BROCHURE

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Ature® inverter

Installation
Operation
Commissioning
Maintenance

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Point-of-use PCA units for parked aircrafts

Ature® inverter

Scroll compressors
Inverter technology
Low power consumption
World first heat pump PCA unit
Uniform supply temperature

1. Introduction

Ature® inverter units of **IBDX** series are autonomous units of direct expansion with inverter technology for air conditioning of the passenger cabin of parked aircrafts. They are compact units, 100% outdoor air, equipped with hermetic scroll compressors, some of them of the latest inverter technology, supplying the cooling, ventilation and heating through reversible heat-pump to the aircrafts. Optionally, with very low temperatures, they can incorporate auxiliary electrical heaters.

These stand-alone air/air units are designed to either be installed on the ground at the foot of boarding bridges (type G), or hanging from them (type B). They provide a global and autonomous solution in new projects as well as in renovation projects for airport terminals.

They are equipped with R-410A refrigerant and inverter control on up to two circuits, which are thus particularly appropriate for improving the overall efficiency of the airport, by reducing power consumption in any position while increasing the comfort of the passengers thanks to a uniform supply temperature.

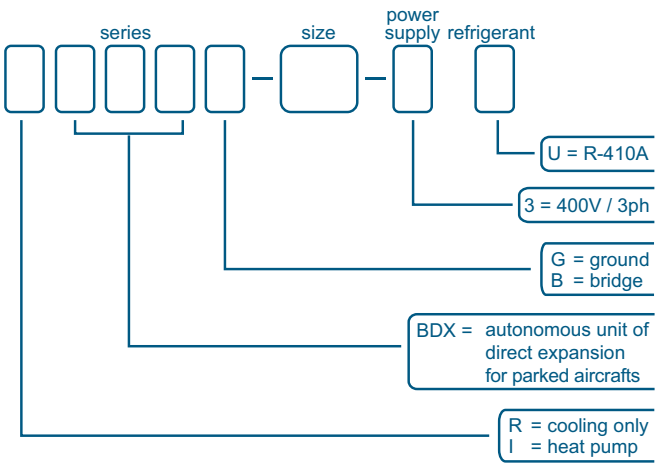
Furthermore, the innovative solution of heat pump with 100% outdoor air for PCA drastically reduces consumption of units in heating mode.

After manufacturing, all units are charged with refrigerant and are tested at the factory, verifying the correct operation of all their components.

The units comply with standards: EN 60-204 - EN 378-2, and directives: Machinery 2006/42/EC - EMC 2014/30/EU - LVD 2014/35/EU - PED 2014/68/EC (Category 2), as well as the applicable specifications of IATA:AHM 973 and 974.

Those in charge of the installation, commissioning, operation, and maintenance of the unit must know the instructions contained in this brochure and the specific technical characteristics of the installation place.

2. Denomination

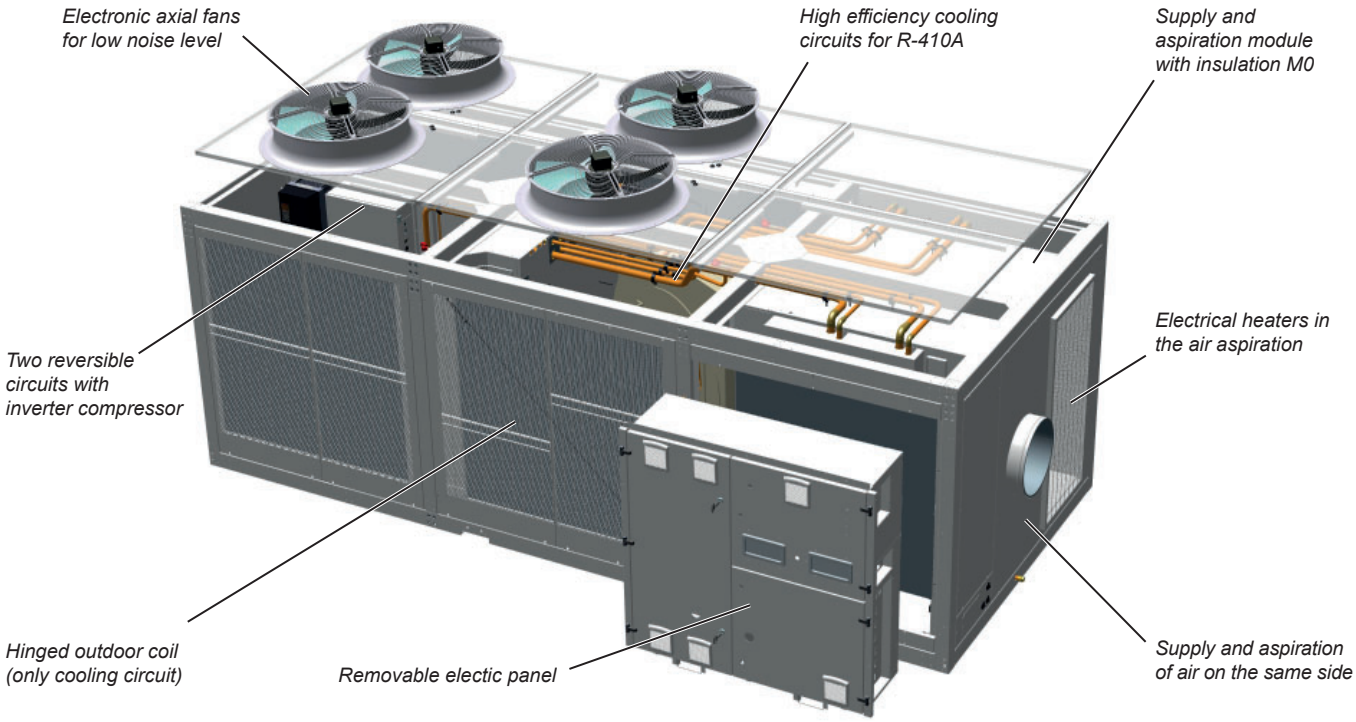


Example IBDXG-1524-3U

3. Operation limits

Air inlet conditions	Cooling	Heating
Minimum	10ºC DB	-5ºC / 95% RH ①
Maximum	46ºC / 13% RH	12ºC DB

① When the outdoor temperature is usually below 5ºC WB it is recommended installing a support element.



4. Unit components

Casing

- Casing made of galvanised steel metal, cold-rolled in accordance with European standards EN 10-142. Finished in polyester paint.
- Self-supporting frame and removable panels to enable comfortable and complete access to any inside part.

Cooling circuits

Model 622 (2 circuits):

- 2 reversible circuits (C1 and C4) composed of:
  * Inverter hermetic scroll-type compressors with frequency converter assembled over shock absorbers.
  * Coil for the control of oil.
  * Crankcase heater.
  * Oil separator.
  * Suction accumulator.
  * Four-way cycle reversing valve and liquid receiver.
  * Anti-acid filter driers.
  * Electronic expansion valve.

Model 723 (3 circuits) and 844, 1524, 1264 (4 circuits):

- 2 reversible circuits (C1 and C4) composed of:
  * Inverter hermetic scroll-type compressors with frequency converter assembled over shock absorbers.
  * Coil for the control of oil.
  * Crankcase heater.
  * Oil separator.
  * Suction accumulator.
  * Four-way cycle reversing valve and liquid receiver.
  * Anti-acid filter driers.
  * Electronic expansion valve.
- Model 723 with 1 cooling-only circuit (C3) and model 844,1524, 1624 with 2 cooling-only circuits (C2 and C3) composed of:
  * Hermetic scroll-type compressors assembled over shock absorbers.
  * Crankcase heater.
  * Anti-acid filter driers.
  * Electronic expansion valve.

Outdoor circuit

- Bird protective grille in the air aspiration.
- Coil with copper pipes and aluminium fins. INERA® coil with fins of an aluminium alloy (in option).
  * In models 1524 and 1624, the coils of the circuits C2 and C3 are hinged to allow access to the inside of the machine and they incorporate flexible sleeves.
  * In models 723 and 844, the coil of the circuit C3 is hinged.
  * In model 622 the coil is not hinged, access to the inside of the machine is done by other panels indicated in this brochure.
- Electronic EC axial fans that adapt the rotation speed to the installation requirements, thereby reducing electricity consumption, the sound level at partial charge and improving the average seasonal output of the unit. Dynamically balanced propellers and outdoor protective grille.
  * In the bridge mounted units (B), the outdoor fans doors are hinged, to allow access to the inside of the machine.
- Condensates drain pan in the reversible circuits. This pan is tilted to prevent water from stagnating and it incorporates antifreeze electrical heater. The bridge mounted units (B) incorporate a pump for easy drain of the pan.

Point-of-use PCA units for parked aircrafts

Ature® inverter

Indoor circuit

- Supply and aspiration of air on the same side.
- Supply-aspiration module with thermal and acoustic insulation 50 mm thick, with fire classification Euroclass A2-s1, d0.
- Centrifugal fan with direct coupling. Electric motor class F, IP55 and internal thermal protection. Turbine balanced statically and dynamically, assembled on bearings. IE3 energy-efficient motors, except motor of 75kW with IE2 efficiency (optionally IE3 efficiency).
- Frequency converter for indoor fan.
- Discharge nozzle:
  * model 622: 14",
  * models 723 and 844: 14" (optionally 2 outputs of 14"),
  * model 1524 and 1624: 18" (optionally 2 outputs of 14").
- Stop-drop in the air supply.
- Gravimetric G4 filter in the air aspiration. Optionally G4+M6.
- Auxiliary electrical heaters assembled on the air aspiration (optional).
- Removable coils with copper pipes and aluminium fins, with skids at the bottom to ease sliding.
- Condensates drain pan in galvanised steel with pump to aid drainage. Optionally in stainless steel. This pan is tilted to prevent water from stagnating.

Protections

- High pressure pressostat.
- Low pressure transducer.
- Compressor discharge temperature control.
- Klixon at the compressor.
- Phase control relay.
- Safety valve in the liquid receiver of the reversible circuits.
- Emergency button.
- Main door switch.
- Automatic switch in the control circuit.
- Magnetothermal protection switches for the power line of compressors and fan motors.
- Smoke detection station.
- Clogged filter detector.
- Electrical heaters safety thermistors (optional).
- Antifreeze protection with electrical heaters of the controls electrical cabinet.
- Cooling by forced ventilation of the electrical cabinet of the frequency converter.
- In bridge mounted units (B), safety microswitches on the hinged doors of the outdoor fans.
- Safety microswitches on the hinged outdoor coils (models 723, 844, 1524 and 1624).

Electrical cabinet

- Removable electrical cabinet, fully wired, with independent access doors to the panel of power, controls, and frequency converter. All doors with ground. Protection IP65. (Plug included).
- This panel is removable to allow access to the indoor coils. Multi-pole connectors to ease a quick coupling, except for the frequency converter.
- High electromagnetic compatibility EMC.
- Main ground connection.
- Compressor and fan motor contacts.

AVANT PCA PRO electronic control

This control is basically comprised of:

- pCO5+ control board.
- pCOe expansion cards for the management of additional components.
- **pGD Touch** terminal with 7-inch screen (WVGA 800x480 resolution, 64K colour, type TFT) that allows users to monitor and change the main control parameters with the appropriate passwords for the maintenance, as well as allowing the display of temperatures and pressures of the unit.

  This terminal is located in the control panel of the machine or, optionally, in a remote keypad, where there are also several actuators and optical warning devices.

- Optionally, this control can have a pGD1 terminal for maintenance and configuration of the unit.

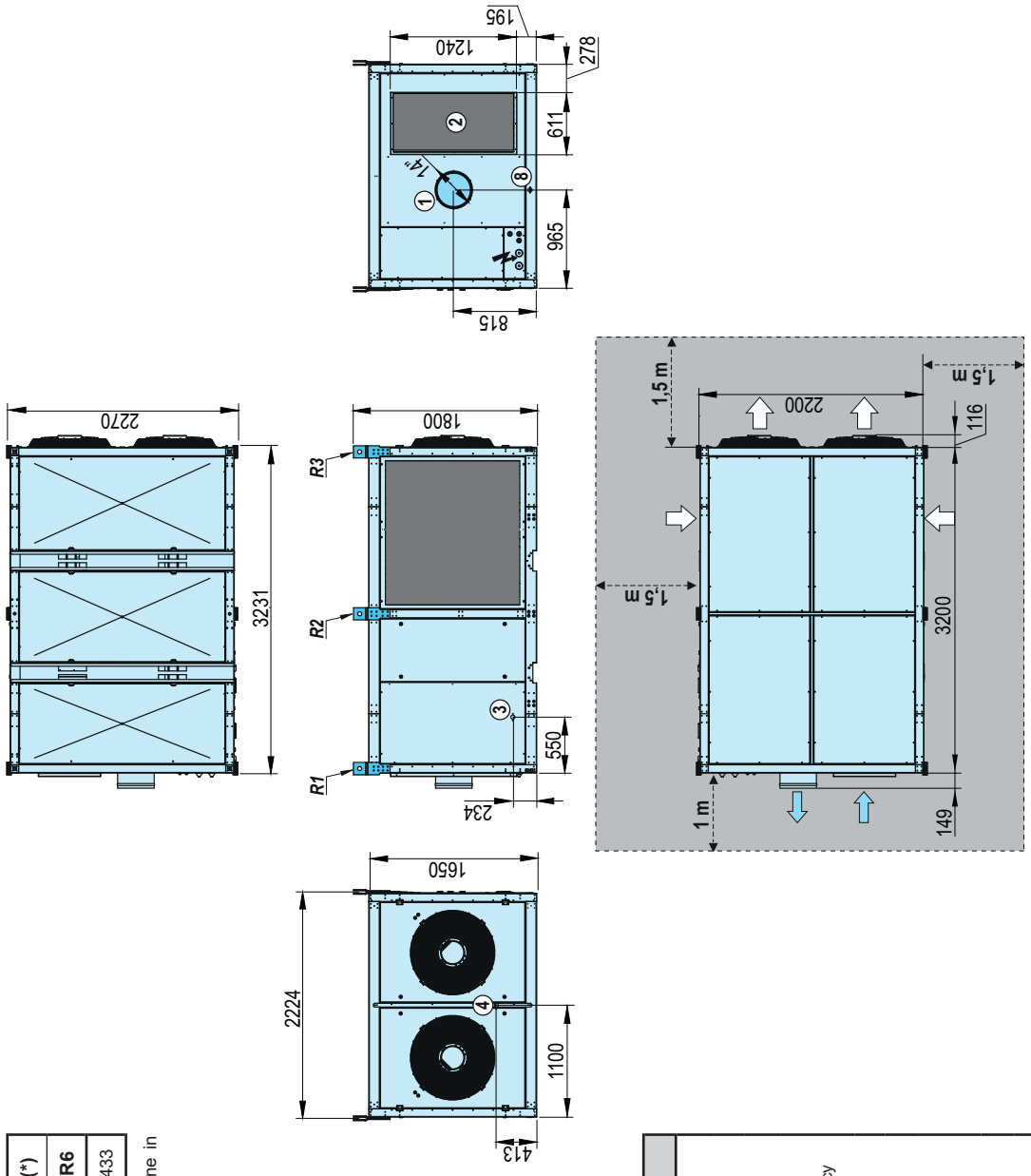
Main functions:

- Selection of the operating mode: Heating, Cooling, Automatic and Ventilation.
- Permanent control of the operating parameters.
- Control of the ambient temperature with cabin probe.
- Compensation of the setpoint based on the outdoor temperature.
- Timing of the compressors.
- Failure diagnosis. The display will show a notice corresponding to the produced alarm.
- General alarm.
- Possibility of communication with a dedicated tool for centralized management. This allows to manage from a computer the selection of the operating mode, the control of the operating status, the parameter settings, as well as the monitoring of alarms.

5. IBDXB-622 DIMENSIONS SCHEME

IBDXB	Weight (kg)	Reactions in the supports (kg) (*)					
		R1	R2	R3	R4	R5	R6
622	2703	422	555	355	366	573	433

(*) Reactions calculated for vertical loads (with the machine in horizontal)

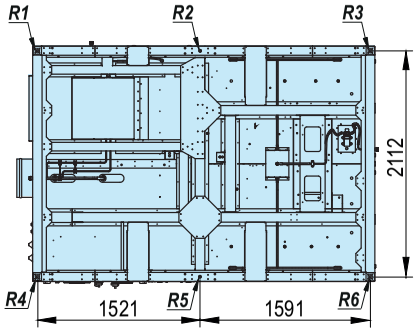


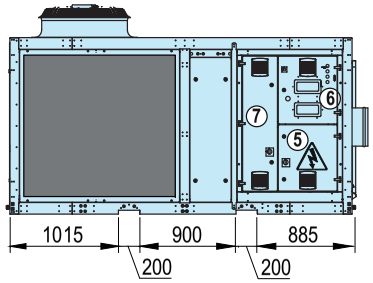
LEGEND

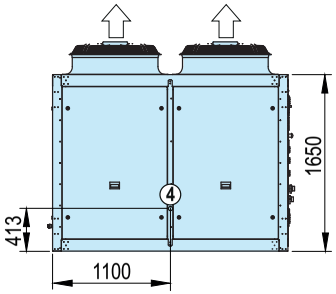
- Outdoor air circulation
- Indoor air circulation
- Electrical cabinet
- Electric power supply
- Door switch on the panels of power, controls and frequency converter
- ① Air supply
- ② Air return
- ③ Condensate outlet of the indoor circuit, junction 3/4"
- ④ Condensate outlet of the outdoor circuit, junction 3/4"
- ⑤ Electrical cabinet of power
- ⑥ Electrical cabinet of controls
- ⑦ Electrical cabinet of the fan frequency converter
- ⑧ Draining plug for cleaning of the indoor circuit pan
- ⑨ Attachment brackets Ø 40 mm
- *Clear space to be observed for maintenance operations and unit start-up*

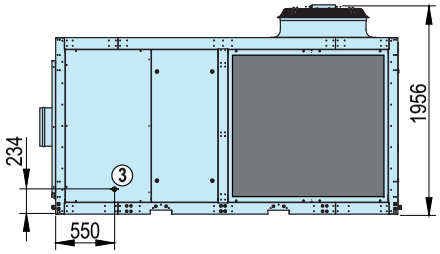
5. IBDXG-622 DIMENSIONS SCHEME

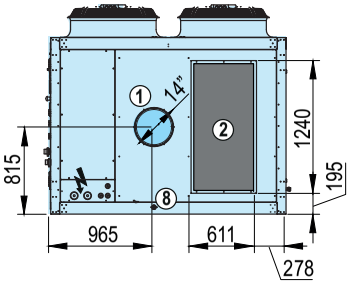
IBDXG	Weight (kg)	Reactions in the supports (kg)					
		R1	R2	R3	R4	R5	R6
622	2600	420	534	325	336	553	432

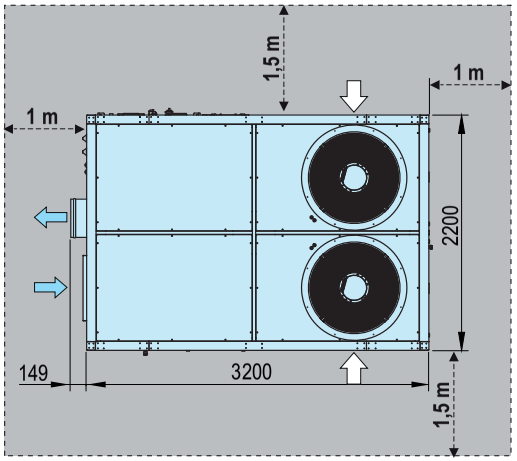












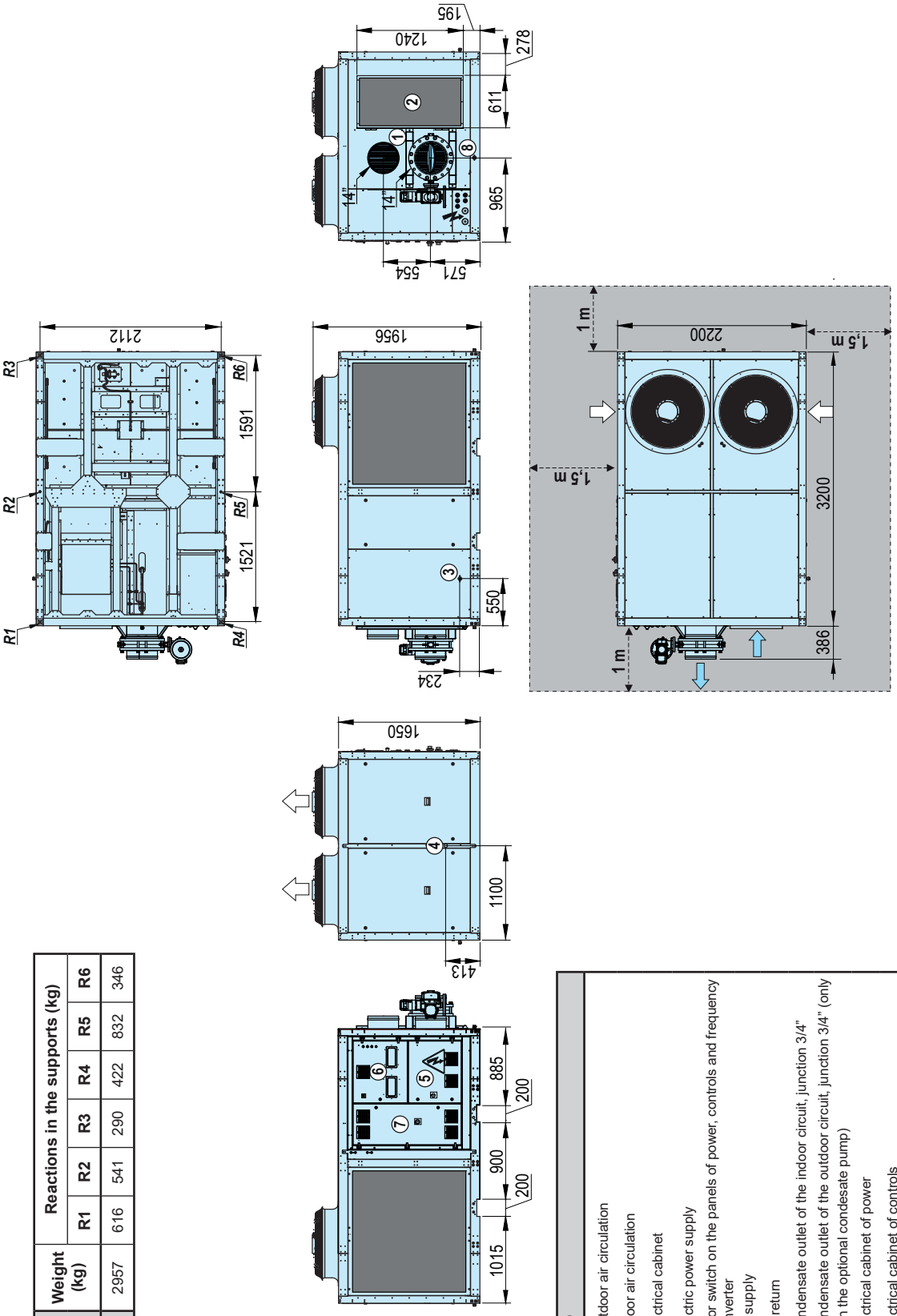
LEGEND

- Outdoor air circulation
- Indoor air circulation
- Electrical cabinet
- Electric power supply
- Door switch on the panels of power, controls and frequency converter
- ① Air supply
- ② Air return
- ③ Condensate outlet of the indoor circuit, junction 3/4"
- ④ Condensate outlet of the outdoor circuit, junction 3/4" (only with the optional condesate pump)
- ⑤ Electrical cabinet of power
- ⑥ Electrical cabinet of controls
- ⑦ Electrical cabinet of the fan frequency converter
- ⑧ Draining plug for cleaning of the indoor circuit pan

Anti-vibration anchoring: rivet nut M12

Clear space to be observed for maintenance operations and unit start-up

5. IBDXG-622 WITH BUTTERFLY VALVE DIMENSIONS SCHEME



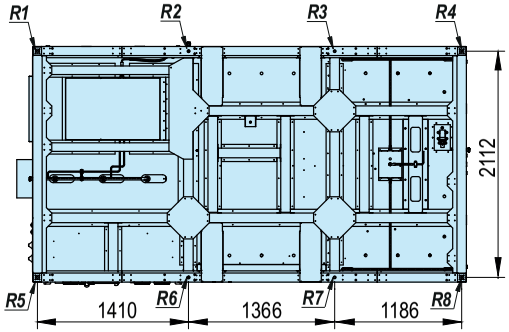
IBDXG	Weight (kg)	Reactions in the supports (kg)					
		R1	R2	R3	R4	R5	R6
622	2957	616	541	290	422	832	346

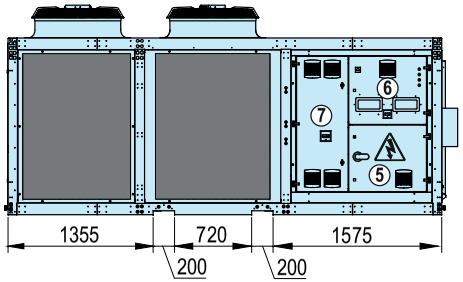
LEGEND

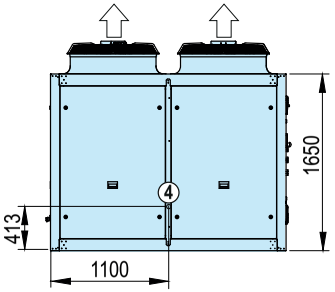
- Outdoor air circulation
- Indoor air circulation
- Electrical cabinet
- Electric power supply
- Door switch on the panels of power, controls and frequency converter
- ① Air supply
- ② Air return
- ③ Condensate outlet of the indoor circuit, junction 3/4"
- ④ Condensate outlet of the outdoor circuit, junction 3/4" (only with the optional condesate pump)
- ⑤ Electrical cabinet of power
- ⑥ Electrical cabinet of controls
- ⑦ Electrical cabinet of the fan frequency converter
- ⑧ Draining plug for cleaning of the indoor circuit pan
- *Anti-vibration anchoring: rivet nut M12*
- *Clear space to be observed for maintenance operations and unit start-up*

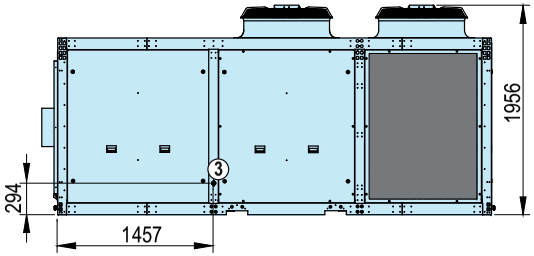
5. IBDXG-723 DIMENSIONS SCHEME

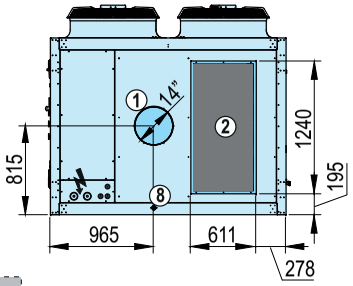
IBDXG	Weight (kg)	Reactions in the supports (kg)							
		R1	R2	R3	R4	R5	R6	R7	R8
723	3750	542	529	432	296	572	577	478	324

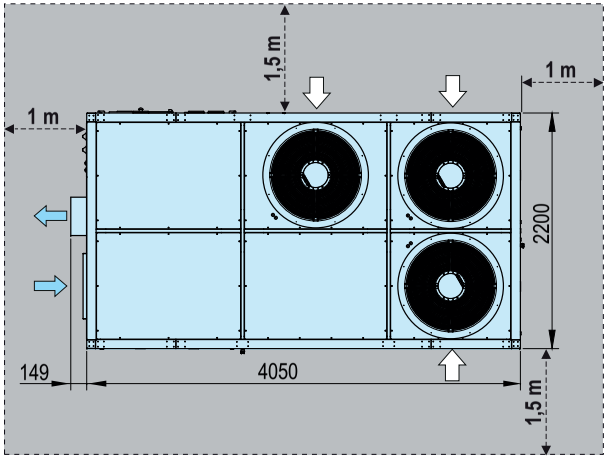












LEGEND

- Outdoor air circulation
- Indoor air circulation
- Electrical cabinet
- Electric power supply
- Door switch on the panels of power, controls and frequency converter
- ① Air supply
- ② Air return
- ③ Condensate outlet of the indoor circuit, junction 3/4"
- ④ Condensate outlet of the outdoor circuit, junction 3/4" (only with the optional condesate pump)
- ⑤ Electrical cabinet of power
- ⑥ Electrical cabinet of controls
- ⑦ Electrical cabinet of the fan frequency converter
- ⑧ Draining plug for cleaning of the indoor circuit pan

Anti-vibration anchoring: rivet nut M12

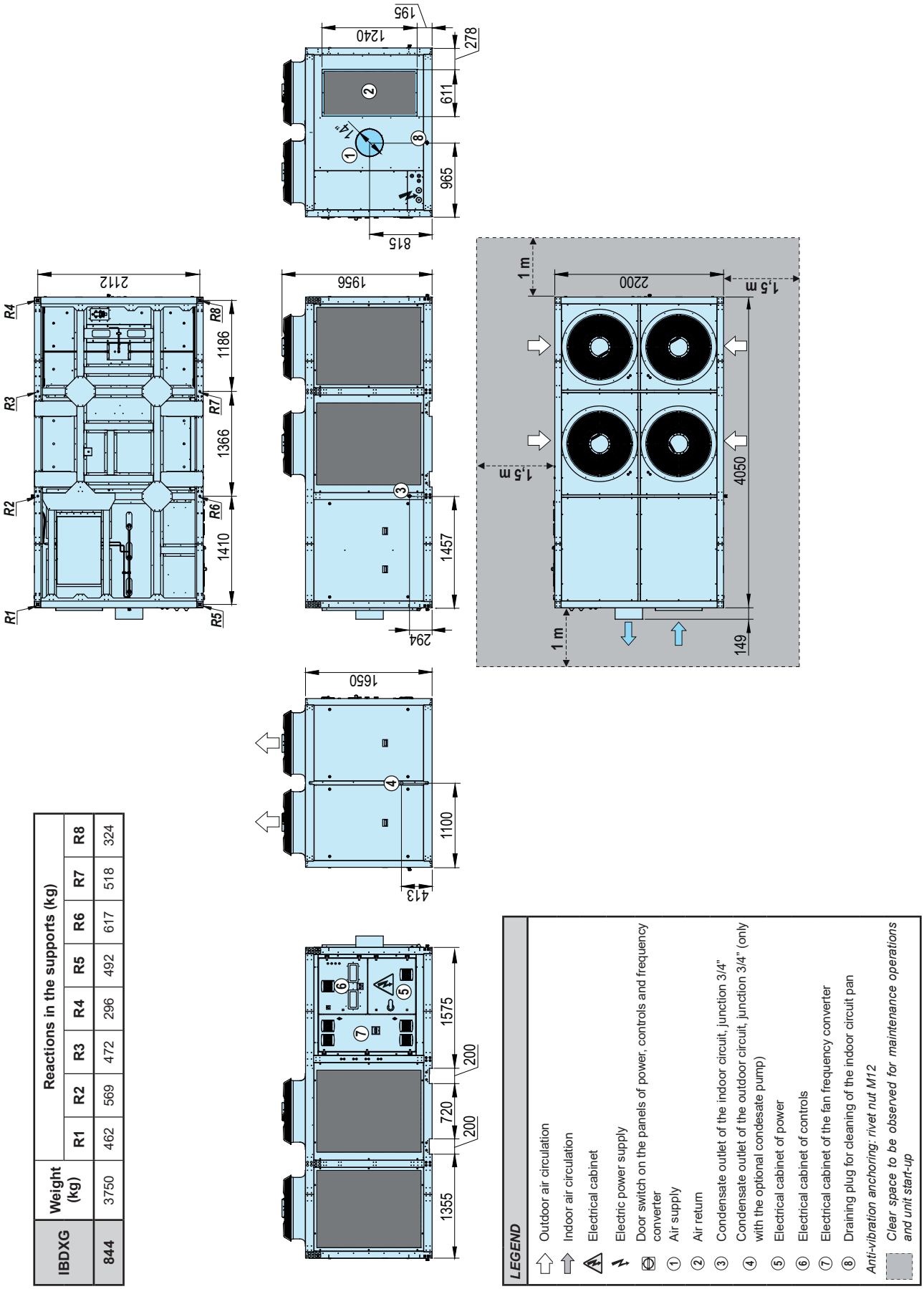
Clear space to be observed for maintenance operations and unit start-up

Point-of-use PCA units for parked aircrafts

Ature® inverter

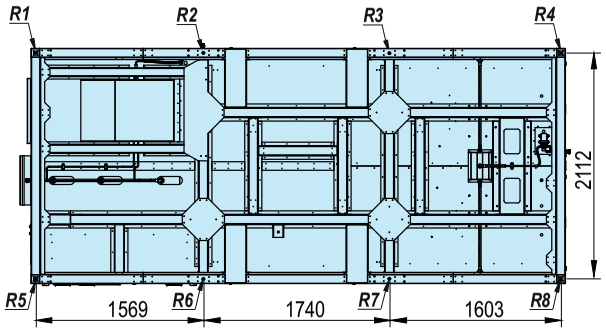
5. IBDXG-844 DIMENSIONS SCHEME

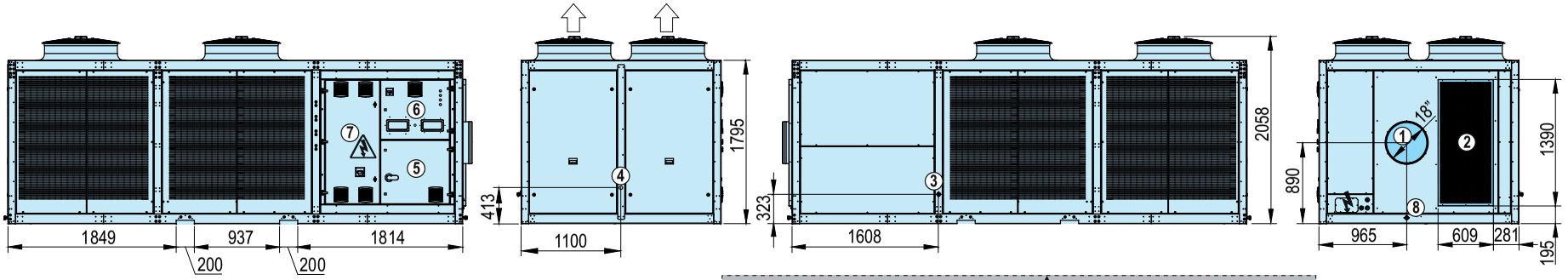
IBDXG	Weight (kg)	Reactions in the supports (kg)							
		R1	R2	R3	R4	R5	R6	R7	R8
844	3750	462	569	472	296	492	617	518	324

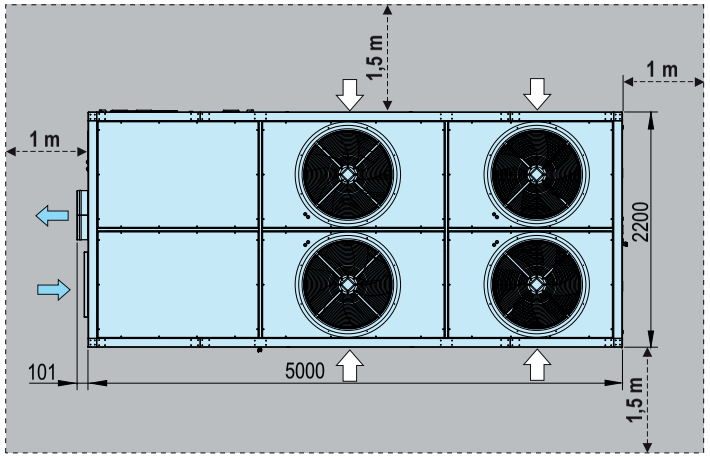


5. IBDXG-1524 / 1624 DIMENSIONS SCHEME

IBDXG	Weight (kg)	Reactions in the supports (kg)							
		R1	R2	R3	R4	R5	R6	R7	R8
1524 / 1624	5108	466	533	1210	189	824	440	1220	226







LEGEND

- Outdoor air circulation
- Indoor air circulation
- Electrical cabinet
- Electric power supply
- Door switch on the panels of power, controls and frequency converter
- ① Air supply
- ② Air return
- ③ Condensate outlet of the indoor circuit, junction 3/4"
- ④ Condensate outlet of the outdoor circuit, junction 3/4" (only with the optional condesate pump)
- ⑤ Electrical cabinet of power
- ⑥ Electrical cabinet of controls
- ⑦ Electrical cabinet of the fan frequency converter
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Anti-vibration anchoring: rivet nut M12

Clear space to be observed for maintenance operations and unit start-up

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Ature® inverter

6. Safety advice

To avoid accidents during installation, commissioning or maintenance, it is required to take into consideration the units specifications: refrigerated circuits under pressure, refrigerant presence, voltage presence and implantation.

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 the maintenance brochures, the labels, and the specific instructions. It is necessary to comply with the norms and regulations in effect.

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.

Use safety goggles and gloves on the job. Be careful with sharp parts or elements in the unit.

Caution: Before intervening in the unit, verify that the main power to the unit is cut off. An electric shock can cause personal damage.

Note: In order to recycle these units follow the stipulations of Directives 2002/96/EC and 2003/108/EC *regarding electrical and electronic equipment and the management of the resulting waste*.

Refrigerant leaks:

A periodical check must be performed for refrigerant gas leaks as per Regulation (EC) Nº517/2014 over **certain greenhouse effect fluoride gases.** Please, consult the frequency of checks in chapter of “Maintenance”.

These units work with refrigerant gas **R-410A**. This fluid is used up to a maximum service pressure of 42 bar.

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	

In case of a leak:

- Toxicity: According to ASHRAE 34, 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 heavier than air and can displace the technician local air. In case of an accidental discharge in a closed enclosure, fans must be used to eliminate said vapours.
- Although the R-410A is not flammable, when in contact with a flame or hot spot it can decompose in fluorhydric acid HF and fluophosgene COF_2 which are highly toxic and corrosive.
- To detect leaks, an electronic leak detector, an ultraviolet lamp or soapy water must be used. Flame detectors do not help.

Important: Immediately repair any refrigerant leak, using a recovery unit specific for R-410A that avoids a possible mixture of refrigerants and/or oils.

7. General recommendations

It is required to follow the recommendations and instructions provided in this manual for installation, start-up and maintenance of the machine, in the labels as well as in the specific instructions.

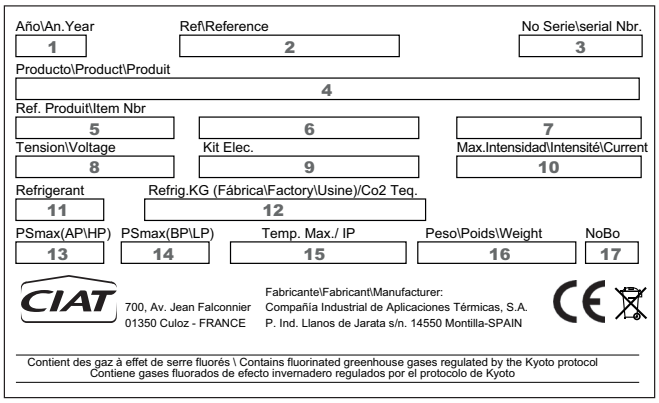
Delivery of the unit

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.

Identification

All units bear, legibly and indelibly, a data plate located in a prime space:



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

Markings (data 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

8. TRANSPORT AND EMPLACEMENT

Handling of the unit

Transport

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

The unit is supplied with skids for manipulation. These allow the unit to slide over the floor, so that it is easily removable from the container. These skids make transport pallets unnecessary.

Discharging of the unit

The unit can be discharged on the unloading dock, at the same height of the transport box, simply by pulling on the skids at the points set out for them. It is also possible to use a crane with a rocker arm and cloth slings, or a forklift truck if it is done on the side of the transport box.

When using any of the three above methods, it is always mandatory to grasp the unit by the points intended for that purpose, as described in this chapter.

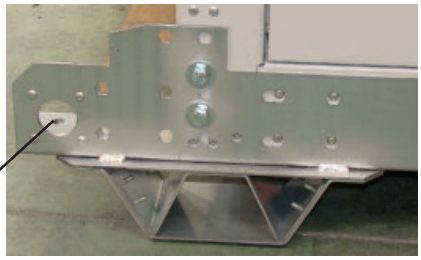
Any handling of the unit by other means or by gripping points different from those described here may be dangerous for both the unit and the personnel who are carrying out the discharging or transport work.

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

- **Discharging to the same plane using skids:**

  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 discharging platform (for example, a dock).

  To do so, each skid will be gripped by the points indicated in the image so that it can be pulled from the unit to be extracted from the box.



Gripping point

- **Discharge via crane:**

  A rocker arm, as well as approved cloth slings, both suitable for the dimensions and weight of the unit, must be used in order to carry out the work safely and without causing damage to the units or to workers.

Make sure that the unit is protected from contact with the hooks to prevent damage to the housing.

Do not raise any of the units by points outside of those specified here. In particular, do not raise them by the traction points of the skids.

- **Discharge via forklift truck:**

  The unit is designed to be transported safely by using a forklift truck. It incorporates in its base two guides to accommodate the forks of the forklift truck for ensuring that the centre of gravity of the unit remains within the forks, and at the same time, avoiding the possible introduction of the truck's fork into functional parts that may cause damage to the unit.

  Each guide also incorporates a fairing to prevent that a misbalance in the transport may cause the unit to turn over and fall from the forklift truck. Each fairing is attached to both sides of the unit using 2 screws M10.

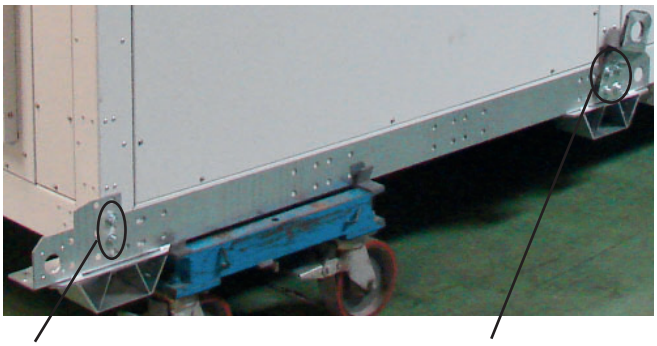
The recommended length for the forks will be 2200 mm, and necessarily as minimum it will be 1700 mm, so that the entire weight-bearing structure of the unit can be supported on the forklift truck.

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.

Placement on site of the G models (ground)

Once the unit is discharged, it must be freed from the transport skids, so that the inserts available for the silent-blocks can be accessed.

Each skid is attached to the unit using two screws M10 at the end of the crossbar and four screws M10 in the middle of the crossbar. The screws attached in the middle of the crossbar are used to support the lifting grips.



2 screws M10 *4 screws M10*

These units have been designed to allow its direct installation on the floor, without the need of additional lifting frames, but providing to the installer of the greatest possible flexibility in deciding the final method of fixing to the installation.

To avoid an eventual transmission of vibrations to the support surface, appropriate damping devices to the weight of the unit must be inserted (silent-block). To do this, the reactions in the supports at the base of the machine must be especially observed (please consult the diagrams of dimensions of Chapter 6).

Preparation of the ground

It is necessary to ensure that the surface where the unit is going to be installed in completely flat. In particular, it is recommended that the height difference between the support points of a same crossbar is not more than 2 mm, and between lines of support of two crossbars not more than 4 mm.

Any defect in the preparation of the unit support surface translates into stresses on the structure, which may result in its deformation.

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.

Ground units do not require free installation height for its operation or maintenance. However, the designer and/or installer must consider the need to install elevated on frame where the installation site can accumulate water or snow which can exceed the height of the base of the machine, blocking the coils or entering inside of the machine.

Silent-blocks assembly

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 frames, 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 previous section.

Although it is expected that this operation can be conducted with crane, since it is not always possible due to the easements of the installation, it would be appropriate to use a forklift truck to raise the machine to a sufficient lifting height to screw the silent-blocks into its base.

Lift the machine with the forklift truck by inserting the forks in the fairings. Then install the 8 silent-blocks. The 4 silent-blocks of the corners must be oblique to the machine, while the 4 interiors must be perpendicular.

Oblique installation *Perpendicular installation*

Point-of-use PCA units for parked aircrafts

Note: the following images refer to the silent-blocks supplied as optional with these units.

The metric threads M12 have been provided for the placement of these silent-blocks in the supports indicated in the diagrams of dimensions of Chapter 6. A hex key 19 or Allen wrench 10 will be used for this operation based on the type of screw used.

This image shows how the silent-block is fixed to the unit.

Next, with the help of the forklift truck, the unit must be lowered to the ground. Do this carefully to avoid damaging the machine.

In the following image, the final assembly of the unit on the silent-blocks can be seen.

Placement on site of the B models (bridge)

Once the unit is discharged it is advisable to release it from the lifting grips and the transport skids. Each skid is attached to the unit using two screws M10 (hex key 17) at the end of the crossbar and four screws M10 in the middle of the crossbar. The screws attached in the middle of the crossbar are used to support the lifting grips. On the other hand it is advisable to keep fairings attached to the base.

The model IBDXB-622 is equipped with 6 vertical brackets for the attachment to the Finger. These brackets are attached to the unit using eight screws M12 x 60 (hex key 19) each one.

Attachment brackets

The auxiliary structure, which depends on the installer, must be equipped with platens of structural steel with a thickness of 20 mm and a round machining diameter 40 mm located in the proper position for the correct assembly with six attachment brackets.

For the calculation of this structure must be especially observed reactions in vertical brackets indicated in the dimensions diagram of Chapter 5.

9. CHECKING BEFORE COMMISSIONING

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

Electrical connections

Installation norms

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

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

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

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

It is mandatory that the wiring of the installation complies with the effective legislation. The installer must fix line protection elements according to the effective legislation.

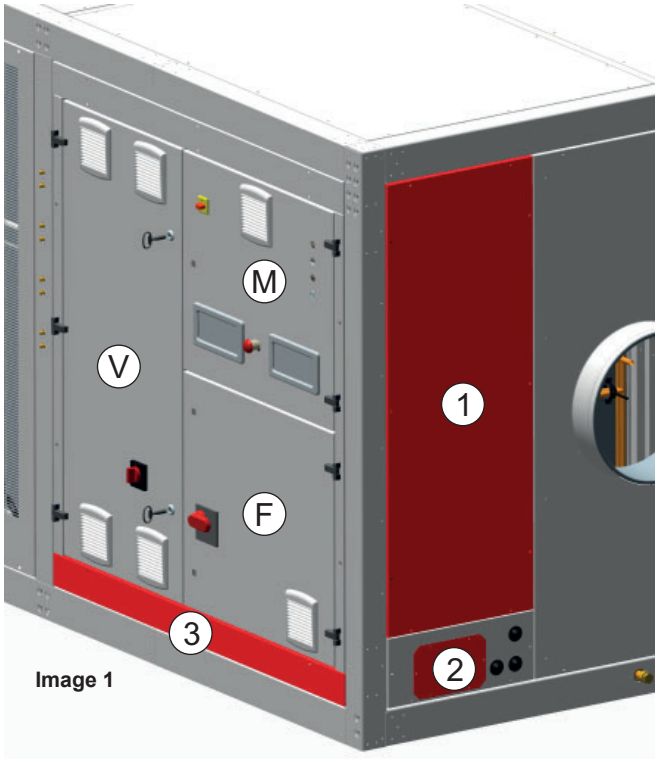


Image 1

Connection

The electrical cabinet is divided into three independent sections: panel of power (F), panel of controls (M) and panel of frequency converter (V), each one with its own door switch.

Access doors to these panels incorporate stainless steel compression latches with 8 mm triangular inserts.

The connections of the electrical cabinet are accessible from the side of the discharge nozzle. The connectors access (1) and the installation wall bushing (2) are located there.

The only connections that have to be carried out on the machine are:

- to lead the electrical power supply to the main switch of the machine.
- to wire the interconnection signals with the quick connectors plugs, as shown in the pictures and according to the wiring diagram.

For these electrical connections it is necessary to remove the following cover plates: (1), (2) and (3), secured by M4 Allen screws.

The cover plate (1) gives access to the connectors of the electrical cabinet. It incorporates quick connectors which facilitate the wiring by the installer and reduce failures of connection, improving the reliability of the unit and facilitating maintenance tasks.

Note: the unit incorporates an auxiliary electrical cabinet in each compressors box (the model 622 incorporates a single panel). Refer to the “Maintenance” chapter where the access to the compressors boxs and to these auxiliary panels is explained.

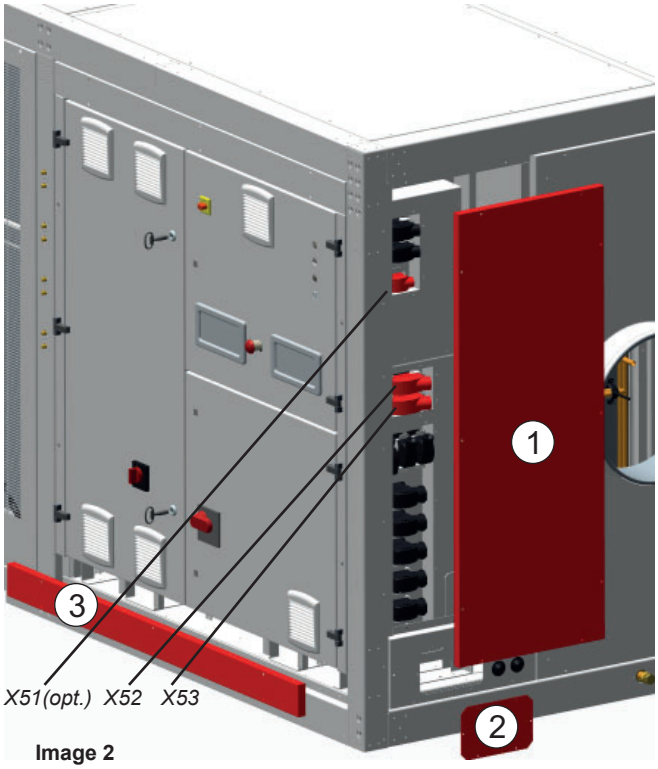


Image 2

Optionally the unit can incorpore a quick switch-rated plugs and receptables.

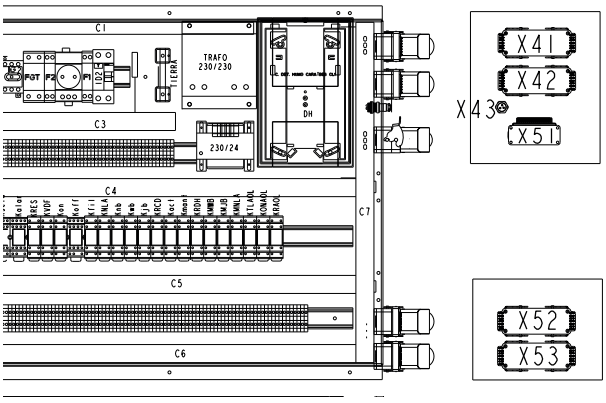
Point-of-use PCA units for parked aircrafts

Interconnection signals

The connectors of the installer are X51 (in option), X52 and X53 (indicated on the electrical diagram). X51 is used for the single-phase power supply 230V / Iph / 50Hz of the controls panel from the CBTH, X52 collects all signals exchanged with AOL and X53 is essentially dedicated for dry contacts.

Three drills in the cover plate (2) have been provided for the hoses of signal connecting to X51 (in option), X52 and X53.

Important: The position and number of connectors may well be varied according to configuration of unit, for more detail consult the electrical diagram included with each unit.



The door of the electrical cabinet of controls includes two collapsible windows for access to the pGD Touch panel (4) and to the control pendant (5). Also it incorporates a set of signal lights (6): green (ON), white (OFF), red (ALARM), yellow (CLOGGED FILTER).

Note: The IBDXG-1524 features an additional blue light that signals intensity limitation.

The door of the electrical cabinet of controls in B models (Bridge) does not include these windows.

In this case, the touch panel and the control pendant are housed in a remote keypad.

For the connection of the keypad refer to the electrical diagram supplied with the unit.

Power supply

To carry out the connection of the power supply of the unit also it is necessary to disassemble the cover plate (3). This facilitates connection to the panel of phases and ground conductors.

First, conductors have to pass through the window done in the cover plate (2) (see Image 2).

These conductors are introduced then below the electrical cabinet to catch them by the bottom (7) and lead them to the main switch and to the ground terminal.

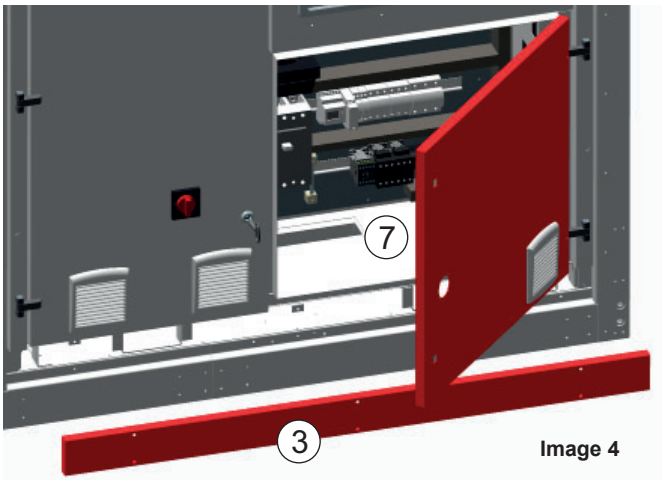


Image 4

Removal of the electrical cabinet

Before the removal of the panel, it must be disconnected the electrical power supply, all the quick connectors and the power cables of the fan frequency converter.

The complete panel is removable to allow the access to the indoor coils. The cover plates (3) and (8), secured by Allen screws M4, must be disassembled for its removal. Then the two pillars of the panel (9) must be unscrewed, each one is secured by two quick screws M10.

The forks of the forklift truck must pass through the blades located at the bottom of the panel (10).

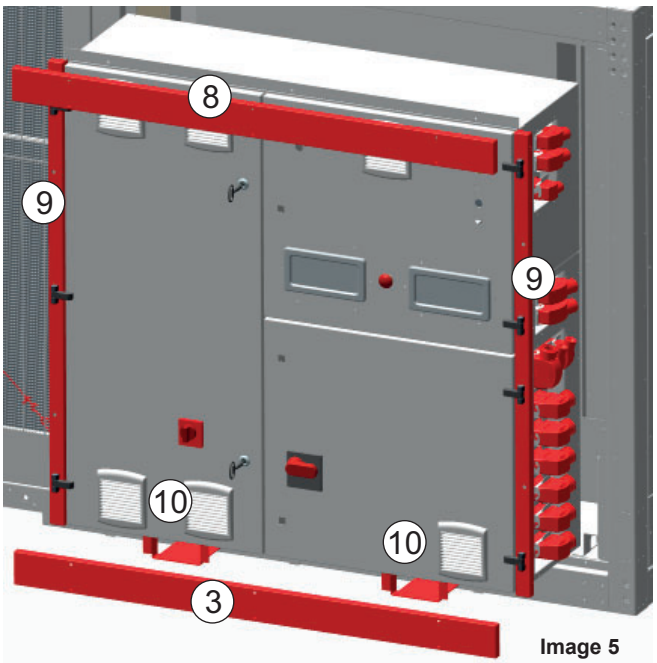
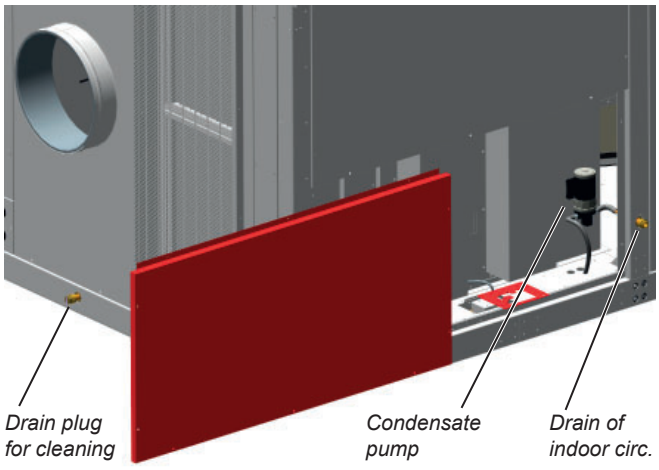


Image 5

Condensate drain connection

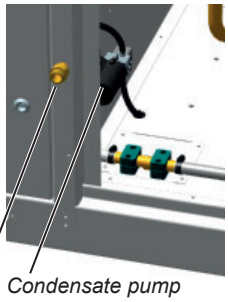
In the dimensions schemes of these units, included in this document, it is possible to observe the position of the drains in both the indoor and outdoor circuits. These drains are junctions 3/4" M.



Drain in the outdoor circuit:

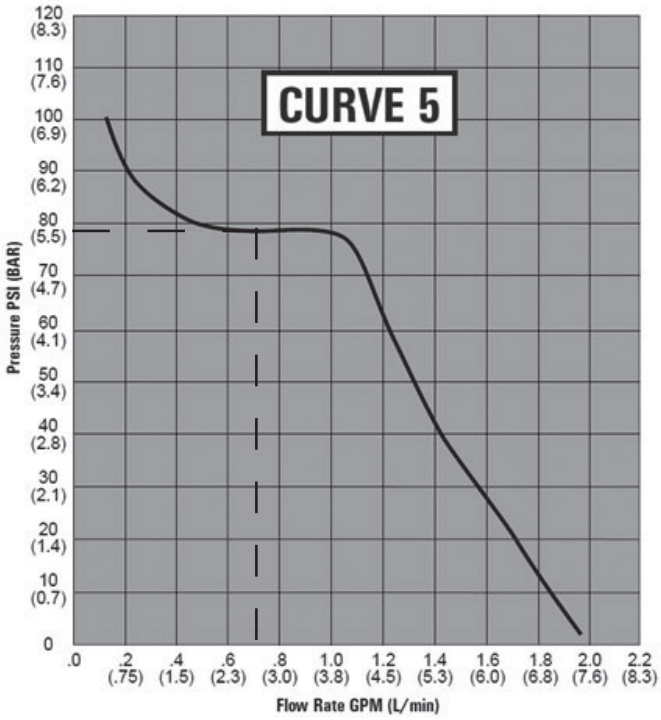
This drainage is carried out with free discharge so it will only be necessary to provide a condensate drain connection in the platform to separate these condensate from the unit. In this case, it's recommended to place a small siphon.

A drain condensate pump, can optionally be installed. The characteristics of the pump must be adequate to this condensate circuit, observing the same requirements as in the previous case. Bridge units (B) are provided in standard with this pump, which is accessed throught the right hinged door of the outdoor fans.



With negative outdoor temperatures, the necessary precautions must be taken to prevent the water in the drain ducts from freezing. The pan of the outdoor circuit incorporates antifreeze electrical heaters.

- *Characteristics of flow - height of the pump (nominal point):*



Drain in the indoor circuit:

The indoor circuit incorporates two condensate collection pans; one in the supply and the other in the aspiration side. The water flows from the supply pan to the aspiration pan, which has underpressure, and from there the pump sends it outside.

The drainage system must be suitable for these features otherwise the flood of the conditioning module could occur and, therefore, the failure of the unit.

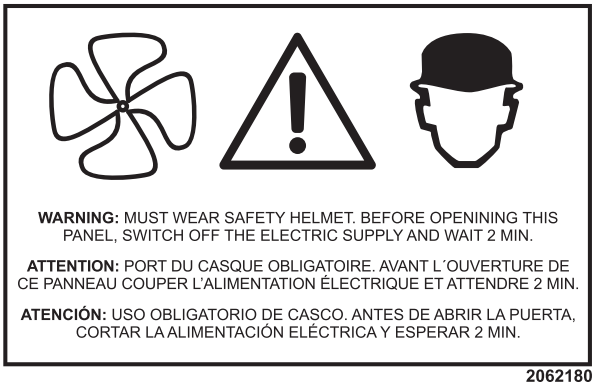
The supply pan also incorporates a drain plug for cleaning.

Point-of-use PCA units for parked aircrafts

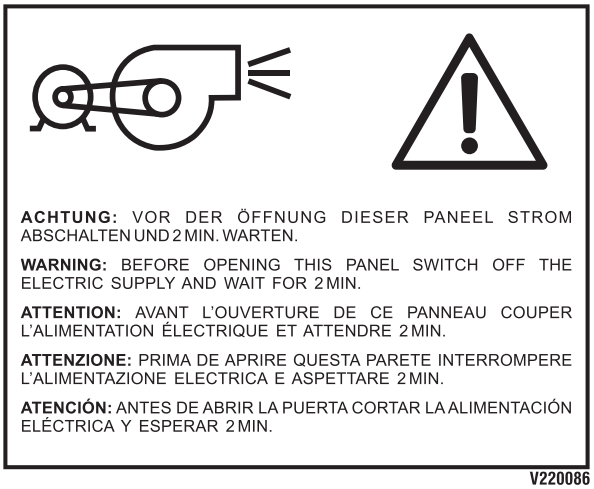
Checks in the fans

- 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.

Axial fan:



Centrifugal fan:



Air ducts connections

It is advisable to take into consideration the following recommendations:

- Curves in the fan supply supply must be avoided. If it is not possible, they must be as smooth as possible.
- 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.

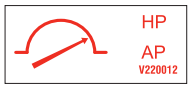
Incorrect

Correct

10. SAFETY ELEMENTS

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.



Low pressure safety

This safety is carried out by the own regulation depending on the measure of an electronic sensor of low pressure.

Liquid receiver safety valve

The reversible circuits include a safety valve in the liquid receiver. Valve tare value at 45 bar.

Caution: Avoid the valve triggering direction.

Main door switch

By using a mechanical device, it impedes access to the electrical cabinet when the unit is with voltage. The electrical cabinet is divided into three independent sections: panel of power, panel of controls and panel of frequency converter, each one with its own door switch.

Magnetothermals for line protection

They are located at the beginning of the power lines for the compressors and motor fans to protect them.

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).

Grounding

A drain wire placed on the metal structure of each part of the electrical cabinet (power, controls and frequency converter) guarantees the electric continuity of all metallic elements.

Phase control relay

This relay ensures that the phase sequence is correct. It prevents the operation of the machine where the phases are crossed in the power supply.

Emergency stop button

This button, located on the control panel, allows to completely stop the unit if there is an emergency situation. The maintenance staff should reset the unit before restarting it.

Important: Do not use this button to stop the unit in normal operation. Repeated use of this switch can cause problems in the indoor fan.

Fan and compressor safeties

Both the fans and the compressor have a thermal protection for the motor. Its mission is to protect the motor against an excessive heating caused by a surge.

Microswitches in hinged coils and doors

These microswitches cut off the power supply of the machine in case of opening of the hinged coils or doors, while the machine is working.

- In bridge mounted units (B), safety microswitches on the hinged doors of the outdoor fans.
- In models 723, 844, 1524 and 1624, safety microswitches on the hinged outdoor coils.

Clogged filter detector

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

Defrost control

In some operating conditions, frost may form in the final cooling stages. To avoid this, the machine can be regulated to stop operation of the compressor with circuit containing frost for a few minutes, and during this time air is driven at a different flow.

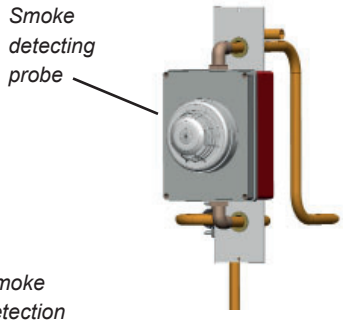
In the reversible circuits, when the unit is working in the heating cycle, this safety device is intended to eliminate ice which could accumulate in the outdoor coils.

These two circuits will never be defrost simultaneously.

Smoke detector

This smoke detection station uses a LED to indicate the installation status, and if the probe detects the presence of smoke in the installation, it stops the operation of the unit.

The probe is accessed by a panel located behind the electrical cabinet.



Electrical heaters safety thermistors

The electrical heaters (in option) 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.

11. COMMISSIONING

Checks prior to commissioning

- It is advisable to make a complete sketch of the installation including the location of the unit and all the components used. This will be very helpful for maintenance and repairs to the installation.
- The following must be verified:
  - That the electrical power supply remains constant and that it corresponds to that featured on the unit data plate.
  - That the electric installation has been carried out according to the electric wiring diagram provided with the unit (consult the chapter on “Checking before commissioning”).
  - The correct connection of the sensors supplied with the unit.
  - That they are no 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. It is necessary to leave the compressor crankcase heater with voltage for 24 hours before starting the compressor.

  Important: first of all it is necessary to give voltage to the switch of the controls panel, and after this, to the power panel.

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

- These units are equipped with scroll type compressors and have a phase control relay. Verify that they turn in the correct direction and, if not, reverse the power wires.

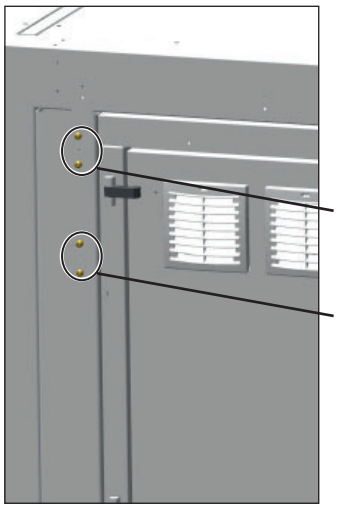
SCROLL COMPRESSOR.
CHECK SENSE OF ROTATION
COMPRESSEUR SCROLL.
VÉRIFIER LE SENS DE ROTATION
COMPRESOR SCROLL.
COMPROBAR SENTIDO DE GIRO
V220040

Control of the refrigerant load

- When commissioning the compressors, check the subcooling and overheating and thus verify if the refrigerant load is appropriate to the operating conditions.

R 410A

- If the refrigerant load is lower than required, the suction pressure will be rather lower than normal, and overheating when suctioning from the compressors will be high. This can cause an interruption in operation due to activation of the refrigerant load safety device. To adjust the refrigerant load, a schrader valve is built into the unit on the liquid line for each circuit.



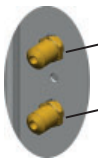
Model 622

Line of high and low schrader valves for C1 and C4 (seen from top to bottom)

Models 723, 844, 1524, 1624

Line of high and low schrader valves for C1 to C4 (seen from top to bottom)

Detail:



- Verify the absence of any leaks of the refrigerant. In case of a leak:
  - Completely empty the unit using a specific recovery unit for R-410A and repair the leak.
  - Next, reload the gas into the unit according to load data provided in the technical characteristics table 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.

Possible problems at commissioning

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

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

- Refrigerant circuit humidity problem, because of an incorrect vacuum realization.
- Air flow lack: very high differences between supply and return 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 supply.
- Noise problems because of excessive air flow.
- Water overflowing to the pan problems, originated by an excessive flow, by a malfunction of the condensate pump, or because a defective unit level.

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,
- 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.

12. MAINTENANCE

The minimum maintenance operations and their frequency are shown in the PCA Specific Plan.

Caution: Before intervening in the unit, cut off main power.

Unit access from all its doors.

General recommendations:

- Do not lean on the unit. A platform must be used to work on a level.
- Do not lean on the copper refrigerant tubes.
- Keep the unit clean.
- Keep the space surrounding the unit clean and cleared in order to avoid accidents and ensure the proper ventilation of the coil.
- Perform a visual (remains of water or oil below or around the unit) and auditory inspection of the entire installation.
- In general, a corrosion control must be performed on the metallic parts of the unit (frame, bodywork, exchangers, electrical cabinet, etc.).
- Check that the insulation foam is not unstuck or torn.
- All the electric connection states must be checked as well, as well as the air tightness of the different circuits.

Next, some recommendations are stated for performing the maintenance and cleaning of the unit's components:

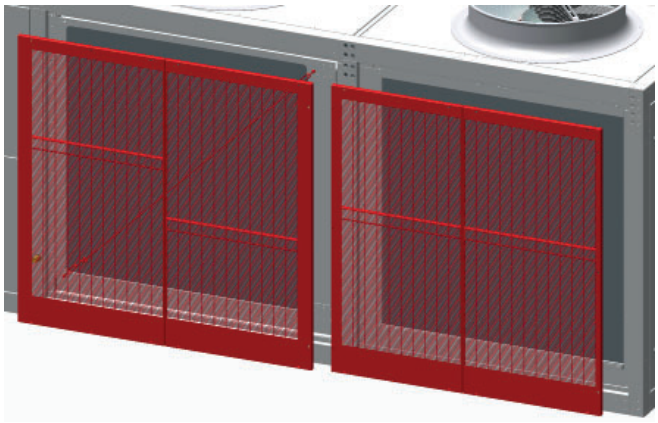
Air coil

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

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

Outdoor coils

Outdoor coils are protected by removable grilles, fixed with Allen M4 screws.

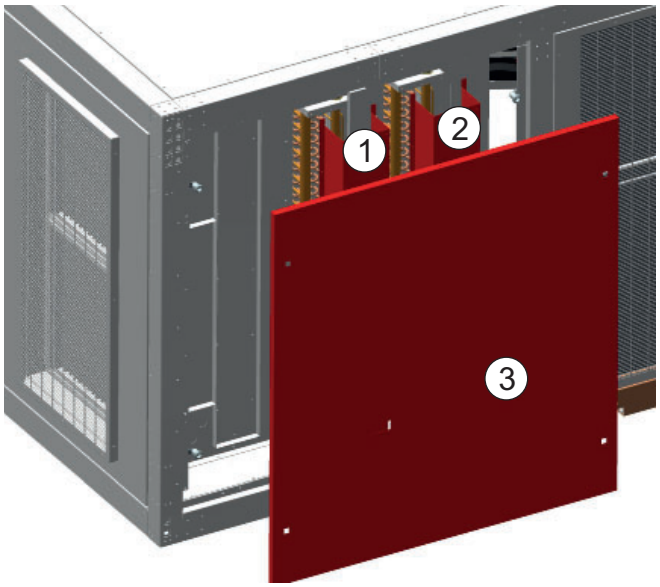


Point-of-use PCA units for parked aircrafts

Indoor coils

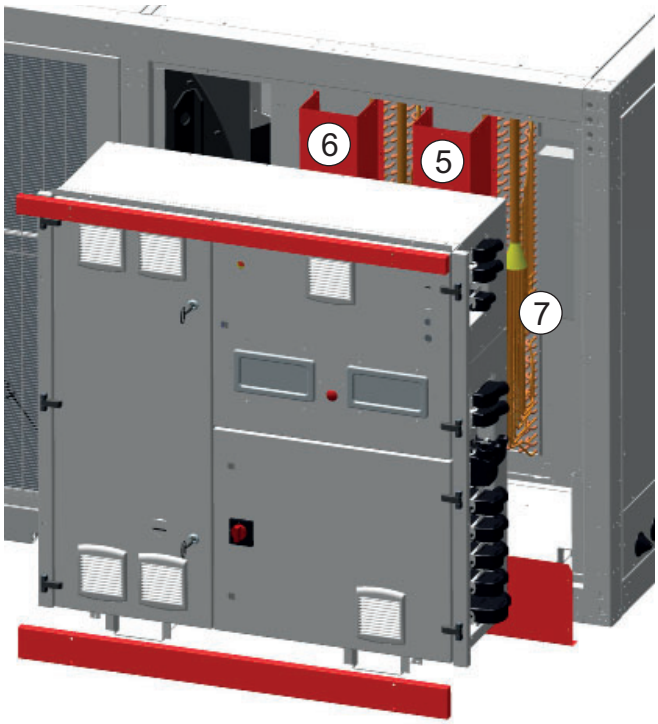
Access to indoor coils of the C1 (1) and C2 (2) circuits is performed by extracting the removable cover plates (3), (1) and (2), fixed with Allen M4 screws.

Note: in the model 622 (with only 2 circuits) is accessed the coil of circuit 1.



Access to indoor coils of the C4 (5) and C3 (6) circuits is performed by removing the electrical cabinet (explained in the section of electrical connection), and then extracting the cover plates (5), (6) and (7), fixed with Allen M4 screws.

Note: in the model 622 (with only 2 circuits) is accessed the coil of circuit 2 (C4).



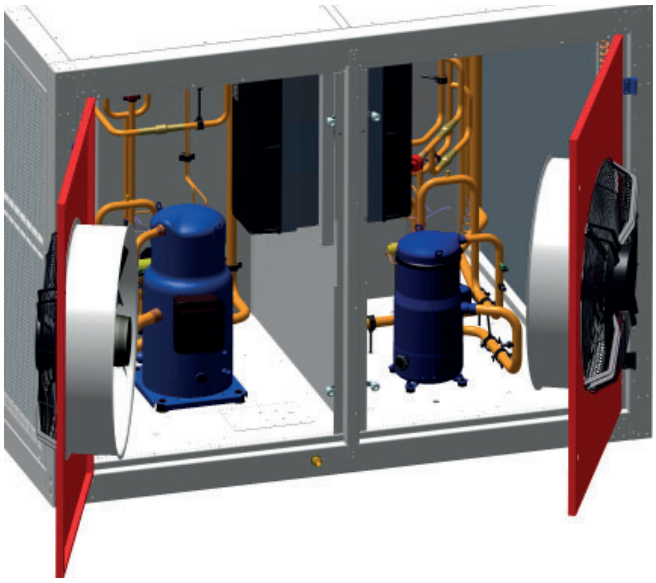
The cover plate (5) also allows access to the supply stop-drop.

Compressors

Model 622

The two circuits of the unit (C1 and C4) are reversible and are equipped with an inverter scroll-type compressor with frequency converter.

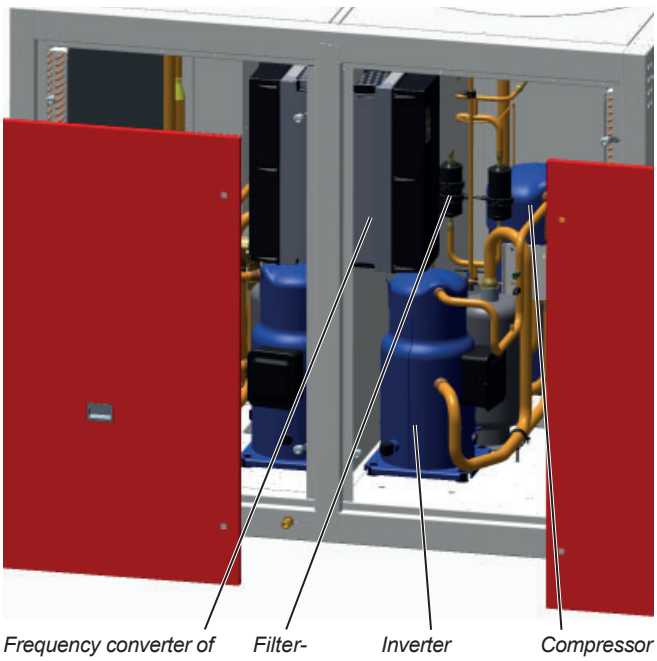
For model 622B (bridge), panels with the outdoor fans are 2 hinged doors to allow access to the compressors.



Before opening the doors of the fans it is mandatory to stop the unit. As additional safety each door incorporates a micro-switch which would cut off the power supply if the hinged door is opened while the machine is working.

Models 723, 844, 1524 and 1624

The two reversible circuits of the unit (C1 and C4) are equiped with an inverter scroll-type compressor with frequency converter. The other one (model 723) or the other two (models 844, 1524, 1624) are cooling-only circuits and incorporate a scroll type compressor.



Important: A drain wire placed on the metal structure of these panels and connected to the frequency converters of the inverter compressors guarantees the grounding. Please, carefully remove the panels.

Compressor replacement

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 unit's data plate.

Oil

- Check the oil level and aspect. In case of a colour change, check the oil quality using a contamination test.
- In the case of the presence of acid, water or metallic particles, replace the affected circuit oil, as well as the filter drier.
- In the event of an oil charge change, only new oil will be used, which will be identical to the original oil and taken from a jug tightly closed until the moment of the charge.
- The type of oil that can be used is: Copeland 3MAF 32cST, Danfoss POE 160SZ, ICI Emkarate RL 32CF, Mobil EAL Artic 22CC.
- The volume needed for each compressor is stated in the "Technical characteristics table" provided with the unit.
- Note: In an inverter compressor, the frequency converter controls the cycles of a solenoid valve that ensures that the oil is distributed to the whole of the scroll.

Filter-drier

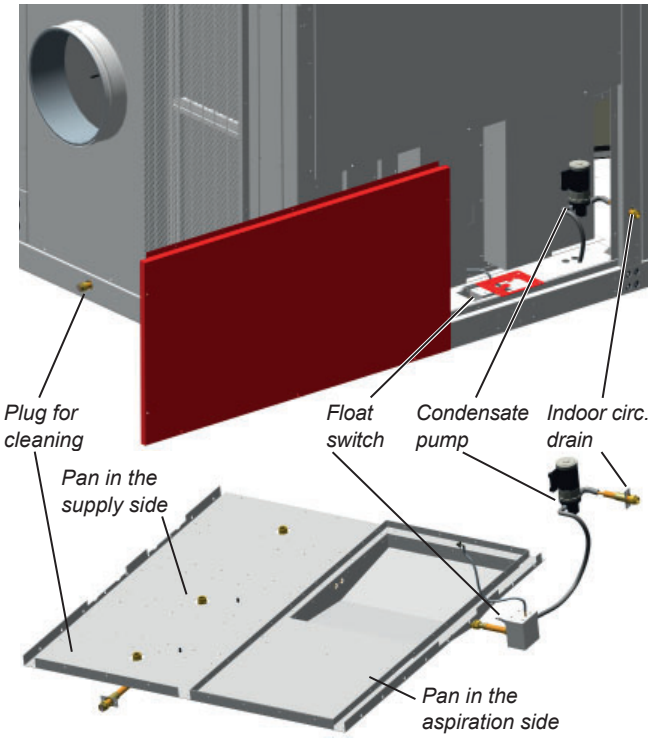
- The filter function is to keep the cooling circuit clean and without humidity, neutralising the acids that can be found in the cooling circuit.
- Verify dirt measuring the difference in temperature at the piping level, at the inlet and at the outlet of the drier.
- If necessary, replace.

Condensate drain pan

- Check that the condensate pans of the indoor and outdoor circuits are clean. There should be no stagnant water. Check also that the drain is not clogged. Check the position and diameter of the drain in the dimensions schemes (Chapter 5).

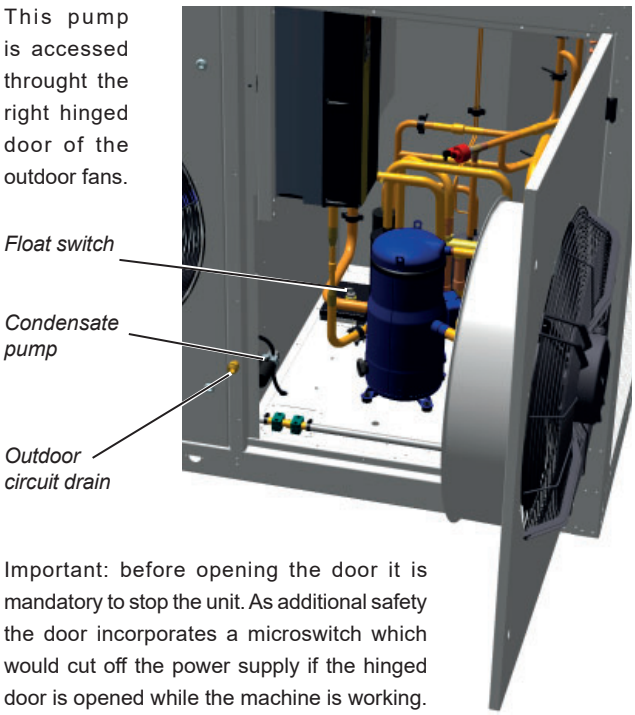
- The **indoor circuit** incorporates two condensate collection pans; one in the supply and the other in the aspiration side. The water flows from the supply pan to the aspiration pan, which has underpressure, and from there the pump sends it outside. Check that the pump is working properly.

  The supply pan also incorporates a drain plug for cleaning, whereby water with non-abrasive detergent can be injected.



- The drain in the **outdoor circuit** is carried out with free discharge in ground models (G). A condensated pump is included in the Bridge models (B).

This pump is accessed throught the right hinged door of the outdoor fans.

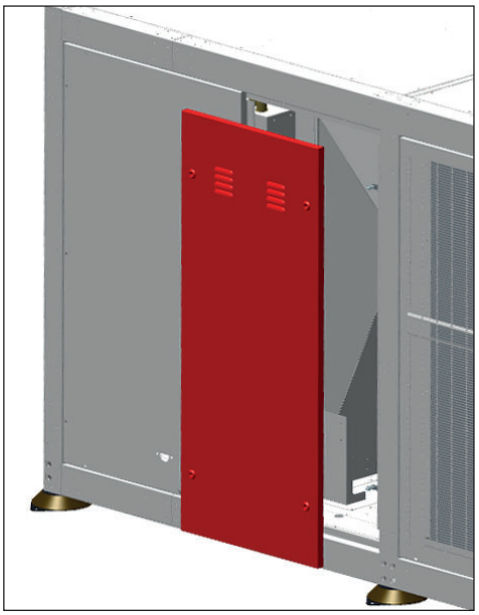


Important: before opening the door it is mandatory to stop the unit. As additional safety the door incorporates a microswitch which would cut off the power supply if the hinged door is opened while the machine is working.

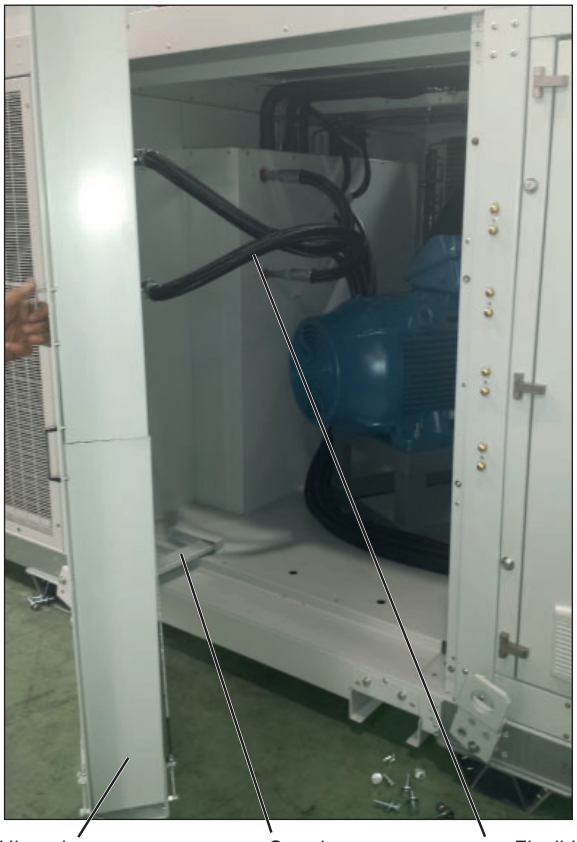
Point-of-use PCA units for parked aircrafts

Centrifugal fan

- **Access to the fan in the model 622**



- **Access to the fan in the models 723, 844, 1524 and 1624**

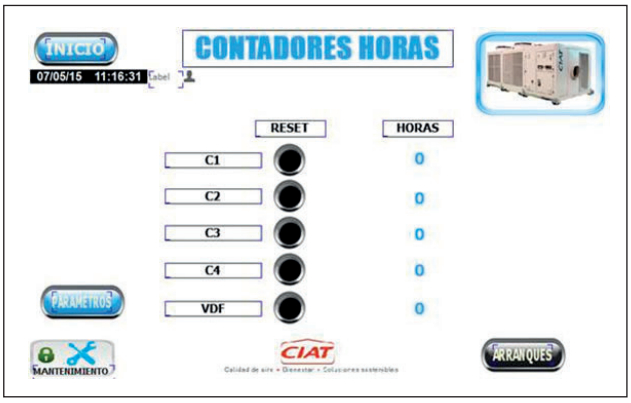


The outdoor coil of the circuit C3 is hinged and it incorporates flexible sleeves. This allows access to the indoor fan motor, centrifugal type with direct coupling.

Note: in the models 1524 and 1624, the oudoor coil of the circuit C2 is also hinged.

Important: Before opening the door it is mandatory to stop the unit. As additional safety, the coil incorporates a microswitch which would cut off the power supply if the hinged coil is opened while the machine is working.

- **Motor maintenance**
  - Verify that the turbine and the motor remain clean.
  - The operation hours accumulated by the frequency converter (VDF) of the motor can be found in the **pGD Touch** terminal of the electronic control.



Important: All the modifications made to the motor must be recorded and archived.

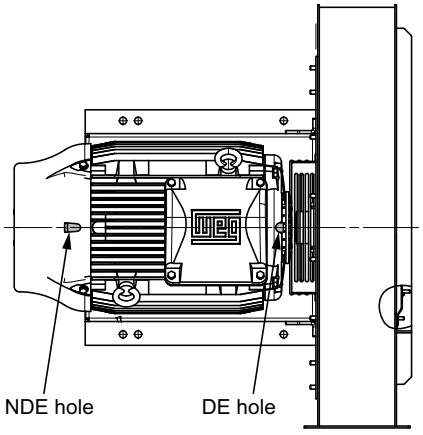
Standard motor

- Check the condition of the bearings, noting the appearance of unusual levels of vibration and noise. The operating hours for maintenance, the type of lubricant (Mobil Polyrex EM oil) and the amount to add are indicated on the motor characteristics plate.

  For example:

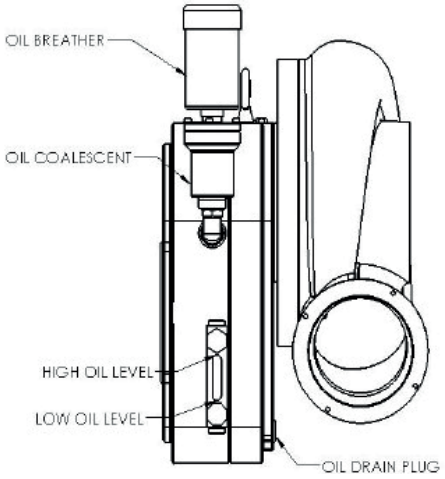
  - Motor 15kW: 20000 hours (13g DE + 13g NDE)
  - Motor 45kW: 5000 hours (27g DE + 27g NDE)
  - Motor 75kW: 4000 hours (27g DE + 27g NDE)

  This type of motors are lubricated on the drive side (DE Drive End) as well as on the rear side, the opposite side from the drive (NDE Non Drive End). All motors incorporate oil feeder holes in the housing.



Special motor

- Verify oil level: before operation, verify oil level is at or below "HIGH" mark indications.



Maintenance Schedule	
Maintenance / Inspection item	**Service frequency**
Oil level check	1 month
Oil charge	2500 hrs or annually, which ever comes first
Desiccant inspection	1 month
Desiccant replacement	Condition dependent. See step 5 below
Grease motor	2500 hrs or annually, which ever comes first

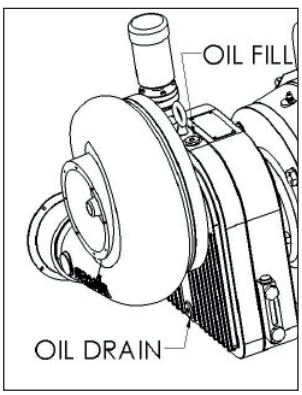
- Oil change:

  NOTE: The oil used in the unit is an ISO 32 fully synthetic turbine oil. The approved oil is Royal Purple SynFilm GT 32, Royal Purple PolyGuard FDA 32 (food grade), MIL-L-7808 OR MIL-23699.

  1. Place bucket under oil reservoir drain fitting.
  2. Remove drain plug from gearbox with a 5/16 inch allan wrench and drain oil from gearbox.
  3. Inspect magnetic drain plug and re-install the drain plug after draining. Torque to 24 ft-lbs.
  4. Fill unit up to the "HIGH" marking on the sight glass.
  5. The oil breather beads are normally blue in color. If the beads are a pink-purple color, unscrew the breather from the coalescent. Reinstall a new breather.

- Adding oil (topping off):

  1. Remove oil fill plug from the top of the gearbox.
  2. Insert funnel into gearbox and add oil. Bring the oil level up to "HIGH" marking on sight glass.



Refrigerant

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

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

  Load 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).

  Please, consult data of carbon dioxide equivalency (t CO2e) in the "Technical characteristics table" provided with the unit.

- 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: Never forget that the cooling systems contain liquids and vapours under pressure. The service pressure of R-410A is approximately 1.5 higher than that of R-407C.

- All necessary precautions must be taken during the partial opening of the cooling circuit. This opening entails the discharge of a certain amount of refrigerant to the atmosphere. It is essential to limit this quantity of lost refrigerant to a minimum by pumping and isolating the charge in some other part of the circuit.
- The refrigerant fluid at low temperature can cause inflammatory injuries similar to burns when contacting the skin or eyes. Always use safety goggles, gloves, etc. when opening ducts that may contain liquids.
- The refrigerant in excess must be stored in appropriate containers and the amount of refrigerant stored at the technical rooms must be limited.
- Refrigerant barrels and deposits must be handled with precaution and visible warning signs must be placed to attract attention over the risks of intoxication, fire and explosion linked to the refrigerant.
- At the end of its useful life, the refrigerant must be retrieved and recycled as per the current regulations.

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.

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

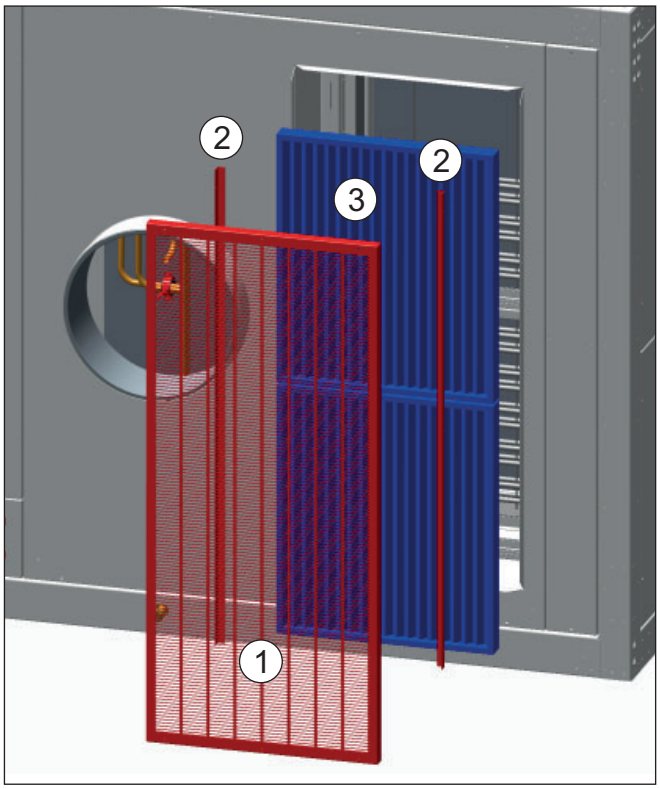
  Note: if the unit incorporates M6 filters as well as electrical resistances in the air aspiration, in case of triggering of the manual thermistor it is advisable to replace these filters to ensure the correct level of filtering.

Point-of-use PCA units for parked aircrafts

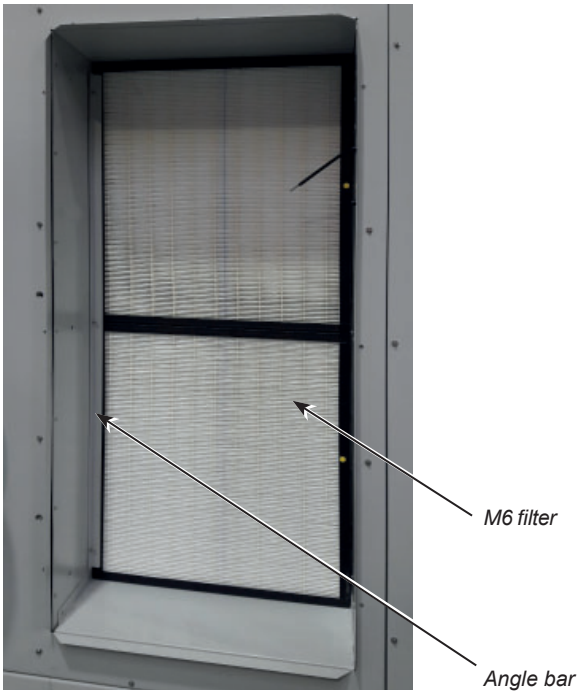
Filter removal:

The filters are located in the air aspiration of the machine. For its extraction, it must be disassembled the grille (1) fixed with Allen M4 screws.

After this, the two angle bars (2) must be unscrewed to extract the frames with the G4 filter (3).



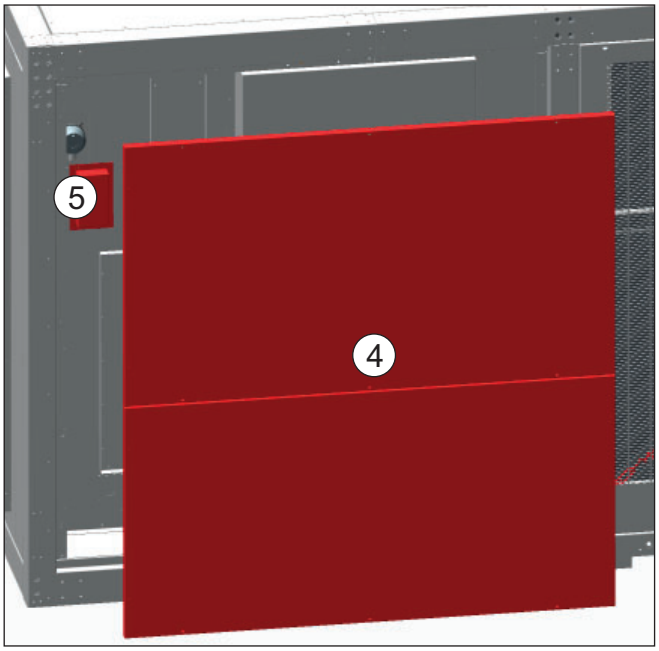
- If the unit incorporates the optional M6 filters, they are located behind the G4 filters. Unscrew the two angle bars for removal.



Clogged filter detector

The unit has a differential pressure switch of air that controls the level of clogging of the filters to limit the pressure drop through these filters.

To access this pressure switch it is necessary to remove the panel (4) and the cover plate (5), fixed with Allen M4 screws.



Air filters in the grids of the electrical cabinet

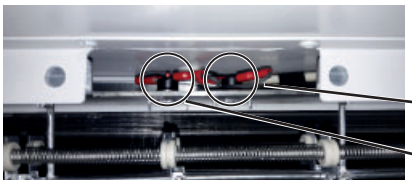
- The appearance of the filters located inside of the grids must be examined periodically, because the clogged filters impede good ventilation.
- Cleaning can be done with a household vacuum cleaner.
- Replace them regularly. 115 x 115 mm G2 filters.

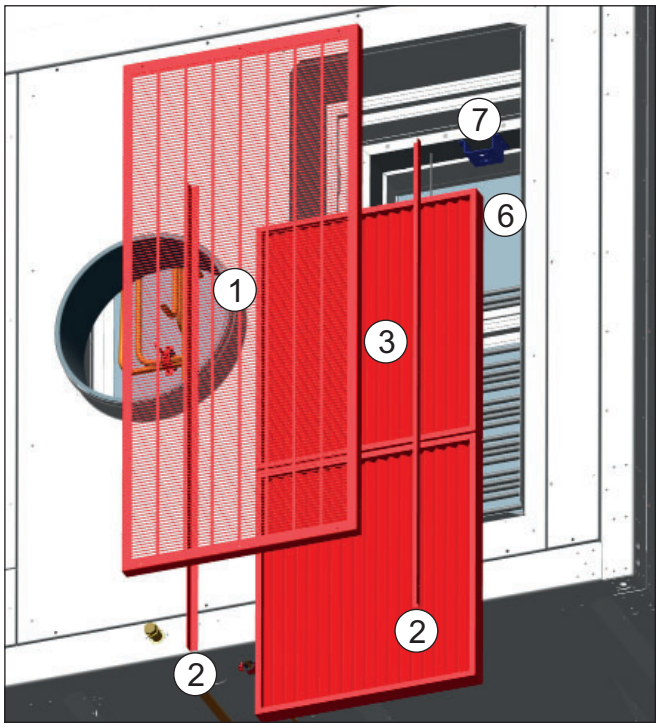
Electrical heaters (optional)

- These units can incorporate auxiliary electrical heaters mounted on the air aspiration side.
- To access the screws securing the frame of electrical heaters, it is necessary to disassemble the aspiration grille (1), fixed with Allen M4 screws.
- After this, the two angle bars (2) must be unscrewed to extract the frames with the G4 filter (3). Two screws Allen M4, one at the top and one at the bottom are those who block the frame (6). If the unit incorporates the optional M6 filters, they must be removed below.
- It is also necessary to disconnect the safety thermistors (7).

  Note: 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. In the event of failure due to high temperature, it also should be performed the above procedure to reset the manual thermistor.

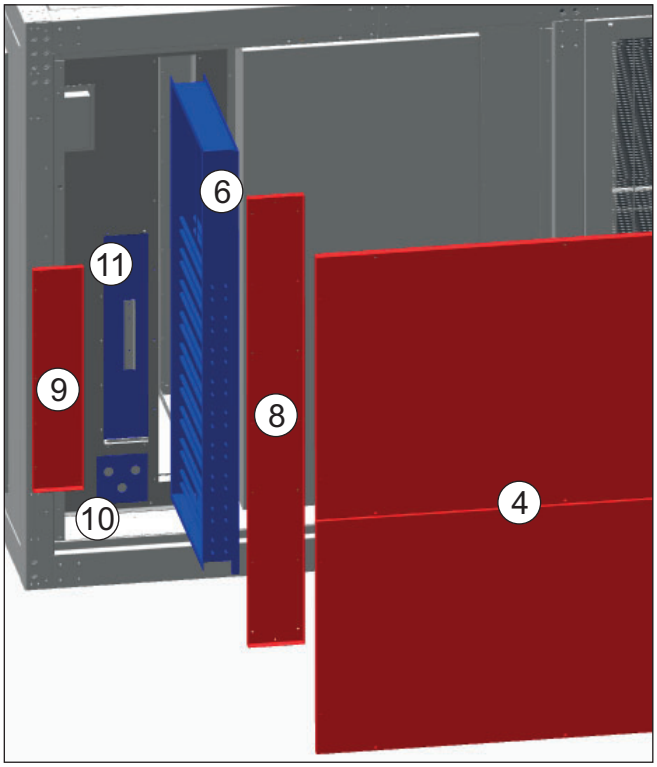
Detail of the safety thermistors:





- Finally, to access the frame with the electrical heaters (6) it's necessary to remove the panel (4) and the cover plate (8), fixed with Allen M4 screw. Then, the cover plate (9) must be removed for the electrical disconnection.

  The power supply has to pass through the cover plate (10) and it's connected in a terminal block (11).



Point-of-use PCA units for parked aircrafts

Maintenance programme

CHECKING / OPERATION	TOOLS	CONSUMABLES	FREQUENCY
COOLING CIRCUITS			
Compressor discharge temperature	Thermometer	-	Annual
	DISPLAY	-	
Liquid line temperature	Thermometer	-	Annual
	DISPLAY	-	
Suction line temperature	Thermometer	-	Annual
	DISPLAY	-	
Condensation temperature	Thermometer	-	Annual
	DISPLAY	-	
Evaporation temperature	Thermometer	-	Annual
	DISPLAY	-	
Noise from the compressors	-	-	2 months
Oil level and appearance in compressors	-	Oil	2 months
Refrigerant load	-	R-410A	6 months
Power consumed by compressors	Ammeter	-	6 months
COILS AND ELECTRICAL HEATERS			
Cleaning of coils	Low pressure air vacuum cleaner perpendicular to fins	-	Annual
Power consumed by electrical heaters	Ammeter	-	Annual
FANS			
Power consumed by outdoor fans	Ammeter	-	Annual
Inspection of the bearings and absence of undefined noise from the outdoor fans	-	-	Annual
Fix the screws on the outdoor fans	Screwdriver	-	Annual
Oil in the 15kW indoor fan motor	-	Oil	20000 hours
Oil in the 45kW indoor fan motor	-	Oil	5000 hours
Oil in the 75kW indoor fan motor	-	Oil	4000 hours
Special fan motor		Oil	see page 26
Inspection of the bearings and absence of undefined noise from the indoor fan	-	-	Annual
Power consumed by indoor fan	Ammeter	-	Annual
ELECTRICAL CABINET AND SOFTWARE			
Checking the terminal screws on the boards	Screwdriver	-	Annual
Checking the terminal screws on the electrical cabinet	Screwdriver	-	Annual
Checking the communication between modules	-	-	Annual
Checking the expansion valve operation	-	-	Annual
OVERALL			
Status of hose attachment to unit flange	-	-	Monthly
Overall oxidation status and fixing the screws	Nut wrench	-	6 months
Cleaning filters and changing unit prefilters	-	Filters	6 months
Changing the filters on the electrical cabinets	-	Filters	6 months
Checking the condensate pump	-	-	2 months
Cleaning the drain system	-	-	2 months

13. CONTROL AND ANALYSIS OF BREAKDOWNS

Symptom	Cause	Solution
Evaporation pressure very high in relation with the air inlet	a) Charge excess b) Wide open expansion valve c) Compressor aspiration 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 aspiration not air tight c) Cycle inversion 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 filter-drier and the expansion valve
Condensation pressure very high in relation to the air supply, 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 load
Evaporation pressure too low (low pressostat cutoff)	a) Low flow in evaporator. Air recirculation b) Frozen evaporator c) Firmly shut expansion valve d) The liquid circuit before and after the expansion valve is clogged. e) Gas lack f) Very low condensation pressure g) Broken evaporator fan	a) Verify the air circuits (flow, filter cleanliness...) b) Verify defrost c) Regulate and check overheating d) Dismount and clean the expansion valve. Replace filter e) Search for leaks, complete charge f) Air temp. in condenser very low (air flow very high). Adjust the flow. g) Repair it
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 intensity 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) Gas lack, cutoff because of low pressure d) Dirty or frosted evaporator e) The evaporator fan does not work, cuts off the low pressostat f) Expansion valve damaged or clogged by impurities (cuts off low pressostat) g) Filter-drier clogged (cuts off low 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 inversion 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

ANNEX I : OPERATION CHECKSHEET

UNIT CHECKSHEET

MODEL	SERIAL NUMBER	DAY	RUN

PRELIMINARY CHECKS				
TERMINAL VOLTAGE (V)				
DIRECTION OF ROTATION	COMPRESSORS		FANS	
PROGRAM VERSION LOADED				
ENTERING VFD SETTINGS				

WORK CYCLE (COOLING / HEATING):

REFRIGERANT		CIRCUIT 1	CIRCUIT 2	CIRCUIT 3	CIRCUIT 4
CONDENSER	INLET TEMPERATURE (ºC)				
	OUTLET TEMPERATURE (ºC)				
	CONDENSATION PRESSURE (bar)				
	BULB TEMPERATURE (ºC)				
	LIQUID TEMPERATURE (ºC)				
	UNDERCOOLING (K)				
EVAPORATOR	INLET TEMPERATURE (ºC)				
	OUTLET TEMPERATURE (ºC)				
	EVAPORATION PRESSURE (bar)				
	DEW POINT TEMPERATURE (ºC)				
	INLET TEMPERATURE (ºC)				
	OVERCOOLING (K)				
REFRIGERANT LOADED (kg)					
EXPANSION VALVES (revolutions)					

UNIT CHECKSHEET

MODEL	SERIAL NUMBER	DAY	RUN

POWER CONSUMPTION

	CIRCUIT 1	CIRCUIT 2	CIRCUIT 3	CIRCUIT 4
COMPRESSORS (A)				
INDOOR FAN (A)				
OUTDOOR FANS (A)				
ELECTRICAL HEATERS (A)				

PROTECTIONS

	CIRCUIT 1	CIRCUIT 2	CIRCUIT 3	CIRCUIT 4
HIGH PRESSURE PRESSOSTAT				
HIGH PRESSURE SENSOR				
LOW PRESSURE SENSOR				
COMPRESSOR INDICATED THERMAL POWER				

START OF DEFROSTING / PRESSURE END		
RA ELECTRICAL HEATER		
RM ELECTRICAL HEATER		
CONDENSATION CONTROL PRESSOSTAT (LOW/HIGH SPEED)		
SMOKE DETECTOR		
CLOGGED FILTER PRESSOSTAT		
DOOR LOCKING		
UNIT LOCKING		

UNIT CHECKSHEET

MODEL	SERIAL NUMBER	DAY	RUN

OTHER CHECKS

CONDENSATE PUMP	
AMBIENT TEMPERATURE SENSOR	
OUTLET TEMPERATURE SENSOR	
CABIN TEMPERATURE SENSOR	
CABIN SENSOR OPERATIONS	
COMMUNICATIONS WITH BMS	

REMARKS

Notes: