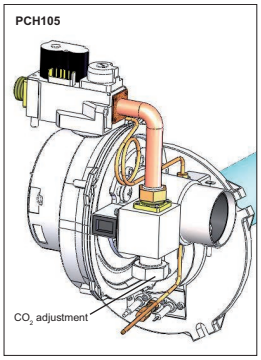
At maximum output, check again that the input pressure in the valve corresponds to the value required; adjust if necessary.

Perform the combustion analysis to verify that the level of CO_2 corresponds to the figures in the table in Paragraph “Gas connection”.

If the measured value is different, turn the adjustment screw on the Venturi pipe. Loosening the screw will increase the CO_2 level, screwing it down will decrease the level.

Set the heater to minimum output, and verify that the level of CO_2 corresponds to the figures in the tables in paragraph “Gas connection”. If the values do not match, screw or loosen the offset screw respectively to increase or decrease the CO_2 level and repeat the procedure.





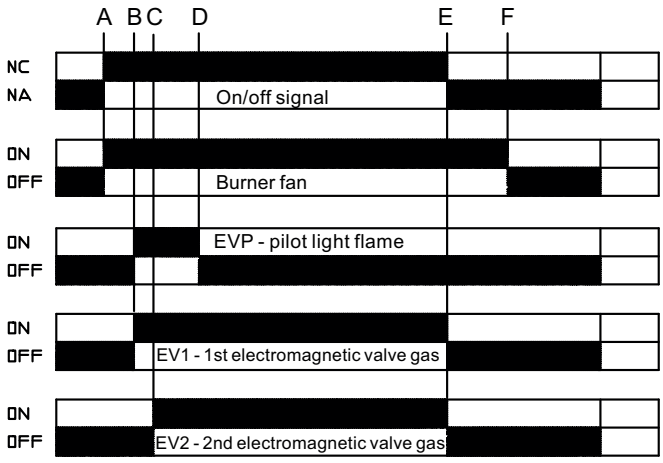
Operating cycle of the burner

- **Burner operation:**

  When the unit demands heat, the modulation PCB will start the operation cycle. It authorises the flame monitoring equipment to start.

  The equipment will immediately start ventilating burner [A] and prewashing the combustion chamber for a preset length of time.

  After the prewash, the ignition phase starts: the equipment opens solenoid EV1 and, in parallel, solenoid EVP which supplies gas to the pilot burner [B].



After detecting the pilot flame, the equipment opens the main gas valve EV2 [C] to supply gas to the main burner.

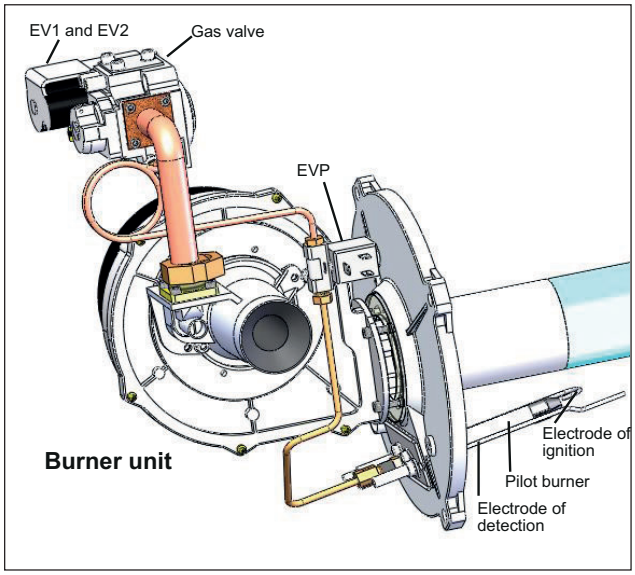
After a time of dual functioning of the two burners (pilot and main), the modulation PCB removes gas from the EVP valve and turns off the pilot burner [D].

A single electrode detects the flame both for the pilot burner and the main burner.

The ignition program lights the burner to obtain an intermediate level heat production capacity, which corresponds to about 30% of the maximum capacity. Once the flame is stabilised for a few seconds at ignition power, the burner begins to modulate its output to reach maximum output, if required, in a variable length of time programmed into the modulation PCB.

During operation, the modulation PCB will regulate the power output of the burner proportionally to the voltage (0-10 Vdc) in the terminals.

If there are multiple power modules, the 0/10 Vdc signal could turn off one or more modules in cascade.



- **Turning off the burner:**

  When the demand for heating ceases, signalled by a voltage lower than the preset limit (0.5 Vdc), the modulation PCB turns off the burner [E]; the fan continues to purge the combustion chamber, post-wash, for a preset length of time [F].

  Opening a contact (see electrical diagram) always causes the burner to stop without causing a fault.

- **Safety thermostats:**

  A safety thermostat with automatic reset and positive safety setting is installed on the heater module. The breaking of the sensitive element corresponds to a safety intervention.

  When the thermostat intervenes, through the flame monitoring equipment, the burner stops and the flame equipment is blocked.

  The block of the flame equipment, caused by the safety thermostat, is signalled on the LCD display of the CPU PCB on the machine with F20. The block is classified as “non-volatile” and requires a manual reset.

  Near the safety thermostat, there is an NTC1 probe set to the value of the ST1 parameter which reduced the burner’s heat output independently from the incoming 0/10 Vdc signal when is reaches the set point. The probe monitors the ratio of heat capacity / cooling air flow. It is not advisable to change the ST1 value.

- **Fxx faults:**

  The modulation PCB can distinguish between 30 different types of faults. This ensures accurate diagnostics. Also, codes and possible causes of faults are listed in this manual.

  For more serious faults that require a manual reset, use the LCD display to reset the CPU PCB on the machine by pressing the arrows at the same time.

- **Air/gas premixing operation:**

  The PCH heater is fitted with a burner that completely premixes air and gas. The air/gas mixing occurs inside the impeller on the motor-fan.

  The air taken into the impeller through the venturi tube, calibrated, creates a vacuum. The vacuum in the venturi is rebalanced by the gas valve, which is pneumatically controlled.

  The air pressure - gas pressure ratio is 1:1. This ratio can be corrected by turning the offset adjustment screw (on the gas valve). The heater is supplied with the offset regulated and the screw sealed.

  A second adjustment can be done with the screw on the venturi, which regulates the value of maximum gas capacity and determines the amount of carbon dioxide (CO_2) in the flue gases.

  This adjustment is also made at the factory. The screw is not sealed to permit conversion to another type of gas, if desired.

  The modulation PCB, mounted on the heater, manages the motor rotation (in c.c.) depending on the heating capacity required by the environment. Varying the rotation speed of the motor changes the air flow capacity and therefore also the gas flow capacity. Minimum and maximum rotation values of the fan are programmed into the PCB and cannot be modified by the user or installer.

Control of the gas burner

Important: All the connections to be established by the client are featured on the wiring diagram included with the unit.

- **Unit electronic control:**

  The Vectic control has a proportional output 0/10V (Y2) where a natural gas or propane gas proportional actuator can be connected.

  The burner connection is managed by the control, in HEATING mode, through an ON/OFF signal of the digital output NO5

  It is possible to select three operating modes for the burner:

  - Operation of the burner as one or two electrical heater stages (both option not compatible).
  - Operation instead of the compressors.
  - Operation instead of the compressors if the outdoor temperature is lower than the value set (5ºC by default).

  When the return temperature drops below the value set for the burner connection the burner will start to operate. The control of the power is carried out in accordance with the temperatures of the supply air and return air. The control compares both temperatures. If the supply temperature is excessively high, the control limits the power supplied by the burner despite the demand. This comparison avoids the stratification of the hot air masses and keeps the supply temperature below the safety value (55ºC by default), which stops the burner.

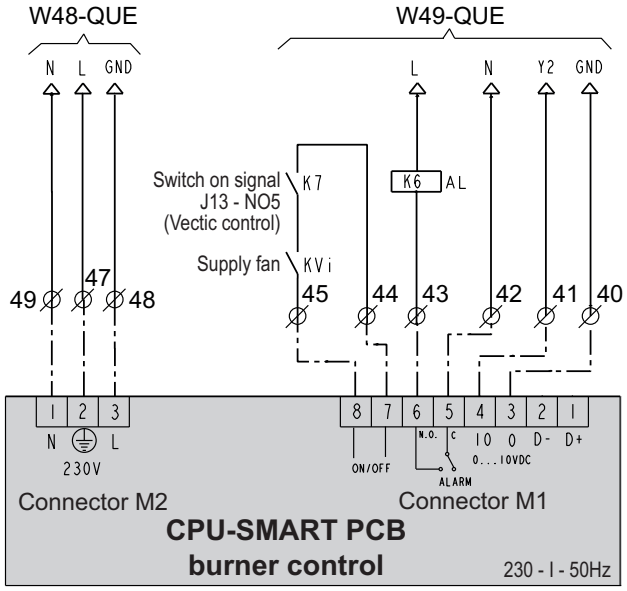
  Moreover, the control compares the supply temperature and the ambient temperature to improve the feeling of thermal comfort.

  The gas burner integrates its own control. The Vectic control only receives a safety signal from the burner in the event of failure (digital input DI5). This signal only indicates the failure.

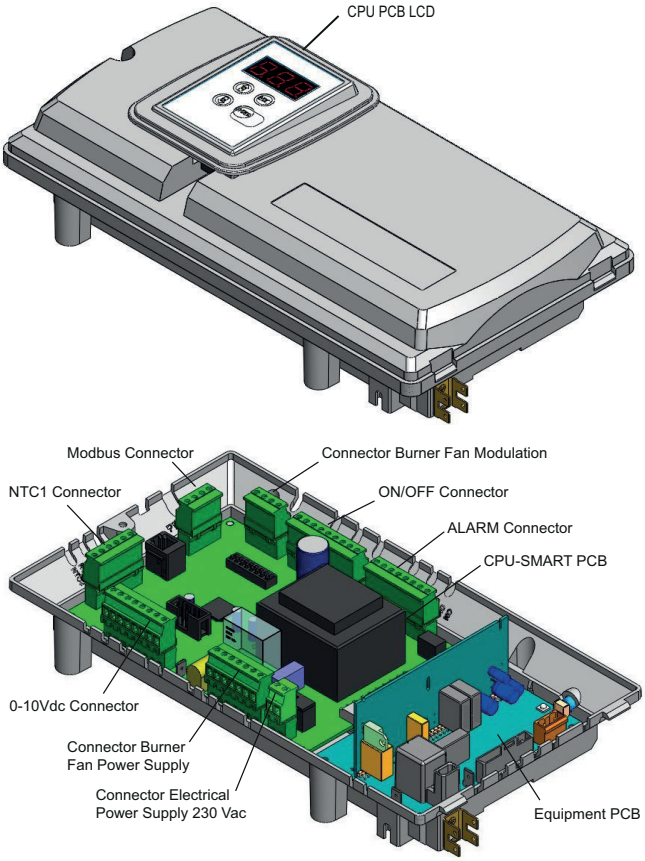
- **Burner control:**

  The gas burner integrates its own CPU-SMART PCB board that manages the operation and the safety devices.

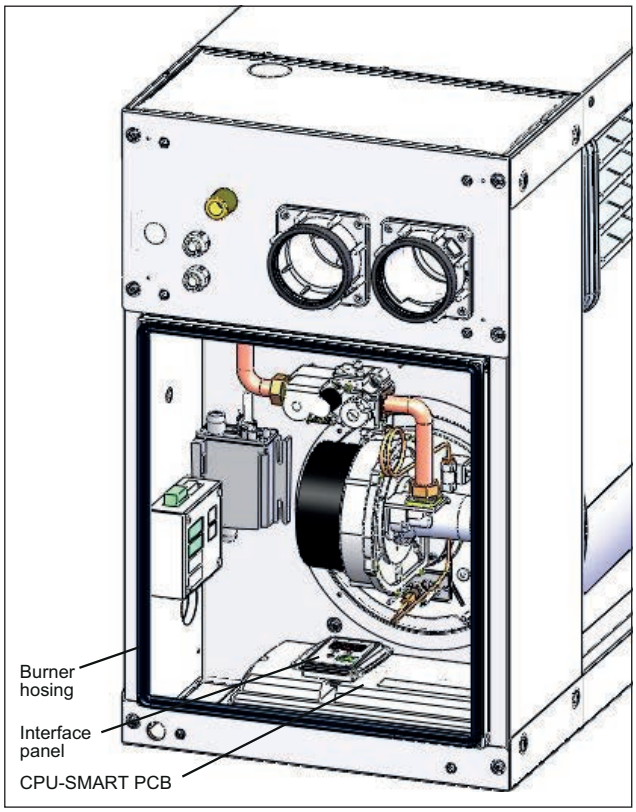
  The cables “W48-QUE” and “W49-QUE” with the wires required for the connection of the CPU-SMART PCB board with the PJ unit must be connected to the connection box “BOX8-QUE” that is located inside of the PJ unit (please consult the paragraph “Electrical connection of the burner”.



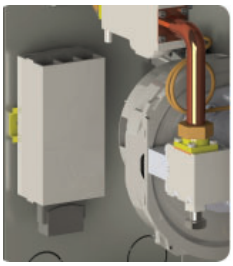
Detail of CPU-SMART PCB board



By removing the access door to the inside of the burner, the CPU-SMART PCB can be seen :



- **Burner protection for low outdoor temperatures (optional):**



With outdoor temperatures below -14ºC WB, a protection kit for low temperature is available. The kit is composed of a 55W electrical heater and a NTC probe.

The burner control manages the electrical heater to maintain a constant temperature inside the burner housing higher than + 1° C.

- **Interface panel:**

Each PCH heater is fitted as standard with a multifunction LCD panel located inside the burner housing, which is used to control, configure and diagnose all operating parameters of the equipment.

The instrument panel is fitted with a red 3 digit LCD display and four function keys: ↑ , ↓ , ESC and ENTER; the display allows the user to display the heater operating mode and its faults. It allows our service centre to change the main operating parameters.

Changing parameters requires a password.

- *Viewing the burner status:*

  The machine status is shown on the display by the following wordings:

  rdy: the machine is on without burner flame; it is waiting for the ON control and/or the heat demand from the room temperature monitoring system.

  On: the machine is on with burner flame or is in the ignition phase.

  Off: the machine is turned off by the control on the LCD. Any heat demands will be ignored. To light the burner, the LCD must show “operation ON”;

  Fxx: Fault detected.

  During normal operation, the display will show the writing **On** if the burner is on; **rdy** when the heater is being switched off or the room temperature has been reached.

  Air when the EST function in the menu FUN was selected by mistake; modify FUN to ON or OFF.

  In the event of communication problems between the CPU-SMART PCB of the burner and the LCD panel, the word CPU will flash on the display if the problem is caused by the CPU; three flashing dots will be displayed if the problem is caused by the display PCB. If needs be, check that the display and the PCB are correctly connected and that the small cable RJ11 is securely held in the connector.

- *Navegating the menu:*

  The menu has three levels. The fisrt is visible without entering a password, the second and third require using second and third level passwords.

  Use the arrows to scroll the menus: ↑ (up arrow) and ↓ (down arrow). Press ENTER to select the menu, and again to select the parameter. Change the parameter with the arrows and confirm the change by pressing ENTER. To exit the parameter or menu, press ESC. If you exit the programming function, after about 10 minutes the program will exit the menu and go back to the “machine status” view.

  To change the parameter, press the arrow keys: pressing ↑ (up arrow) increases the parameter by 1, pressing ↓ (down arrow) reduces it by 1. Pressing both arrow keys for at least three seconds increases the parameter scroll speed.

  To confirm a change in parameters, press ENTER for at least 3 seconds. The change in the parameter is signalled by a flash of the display.

  All submenus scroll from the bottom towards the top, and they start over when the end of the menu is reached.

- *Entering the password:*

  - From the initial screen (ON/OFF/rdy/FXX) use the ↑ (arrow up) and ↓ (arrow down) keys to reach the ABI function; hold down the ENTER key for 3 seconds;
  - Set the password inside the menu ABI and confirm it with ENTER; hold it down per approximately 3 seconds (the flashing display will show that the parameter has been stored);
  - Press ESC and, by using the ↑ and ↓ arrow keys, return to the initial screen (ON/OFF/rdy/FXX); press ENTER for 3 seconds;
  - Use the ↑ and ↓ arrow keys to reach the desired menu item (Flt, I/O, SET, PAR);
  - Press ENTER to access the function;
  - Use the ↑ and ↓ arrow keys to select the parameters to be displayed and edited;
  - Press ENTER to display the parameter value;
  - Use the ↑ and ↓ arrow keys to edit the value (only SET and PAR);
  - Press ENTER to confirm the change made;
  - To exit the parameter and the menu, press ESC until the initial screen is displayed (ON/OFF/rdy/FXX).

- *First level menu:*

  The following menus are present on the first level:

  machine status gives information about the operation of the PCH (ex. rdy, ON, etc.);

  FUN from FUN it is possible to select the function ON, OFF or EST (do not select EST);

  REG this menu allows the user to force the burner to the minimum or the maximum for combustion tests; it automatically returns to the previous position at the end of the preset time (10 minutes);

  TIN allows the user to read the value of the 0/10 Vdc signal coming into the PCH;

  Pra not used;

  ABI used to enter the PWD to access menus of second and third level.

  Entering the password 001 will provide access to the second level and make the Set Point and I/O menus available.

  Entering the second password grants access to third level. This password must be requested directly to CIAT technical service.

- **Reset:**

  The modulation PCB allows the operator to identify more than thirty different causes of faults. This makes it possible to manage each event very precisely.

  To reset the faults, press both arrows simultaneously for a few seconds.

  If ignition fails, the flame monitoring system reattempts ignition four times. After four failed attempts, it will block and display the code F10.

  The faults code and cause of the faults is shown in the FAULT table in next Paragraph.

  If the flame monitoring equipment is blocked (codes from F10 to F20), it is also possible to unblock it by using the button on the equipment itself. This block is shown by a LED that lights up on the equipment.

  Warning: The flame monitoring equipment memorises the number of manual resets that are performed during its lifetime. In case of five resets performed in a period of 15 minutes, without a flame being ignited and detected, the equipment will go into a “timed” lockout (F13). In this case, it is required to wait another 15 minutes before resetting again. Press the reset button on the equipment to immediately reset this block condition.

  Note: should the safety thermostat (STB) be open before starting the start-up cycle (this could be caused, for example, by low temperatures), the pilot light equipment will be kept in “standby” and block F15 will be shown.

- **Analysis of Blocks - Faults**

  The CPU-SMART manages two types of blocks:

  - preventive, it warns the client that the PCH heater requires maintenance;
  - operational, it stops the PCH heater for safety reasons or to ensure its correct operation.

  Some operational blocks require manual resets; others reset themselves when the problem that caused them is solved.

  Below is a complete list of faults, possible causes and possible remedies.

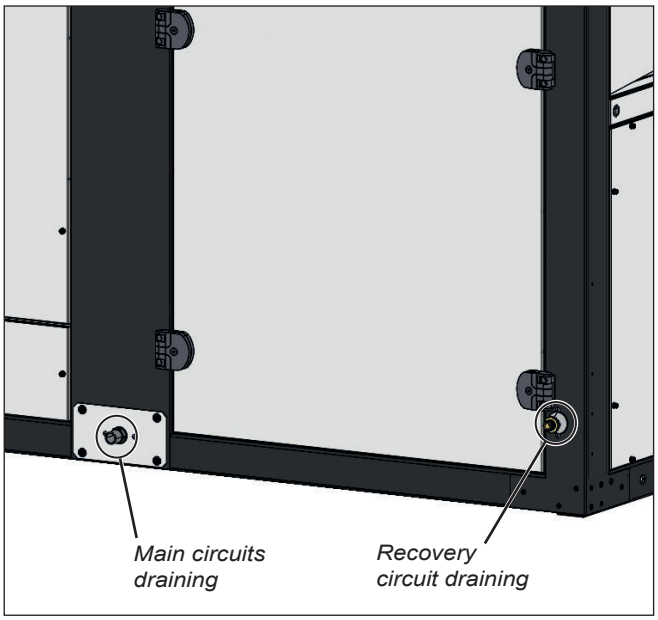
Fault	Description	Cause	Remedy
Blocks caused by Flame - Dependent on the TER equipment			
F10	Failure to ignite flame after 4 attempts performed by the equipment	• Phase and neutral reversed. • Earth wire not connected. • Phase-phase connection without neutral. • Start-up electrode failed or badly positioned • Detection electrode failed or badly positioned • Detection electrode that moves or disperses to the earthing system when hot. • Low CO2 value	Manual reset
F11	Ill-timed flame		
F12	Failure of ignition; not visible. The count, displayed in the historical list, indicates whether the heater has had problems with ignition		
F13	The TER equipment doesn’t accept the reset command from CPU-SMART	TER has finished its 5 reset attempts in the period of 15 minutes.	Wait 15 min. or use reset button on equipment
F14	Lack of communication between TER equipment and CPU for more than 60s	TER equipment or CPU-SMART PCB broken	Auto-reset
F15	The CPU-SMART PCB sent the ignition signal to the equipment. After 300 seconds, the equipment has not yet lit the flame	safety thermostat blocking start up	Check contact closing
		TER equipment broken	Manual reset
F16	Generic equipment block	TER equipment broken	Manual reset
F17	Internal malfunction of TER equipment that does not accept reset command from CPU-SMART	TER equipment broken	Manual reset of equipment
Blocks caused by temperature (safety blocks)			
F20	Activation of safety thermostat STB	• Excess air temperature due to lack of air circulation • Safety thermostat broken or not connected	Manual reset
Block FAN - burner ventilator			
F30	Fan speed too low in start up phase - VAG	Burner fan broken. FAN electrical cables broken or not connected	Manual reset
F31	Fan speed too high in start up phase - VAG		Manual reset
F32	Fan speed, during operation, outside minimum and maximum set parameters - VAG		Manual reset, autoreset after 5 min.
NTC probes broken or missing			
F41	Probe NTC1 error, air intake temperature	Absence of signal from probe or broken probe	Auto-reset
Over-temperature			
F51	The temperature of the air intake probe NTC1>TH1	• The minimum heat power of the PCH heater module is over-sized compared to the power output required by the environment. • Check the TH1 param. - air intake set point.	Auto-reset if NTC1< TH1-15
Lack of voltage			
F75	No voltage during operation cycle (excluding stand-by); the fault is not visible on remote control but only counted.	No voltage during operation	Auto-reset
Internal malfunction of CPU-SMART PCB			
F00	Internal malfunction of CPU-SMART PCB	Perform a manual reset of the PCB; replace the CPUSMART if the problem persists	Manual reset

12.10 Cooling recovery circuit (CR and CT assemblies)

Thermodynamic circuit dedicated to the recovery of the extracted air energy, with independent and proportional control, adapted to the air renewal requirements in order to raise the COP and EER of the unit.

The circuit is composed of:

- Return EC plug-fan.
- Air circuit comprised of coils with copper pipes and aluminium fins.
- Electronic expansion valve.
- Hermetic scroll-type compressor assembled over antivibration mounts.
- Crankcase heater.
- Four-way cycle reversing valve.
- Anti-acid dehydrator filter.
- High and low pressure transducers.
- Condensates drain pan, with a 1/2" M gas threaded plastic drain connection.

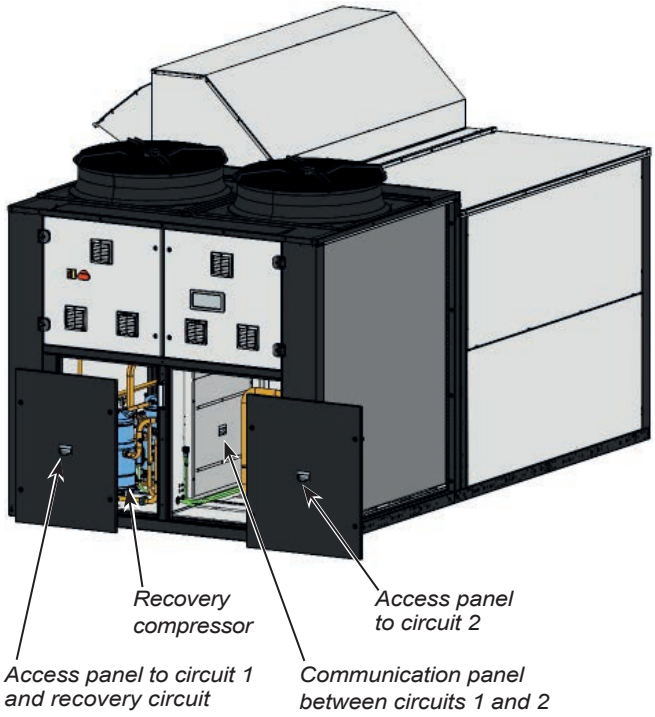


Characteristics of the recovery circuit

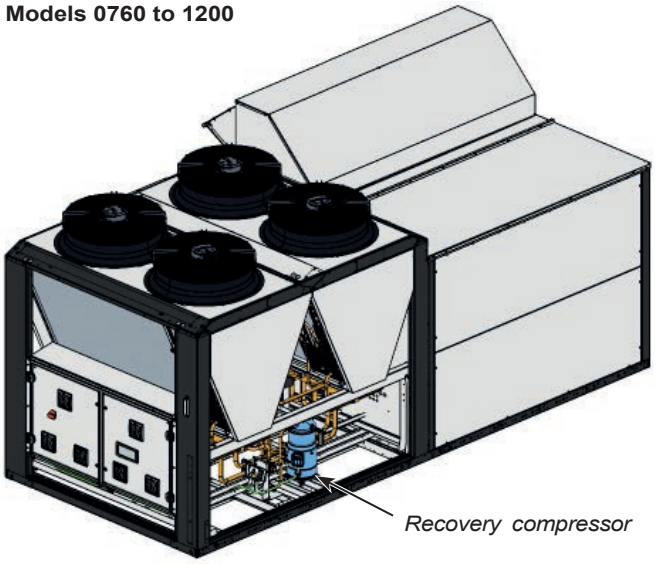
IPJ		0420 to 0500	0560 to 0620	0680 to 0720	0760 to 0960	1050 to 1200
Compressor type		Scroll				
No. of compressors / circuits		1 / 1				
Max. absorbed current	(A)	13,7	18,7	21,7	24,0	27,5
Oil type		Copeland 3MAF 32cST, Danfoss POE 160SZ, ICI Emkarate RL 32CF, Mobil EAL Artic 22CC				
Volume of oil	(l)	3,0	3,3	3,3	3,3	3,6
Charge of R-410A	(kg)	5,3	6,4	6,4	7,6	11,9
Environm. impact	(tCO2eq)	11,1	13,4	13,4	15,9	24,8

Access to the recovery circuit

Models 0420 to 0720



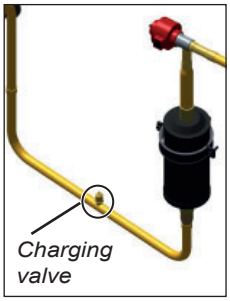
Models 0760 to 1200



Adjusting the refrigerant charge

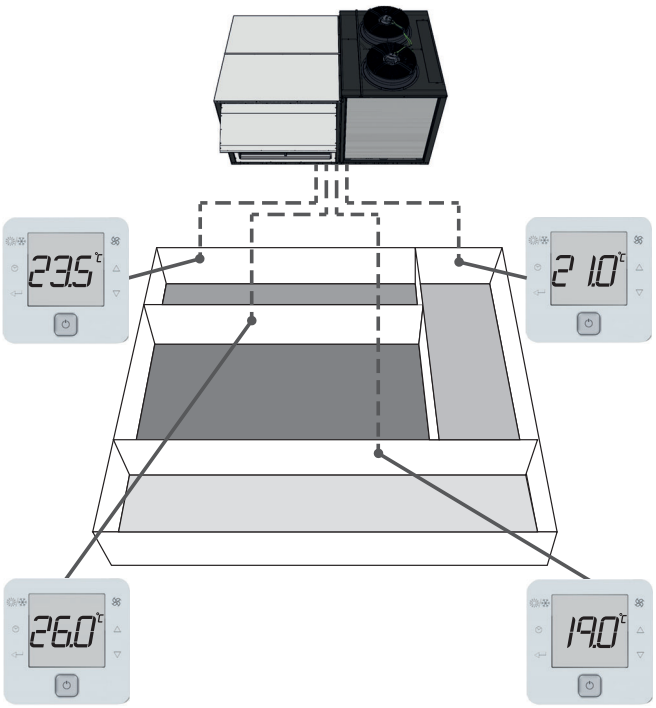
The charging valve (schrader type) must be used to adjust the refrigerant charge of the recovery circuit when this one is lower than required. It's placed on the liquid line before the dryer filter.

In models 0420 to 0720, the charging valve can be accessed via the compressors box on circuit 2, removing the communication panel between both circuits.



12.11 Zoning of the air flow

This option allows the management of the air flow of the unit to condition up to 4 different zones with a minimum air flow of 35% (all of them in same operating mode: heating or cooling). This function allows to adapt the indoor air flow to the installation requirements.



Regulation gives the control signal to the dampers installed in each zone (dampers and servomotors for those dampers not supplied). The unit modifies the air flow and capacity depending on information coming from sensors in each zone and considering active zones in each moment.

The option includes 4 zone terminals (one for each zone), the additional control board supplied in an independent box to be connected with the 4 terminals, the unit board and also to the servomotors that control dampers in each zone (dampers and servos not supplied).

The temperature information for each zone is coming from temperature sensor integrated inside each zone terminal. It is not needed to install any extra ambient sensor.

Zone terminals

These terminals are the same as the TCO user's terminal (optional).

The main screen shows the ambient temperature, current operating mode of the unit, time and day of the week.

The following screen shows the temperature setpoint for this zone in the current operating mode.

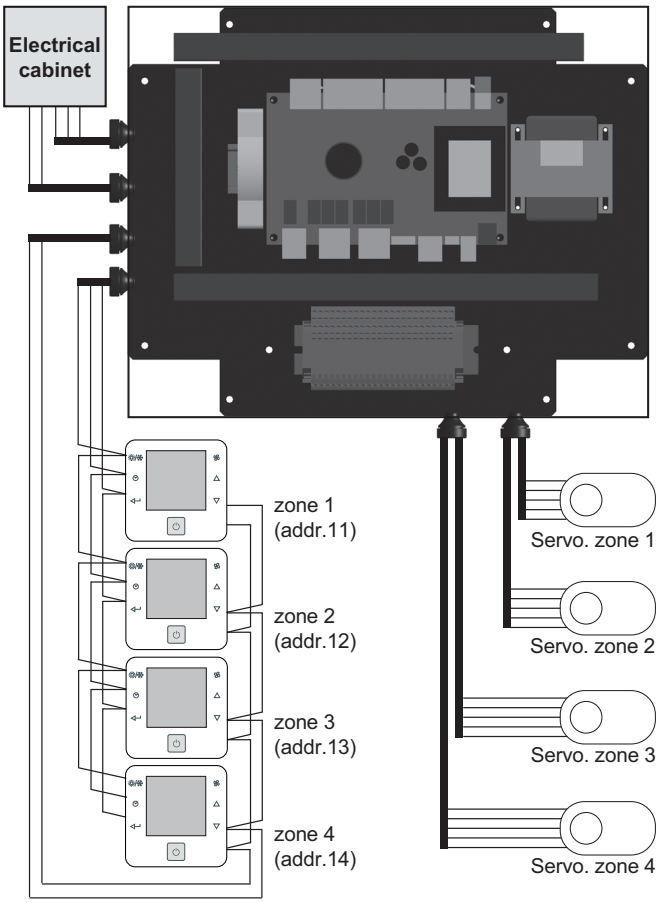
This screen can also show the zone that corresponds to the terminal, the regulation band associated with the temperature setpoint, the active alarms by means of codes and the delay set for the opening/closing of the damper.

These terminals also allow the schedule programming.

With the air zoning, the VecticGD terminal it also provides information on setpoints for each zone.

Zoning box connections

The control board of the air zoning is assembled in a separate box from the PJ unit. This board is connected in series on the Field-Bus of the main board of the Vectic control, placed on the electrical cabinet of the unit.



The installer must carry out the following connections:

- **Connection of the zone terminals:**
  - Power supply (the same as the control board) at 230Vac 50/60Hz (L&N): 2 wires (section 0.5 at 1.5 mm²).
  - Communication (RX+/TX+ & RX-/TX-): shielded cable type AWG20 or AWG22 with 1 braided pair + drainwire + shielding (e.g., model BELDEN 7703NH).

  Zone terminals can be installed at a maximum distance of 100 metres from the zoning box.

  These terminals are configured with their corresponding address in the factory. In the unlikely event of a communications failure the screen will display "Cn". Please make sure to check connections and the firmware version.
- **Connection of the servomotors for the supply dampers:**
  - 5 wires (section 0.5 at 1.5 mm²), supply 24Vac.
- **Connection to the electrical cabinet of the PJ unit:**
  - Power supply: 230Vac ((L&N): 2 wires (section 0.5 at 1.5 mm²).
  - Communication (RX+/TX+ & RX-/TX-): shielded cable type AWG20 or AWG22 with 1 braided pair + drainwire + shielding (e.g., model BELDEN 7703NH).

Note: Please refer to the wiring diagram provided with the unit and the Vectic control manual to get more detailed information about the wiring.

13.1 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 “Electrical connection”).
  - The correct connection of the sensors supplied with the unit (consult the chapter on “Electrical connection”).
  - That they are no cables 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: the compressor crankcase heater must be put under 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 ABSCENCE 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).

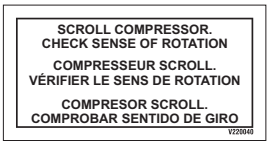
IMPORTANTE: RECALENTAMIENTO DE ACEITE DEL CÁRTER

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

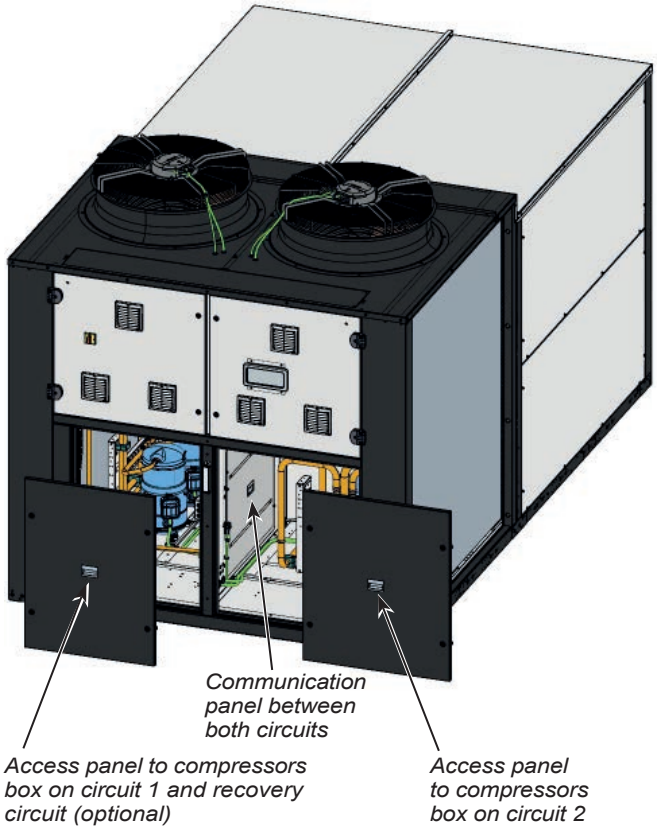
Important: As a safety feature to ensure heating of the crankcase heater, if there is a power cut lasting over 2 hours, the compressors will be locked. The unit must be powered for 8 hours to unlock them. The VecticGD terminal unit display will shows the time remaining until they can be unlocked.

- 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.

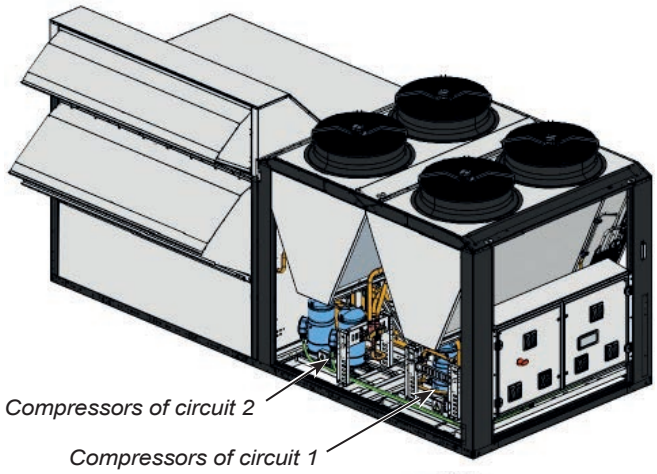


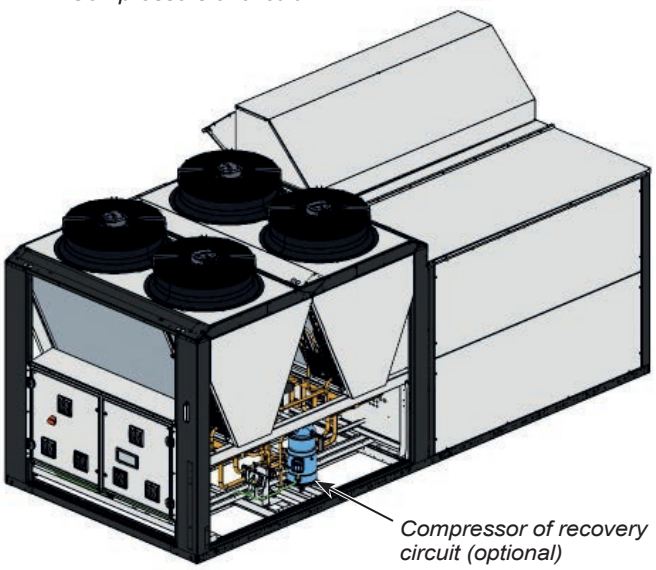
- Check the unit operation and verify the safety devices.

Models 0420 to 0720



Models 0760 to 1200





Control of the refrigerant charge

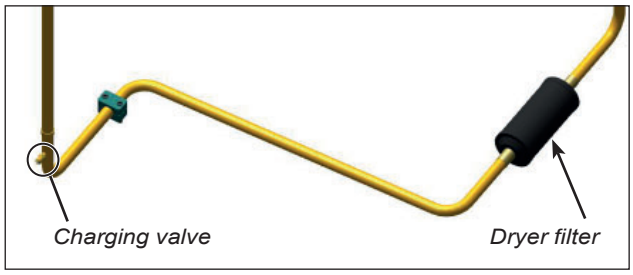
- Each unit is shipped with an exact charge of refrigerant for proper operation.

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, each circuit has a schrader-type valve in the liquid line, before the dryer filter.



- 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.

13.2 Possible problems at commissioning

All indications given in this manual 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.

13.3 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 voltage,
- current absorbed by the compressors, fans and other electrical components,
- significant temperatures in the cooling circuit (see attached table),
- other aspects considered interesting such as 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)	ºC	
	Condensation pressure	bar	
	Condensation temperature (2)	ºC	
Air condenser	Gas inlet temperature	ºC	
	Liquid outlet temperature (3)	ºC	
	Air inlet temperature	ºC	
	Outdoor temperature	ºC	
	Air outlet temperature	ºC	
Air evaporator	Air inlet temperature	ºC	
	Air outlet temperature	ºC	
	Liquid inlet temperature	ºC	
	Evaporation outlet temperature (4)	ºC	
Subcooling (2) - (3)		ºC	
Overheating (4) - (1)		ºC	

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

The minimal maintenance operations and their periodicity will be made in accordance with 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.

14.1 General recommendations

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 electrical cabinet.

Preliminary advise

- Keep the unit clean.
- To avoid accidents and ensure proper ventilation of the coil, keep the unit and the space around it clean and clear of clutter.
- Check the fouling level of the coil.

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 dryer.
- 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:

Main circuits:

IPJ	0420	0450	0500	0560	0620	0680
Volume (l)	4 x 3,0	2 x 3,0 + 2 x 3,3	4 x 3,3	4 x 3,3	4 x 3,3	4 x 3,3

IPJ	0720	0760	0840	0960	1050	1200
Volume (l)	2 x 3,3 + 2 x 3,6	2 x 3,3 + 2 x 3,6	3 x 3,6 + 1 x 6,1	1 x 3,6 + 3 x 6,1	4 x 6,1	4 x 6,1

Cooling recovery circuit (optional):

IPJ	0420	0450	0500	0560	0620	0680
Volume (l)	3,0	3,0	3,0	3,3	3,3	3,3

IPJ	0720	0760	0840	0960	1050	1200
Volume (l)	3,3	3,3	3,3	3,3	3,6	3,6

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:

Charge kg x GWP = t CO2e

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:

Main circuits:

IPJ	0420	0450	0500	0560	0620	0680
Charge (kg)	34,0	34,0	34,0	37,0	37,0	37,5
Environ. impact (t CO2e)	71,0	71,0	71,0	77,3	77,3	78,3

IPJ	0720	0760	0840	0960	1050	1200
Charge (kg)	38,0	54,0	56,0	56,0	67,0	68,0
Environ. impact (t CO2e)	79,3	112,8	116,9	116,9	139,9	142,0

Cooling recovery circuit (optional):

IPJ	0420	0450	0500	0560	0620	0680
Charge (kg)	5,3	5,3	5,3	6,4	6,4	6,4
Environ. impact (t CO2e)	11,1	11,1	11,1	13,4	13,4	13,4

IPJ	0720	0760	0840	0960	1050	1200
Charge (kg)	6,4	7,6	7,6	7,6	11,9	11,9
Environ. impact (t CO2e)	13,4	15,9	15,9	15,9	24,8	24,8

- 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.

- Always remember that refrigeration systems contain pressurised liquids and vapours. All necessary provisions must be made when the system is partially opened: ensure the part of the circuit concerned is not pressurised.
- Partial opening of the primary refrigerating circuit will cause a certain quantity of refrigerant to be released into the atmosphere. It is essential to keep the amount of lost refrigerant as low as possible by pumping the charge and isolating it in another part of the system.
- The refrigerant and lubricating oil, and the low-temperature liquid refrigerant in particular, may cause inflammatory lesions similar to burns if they come into contact with the skin or eyes. Always wear protective eyewear, gloves and other protective equipment when opening pipes or tanks liable to have liquids in them.
- Store unused refrigerant in the appropriate containers and limit the amounts stored in mechanical rooms.
- Cylinders and tanks of refrigerant must be handled with care and signs warning users of the related poisoning, fire and explosion hazards must be clearly visible.

  Refrigerant that reaches the end of its life must be collected and recycled in accordance with applicable regulations.

14.2 Servicing

It's recommended to note down the operating readings and perform the following checks at least twice a year and mandatory after each time a unit is started for seasonal use.

Weekly checks

With the unit running at full capacity, check the following values:

- LP compressor suction pressure and HP compressor discharge pressure.
- The oil level and its appearance. If the colour changes, check the quality.
- Also check whether the safety devices operate correctly.
- Check the entire system for traces of water or oil under or around the unit and for any unusual noises.

Monthly checks

- Check all the values listed in the table "Operating readings" on chapter 13.
- Check for corrosion on all metal surfaces (chassis, casing, exchangers, electrical cabinet, etc.).
- Make sure that the insulating foam is neither detached nor torn.
- Check the coolants for any impurities which could cause wearor corrosion in the exchanger.
- Check the circuits for leaks.
- Check whether the safety devices and the expansion valve(s) operate correctly.

Annual checks

- Carry out the same inspections as during the monthly checks.
- Carry out an oil contamination test (every year or every 5000 hours). If acid, water or metal particles are found, replace the oil in the circuit concerned and the dryer. Follow the recommendations of paragraph 14.1.
- Check the electrical connections to ensure they are tight and in good condition.
- Check the condition of the contacts and the current at full load on all three phases.
- Check the electrical box for water seepage.

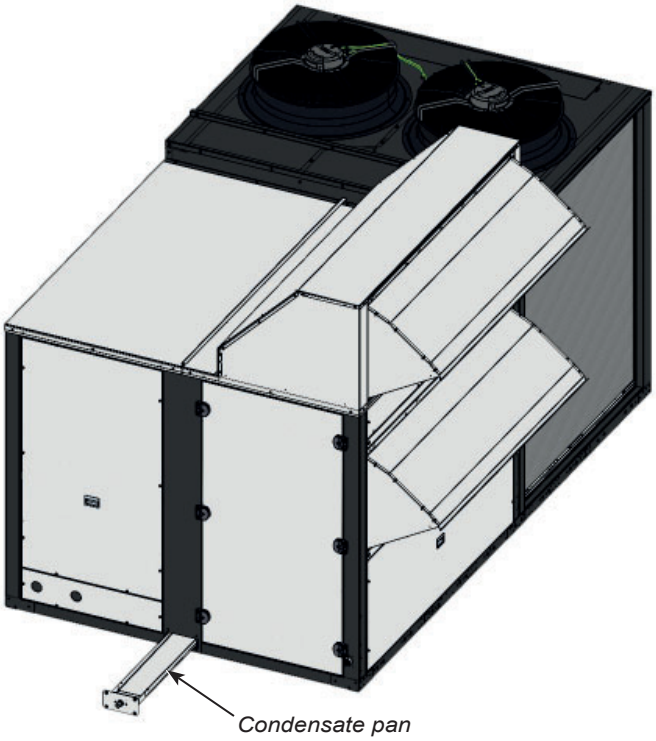
N.b.: The intervals for cleaning are given as a guide and should be adapted to each unit.

14.3 access to the main components

Condensate drainage pan

- These units are equipped with a condensate drainage pan sloped toward the drain.

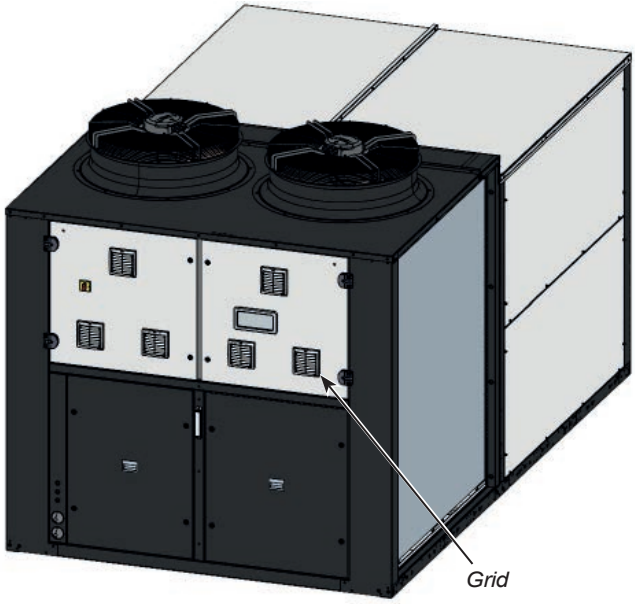
  Note: This pan is removable for easy cleaning in models 0420 to 0720. It is secured to the unit using 4 M6 Allen screws.

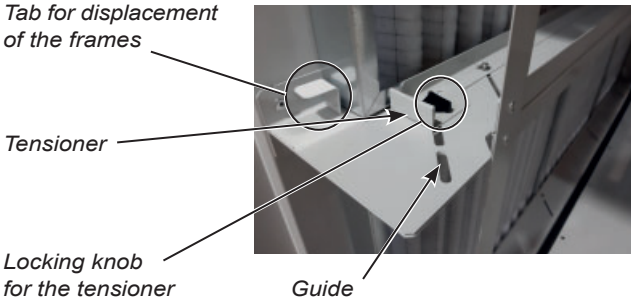


- Check that the condensate pan is sufficiently clean.
- Check that the drain is not clogged.
- Cleaning of the pan can be done with water and non-abrasive detergent.

Air filters in the grids of the electrical cabinet

- The appearance of the filters located inside of the grids must be examined periodically, because the clogged filters impede good ventilation.
- Cleaning can be done with a household vacuum cleaner. Replace them regularly. 115 x 115 mm G2 filters.





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.

  The pressure drop data of the technical catalogue are given for clean filters. 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 and F9). It is necessary to replace them.

Filter removal:

- The access panel to the filters features dual locks which can serve as a hinge or can be used to remove the panel.

  Check that the locks are not blocked. Open the locks with a 4 mm Allen key (in an anticlockwise direction).

  Caution: pay attention when opening the panel to avoid any damage to the siphon of the condensate drain.
- The thickness of the frames is 25 mm for G2 and G4 standard type; and 50 mm for the G4 low pressure drop and all opacimetric filters.

  Filters supplied from the factory can be replaced on site by other types of filters with different thickness.

  The filter holder structure supports the following filter combinations: 25 mm, 25 mm + 50 mm, 50 mm + 50 mm.

  The filter holder structure incorporates a tensioner that can be moved along a guide to adjust the width according to the chosen combination. With the help of a locking knob, the position of the frames is locked after placement.

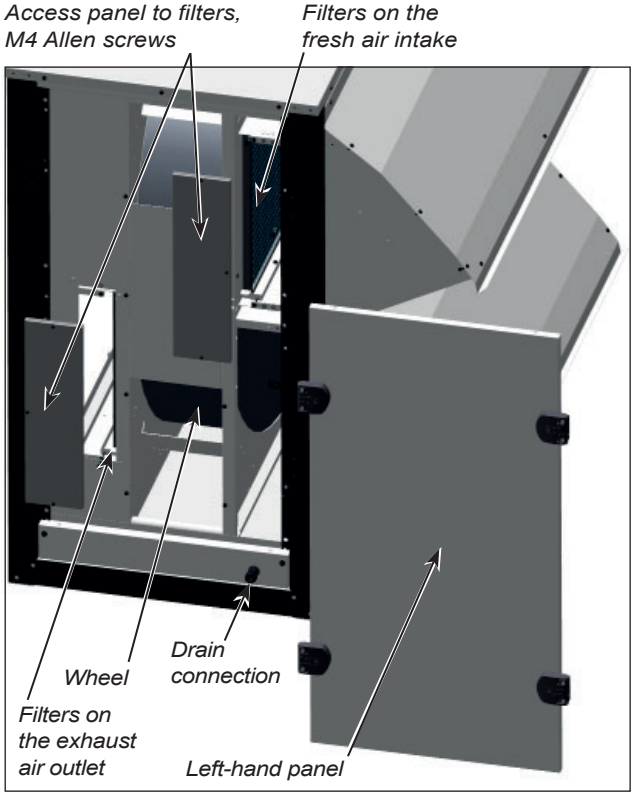
  To extract the frames from each row, simply slide the tab.

Air filters in the recovery module

- The inside of the heat recovery unit module is accessed via the left-hand panel (front view), for maintenance tasks concerning the filters and the condensate pan. This panel features dual locks.

  The access panels to the filters are secured using M4 Allen screws.The procedure for cleaning the filters is described In the preceding paragraph.

  This module features gravimetric filters G4 with low pressure drop, both on the fresh air intake and on the exhaust air outlet.



Air coil

- Check that the coil is free from dust and grease.
- Cleaning the accumulated dust on the coil can be performed using a soft-bristled brush or 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.

Note: an optional protective grille can be fitted to the coils.

Compressor

In the case of compressor replacement:

- Disconnect the unit from power supply.
- Completely empty the refrigerant charge using a specific recovery unit for R-410A
- Disconnect electrically the compressor.
- Carefully unsolder 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.

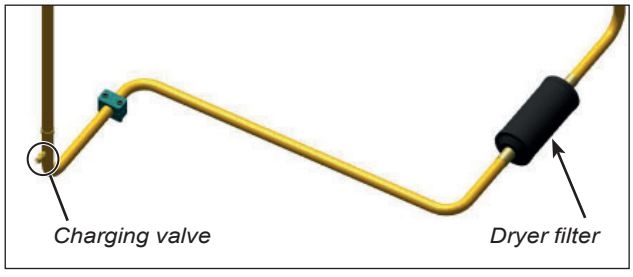
Warning: when tightening the compressor screws, please consult the maximum torque that can be applied.

If a torque wrench is not available,tighten them until they are snug then tighten a further ¾ turn.

- Solder the suction and discharge piping.
- Connect the compressor in accordance with the wiring diagram.
- Make vacuum and next, reload the gas into the unit according to charge data provided in the table of paragraph 14.1 “General recommendations” and in the unit’s data plate.

Dryer filter

- The filter function is the preserve the cooling circuit clean and without humidity, neutralizing the acids that can be found in the cooling circuit.
- Measure the difference in the temperature of the pipes at the dryer inlet and outlet.
- If necessary, replace.



Refrigerant leak detector (optional)

The gas detector sensor is a device that signals leaks in refrigerant. This sensor is installed next to the supply fan. In case of alarm, it is reset manually.

Maintenance:

- Annual testing: it is necessary to carry out testing every year.
- 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.

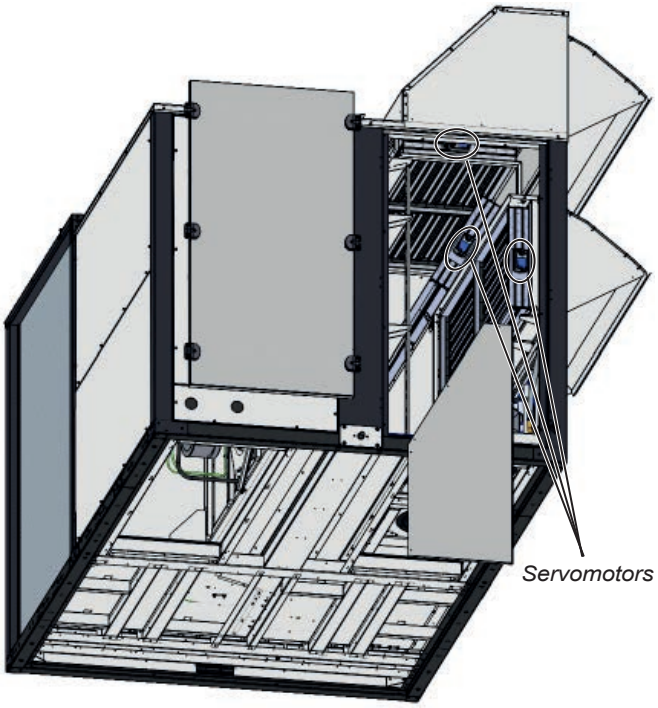
Note: Check the documentation attached to the leak detector for taring and calibration testing.

Active recovery (optional)

- A cooling recovery circuit is optionally available for these units (CR and CT assemblies). It is a complete circuit with independent electronic control.
- The same recommendations for the maintenance of the components of the main circuits must be followed for the components of this circuit.

Mixing boxes (optional)

In units with mixing box assemblies, it is advisable to check the condition of the servomotors of the motorised dampers.



Centrifugal fan (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.

Gas burner

Only qualified staff are allowed to undertake maintenance tasks or resolve a breakdown.

Pay attention to the temperatures of some components after operation. They could be very high (exchanger, flue exhaust, etc).

Hazard: Never use a naked flame whilst checking the burner. Never store flammable material in the machine room.

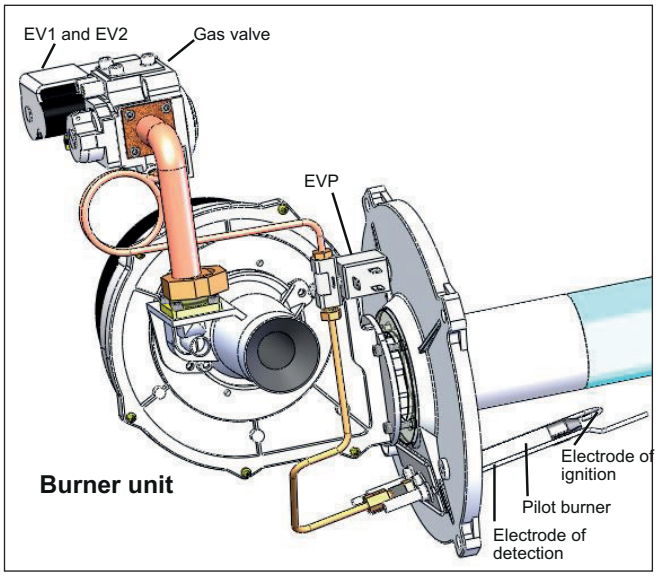
During the maintenance, the user must always strictly follow the instructions given in all the chapters of this brochure, as well as on the manufacturer's (APENGROUP) installation and maintenance brochure for the burners in the PCH series, supplied with the unit.

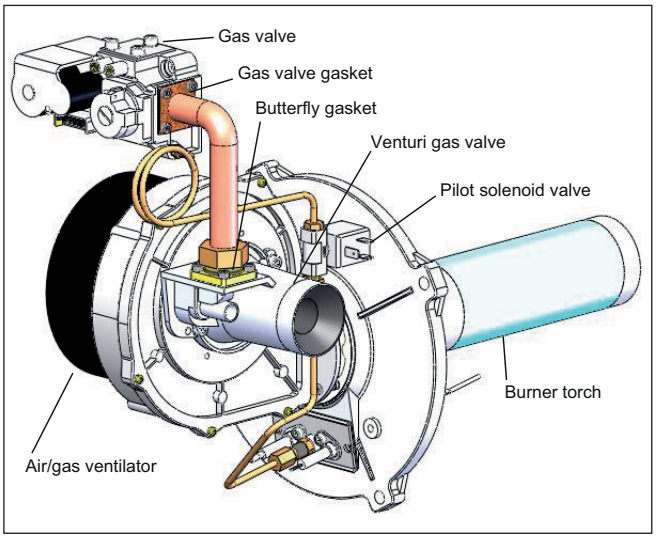
The maintenance and checking of the combustion must be performed in compliance with the legislation in force. Any modification or change in the material must be undertaken with the manufacturer's consent; the replacement of a faulty component for another non-compliant component could present a hazard for which CIAT could not accept liability.

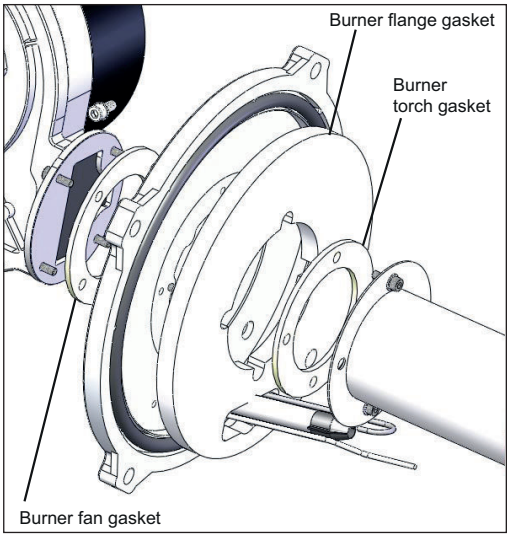
To keep the machine efficient and guarantee a long lifetime of the heater, it is advisable to run some inspections every year, before turning it on for the season:

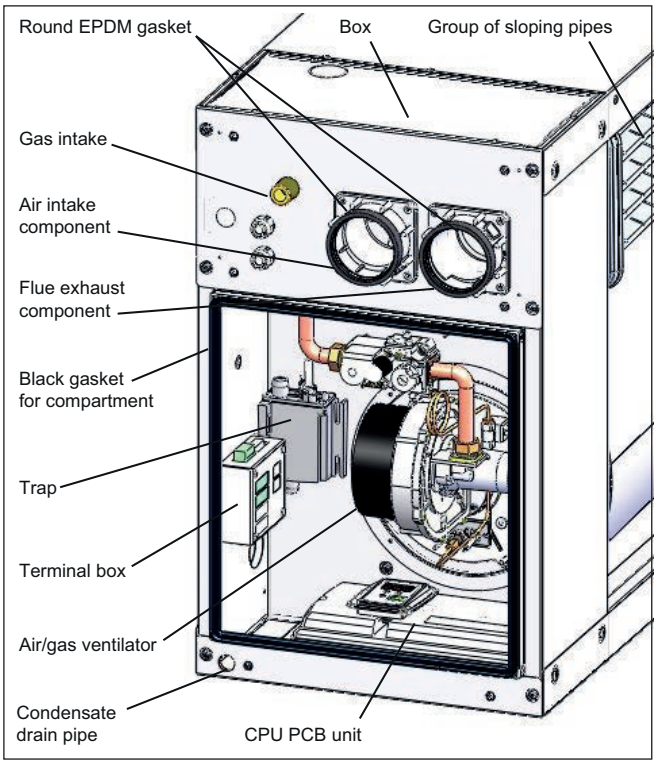
1) check the status of the start-up electrodes, detection electrodes and pilot flame;
2) check the status of flue exhaust and air intake ducts and terminals;
3) check the status of the venturi;
4) check and clean the exchanger and burner;
5) check and clean the water trap
6) check the intake pressure at the gas valve;
7) check the function of the flame monitoring equipment;
8) check the safety thermostat(s);
9) check the ionization current.

Note: Operations at points 1, 2, 3, 4 and 5 must be performed after disconnecting the heater from the electrical mains and closed the gas supply. Operations at point 6, 7, 8 and 9 must be done with the heater on.





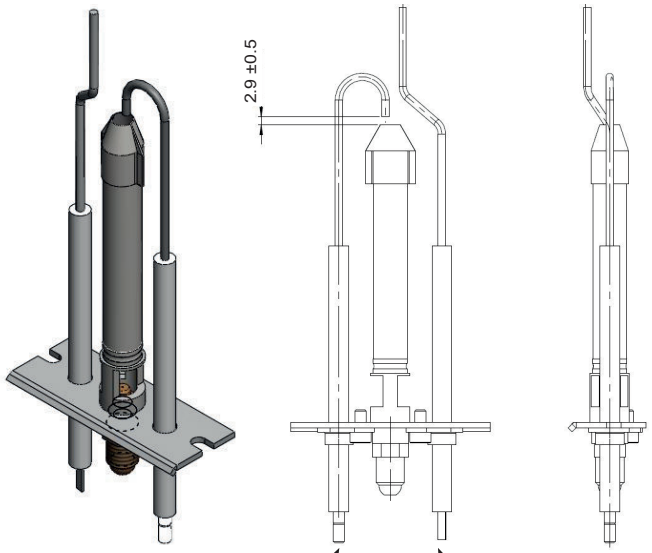




1) Inspection of electrodes

Dismantle the complete pilot flame and use a jet of compressed air to clean the mesh and nozzle. Check the integrity of the ceramic and use sandpaper to remove any oxidation on the metal parts of the electrodes. Check the correct position of the electrodes (see drawing below).

It is important that the detection electrode is at a tangent to the head of the pilot and not inside it. The start-up electrode must discharge onto the mesh of the pilot burner.



Verify that the start-up electrode discharges on the external edge of the pilot burner

Keep the detection electrode at a tangent to the pilot burner

2) Inspection of flue exhaust and air intake ducts

Visually inspect where possible or examine with specific tools to learn the status of the ducts.

Remove dust that forms on the air intake terminal.

3) Inspection and cleaning of the venturi

Remove any dirt at the mouth of the venturi with a brush, and be careful to not let it fall inside the venturi.

4) Inspection and cleaning of the exchanger and burner

Perfect combustion in PCH heaters prevents soot forming, which is normally caused by bad combustion.

It is advisable, therefore, to not clean the exchanger and burner unless there are exceptional circumstances.

An accumulation of soot inside the exchanger could be revealed by a sizeable variation in the heat output that is not caused by improper functioning of the gas valve.

Should it become required to clean the burner and/or exchanger, all of the gaskets mounted between the burner and the exchanger must be replaced.

5) Inspection and cleaning of the water trap

Clean the trap every year, and check the connections. Make sure there are no traces of metallic residue. If metallic residue has formed, increase the number of inspections.

6) Inspection of intake gas pressure

Verify that the intake pressure at the valve corresponds to the value required for the type of gas connected.

This verification must be done with the heater on at the maximum heat output.

7) Inspection of flame monitoring equipment

With the heater operating, close the gas tap and verify that the machine faults, signalled on the LCD display with code F10.

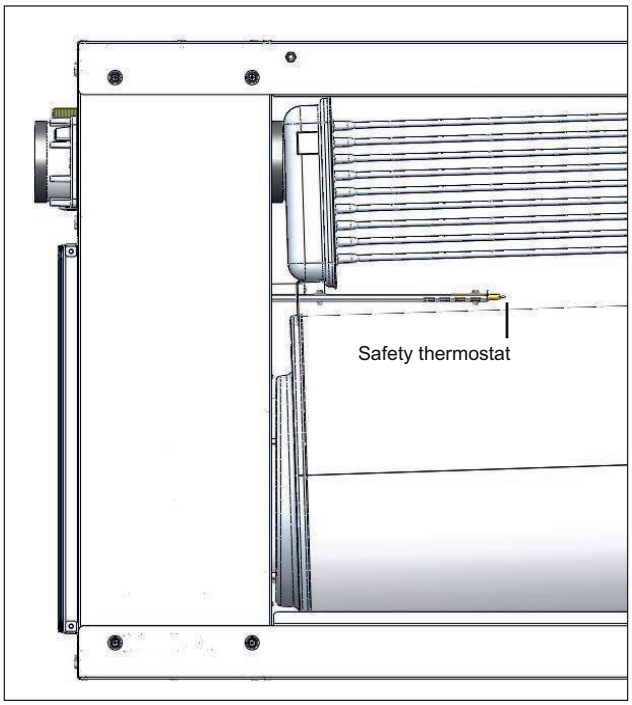
Reopen the gas tap, reset the fault and wait for the heater to start back up.

8) Inspection of the safety thermostat(s);

This procedure must be done with the heater on and the burner lit.

Open the thermostat series with an insulated tool [230 V], remove the fast-on from the safety thermostat, wait for the F20 block signal to appear on the LCD display.

Reclose the thermostat series, then reset the fault.



9) Inspection of the ionization current.

This procedure can be done directly from the LCD display by entering into the I/O menu (password 001). The **IOn** parameter indicates the value of the ionization current, and the reading is as follows:

- 100, indicates that the value is more than 2 microAmperes, which is plenty for the equipment to function;
- from 0 to 100, indicates a value from 0 to 2 microAmperes; for example, 35 corresponds to 0.7 microAmperes, which is the minimum threshold detectable for the flame monitoring equipment.

The value of the ionisation current must not be below 2 micro-Amperes. Lower values indicate: the detection electrode in a bad position, a rusted electrode or one about to stop functioning.

Replacing the gas valve of the burner

If the gas valve must be replaced, it is required to proceed with an inspection and possibly calibrate the CO_2 level through the adjustments on the Venturi pipe.

It is advisable not to calibrate the offset: the valve calibration is performed by the manufacturer.

If necessary, carry out the combustion analysis procedure as described in paragraph “Analysis of combustion”.

It is recommended to always carry out the flue gas analysis after replacing the gas valve.

15 - CONTROL AND ANALYSIS OF BREAKDOWNS

Symptom	Cause	Solution
Evaporation pressure very high in relation with the air inlet	a) Charge excess b) High air temperature c) Compressor suction not air tight d) Cycle reversing valve in middle position	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	a) Gas lack b) Compressor suction not air tight c) Cycle reversing valve in middle position d) Liquid circuit plugging	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	a) Insufficient air flow b) Air inlet temperature very high c) Dirty condenser (does not exchange) d) Much refrigerant charge (flooded condenser) e) The condenser fan is broken down f) Air in the cooling circuit	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 charge
Evaporation pressure too low (low pressure safety cut-off)	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	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)	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	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	a) Electrical power supply very low b) Power cable disconnected	a) Control line voltage and locate voltage drop b) Verify connections
Repeated compressor starts and stops	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 the low pressure safety) g) Dehydrating filter clogged (cuts off the low pressure safety)	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	a) Loose attachment b) Oil lack c) Compressor noise	a) Fix b) Add oil to recommended level c) Replace
Noisy operation	a) Unit installed without antivibration protection	a) Place base over shock absorbers
Cycle reversing is not carried out: - No defrosting - Does not change winter - summer cycles	a) Electrical fault b) Inversion valve coil defective c) Defrost method not working d) Cycle reversing valve in middle position e) Control fault	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 enthalpic control)	a) Dirt in the humidity sensor	a) Disassembly the probe encapsule. 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.

16 - FINAL SHUTDOWN

Shutting down

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

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

Fluids to be recovered for treatment

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

Materials to be recovered for recycling

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

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).

Notas: