Coolblade BTD series

EN

Installation, use and maintenance manual

24-02-2020

WESTERN™ AIRCONDITIONING WARMTEPOMPEN

BlueBox by Swegon

THANK YOU

Thank you for choosing our product.

It is the result of many years' experience and careful design and has been built with first-class quality materials and advanced technologies.

Declaration or certificate of conformity also guarantees that the equipment meets the requirements of the European Machinery Safety Directive.

The quality level is constantly monitored, and therefore our products are synonymous with Safety, Quality and Reliability.

Changes considered necessary for product improvement may be made to the stated data at any time without any obligation to give prior notice.

Thank you again

Read this manual carefully before installing, testing or starting this unit.

Give this manual and all complementary documentation to the operator of the system who will be responsible for keeping them so they are always available if needed.

The images and drawings contained herein are examples only.

Contents

1 INTRODUCTION

1.1 Conformity

With regard to relevant regulations and directives, see the declaration of conformity that is an integral part of the manual.

1.2 Description

1.2.1 Symbols

A description of the main symbols used in this manual and on the labels affixed to the unit is given below.

Danger symbol; take extreme care.

Danger symbol; moving mechanical parts.

Danger symbol; live parts.

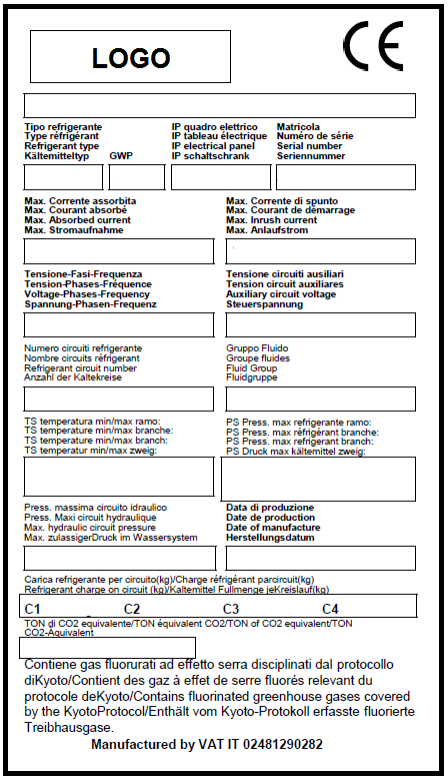
Warning symbol; important information

Note symbol; suggestions and advice

1.2.2 Labels

For the constructional features, available models and technical data, please refer to the Technical Catalogue.

The model, serial number, features, power supply voltage and so on are shown on the labels affixed to the unit (the following illustrations are shown only as an example).



The Manufacturer adopts a continuous development policy and, in this perspective, reserves the right to make changes and improvements to the documentation and to the units without prior notice.

The Technical Catalogue, the labels placed directly on the unit and the various diagrams referred to below, must be considered an integral part of this manual.

Do not remove or alter the labels placed on the unit.

2 SAFETY

2.1 General safety precautions

The equipment operator is responsible for complying with regulatory obligations.

The equipment operator is the person who has actual control over the technical operation and free access, which means the possibility of monitoring its components and their operation and the possibility of granting access to third parties.

The equipment operator has the power (including financial power) to decide on technical modifications, checks and repairs.

The equipment operator may give instructions to employees or to external companies for carrying out maintenance and repair operations.

Only an authorised operator should be able to access the unit.

Installation and maintenance or repair of the unit must be carried out by personnel and companies holding a certificate issued by a certification body designated by a member state that certifies the requirements contained in Commission Regulation (EC) No. 517/2014.

The internal danger zone can be accessed by removing the protective devices and entering the unit.

On no account must unqualified personnel be allowed to enter the unit and no one should be allowed to enter before the power to it has been turned off.

The user can interact with the unit only through the control and external OK signals.

Only authorised knowledgeable personnel may access the unit in compliance with safety in the workplace regulations. Council Directive 89/391/EEC, of 12 June 1989, on the introduction of measures to encourage improvements in the health and safety of workers at work.

Also, knowledge and understanding of the manual are indispensable for reducing risks and for improving the health and safety of workers.

The operator who enters the unit must have sufficient knowledge to perform the various activities throughout the technical life of the machine.

The operator must know what to do when faced with possible anomalies, malfunctions or conditions of danger to himself or others, and in any case, he must comply with the following instructions:

Do not do anything that goes beyond your duties and technical knowledge.

Inform the manager immediately and do not take personal initiatives.

Before carrying out any work on the unit, make sure you have turned off the power supply to it. Refer to the section on maintenance work.

In units with capacitors and/or inverters, certain components can remain live for several minutes even after having turned off the main switch.

Wait 10 minutes before working on the electrical parts of the unit.

Circuits supplied from external sources (made with orange cable) can remain live even after the power supply to the unit has been turned off.

Work on the unit only if there is sufficient lighting for the type of work to be carried out.

Failure to comply with the instructions in this manual and any modifications made to the unit without prior written consent, will immediately void the warranty.

The law regulating the use of stratospheric ozone depleting substances prohibits the release of refrigerant gases into the environment and obliges owners to recover and return them to the dealer or take them to special collection centres at the end of their operational life.

The refrigerant contained in the refrigerant circuit is included among the substances subject to special control regulations provided for by law and must therefore be disposed of as indicated above.

Particular care should be taken during maintenance operations in order to reduce refrigerant leaks as much as possible.

2.1.1 Discharge of the safety valves

If present on the refrigerant circuit, installation requirements and/or national regulations lay down that the discharge of the safety valves must be routed to the outside.

The conveying must be done with a pipe whose diameter must be at least that of the valve outlet, and the weight of the pipe must not be borne by the valve.

Always direct the discharge to areas where the jet cannot cause harm to anyone.

Risk of burns following contact with hot and cold parts.

2.2 Basic rules

All the units are designed and built in compliance with Directive 2014/68/EU of the European Parliament and of the Council of 15 May 2014 on the approximation of the laws of the Member States relating to pressure equipment.

To ensure maximum safety, in order to prevent possible risks, follow the instructions below:

- this product contains pressurised vessels, live components, moving mechanical parts and very hot and cold surfaces that, in certain situations, can pose a risk: all maintenance work must be carried out by skilled personnel equipped with the necessary qualifications in accordance with current regulations. Before carrying out any operation, make sure that the personnel in charge has full knowledge of the documentation supplied with the unit.
- always have a copy of the documentation near the unit.
- The operations indicated in this manual must be integrated with the procedures indicated in the user instruction manuals of the other systems and devices incorporated in the unit. The manuals contain all the necessary information for safely managing the devices and the possible operating modes.
- use suitable protection (gloves, hard hat, protective glasses, safety shoes, etc.) for all maintenance or control operations carried out on the unit.
- Do not wear loose clothing, ties, chains, watches, etc., which can get caught in the moving parts of the unit.
- always use tools and protective equipment in excellent condition.
- The compressors and delivery gas pipes are at high temperature. Therefore, when working in the immediate vicinity, be careful to avoid touching any components of the unit without suitable protection.
- do not work in the discharge trajectory of the safety valves.
- if the units are positioned in unprotected places which can easily be reached by unqualified persons, suitable protection devices must be installed.
- the user must consult the installation and use system manuals, incorporated and attached to this manual.
- there may be potential risks that are not obvious. Warnings and signals are therefore displayed on the unit.
- Do not remove the warnings.

It is expressly forbidden to:

- remove or disable the safety guards;
- tamper with and/or modify, even partially, the safety devices installed on the unit.

If there are alarm warnings and consequent tripping of the safety devices, the user must call in skilled maintenance technicians to fix the problem immediately.

An accident can lead to serious injury or death.

The safety devices must be tested according to the guidelines in this manual.

The manufacturer does not assume any liability for damage/injury to persons, pets or objects arising from the re-use of individual parts of the unit for functions or assembly situations different from the original ones. Tampering with/unauthorised replacement of one or more parts of the unit is prohibited.

The use of accessories, tools or consumables other than those recommended by the Manufacturer relieves the latter from civil and criminal liability.

Deactivation and scrapping of the unit must be carried out only by suitably trained and equipped personnel.

The units do not fall within the scope of Directive 2014/34/EU of the European Parliament and of the Council, of 26 February 2014, on the approximation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres.

2.2.1 Water flow rate at the heat exchangers

It is necessary to ensure that the water flow rate during operation is no higher than 1.5 times and no lower than 0.5 times the nominal flow rate of the unit stated in the Technical Catalogue.

In any case, refer to the specific Technical Catalogue for the allowed conditions for water flow in and out of the exchangers.

2.2.2 Water composition

Dissolved substances in the water can cause corrosion in the heat exchangers.

It is mandatory to make sure the parameters of the water comply with the following table:

Description	Values
Total hardness	2,0 ÷ 6,0 °f
Langelier index	- 0,4 ÷ 0,4
pH	7,5 ÷ 8,5
Electrical conductivity	10÷500 µS/cm
Organic elements	-
Hydrogen carbonate (HCO3-)	70 ÷ 300 ppm
Sulphates (SO42-)	< 50 ppm
Hydrogen carbonate / Sulphates (HCO3-/SO42-)	> 1
Chlorides (Cl-)	< 50 ppm
Nitrates (NO3-)	< 50 ppm
Hydrogen sulphide (H2S)	< 0,05 ppm
Ammonia (NH3)	< 0,05 ppm
Sulphites (SO3), free chlorine (Cl2)	< 1 ppm
Carbon dioxide (CO2)	< 5 ppm
Metal cations	< 0,2 ppm
Manganese ions (Mn++)	< 0,2 ppm
Iron ions (Fe2+, Fe3+)	< 0,2 ppm
Iron + Manganese	< 0,4 ppm
Phosphates (PO43-)	< 2 ppm
Oxygen	< 0,1 ppm

ppm = mg/l

The use of water with values above the limits stated in the table will immediately void the warranty.

It is mandatory to include a system for eliminating possible organic substances in the water that could pass through the filter and settle in the heat exchangers, which would lead to malfunctioning and/or breakage over time.

The use of water containing organic substances will immediately void the warranty.

2.3 Noise

The starting of the unit, with activation of its components, emits a noise whose intensity varies depending on the operating level.

The correct location choice and the correct installation prevent the unit causing annoying noise due to resonances, reflections and vibrations.

2.4 Residual risks

The unit uses technical means suitable for protecting people, animals and things against hazards that cannot reasonably be eliminated or sufficiently reduced through design.

The presence of an operator is not required for normal operation of the unit. The change from the "OFF" state to the "ON" state, and vice versa, of the unit can be carried out remotely or through the display, without having to enter areas at risk.

Access restriction is part of correct installation to eliminate residual risks during normal operation.

Removal of the restrictions gives access to cold parts, hot parts and sharp edges.

When the electrical boxes and the electrical control panel are open, live parts can be accessed.

Do not:

- remove or disable the safety guards;
- tamper with and/or modify, even partially, the safety devices installed on the unit.

2.5 Safety information on the refrigerant fluid

This chapter only applies to units equipped with a cooling circuit; It does not apply to those where there are only one or two water coils.

This product contains fluorinated greenhouse gases included in the Kyoto protocol. Do not release these gases into the atmosphere.

Type of refrigerant: R410A

GWP value: 2088. Based on "IPCC Fifth Assessment Report".

GWP is the global warming potential.

Periodic inspections are necessary to check for refrigerant fluid leaks in accordance with local and/or European regulations.

2.5.1 Hazards and health consequences

If accidentally released, rapid evaporation of the liquid can cause freezing.

In case of contact with the liquid:

- defrost the various part with water;
- remove clothing carefully;
- rinse thoroughly with water.

Contaminated clothing and shoes should be washed before reuse.

High vapour concentrations can cause headaches, dizziness, drowsiness and nausea, and may lead to unconsciousness and cardiac arrhythmia.

If inhaled move the victim to fresh air. Artificial respiration and/or oxygen may be necessary. Call a doctor immediately.

In case of contact with eyes, remove contact lenses. Rinse immediately with plenty of water, holding the eyelids open, for at least 15 minutes.

The safety data sheet drawn up by the producer of the refrigerant can be obtained from the manufacturer of the unit.

3 RECEIVING THE PRODUCT AND STORAGE

3.1 Reception

On receiving the unit, check that it is undamaged, bearing in mind that it left the factory in perfect condition.

Report any signs of damage immediately to the transporter and make a note of these on the Delivery Sheet before signing it.

The relevant sales department or the manufacturer should be informed of the extent of the damage as soon as possible.

The Customer must draw up a written and photographic report concerning any and all significant damage.

Disposal of the packing material is the responsibility of the consignee and must be carried out in compliance with the regulations in force in the country in which it is carried out.

3.2 Transport

The unit is sent from the factory using suitable vehicles, with correct locking in order to prevent any possibility of movement whilst in transit by road that may damage it or cause accidents.

If there is to be trans-shipment to other vehicles to continue the journey, it is essential to adopt all necessary measures for ensuring the correct safety conditions, with regard to the vehicles used and the anchorage, in order to prevent damage.

If the unit is to be transported over uneven roads, the manufacturer must be informed beforehand so that suitable measures can be taken in order to prevent damage to the unit.

If it is to be transported by container, make sure it is correctly anchored.

3.3 Handling

Before each unit handling operation, check that the lifting capacity of the machinery used is compatible with the weight of the unit.

Handling must be carried out by adequately equipped qualified personnel.

In all lifting operations, make sure the unit is firmly secured in order to prevent accidental falls or overturning.

Lifting must be carried out by qualified and authorised personnel taking the necessary precautions; if carried out incorrectly, lifting can cause serious damage and physical injury.

The handling operations must be carried out slowly and sudden manoeuvres and knocks must be avoided.

Do not, under any circumstances, stand or pass under or near the unit when it is lifted off the ground. Use only the lifting system designed and prepared for the unit.

During unloading and positioning of the unit, great care must be taken to prevent sudden or violent manoeuvres, and the components of the unit must not be used as lifting points.

Make sure the machinery and lifting ropes are of suitable size and capacity and strictly follow their operating instructions. Use only equipment that is in excellent working order.

All work on the unit, including unpacking and connections, must be carried out with the unit resting on the ground.

Refer, in any case, to the lifting instructions provided with the unit.

Be careful when handling. The centre of gravity of the unit is high.

The units are dispatched screwed onto pallets having anti-overturning boards. To unload them from the vehicle, use a forklift truck.

Insert the forks under the unit on the side where the anti-overturning boards are fixed, with the forks as far apart as possible, until they protrude from the back of the base, and keep the centre of gravity of the unit centred between the forks.

Pallet trucks can be used for handling inside buildings. Insert the forks under the unit on the side where the anti-overturning boards are fixed.

3.3.1 Removing the pallet for DX, CW, DW and ED+ units

To remove the pallet, it is mandatory for at least two people to be present and they must be suitably trained and equipped with all PPE required by current regulations.

Before removing the pallet, check that the feet on the base of the unit are fully screwed in. If they are not, screw them in fully.

Undo the screws that anchor the brackets fixing the unit to the pallet, using a CH10 spanner or a screwdriver with 10 mm insert; then undo the screws that anchor the brackets fixing the unit to itself, using a CH13 spanner or a screwdriver with 13 mm insert, and remove the brackets.

Fig. 1 Removing the bracket anchoring the unit to the pallet

After removing the fixing brackets from both sides, remove the screws joining the two parts of the pallet on the central plugs.

Fig. 2 Removing the pallet joining screws

While one operator lifts the unit pivoting on a short side, the other pulls out the first half of the pallet.

After pulling out the first half of the pallet, slowly place the unit on the floor.

Be particularly careful to prevent the feet situated under the base of the unit from touching the floor during this operation, because this would cause irreparable damage to the feet.

Repeat the operation on the opposite side to pull out the other half of the pallet.

The unit should be placed horizontally by both operators standing on opposite sides. The movement should be carried out slowly, being careful to avoid knocking against anything that could damage the unit.

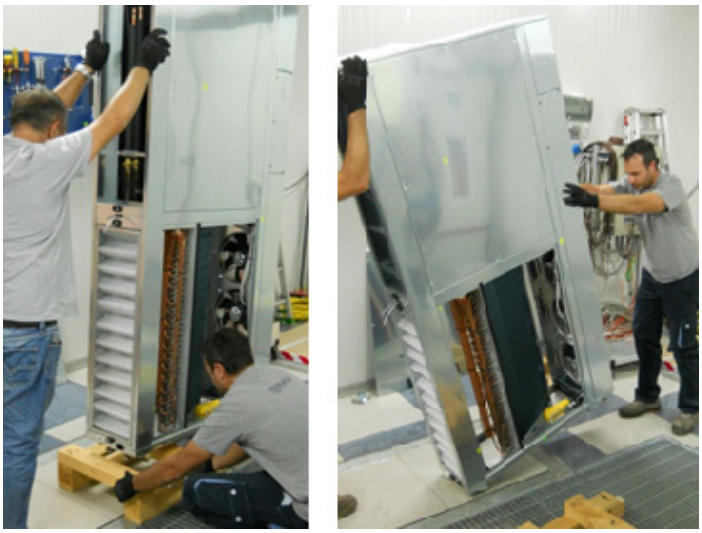


Fig. 3 Removing the pallet and placing the unit on the floor

Now the unit can be moved along on its wheels.

Handling must always be carried out by two operators since the unit is unstable because of its high centre of gravity.

Move the unit slowly, only on smooth floors, avoiding obstacles, steps or ramps sloping by more than 6°.

3.3.2 Removal of DX/CW rack-mounted units from the pallet

To remove the pallet, it is mandatory for at least two people to be present and they must be suitably trained and equipped with all PPE required by current regulations.

Undo the screws that anchor the brackets fixing the unit to the pallet, using a CH10 spanner or a screwdriver with 10 mm insert; then undo the screws that anchor the brackets fixing the unit to itself, using a CH13 spanner or a screwdriver with 13 mm insert, and remove the brackets.

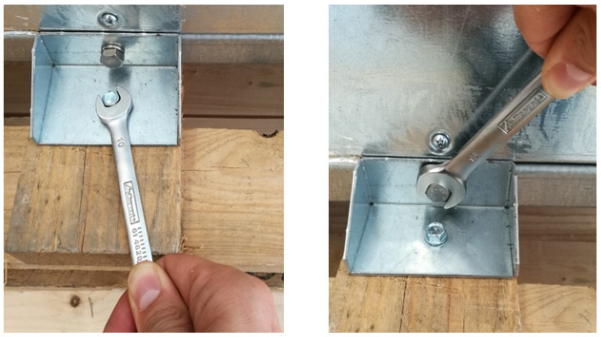


Fig. 4 Removing the bracket anchoring the unit to the pallet

After removing the mounting brackets on both sides, the unit is lifted from the pallet in two different ways:

- with the help of a short-forked forklift truck;
- with the help of a crane or hoist.

Unit lifting with short-forked forklift truck
If the lifting equipment in use is a forklift with short forks, protective material must be placed between the unit and the forklift, for instance a wooden board, and the unit must be secured to the forklift with fastening straps.

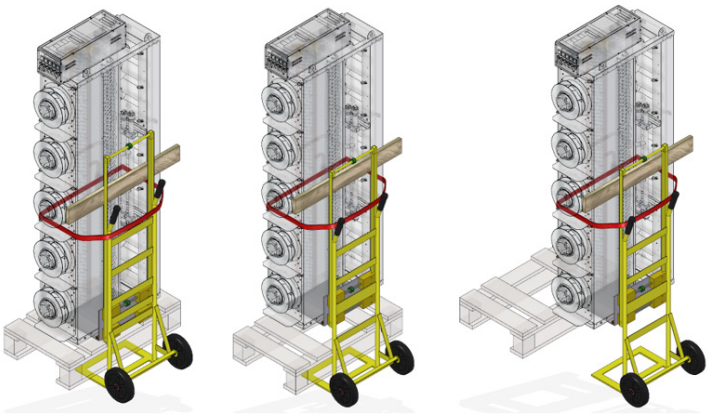


Fig. 5 Example of unit lifting with a short-forked forklift truck

The forklift truck is removed as follows:

- lower the forklift as much as possible;
- remove the straps that secure the unit to the truck;
- use a crowbar or a similar device to lift the unit enough to allow for the removal of the truck.
- Remove the protective devices from the unit.

Unit lifting with a crane or hoist
The crane or hoist in use must be of suitable lifting capacity. Connect the wire ropes, synthetic harnesses or chains to the four lifting brackets featured on the unit roof and then lift the unit.

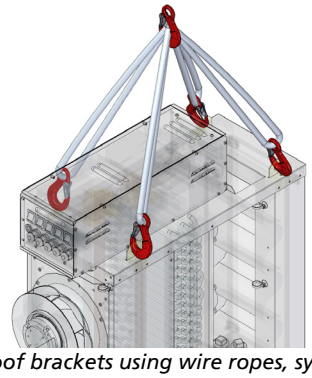


Fig. 6 Unit lifting from roof brackets using wire ropes, synthetic harnesses or chains

The four hooking points must be used simultaneously at all times. Make sure that the load is evenly distributed on the wire ropes, synthetic harnesses or chains.

3.4 Storage

The units are built to be installed in indoor environments.

Storage outdoors is not allowed. Upon receipt they must be put in locations protected from weather agents.

4 PRODUCT DESCRIPTION

4.1 Intended use

The units are precision air conditioners intended for air temperature control in Data Centres.

The units are designed for the air conditioning of high power density racks in “in row” configuration with “cold aisle – hot aisle” layout, where only sensible cooling is required.

Rack-mounted units are designed for installation in the racks specifically made for this purpose.

Three versions are available:

- with chilled water coil to be connected to a chilled water supply line;
- with direct expansion coil to be combined with a remote motocondensing unit.
- with direct expansion coil and integrated refrigerant circuit, to be combined with a remote condenser.

Their use is recommended within the operating limits indicated in the Technical Catalogue.

4.2 Unintended use

The unit must not be used:

- in an explosive atmosphere;
- in a flammable atmosphere;
- in extremely dusty environments;
- in an environment that is not compatible with the stated IP protection rating;
- by untrained personnel;
- in a way that does not comply with the regulations in force;
- with incorrect installation;
- with power supply defects;
- with total or partial failure to comply with the instructions;
- with lack of maintenance and/or use of non-original spare parts;
- with inefficient safety components.
- with modifications or other work not authorised by the Manufacturer.

4.3 Control and safety devices

The unit is integrally managed by an electronic microprocessor controller that, through the various sensors, keeps its operation within safety limits.

All the parameters involved with control of the unit are shown in the “Control Manual” that is an integral part of the documentation of the unit.

The manual fully describes the logic with which the checks of the unit take place during the various operating stages.

The control and safety devices are shown in the Technical Catalogue.

4.4 Principles of operation

The units cool the air with a water coil or with an evaporating coil in a refrigeration cycle.

In the first case, the unit will be connected to a chilled water network, and in the second case, it will be combined with a remote motocondensing unit or with a remote condenser.

In both cases, the capacity is modulated by changing the speed of the fans depending on air return temperature.

Units with water coil, if provided with valves, or units with evaporating coil connected to variable-capacity motocondensing units, or with evaporating coil and integrated refrigerant circuit with variable-capacity compressor can also modulate the cooling capacity by controlling the air supply temperature.

4.5 Structure

The structural frame is fabricated with galvanised sheet-iron that is externally epoxy polyester powder coated. The removable panels, made of epoxy polyester powder coated galvanised sheet-iron, are internally insulated with open-cell matting. This type of panelling is designed to ensure a good level of thermal and acoustic insulation.

Air tightness is obtained with adhesive sealing strips around the edges of the panels.

The internal panels are made of galvanised sheet-iron.

4.6 Specifications

Air conditioners for Data Centres and technical rooms.

The envisaged versions are with chilled water or direct expansion.

The units are intended for in-row cooling of equipment and devices fitted in hot aisle/cold aisle configuration or for installation in racks specifically made for this purpose.

4.7 Air system

4.7.1 Unit fans

The units are equipped with fans, with external rotor motor directly coupled to the impeller. By choice, the fans can be axial or radial. These fans do not need any special maintenance as they do not have any connecting parts (belts, pulleys).

The fan motors are EC, that is, electronically commutated brushless and are powered by AC mains voltage. Speed control is obtained via DC 0-10V control signal coming from the microprocessor installed on the unit.

The fans are not provided with a contactor and are constantly live as soon as the main disconnect switch of the unit is closed.

4.7.2 Fan replacement

A radial fan can be replaced safely without turning off the power to the unit, but this operation must be carried out by suitably trained qualified personnel, because it requires working with components that remain live (fan connector).

To replace a radial fan:

- after checking which fan is not working, remove the protective front panel next to the faulty fan by taking out the screws fixing it to the structure of the machine;
- Plug out the electrical connector.
- With the help of a long Phillips screwdriver, undo the 4 screws that hold the grille (that is integral with the fan) to the fan panel.
- Remove the grille and the fan that is integral with it.
- remove the safety guard from the faulty fan and fit it on the new one;
- Secure the grille, which is now supporting the new fan, to the fan panel by doing up the 4 screws. Be careful to tighten them properly.
- Plug in the electrical connector.
- The fan starts spinning if voltage has not been cut out to the machine.
- Secure the cables with a plastic clamp. The clamp must be the same type as that used in the disassembled fan.
- fit the protective front panel back in place;
- turn the power to the unit back on, if it had been turned off.

Fig. 7 Electrical connections of radial fans

An axial fan can be replaced safely without turning off the power to the unit, but this operation must be carried out by suitably trained qualified personnel, because it requires working with components that remain live (fan connector).

To replace an axial fan:

- after checking which fan is not working, remove the protective front panel next to the faulty fan by taking out the screws fixing it to the structure of the machine;
- Plug out the electrical connector.
- With the help of a long Phillips screwdriver, undo the 4 screws that hold the grille (that is integral with the fan) to the fan panel.
- Remove the grille and the fan that is integral with it.
- remove the safety guard from the faulty fan, fit it on the new one and fix it in the same way as it was fixed on the faulty fan;
- Secure the grille, which is now supporting the new fan, to the fan panel by doing up the 4 screws. Be careful to tighten them properly.
- Plug in the electrical connector.
- The fan starts spinning if voltage has not been cut out to the machine.
- fit the protective front panel back in place.
- turn the power to the unit back on, if it had been turned off.

Fig. 8 Electrical connections of axial fans

4.7.3 Radial fan replacement in rack-mounted Coolblade

A radial fan can be replaced safely without turning off the power to the unit, but this operation must be carried out by suitably trained qualified personnel, because it requires working with components that remain live (fan connector).

To replace a radial fan:

- Check for the malfunctioning fan.
- (Optional) Cut out voltage to the unit by unplugging the power cables from their outlets.
- Turn the fan switch on the front of the electrical control panel to cut out voltage to the fan. Locate the correct switch corresponding to the fan, referencing the labels in the unit and on the corresponding wiring diagram.
- Plug out the connector of the fan that needs replacement.
- Using a long Phillips screwdriver or a driver with a cross insert, undo the 4 screws that secure the fan plate to the fan panel.
- Turn the fan plate by 90° and take out the plate and the fan.
- Remove the malfunctioning fan from the support plate by undoing the four screws that hold the fan support grid to the plate.
- Fit the new fan on the fan plate doing up the 4 screws. Be careful to tighten them properly.
- Install the fan support plate with the new fan, repeating the operation above in reverse order. Then tighten the four locking screws properly.
- Plug the connector in to the new fan.
- Turn the switch featured on the front of the electrical control panel to energise the replaced fan.
- The fan starts spinning if voltage to the unit has not been cut out.
- turn the power to the unit back on, if it had been turned off.

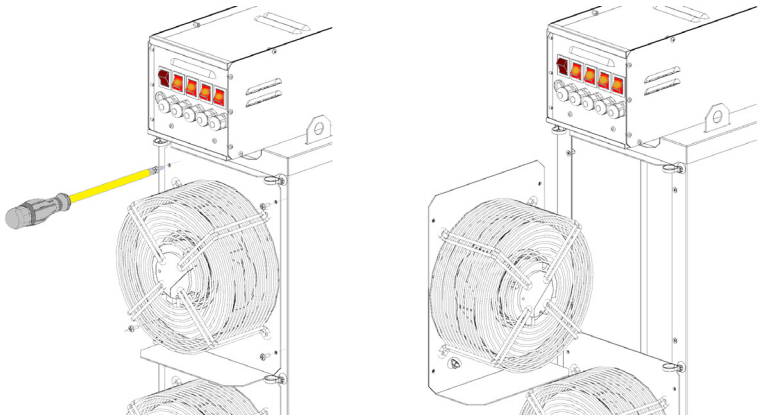


Fig. 9 Fan plate removal

4.7.4 Air flow sensor

This device prevents the unit operating in the absence of air flow.

The control is carried out by a differential pressure switch that detects the pressure difference between upstream of the filters and downstream of the coil.

The alarm is signalled by the controller with a delay after sensor detection.

To check sensor operation, open the automatic circuit breaker of the fan section (QMV in the wiring diagram), and then switch on the unit.

The alarm must appear in the controller within a few tens of seconds.

The air flow sensor is set at the factory to 30 Pa

4.7.5 Dirty filter sensor

The level of air filter clogging is checked by means of a differential pressure switch that measures the pressure drop between upstream and downstream of the filter.

The control panel will signal, via an alarm on the display, the need to replace or clean the filter. The machine will continue to work in any case.

In units with radial fans, the dirty filter sensor is set at the factor to 180 Pa.

In units with axial fans, the dirty filter sensor is set at the factor to 100 Pa.

Fouling of the filter causes a reduction in air flow rate and therefore of machine performance; we advise restoring the filter as soon as possible after the warning.

4.7.6 Air filters

The units are equipped with filters on the air return line with different degree of efficiency depending on the version. The filter change must always be carried out from the back of the unit.

Each filter is locked in its seat by two plastic tabs; to remove the filter, turn the tabs to free the filter and take it out. After the new filter has been fitted, lock it in its seat by turning the tabs.

The filters can be cleaned with compressed air.

If the filters are particularly clogged or damaged, they must be replaced.

If it is necessary to replace them, use only filters of the same size and the same filter grade; the use of different filters can compromise the operation of the unit.

4.7.7 Flooding sensor

Except for ED+ units, the units are fitted as standard with a flood sensor, which activates a warning if the water in the condensate drip tray exceeds a safe level. Through the controller, it is possible to configure the warning as flooding alarm that must stop the unit or as just a message on the display.

4.8 Control panel

The unit is fully managed by an electronic system with microprocessor that has a touch screen display as interface.

By using the display, you can access all the unit's functions, such as visualising the operating parameters, setting the parameters, managing and analysing any problems.

Fig. 10 Main mask

Basic operations such as starting and stopping the unit, changing the set point and the status check of the operation, can be carried out easily.

For the other operations, refer to the manual of the control that is an integral part of the documentation of the unit.

The instructions below reference the main screen that is accessed from any other screen in the system by tapping the "Menu" icon, where provided, or the "Green arrow pointing left" icon.


"Menu" - pressing of this icon on the Home page gives access to the "Menu" screen. If this icon is pressed on any other screen, the system moves back by one level;


A click on this icon enables going back to the "loop" of the previous menu, gaining access to it with the active credentials.

4.8.1 Switch the unit on and off from the display.

Use the "On/Off" icon on the main screen to go to the page where the buttons to start and stop the unit are featured.

The top area of the screen shows the status of the unit: the "On/Off" icon is provided in the central area.

A tap on the icon changes the status of the unit from "running" to "off" and vice versa.

4.8.2 Switch the unit on and off from external OK signal

In order to switch the unit on and off from external OK signal, make sure the feature is active.

To switch the unit on, close the external OK signal. To switch it off, open it.

The external OK signal should be connected to terminals "1" and "56" in the terminal board.

The external OK signal must be a potential-free contact.

4.8.3 Change of set points

The "Menu" icon provided in the main screen leads to the main menu page.

Go to the "Setpoint" sub menu and select the function whose setpoint is to be changed.

Scroll the parameters until the desired parameter setpoint is achieved.

Select the setpoint parameter to enable the edit keypad.

Set the new value and apply the green tick to confirm.

4.9 Installation of control panel for Coolblade in rack

The display is part of the standard supply of Coolblade units in rack, housed in a plastic compartment.

The display may be mounted on the rack door using two M4 screws. If this is the installation option selected, provision must be made for a hole on the rack door to run the telephone cable required for display connection to the unit controller. Alternatively, the display can be wall mounted using its housing, it may be left in the rack or it may be installed on a dedicated mount provided by the rack manufacturer. In the latter case, the display may be removed from the plastic housing and fitted directly on the mount using two M4 screws.

4.10 Electrical control panel removal from rack-mounted units

The electrical control panel in rack-mounted units must be removed from the unit whenever access to it cannot be gained from the top to perform work.

Procedure for panel removal from the unit

- Cut out voltage to the unit by unplugging the power cables from the outlets at the back of the panel.
- Unplug all the signal connectors and the RJ45 cable, where fitted, at the back of the panel.
- Unplug the connectors of the fans in the front part of the unit.
- Unplug the telephone cable from the display in the front part of the unit.
- With the help of a CH7 wrench undo the screws that secure the panel to the frame (2 at the front and 1 at the back of the unit).
- The electrical control panel can be removed both from the front and the back of the unit.
- After work is completed on the electrical control panel, the panel must be put back in place following the procedure described above in reverse order.

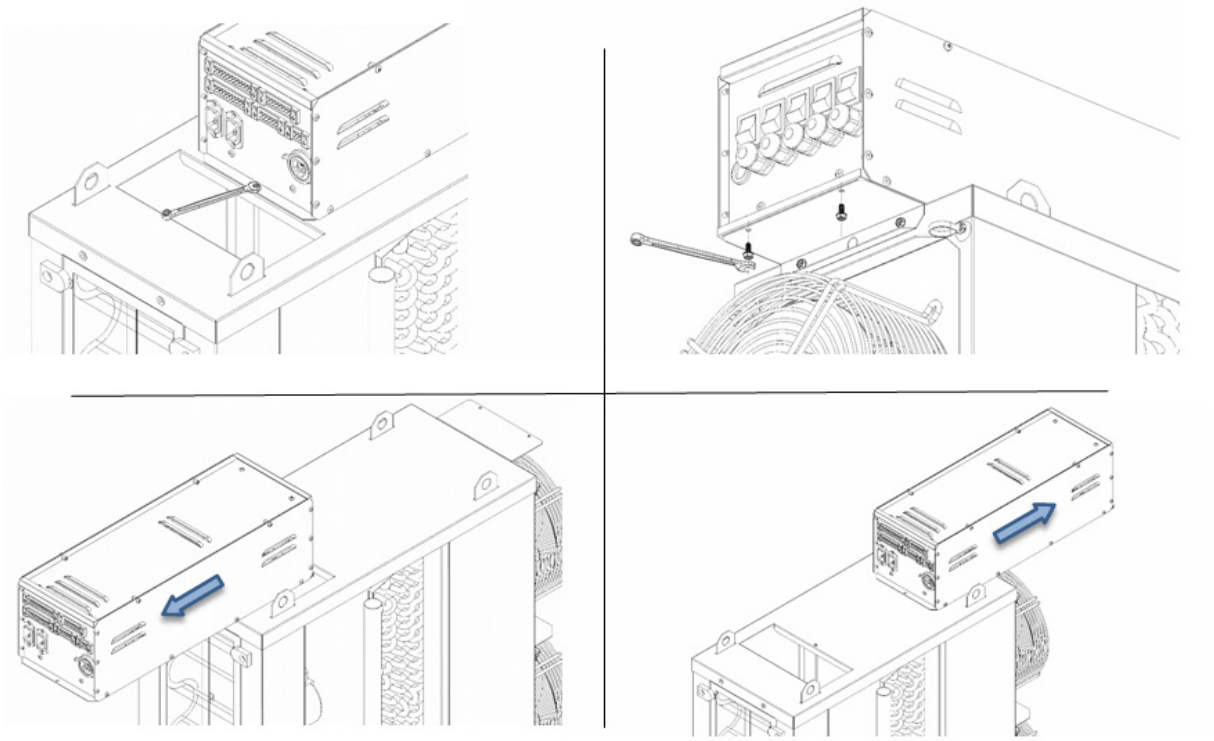


Fig. 11 Electrical control panel removal

4.11 Removal of electrical control panel from Coolblade DX/CW/DW/ED+ units

In Coolblade DX/CW/DW/ED+ units the electrical control panel is installed on sliding rails. If work is required on the panel, this may be taken out from the back side of the unit.

Procedure for panel extraction from the unit

- Remove the air filters from the back of the unit.
- Turn the main power switch to cut out power to the unit.
- Remove the filter brackets.
- Remove the bottom panel that protects the inverter (this only applies to Coolblade ED+ units).
- Remove the grid protecting the electrical control panel.
- Gently push the electrical control panel forward so that the sliding rails are released.
- Take out the electrical control panel to the desired position.

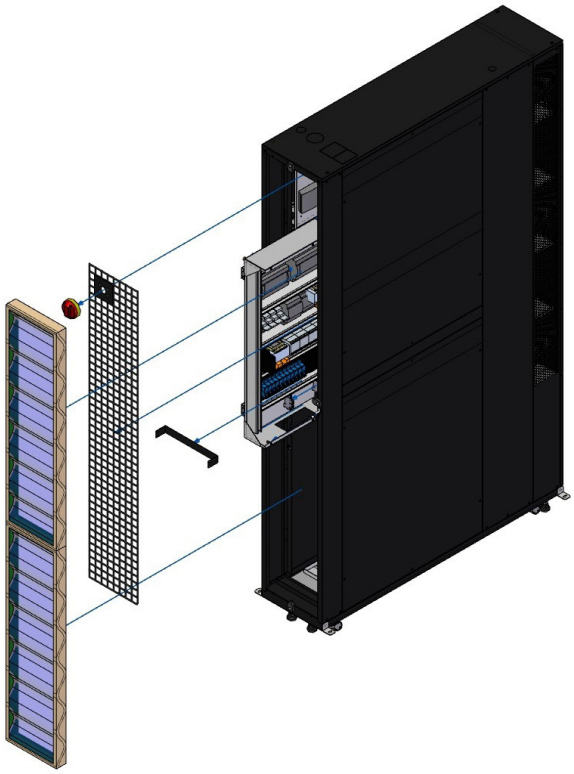


Fig. 12 Electrical control panel extraction

When work on the electrical control panel is completed, the sequence above must be repeated in reverse order to fit the panel back in place. Make sure that the electrical cables coming out of the panel do not come into contact with the finned coil. Check that the rails are locked in position.

4.12 Wiring diagram

The wiring diagram is an essential part of the documentation and is present inside each unit.

It is essential to refer to this document if you are unsure about anything or need further explanations regarding the auxiliary electrical connections and power connections as well as for the electrical specifications.

In particular, refer to the wiring diagram as regards the possibility of remotely managing the functionalities that contemplate this.

5 INSTALLATION

During installation or whenever work must be carried out on the unit, it is essential to strictly follow the instructions in this manual, comply with the directions on the unit and in any case take all necessary precautions.

The pressures in the refrigerant circuit and the electrical components can create risky situations during installation and maintenance work.

5.1 Dimensions and weight

In order to correctly position the unit, please refer to the dimensional drawing supplied with the order confirmation for its size and weight.

5.2 Place of installation

The following should be taken into account when establishing the best place to install the unit and the relevant connections:

- size and origin of the hydraulic piping;
- location of the power supply;
- accessibility for maintenance or repair operations;
- load-bearing capacity of the support surface;
- possible glare, resonance, acoustic interactions with elements outside the unit;

As regards installation of the motocondensing unit, when present, refer to the relevant documentation.

All models in the series are designed and built for indoor installation; it is therefore absolutely necessary to avoid positioning and even storage in outdoor environments even if protected against weather conditions.

It is obligatory to observe the clearances specified in the dimensional drawing of the unit.

5.3 Installation

Upon installation, these units require different stages of assembly, depending on their operation and type.

The cases can be:

- Units equipped with water coil; the units are shipped from the factory already tested and only need electrical and hydraulic connections for installation.
- Units equipped with evaporating coil; as regards their operation, these units are shipped from the factory “dry run” tested. The refrigerant circuit is charged with nitrogen and helium. In addition to the electrical connections, a refrigerant connection is also required.

5.3.1 Putting the DX/CW/DW/ED+ units in place

The units are designed to be installed in a row alongside racks in a “cold aisle – hot aisle” layout, and they therefore require a clear space on the front and on the back, to allow correct air flow and to enable extraction of the air filters and access to the controller and to the electrical control panel.

Once the unit has been placed in its final position, adjust the feet under the base to level the unit and then lock the feet in position, by tightening the lock nuts on the threaded rod of the feet with a fork spanner.

Access for the electrical and refrigerant connections can be gained from both the upper and lower part of the unit. For some sizes of the water units, access for the hydraulic connections must be specified at the time of ordering.

Make sure that the floor can support the weight of the unit (refer to the documentation attached to the unit).

Once any pre-cut parts have been opened and all connections have been made, appropriate measures must be taken to prevent unwanted air seepage (for example, by sealing unused spaces or covering unused holes).

When installing multiple units in the same room, it is necessary to take all precautions in order to optimise air distribution and prevent its recirculation.

Given the high specific airflow, a proper study must be carried out if the units are installed in areas permanently occupied by people.

5.3.2 Putting the DX/CW rack-mounted units in place

These units are designed for installation in racks specifically made for this purpose.

The units in OL (open loop) version are supplied with air filters and they are set up to take the air from the back, where the filters are installed, and to deliver it either frontally or laterally. Provision must be made for an appropriate space at the back of the rack to remove the filters and at the front to remove the electrical control panel and the fans with their support plates.

The units in CL (closed loop) version are supplied with air filters and they are set up to take the air from the side and to deliver it either frontally or laterally. Provision must be made for an appropriate space at the front of the rack to remove the electrical control panel and the fans with their support plates.

After placing the unit in its final position, secure the unit to the rack using the screws and the threaded inserts supplied with the unit. Fill any bypass between the unit and the rack by means of a gasket of suitable thickness, where necessary.

Access for the electrical and refrigerant connections can be gained from both the upper and lower part of the unit. For some sizes of the water units, access for the hydraulic connections must be specified at the time of ordering.

Once any pre-cut parts have been opened and all connections have been made, appropriate measures must be taken to prevent unwanted air seepage (for example, by sealing unused spaces or covering unused holes).

When installing multiple units in the same room, it is necessary to take all precautions in order to optimise air distribution and prevent its recirculation.

Given the high specific airflow, a proper study must be carried out if the units are installed in areas permanently occupied by people.

5.3.3 Positioning the motocondensing unit

If a motocondensing unit is to be installed, see the relevant manual to position it.

5.3.4 Positioning the remote condenser

If a remote condenser is to be installed, see the relevant manual to position it.

5.4 Hydraulic connections

5.4.1 Connections to the water chiller coils

The unit may be equipped with modulating control valve. The valve can be a two-way or a three-way valve, and is provided with electrical servo control with 0-10V signal.

For the hydraulic connections, observe the following guidelines:

- use copper or steel pipes or hoses;
- adequately insulate the pipes;
- install shut-off valves in/out of the unit;
- install a thermometer and a pressure gauge at the input and output of the unit.

The diameters and types of connection required are indicated in the dimensional drawings.

Should the fluid contained in the hydraulic system be able to fall to near or below zero Celsius, add an appropriate percentage of antifreeze.

The hydraulic connections can be carried out from the bottom or from the top; open the rectangular pre-cut parts prepared on the bottom or on the top of the unit, according to where the pipes will be passed through.

For rack Coolblades, plug the two unused hydraulic connections with the supplied threaded plugs, taking care to tighten them correctly using a suitable sealer.

5.4.2 Connection to the condensate drain

All units are equipped with a condensate drip tray on the bottom of the unit.

It is advisable to install a syphon and to make the discharge pipe slope slightly to help outflow. Once the connection has been completed and before starting the unit, fill the syphon with water.

Fig. 13 Condensate drain

The condensate drip tray is provided with a 1/2" GJ fitting.

If the condensate drain line slopes upwards or there are upward height differences to overcome, it is advisable to use a condensate extraction pump (available as optional extra).

5.4.3 Connection to condensate exhaust pump

If the unit is fitted with a condensate exhaust pump (option installed on board the machine), the condensate exhaust pipe coming from the pump must be run to the desired condensate exhaust point, in compliance with the operating limits of the pump (pipe length and exhaust height), as specified in the operating instructions of the pump. Where necessary, the condensate exhaust pipe may be extended using a pipe of the same type and diameter, in compliance with the operating limits of the pump. The connection fittings are not included in the supply.

The power cord and the thermal overload protection contact of the condensate exhaust pump must be connected as specified in the wiring diagram of the unit.

The condensate exhaust pump is a submersible pump and it is directly installed in the condensate drip tray. The latter has such intrinsic features as to cause a small amount of water, which the pump cannot drain, to remain in it.

5.4.4 Replacement of condensate exhaust pump

If the condensate exhaust pump (option) needs to be replaced, follow the procedure below.

- Cut out power to the unit.
- Remove the bottom blind panel from the front of the unit.
- Remove the humidifier cylinder, where fitted.
- Disconnect the condensate exhaust pipe and cut out power to the condensate exhaust pump.
- Remove the malfunctioning condensate exhaust pump.
- Install the new condensate exhaust pump in the same position as the replaced pump.
- Connect the condensate exhaust pipe and the power cord, in compliance with the connections specified in the wiring diagram of the unit.
- Fit back the humidifier cylinder, where provided.
- Re-energise the unit.
- Check for correct operation of the condensate exhaust pump.

5.4.5 Installing the flow switch

For units with water coil, a flow switch for indicating the no flow alarm is available as accessory. If supplied with the unit, the connection is to be made by the installer.

The flow switch has a cable for the electrical connection and the paddle that detects water flow is already fitted.

The flow switch should be inserted in the water pipe at the outlet of the unit in a straight section of the pipe. The distance between the flow switch and any other components (filters, valves, etc.) must be at least 5 times the diameter of the pipe.

The arrow on the switch must be aligned with the water flow.

The flow switch is calibrated for installation on a horizontal pipe.

The push rod must be in the vertical position.

The connections of the flow switch with the terminal board in the electrical control panel must be made using the common terminal and the one that is normally open when there is no water circulation.

Check the wiring diagram for the terminals intended for the flow switch.

Lock the cable in place with cable ties in the section between the flow switch and the inlet to the electrical control panel.

5.4.6 Connection to the humidifier

Where present, the humidifier must be supplied with untreated mains water, preferably filtered from impurities and / or waste. The diameters of the couplings are reported in the dimensional drawings.

We recommend that the drain duct should consist of a non-electrically conductive material.

The water discharged from the humidifier can reach 100 ° C.

It is compulsory to implement a syphon in order to drain the water from the humidifier.

Absolutely do not fill the humidifier with demineralised or softened water.

Further information concerning installation may be found in the "Humidifier" chapter and in the humidifier manual enclosed with the unit’s documentation.

5.5 Refrigerant connections for ED+ units

For these units, remote installation of the condenser is envisaged.

The refrigerant circuits fitting shut-off valves are filled in the factory with a mixture of helium and anhydrous nitrogen at a pressure of 10 bar.

Check that the unit is pressurised as this will confirm that the refrigerant circuit has not been damaged in transit.

The following operations require pressurised pipes and brazed connections to be made, and these must be carried out by skilled staff with the necessary qualifications in accordance with current regulations.

The sizing and construction of the refrigerant lines affect the reliability and the performances of the product.

5.5.1 Calculation of equivalent length

The calculation of the piping equivalent length should take account of the equivalent head losses caused by the bends, fittings and non-return valves fitted along the piping. Each of the above-mentioned parts causes a local head loss that needs to be added to the length of straight pipe sections and may be estimated as shown in the table below.

Nominal diameter	Equivalent length [m]				
mm	Bend 45°	Bend 90°	Bend 180°	Ball valve	Non-return valve
10	0,24	0,45	0,70	2,00	1,80
12	0,25	0,50	0,75	2,10	1,90
14	0,26	0,53	0,80	2,20	2,00
16	0,27	0,55	0,85	2,40	2,10
18	0,30	0,60	0,95	2,70	2,40
22	0,35	0,70	1,10	3,20	2,80
28	0,45	0,80	1,30	4,00	3,30

5.5.2 Piping implementation

In order to lay the pipes, use hard or soft copper pipes, of a size suitable for the cooling capacity and the distance to be covered and of an adequate thickness for the maximum designed pressure and the type of refrigerant used. Table 1 shows the recommended diameters for the admissible equivalent lengths.

The route of the pipes must be as short and straight as possible, making sure the following basic rules are complied with:

- use the fewest number of bends possible, preferably as wide as possible;
- provide a slight slope of the flow line (1% downwards) in the horizontal sections in order to facilitate the passage of the oil;
- fit suitable syphons every 5 metres in the vertical riser sections of the gas delivery pipe to the condenser, placing the first one immediately at the outlet of the unit;
- maintain the gas discharge lines separate from the liquid back-flow one, if not isolated;
- support the horizontal and vertical lines with suitable vibration dampers;
- should the capacitor be placed in a higher position compared with the unit, install a non-return valve on the discharge line near the input of the condenser; should the capacitor be placed in a lower position compared with the unit, install a non-return valve on the liquid line near the output of the condenser;
- solder the joints, avoiding butt welds by using sleeves or enlarging the tubes;
- adequately protect the various components such as valves or taps fitted nearby, e.g. by wrapping them with wet rags, during braze-welding;
- once the junctions have been completed, blow-clean the tubes to remove any dirt;
- press the plant to search for any leaks.

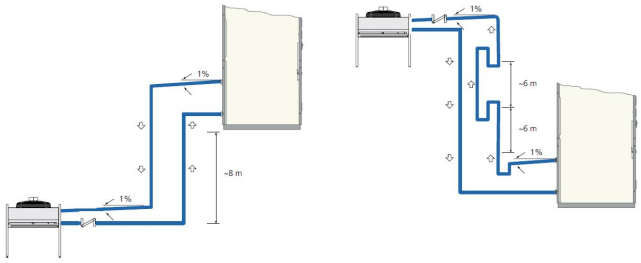


Fig. 14 Separate section refrigerant connections

Table 1 - R410A recommended diameters - The thickness of the pipe must be compatible with the refrigerant used and with current regulations

Model	Equivalent length 10 m		Equivalent length 20 m		Equivalent length 30 m		Equivalent length 40 m		Equivalent length 50 m	
	Gas	Liquid	Gas	Liquid	Gas	Liquid	Gas	Liquid	Gas	Liquid
13 - 13L	12	12	12	12	12	12	16	12	16	12
21 - 21L	16	12	18	12	18	12	22	16	22	16

Model	Equivalent length 60 m		Equivalent length 70 m		Equivalent length 80 m		Equivalent length 90 m		Equivalent length 100 m	
	Gas	Liquid	Gas	Liquid	Gas	Liquid	Gas	Liquid	Gas	Liquid
13 - 13L	16	12	-	-	-	-	-	-	-	-
21 - 21L	22	16	22	16	22	16	22	16	22	16

The above mentioned diameters were chosen in order to optimise the performance of the units, contemporaneously ensuring the proper operation at the permissible conditions and to contain the refrigerant charge within reasonable limits.

Should the length of the cooling lines envisage an increase of the diameters compared with those required for a length of 10 m, we recommend implementing the horizontal sections of the cooling line with the diameters prescribed for the total length, while the vertical sections must be implemented maintaining the prescribed diameters for a length equal to 10 m.

For example, consider size 21 with a total length of the refrigerant lines equal to 40 m, where 30 m are horizontal sections and 10 m are vertical risers. The diameters of the horizontal lines will be 22 mm for the delivery and 16 mm for the liquid respectively, while the diameters of the vertical lines will be 16 mm for the delivery and 12 mm for the liquid.

In units equipped with an inverter-controlled compressor, the maximum length of the pipes is 60 metres for sizes 13 and 13L, and 100 metres for sizes 21 and 21L. Pay attention and comply with the max. height differences between the indoor and the outdoor unit, as shown in the dedicated table provided in this section.

As regards units equipped with an inverter-controlled compressor, the following applies. If the unit was not provided in the factory with the optional “setting for refrigerant line length extension over 30 m” - sizes 13 and 13L - or the optional “setting for refrigerant line length extension over 50 m” - sizes 21 and 21L -, the parameters of the oil return circuit should be adjusted when the equivalent piping length exceeds the values above. Contact our After-Sales Service, where necessary.

Table 2 - refrigerant charges* for units with separate section circuits, excluding the pipes (compressors with inverter)

Model	-	13 - 13L	21 - 21L
Refrigerant charge without condenser	kg	2.5	2.8
Refrigerant charge with standard condenser	kg	3.5	4.1
Refrigerant charge with LN condenser	kg	3.8	4.6
Refrigerant charge with oversize condenser	kg	3.8	5.1
Refrigerant charge with oversize LN condenser	kg	4.3	5.4
Refrigerant charge with EC condenser	kg	3.5	4.1
Refrigerant charge with EC LN condenser	kg	3.8	4.6
Refrigerant charge with oversize EC condenser	kg	3.8	5.1
Refrigerant charge with oversize EC LN condenser	kg	4.3	5.4
Refrigerant charge with HT condenser	kg	4.8	5.4

* The amount of refrigerant is indicative and has been calculated theoretically. The actual charge may differ from the calculation

Table of additional R410A refrigerant charges per linear metre of pipe

Outer Diameter [mm]	Gas [kg]	Liquid [kg]
10	0.0045	0.0474
12	0.007	0.074
14	0.01	0.1
16	0.014	0.145
18	0.018	0.19
22	0.028	0.3

* Discharge saturation temperature 45 ° C, liquid temperature 40 ° C

Suggested additional oil charge: over 20 metres of linear development of the pipes, add a quantity of oil equal to 2% in weight of the total refrigerant present in the circuit. Refer to the type of oil indicated on the compressor's label.

If needed, be careful to top up with the correct type of oil. Always use the oil recommended by the Manufacturer of the compressor or a perfectly equivalent oil. The use of an incorrect type of oil may cause serious damage to the compressors and immediately void any guarantee.

Table of configurations

Relative position of the condensing unit	Syphons on the gas line	Liquid line insulation	Gas line insulation	Maximum height difference between the sections	Non-return valve to the condenser
Higher level condensing unit	Every 5 m of vertical riser	Only in the case of long stretches exposed to sunlight or to high room temperatures	Necessary	15 m for mod. 13 - 13L 30 m for mod. 21 - 21L	Recommended on input
Lower level condensing unit	-	Only in the case of long stretches exposed to sunlight or to high room temperatures	Necessary inside the building	8 m	Recommended on output

5.5.3 Changes in temperature and speed in the cooling lines

Below are the diagrams for calculating the temperature variations in the delivery pipes and the liquid speed in the cooling line pipes.

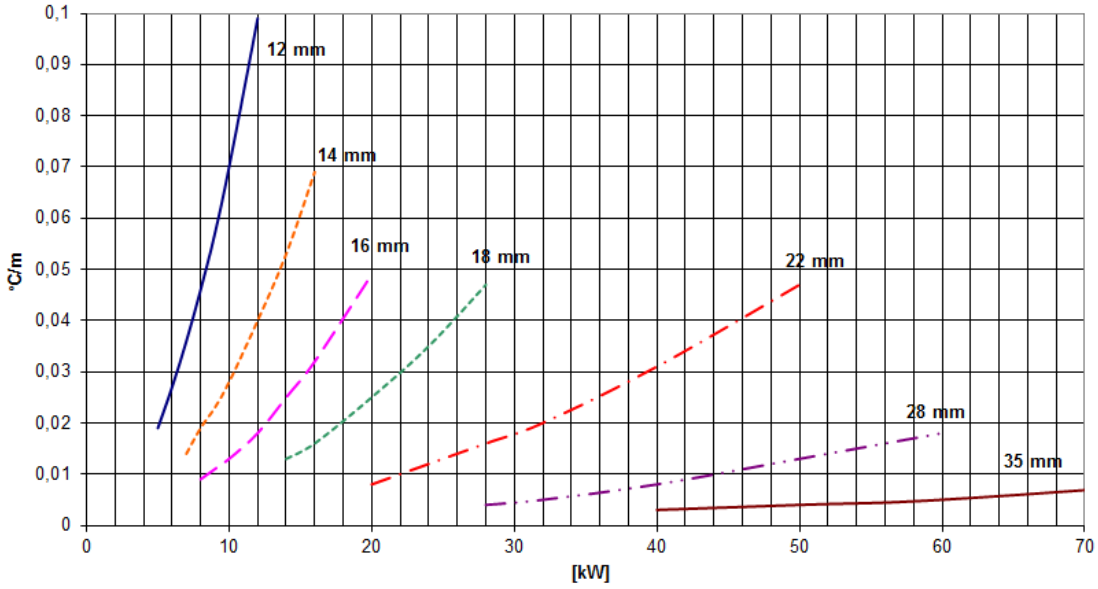


Fig. 15 Change of saturation temperature in the discharge lines

This diagram is useful in order to approximately determine the variation in saturation temperature, per equivalent linear metre of pipe, on the basis of the cooling capacity and the diameter of the discharge line.

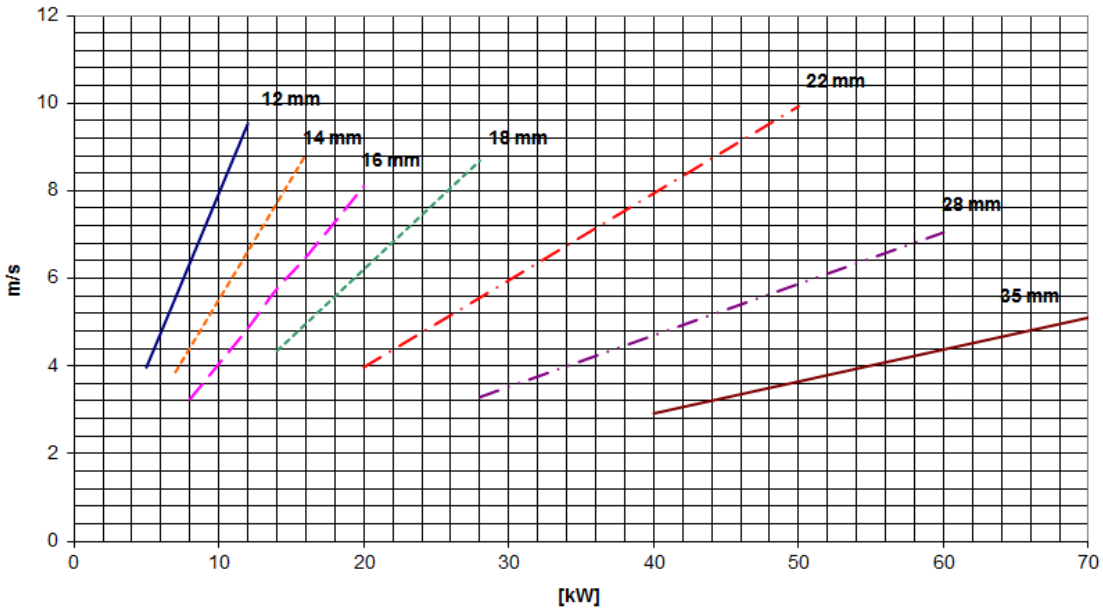


Fig. 16 Speed in the discharge lines

This diagram is useful in order to determine the approximate speed of the refrigerant, in metres per second, on the basis of the cooling capacity and the diameter of the discharge line.

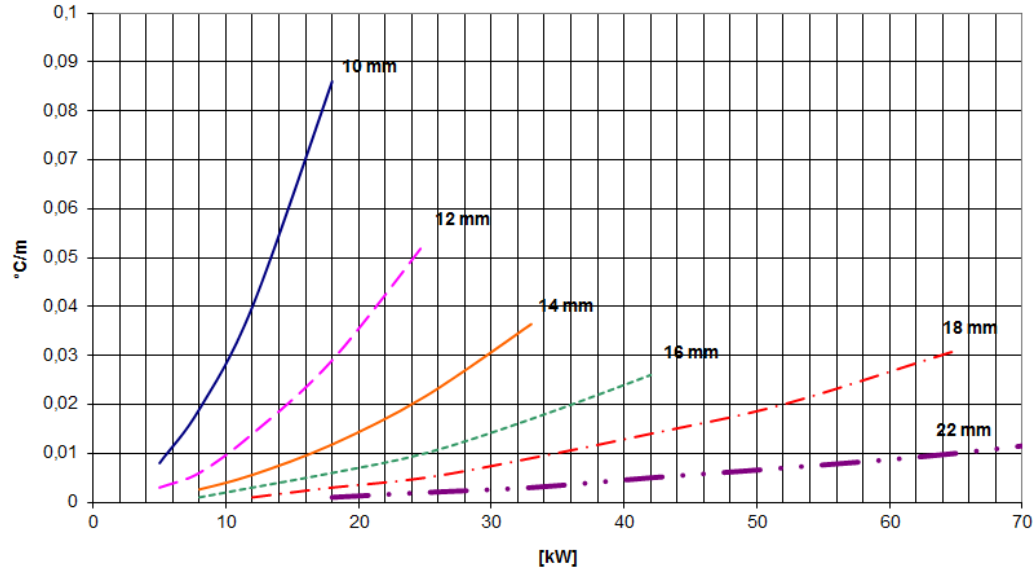


Fig. 17 Change of saturation temperature in the liquid lines

This diagram is useful in order to determine the approximate variation in saturation temperature, per equivalent linear metre of pipe, on the basis of the cooling capacity and the diameter of the liquid line.

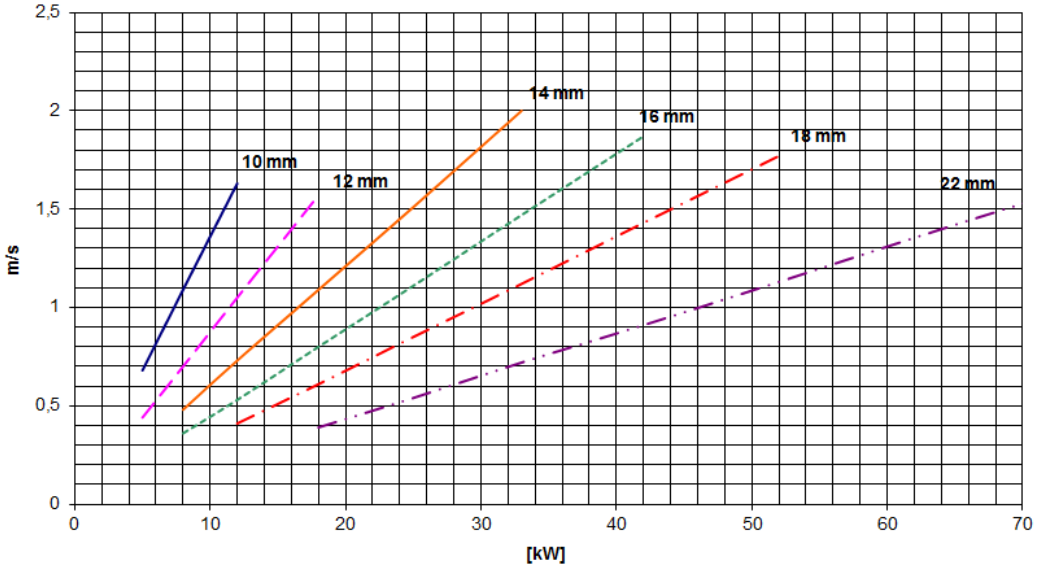


Fig. 18 Speed in the liquid lines

This diagram is useful in order to determine the approximate speed of the refrigerant, in metres per second, on the basis of the cooling capacity and the diameter of the liquid line.

These diagrams, and those of the previous page, are valid for the following conditions:

- saturation evaporation temperature equal to 8° C;
- superheating equal to 5 ° C;
- saturation condensing temperature equal to 50 ° C;
- sub cooling equal to 5 ° C;

5.5.4 Change in performance

In order to calculate the actual pressure drop and the consequent performance reduction coefficient, use the graph "Change in the saturation temperature in the flow lines".

Given the cooling capacity specifications for each refrigerant circuit:

- find the pressure drop per metre of length according to the diameters actually used;
- multiply them by the actual equivalent length for each diameter;
- if various diameters have been used, sum the result obtained in order to obtain the total pressure drop per refrigerant circuit (expressed in ° C);
- Based on the total pressure loss, verify the yield loss percentage and the increase of power consumption in the graph below.

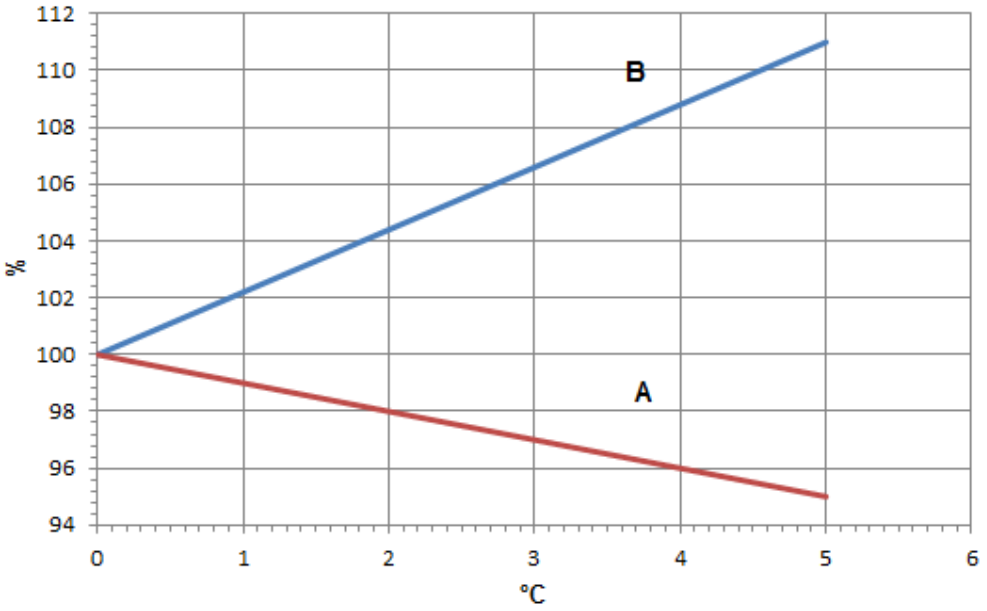


Fig. 19 Loss of yield (curve A) and increase of power absorbed (Curve B) based on the increase of the saturated condensing temperature

If the loss exceeds 3 to 4 °C, we recommend that the remote condenser be increased by one size in order to prevent undesired shut-downs due to the tripping of the high pressure switch in high outdoor temperature conditions (evaluate the operating limit decrease).

5.6 Refrigerant connections for DX units

Direct expansion units are designed to be connected one-to one with motocondensing units.

The units are “dry run” tested. The refrigerant circuit is filled at the factory with a mixture of helium and anhydrous nitrogen at a pressure of about 10 bar.

Check that the unit is pressurised as this will confirm that the refrigerant circuit has not been damaged in transit.

The following operations require pressurised pipes and brazed connections to be made, and these must be carried out by skilled staff with the necessary qualifications in accordance with current regulations.

The sizing and construction of the refrigerant lines affect the reliability and the performances of the product.

5.6.1 Piping implementation

In order to lay the pipes, use copper pipes, of a size suitable for the cooling capacity and the distance to be covered and of an adequate thickness for the maximum design pressure and the type of refrigerant used.

For this purpose, refer to the documentation of the motocondensing unit.

Thermally insulate the inlet line and the outlet line of the unit with insulating material at least 9mm thick, if the expansion valve is installed in the motocondensing unit.

If the expansion valve is installed in the unit, the liquid line need not be insulated.

5.7 Vacuum and refrigerant charge for ED+ units

Open the taps of the indoor unit and evacuate the pre-charged nitrogen before completing the refrigerant connections. Do not leave the refrigerant circuit open for more than 15-30 min as the high hygroscopic capacity of the oil may cause the absorption of moisture detrimental to the circuit.

Carry out the vacuum of the entire system with a high vacuum pump, able to reach 0.1 mbar of residual pressure. Connect the vacuum pump to several points of the refrigerant circuit in order to ensure better evacuation.

Never use the compressor as a vacuum pump, doing so will invalidate the warranty.

Once the vacuum has been obtained, load the system from the charging socket 5/16 "SAE placed on the liquid line. Perform charging in liquid form. Table 2 shows the estimated refrigerating charges for indoor units and capacitors, to which it is necessary to add the charge contained in the connecting lines. The final charge could differ slightly according to the necessary adjustments (see subsequent chapters).

5.8 Vacuum and refrigerant charge for DX units

Open the valves of the unit and evacuate the pre-charge of nitrogen and helium before completing the refrigerant connections.

Carry out the vacuum of the entire system with a high vacuum pump, able to reach 0.1 mbar of residual pressure. Connect the vacuum pump to several points of the refrigerant circuit in order to ensure better evacuation.

Charge with refrigerant as shown in the documentation of the motocondensing unit.

When charging is complete, add the refrigerant for the evaporating coil.

The volume of the coil is:

- 2.3 litres for size 12;
- 3.5 litres for size 19;
- 4.1 litres for size 25.

5.9 Electrical connections

All electrical operations must be carried out by personnel having the necessary legal requirements, and trained and informed on the risks connected with these operations.

The sizing and characteristics of the power lines and relevant components must be determined by staff qualified to design electrical systems, following the international and national regulations of the place of installation of the units in conformity with the regulations in force at the time of installation.

To install components outside the unit, you must refer to the wiring diagram supplied with the unit.

The wiring diagram, along with the manuals, must be kept carefully and made available for future work on the unit.

Overview:

- The electrical connections must comply with the information shown in the wiring diagram attached to the unit and the regulations in force in the place of installation.
- grounding is required by law;
- The installer must connect the earth cable to the PE terminal on the earth bar situated in the electrical control panel.
- Make sure the power supply voltage corresponds to the rated data of the unit (voltage, number of phases, frequency) stated on the plate on the unit.
- the standard power supply voltage (see specific wiring diagram) must not fluctuate by more than ±10% and the unbalance between phases must always be less than 2%. If this does not occur, contact our technical department to choose suitable protection devices.
- The control circuit power supply is taken from the power line via a transformer situated in the electrical control panel; the control circuit is protected by fuses.

Make sure no voltage is present before carrying out any operation on electrical parts.

Use separate passages for the connections of the power supply and of the signals.

The power cable and the signal cable in all units can be connected in the machine from the top or from the bottom.

For connections from the top, open the two round pre-cut parts present on the top of the unit; pass the power cable through the larger diameter pre-cut part and the signal cable through the smaller diameter pre-cut part.

For connections from the bottom, open the two round pre-cut parts present on the bottom of the unit; pass the power cable through the larger diameter pre-cut part and the signal cable through the smaller diameter pre-cut part. The recommended route for the power cable is the one shown in the illustration below.

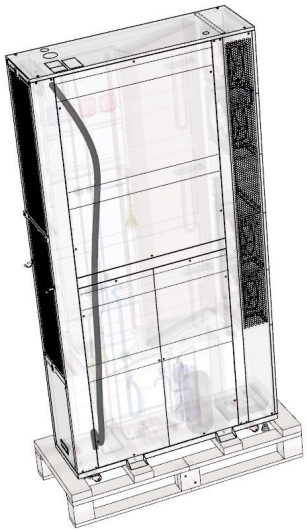


Fig. 20 Recommended route for the power cable from the bottom

Before passing the cables through the pre-cut parts, protect the edges with cable glands of suitable diameter, or with a rubber edging strip, to prevent the cables from being damaged from contact with the sheet metal edges.

To fix the power cable, use power cable fixing systems that resist tensile and torsional stresses.
The weight of the cables must not be borne by the electrical connection system.

The cross-section of the cable and the line protection devices must correspond to those indicated in the wiring diagram.

Units with motocondensing unit envisage electrical connections between the two parts.
To carry out the connections, refer to the wiring diagram of the unit and to the documentation supplied with the motocondensing unit.

The connections to the electrical control panel must be made maintaining the stated IP protection rating.

If you use a residual current device to protect the power line, in units with inverter, use type "B" or "B+" residual current devices, with minimum tripping threshold of 300 mA and delayed tripping.

In units fitted with the “Black out restart with UltraCapacitor (BORU)” option with dual power supply and manual switching (standard), but without the “Dual power supply with automatic switching (DAA)” option, line switching from the primary to the secondary power line in the event of a blackout is a manual process. In other words, the main power switch must be moved from position 1 to position 2 before the UltraCapacitor charge goes down, i.e. within approx. 40 seconds under rated charge conditions.
If the power line is to be switched automatically, the unit must be fitted with the “Dual power supply with automatic switching (DAA)” option.

6 COMMISSIONING

6.1 Preliminary operations

Make sure the main disconnect switch is in the OFF position.

The unit should only be started up by qualified personnel authorised by the manufacturer.

Check:

- that the electrical connection has been made correctly and that all terminals are properly tightened;
- that the voltage on the FN terminals is 230 V ± 10% (or the rated voltage of the unit if there are special voltages). If the voltage fluctuates frequently, contact our technical department in order to choose suitable protective devices.

Be careful with the electrical checks and use only suitable tools.

For CW and DW units with water coil, check:

- that the hydraulic connections have been made correctly, following the directions on the inlet/outlet plates on the machine and/or on the supplied diagrams;
- that a mechanical filter (recommended component) has been installed in the hydraulic circuit at the inlet of the unit;
- that the hydraulic system has been vented, eliminating any excess air, loading it gradually and opening the venting devices on the top;
- that the installer has prepared an expansion vessel of suitable capacity for the water volume of the system;

For DX units with direct expansion coil, check:

- that the electrical connections have been made correctly, following the directions on the plates on the machine and in the supplied diagrams;
- that all the taps in the refrigerating circuit are open;
- that there are no refrigerant fluid leaks, using a leak detector if necessary (the presence of oil stains is a sign of refrigerant leaks).

For ED+ units, after putting the master switch of the unit in the ON position and checking on the user interface that the unit is in OFF state, check that the crankcase heaters are being powered correctly.

The crankcase heaters are switched on when the main disconnect switch is closed and this must be done at least 12 hours before starting the unit.

To check that the heaters are working correctly, check that the lower part of the compressors is hot and in any case at a temperature of 10 - 15 °C above ambient temperature.

The crankcase heaters are switched on when the main disconnect switch is closed and this must be done at least 12 hours before starting the unit.

To check that the heaters are working correctly, check that the lower part of the compressors is hot and in any case at a temperature of 10 - 15 °C above ambient temperature.

For units with direct expansion coil, make sure the preliminary operations have been carried out and that the unit can be started according to the relevant instructions.

After carrying out the above checks, make sure all the infill and closing panels of the unit are fixed properly, and then put the master switch of the unit in the ON position and check on the user interface that the unit is in OFF mode.

6.2 First starting

For direct expansion DX units, make sure the electrical connection with the motocondensing unit is correct and that the motocondensing unit can be started.

For CW and DW units with water coil, make sure there is water in the hydraulic circuit and that it can circulate correctly.

So that the unit can operate, the external OK signal device must be closed (refer to the wiring diagram provided with the unit).

The external OK signal device must be short-circuited if not needed for system requirements.

Start the unit by acting on the user interface of the control.

The fans start and then, with regard to the reference air temperature, the unit starts to cool the air.

For ED+ units that will have a remote condenser, make sure the electrical connection is correct and that the master switch of the remote condenser is in the "ON" position.

So that the unit can operate, the external OK signal device must be closed (refer to the wiring diagram provided with the unit). The external OK signal device must be short-circuited if not needed for system requirements. Start the unit by acting on the user interface of the controller. The first devices to start up are the air supply fans. Then the compressor and/or heating elements or the humidifier (if present) may start up in relation to the temperature and humidity of the return air. After a few hours of operation of the compressors, check that the liquid sight glass has a green ring: if it is yellow, there is moisture in the circuit. In this case, the circuit must be dried by qualified authorised personnel. Check that bubbles do not appear at the liquid sight glass. The continuous passage of bubbles can indicate there is insufficient refrigerant and it needs to be topped up. However, the presence of a few bubbles is allowed. It is mandatory to keep a register for the unit (not supplied), which allows you to keep track of the work carried out on the unit. This will make it easier to appropriately organize the work to facilitate the checks and the prevention of malfunctions. State the following in the register: the type of refrigerant, the date and type of work done (routine maintenance or repair), description of the work with any parts replaced, measures implemented, the operator who carried out the work and his qualification.

6.3 Calibration of safety components

Any work on the unit must be carried out by qualified authorised personnel. Incorrect calibration values can cause serious damage to the unit and harm people.

The control and safety equipment is calibrated and tested in the factory before the unit is shipped.

However, after the unit has been started, the safety devices must be checked (only the high pressure switches).

The checks must be carried out as described in the "Periodic checks" chapter.

The calibration values are shown in the table

Control and safety components	Activation set point	Differential	Reset
High-pressure switch	40.5 barg	7,5 barg	Manual
Low pressure switch (if any)	4,5 barg	1,5 barg	Automatic
High pressure safety valve	45 barg	-	-

6.4 Checks during operation

After a few minutes from the compressor start-up, check that:

- the condensation temperature is approximately 15 ° C higher than the outside air temperature (for units equipped with remote condenser) or 5°C higher than the temperature of the output water from the plate integrated condensers, but in any case not below 35°C of saturation temperature corresponding to the condensation pressure;
- the operating variables (temperature, pressure) measured by the probes on the machine and displayed by the microprocessor control switch must correspond to real values;

After a few hours from starting the compressors, when the air temperature is approaching the set point values set, check that:

that the electrical absorption of the unit is close to the data shown in the wiring diagram. Considerably different values may be due to the reduced capacity operation of the unit, at working conditions very different from nominal ones, or to the malfunctioning of one or more components.

- the liquid sight glass must be green;
- that no bubbles appear on the sight glass placed in the liquid pipe. The continuous presence of bubbles may indicate a lack of refrigerant charge; the occasional or sporadic presence of bubbles is allowed;
- the superheating of the refrigerant fluid in inlet must be approximately between 5-7 ° C;
- the sub cooling of the refrigerant in the liquid line, when leaving the condenser, should be in the range of 2-5 ° C. Too high a sub cooling value may indicate that the refrigerant charge is too high or that there are non-condensable elements in the cooling circuit;
- that the coolant filter is not blocked or clogged. To this end, it is sufficient to detect the temperature of the liquid pipe immediately before and immediately after the filter, checking that there are no significant differences (up to a couple of degrees ° C are allowed).

6.5 Alarms and malfunctions

Possible malfunctions will trigger the protective devices and safety devices of the unit before serious faults occur.

All the “warnings” and “alarms” are recorded in the memory of the control and displayed on the display of the unit.

Before resetting an alarm, the cause that triggered it must be found and eliminated.

An alarm going off repeatedly quickly leads to serious damage to the unit.

Refer to the manual of the control for the alarms and warnings that appear on the display of the unit.

In case of anomalies not handled by the control panel, refer to the following troubleshooting section.

This troubleshooting section does not include causes due to deliberate work or tampering or particularly serious malfunctions, for which a thorough analysis is necessary.

SYMPTOM	LIKELY CAUSE	POSSIBLE SOLUTION
The unit does not start, the display is off.	No mains voltage.	Check that the main disconnect switch is in the “ON” position.
		Check for voltage in the power supply line.
	No voltage to the auxiliary circuit.	Check that the protective devices upline and downline of the transformer of the auxiliary circuit are undamaged.
		Reset the triggered protective device after eliminating the cause that triggered it
The unit does not start, the display is off, the control is powered correctly.	The unit is switched off from the display and the display is disconnected or not working.	Restore the connection of the display or replace it.
The unit does not start, the display is off, the control is powered correctly but the LEDs are not flashing.	The control is not working.	Replace the control.
The unit is operating normally, the display is off.	The connection of the display to the control is disconnected.	Restore the connection between the display and the control.
	The display is not working.	Replace the display.
Abnormal noises from the unit due to vibrations.	Some components (compressors, fans) vibrate abnormally.	Check for correct fastening of the components and for their correct operation. If necessary, replace the component generating abnormal vibration.
Abnormal noises on the hydraulic pipes.	Operation of the system pump outside its performance curve with excessive water flow rate.	If it is not possible to work on the control of the pump, close the shut-off device on the delivery side of the unit until the nominal flow rate is restored.
	Presence of air in the system.	Check that the air valves are not shut off by valves.
		Vent the system.
Presence of oil on the discharge of the safety valve.	Opening of the valve due to failure of the protective devices to operate.	Check that the high pressure switches are working and, if necessary, replace them.
		The valve must be replaced.
	Opening of the valve due to overtemperature;	Replace the valve and restore the charge.

SYMPTOM	LIKELY CAUSE	POSSIBLE SOLUTION
High-pressure alarm	Condenser fans not working	Refer to the remote condenser manual.
	Condenser fans not working or working at very low speed	Incorrect setup of condensation control in micro processor or speed regulators malfunctioning
	Metal filter in water exchanger (condenser) clogged	Clean the filter.
	No water circulation in exchangers (condensers)	Check the shut-off valves, the circulation pumps and the corresponding control devices.
	Non-condensable gases present in cooling circuit	First drain the cooling circuit and create vacuum in it. Then refill the circuit.
Low pressure alarm	No cooling gas	Locate leaks, repair them, create vacuum in the circuit and refill it.
	Very poor air flow	Check the ducts and the condition of the filters. Check the evaporator for clogging. Check that the fan rotation direction and speed are correct.
	Cooling fluid filter clogged	Check and replace it.
	Valve in fluid line not fully open	Check and open fully, if necessary.
The fans will not get started.	Fan motor contactor is de-energised (where fitted)	Check voltage to the contactor coil ends and the coil continuity
	Automatic switch tripped in fan motors	Check the insulation between the windings and between the windings and the earthing point. If no problems are identified with the insulation, close the automatic switch and try to restart the machine.
	Fan motor malfunctioning	Check and, if necessary, replace it.
	Incorrect connections	Check and, if necessary, repair them.
Fluid pipe frosted (downline the fluid valve)	Fluid valve partially closed	Open the valve completely.
Fluid pipe frosted (downline the fluid filter)	Fluid filter clogged	Replace the filter.
Low ambient temperature	Temperature probe defective	Check the probe and replace it, if necessary.
	Heating system malfunction: three-way valve malfunction	Check that the three-way valve is working correctly.
	Heating system malfunction: failure to power the electrical heaters	Check the protections.
	Heating system malfunction: electrical heaters malfunctioning	Replace any defective heaters.

SYMPTOM	LIKELY CAUSE	POSSIBLE SOLUTION
High ambient temperature	Heaters operating beyond working limits: temperature probe defective	Replace the probe.
	Three-way hot water valve constantly engaged: three-way valve control defective	Check that the three-way valve is working correctly.
Low ambient humidity (only for units with humidifier)	Too much fresh air in the winter season	Reduce the fresh air.
	Failure to insulate area from external environment	Improve the insulation from the non-conditioned environment.
	The humidifier does not work.	Check that the humidifier is in good working order.
High ambient humidity (only for units with humidifier)	Too much fresh air in the summer season	Reduce the fresh air.
	Failure to insulate area from external environment	Improve the insulation from the non-conditioned environment.
Partially frosted evaporating coil	Incorrect air flow distribution on evaporating battery	Check the ducts and the air filters.
Noisy compressor	Fluid return to compressor	Measure the overheating and calibrate the valve accordingly.
		Check that the expansion valve bulb is positioned correctly and is in good contact.
Expansion valve hunting	Condensation pressure unstable	Modify the condenser setting to stabilise the condensation pressure.
	Flashes detected in fluid line upstream the valve	Check the filled amount of refrigerant or obstructions in the fluid line
	Incorrect positioning of temperature sensor in expansion valve	Restore the correct position and secure it correctly to the intake pipe.

6.6 Temporary stop

The shutdown of the unit for a few days is considered as temporary.

The unit must be stopped using the display of the control, the external OK signal or via serial if included.

During the temporary stop, the unit must be powered correctly.

When the temporary stop is carried out in this way, all that needs to be done to restart the unit is to set the control to “ON”.

6.7 Stop for long periods of time

When the unit is not used for months this is considered a long period shutdown.

Should the unit be expected to stop for long periods, it is necessary to:

- turn the unit off by means of the control switch;
- disconnect the power supply using the switch / general switch of the unit;
- empty and clean the condensation drip tray;
- empty the humidifier cylinder if any.

This case record can in fact be traced back to the storage condition; therefore, refer to the relevant set limits.

Repeat the start-up procedure at the next restart.

7 MAINTENANCE

All the operations described in this chapter must always be carried out by qualified and authorised personnel.

Before carrying out any work on the unit or accessing internal parts, make sure you have turned off the power supply to it.

The compressors and delivery pipes are very hot. Be particularly careful when working near them.

Be particularly careful when working near the finned coils as the aluminium fins are very sharp.

Do not access moving parts without guards.

In units with capacitors and/or inverters, certain components can remain live for several minutes even after having turned off the main switch.
Wait 10 minutes before working on the electrical parts of the unit.

Circuits supplied from external sources (made with orange cable) can remain live even after the power supply to the unit has been turned off.

Work on the unit only if there is sufficient lighting for the type of work to be carried out.

7.1 Adjustments

All the parameters that control the operation of the unit can be set through the user interface of the control.

Refer to the control manual should modifications be necessary, but contact the manufacturer first.

Calibrations regarding the safety of the unit cannot be modified (safety valves, high pressure switches, fuses, etc.) or are in any case protected from tampering (calibration of thermal overload protection devices, timers, etc.).

If in any case replacement becomes necessary, it is essential to use components supplied by the manufacturer (in the case of adjustable parts) or with the same sizes and characteristics (in the case of fuses).

7.2 External cleaning

When there is a remote condenser, the finned heat exchanger is the component of the unit which requires greatest attention.

It is essential to keep it clean and free of dirt and/or deposits that can hinder or prevent air flow.

Regular cleaning of the surface of the coil is essential for the unit to work correctly and also increases the operating life of the exchanger and the unit.

Frequent and correct cleaning of the coils contributes to considerably reducing corrosion problems.

Please refer to the manual for the timing and modes of operation.

7.3 Internal cleaning

It is essential to keep the installation site clean and tidy for correct maintenance of the unit and to keep it in good working order.

7.3.1 Cleaning the unit

Keep the inside of the electrical control panel and (where present) the compressor compartment clean.

Keep the inside of the electrical control panel and the compressor compartment clean.

After working on the unit, always clean the electrical control panel of any work remnants and extraneous components.

Restore the safety devices and protective devices that had to be removed in order to carry out the work.

Use a vacuum cleaner to eliminate small objects, work remnants and/or any dust.

Do not use compressed air

If you have to carry out work on compressors inside the compartment, before closing it again, check that the electrical box of the compressor is closed correctly and that any refrigerant circuit valves are in the correct state, and make sure you do not leave any materials inside the compartment.

7.4 Periodic checks

Carry out periodic checks to make sure the unit is working correctly:

OPERATION	RECOMMENDED FREQUENCY
Check the operation of all the control and safety equipment as described previously.	Monthly
Check the tightness of the electrical terminals in the electrical control panel and in the terminal boards of the compressors. The moving and fixed contacts of the contactors must be cleaned periodically and should be replaced whenever they show signs of deterioration.	Monthly
Check the refrigerant charge through the liquid sight glass.	Monthly
Make sure there are no oil leaks from the compressor.	Monthly
Make sure there are no water or water/glycol mixture leaks in the hydraulic circuit.	Monthly
If the unit is to remain out of service for a long time, drain the water from the pipes and the heat exchanger. This operation is necessary if ambient temperatures lower than the freezing point of the fluid used are expected during the time it is to remain stopped.	Seasonal
Check the filling of the water circuit.	Monthly
Check that the differential water pressure switch, or the flow switch (where present), is working correctly.	Monthly
Check the crankcase heaters of the compressors.	Monthly
Clean the air filters	Monthly
Clean the ventilation filters of the electrical control panel.	Monthly
Check the moisture indicator on the liquid sight glass (green = dry, yellow = wet). If the indicator is not green, as indicated on the sight glass sticker, replace the filter.	4 months
Check the condition, fixing and balance of the fans.	4 months
Check that the noise emitted by the unit is normal.	4 months

This planning refers to an average installation; there could be installations in which it may be necessary to increase the frequency of some checks.

Current legislation may require considerably longer intervals on periodic checks than the recommended ones, also in reference to the safety devices installed and to the refrigerant charge present, without causing the warranty on the unit to be voided.

7.5 Unscheduled maintenance

After correctly starting-up and carrying out the relevant checks, the units normally do not need any intervention by the customer service in order to check the charge of the refrigerant gas.

7.5.1 Special work

With use of the unit, particular situations may occur that require work to be carried out promptly.

Even in an emergency, work on the unit must be carried out by skilled personnel in safe conditions.

The presence of oil on the unit, on the pipes or on parts of the unit can be a sign of gas leaks.

Repair the leakage point and restore the charge of refrigerant gas.

In the case of small oil leaks, clean the dirty parts with absorbent cloths, otherwise recover the leaked oil with absorbent sheets. In any case, the material used must be disposed of in accordance with current rules and regulations.

Check whether it is necessary to restore the oil charge.

In the case of spillage of the water and glycol mixture of the system, stop the operation of the unit and immediately stop the supply by closing the valves to isolate the leaking part.

Prepare suitable means for containing the spillage (absorbent rolls, cloths, sheets).

As far as possible, recover the liquid with a wet vacuum cleaner.

In the event of environmental damage that will require reclamation work, inform the relevant authorities.

The recovered liquid and the material used must be disposed of in accordance with current rules and regulations.

8 DECOMMISSIONING

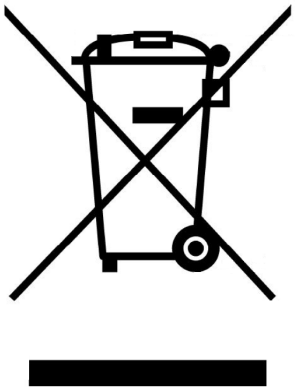
With reference to the European waste management directive, we inform you of the following:

- The owner of electrical and electronic equipment (EEE) is obliged not to dispose of it as non-separated municipal waste, and must dispose of it via separate collection through public or private waste collection systems as required by local regulations.
- The owner can return EEE to the dealer at the end of its life when purchasing equivalent new equipment.

This EEE may contain hazardous substances such as refrigerant gases, lubricating oils and accumulators or other materials, and improper or incorrect disposal of them may have adverse effects on human health and the environment.

Incorrect disposal of them also entails penalties as provided for by local regulations.

The symbol shown on the equipment, which indicates separate collection of EEE, is a crossed out wheelie bin accompanied by a solid horizontal bar and identifies that it was put on the market after 13 August 2005.



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