MITSUBISHI ELECTRIC HYDRONICS & IT COOLING SYSTEMS S.p.A.

CLIMAVENETA®

MANUAL FOR INSTALLATION USE AND MAINTENANCE

Translation of the original instructions

i-AX / i-AW PRECISE

Air conditioners for IT Cooling.
For laboratories and metrology rooms

All series with Under (U) air delivery, Over (O) air delivery. 50 and 60Hz range.	
i-AX PRECISE	**i-AW PRECISE**

UM_iAXAWPRECISE_00_Z_11_20_EN

EN

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1 GENERAL REQUIREMENTS

BEFORE CARRYING OUT ANY OPERATION ON THE MACHINE READ THIS MANUAL CAREFULLY AND MAKE SURE YOU UNDERSTAND ALL INDICATIONS AND INFORMATION CONTAINED IN THE DOCUMENT

KEEP THIS DOCUMENT IN A KNOWN PLACE AND EASILY REACHABLE FOR THE WHOLE PERIOD OF THE MACHINE'S OPERATIONAL LIFE.

1.1 GENERAL INFORMATION AND SAFETY

1.1.1 OBJECTIVE OF THIS MANUAL

This manual, which is an integral part of the machine (1), has been prepared by the manufacturer to provide the information necessary to all persons authorized to interact with the machine during its useful life: The Purchasers, Plant Designers, Carriers, Handlers, Installers, expert Operators, specialized Engineers and Users.

Apart from adopting a good usage technique, the persons who receive this information must read it carefully and must implement it strictly.
The time devoted to the reading of this information will allow you to avoid any health and safety hazard, as well as any financial damage.

This information has been written by the manufacturer in its original language (Italian) as "ORIGINAL INSTRUCTION".
The information is even available in English as "TRANSLATION OF ORIGINAL INSTRUCTION" and may be translated into other languages to meet any legislative and/or business requirements.
Even though this information does not fit the machine perfectly, this does not prejudice its function.

Keep this manual in a well-known and easily accessible place, so that it will be always available for future reference, when necessary.

The manufacturer reserves the right to modify the product without prior notice.
To highlight the most important sections of this text, some symbols have been adopted whose meaning is described below.

DANGER
Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury

MANDATORY
Indicates that any unsafe practices must be avoided which could prejudice health and safety and cause financial damage

INFORMATION
Indicates any important technical information that must not be neglected

(1) this term is used for simplicity, as defined in Machinery Directive.

1.1.2 GLOSSARY AND TERMS

Several terms that recur throughout this manual are described below, to provide a more complete explanation of their meaning.

Manufacturer: is the company that has designed and built the machine in compliance with current laws and adopting all the rules of good construction techniques, paying attention to the safety and health of people interacting with the machine.

Purchaser: he is responsible for any purchase and must supervise the organization and assignment of tasks, ensuring compliance with all applicable laws.

Owner: Legal representative of the company, body or natural person who owns the plant in which the machine is installed: he is responsible for checking compliance with all the safety regulations indicated by this manual as well as by current national legislation.

Designer: a competent skilled person appointed and authorized to prepare a project that must consider all the legislative, regulatory, and workmanlike performance principles applicable to the plant. In any case, apart from conforming to the manufacturer's instructions, he must consider all safety-related matters for the people who must interact with the machine during its expected useful life.

Installer: a competent skilled person duly authorized and responsible for the setting-up of the machine/plant, according to project specifications and the manufacturer's directions and in conformity with the applicable industrial safety laws.

User: a person authorized to control the use of the machine according to the "instructions for use" and the industrial safety laws in force.

Carriers: those who deliver the machine using suitable means of transportation. They must load and position the machine properly, to prevent any sudden displacement during the transportation. When any loading/unloading means are used, these must conform to the markings affixed on the machine to ensure their safety and for the safety of all the people who could interact with these operations.

Handlers: they arrange the machine properly and affix all the necessary markings for safe and correct handling. On receipt of the machine, they ensure handling to the installation point, according to the instructions affixed on it. All these operators must have adequate skills and must comply with the instructions provided for their safety and for the safety of the people who could interact with these jobs.

Maintenance technician: Person authorized by the owner to perform on the machine all the adjustment and control operations specifically indicated in this manual, to which it must strictly follow, limiting its action to what is clearly permitted.

Expert operator: a person appointed and authorized by the User or the Purchaser to proceed with the use of the machine and the relevant ordinary maintenance jobs, according to the manufacturer's instructions. In case of failures not covered by this manual, he must request the intervention of a skilled Engineer.

Skilled Engineer: Person authorized directly by the Manufacturer to carry out all the ordinary and extraordinary maintenance operations, as well as any adjustment, control, repair and replacement of parts that may be necessary during the life of the machine.
Outside the Italian territory and in the countries where the Manufacturer is directly present with his own subsidiary, the Distributor is obliged, under his own complete responsibility, to equip himself with adequate and proportional Technicians to the territorial extension and to the business.

Ordinary maintenance: all the jobs necessary for maintaining the machine in perfect working order. These jobs are scheduled by the manufacturer, who sets out the necessary core competences and procedures.

Extraordinary maintenance: all the jobs necessary for maintaining the machine in perfect working order. These jobs cannot be predicted, are not scheduled by the manufacturer and must be carried out by a specialized Engineer only.

1.1.3 ENCLOSED DOCUMENTATION

The following documentation is delivered to the customer together with the machine:

- **Installation, Use and maintenance manual**: includes the list of scheduled maintenance operations.
- **Wiring Diagram**: specific for the machine. It is used by the operators working on the electrical system, to identify the various components and connections.
- **Dimensional lay-out** and lifting
- **Refrigerant / Hydraulic diagrams**
- **Recommended spare parts list:** indicates the spare parts that should be always available
- **Assembly instructions for possible accessories:** the methods of installation on the machine are described.
- **CE Conformity Declaration**: indicates that the machines follow the European Directives in force.

1.1.4 SAFETY REGULATIONS

During the design and production stages, the manufacturer has paid close attention to all possible sources of safety and health hazard to the people who interact with the machine. Apart from complying with the applicable laws, the manufacturer has adopted all the applicable "workmanlike performance rules". The aim of this information is to make users aware of the attention necessary for preventing any hazard. Caution is however mandatory.
Safety is also in the hands of all operators interacting with the machine.
Carefully read the instructions in the supplied manual and those applied directly on the machine, in particular respect those concerning safety.

The installation of this machine within a plant requires a global project that considers all "workmanlike performance" requirements, as well as legislative and regulatory principles. Special care must be devoted to all the technological instructions and information indicated by the manufacturer.
Do not tamper with, remove, or bypass the safety devices installed on the machine. Failure to meet this requirement will result in serious safety and health hazard to people.

The personnel that carries out any type of job during the life of the machine must be adequately qualified and skilled from a technical standpoint and must have gained experience in this specific sector.
The lack of these requirements could prejudice the health and safety of people.

During the normal use or for any job on the machine, keep the perimeter space in adequate conditions, to prevent any safety and health hazard to people.
Some stages may require the help of one or more assistants. In these cases, we recommend that you train and inform them properly on the type of activity to be carried out, to prevent any safety and health hazard to people.

Handle the machine according to the information provided directly on the packaging and in the instructions for use delivered by the manufacturer.

During handling, if necessary, seek the help of one or more assistants to receive adequate signals.
The personnel that loads, unloads and handles the machine must be adequately qualified, skilled, and experienced in this specific sector and must be in command of the lifting equipment to be used.

During the installation stage, respect the perimeter space indicated by the manufacturer, considering also any other surrounding activity. This requirement must be met also according to the applicable industrial safety laws.
The installation and connections must be carried out, about the machine, according to the manufacturer's instructions. The person responsible for these operations must consider also all the applicable regulatory and legislative requirements, ensuring the workmanlike execution of the installation and connection jobs. Once the installation is completed and before starting the machine, he must make sure, through a general check, that these requirements have been met.

If the machine is to be transferred using any means of transportation, check that these are fit for their intended use and load/ unload the machine in such a way that there is no hazard to the operator and the people directly involved.

Before moving the machine using the said means of transportation, make sure that the machine and its components are anchored to such means firmly and that their profile does not exceed the maximum fixed volume. If necessary, prepare the appropriate DANGERs.

The operator, apart from being well-informed about the use of the machine, must be properly qualified and experienced, based on the type of job to be effectuate.

Use the machine only for the purposes recommended by the manufacturer. Using the machine for any improper job may result in serious safety and health hazard and financial damage.

The machine has been designed and manufactured in such a way that it can satisfy all the working conditions indicated by the manufacturer.
Tampering with any device to obtain any different performance may result in safety and health hazard and financial damage.

Do not use the machine if the safety devices have not been perfectly installed and are not effective. Failure to meet this requirement may result in serious safety and health hazard.
Keep the machine in perfect working order, carrying out the scheduled maintenance jobs recommended by the manufacturer.
Proper maintenance will ensure better performance, longer life, and the constant maintenance of safety requirements.

Before carrying out any regulation and maintenance job on the machine, activate all the safety devices provided and consider whether the personnel involved and the operators nearby must be informed properly or not. In particular, carefully indicate the neighbouring areas and prevent the access to all devices that, if activated, are likely to cause unpredictable dangers, causing damage to people's safety and health.

The regulation and maintenance jobs must be effectuating by authorized operators, who must arrange all the necessary safety conditions, according to the procedures indicated by the manufacturer.

All maintenance jobs that require any specific technical skill or expertise must be carries out only by qualified personnel, adequately experienced in the relevant sector of intervention.

To carry out any maintenance jobs in areas that are difficult of access or dangerous, ensure proper safety conditions for yourself and for other people, according to the applicable industrial safety laws.

Replace any worn components with original spare parts only. Use the components recommended by the manufacturer, so as to ensure the machine performance and the expected safety level.

1.1.5 PRECAUTIONS AGAINST RESIDUAL RISKS

Prevention of residual mechanical risks

- install the machine according to the provisions of this manual;
- perform all the maintenance operations provided for in this manual regularly;
- wear protective equipment (gloves, eye protection, helmet, ...) appropriate to the operations to be performed; do not wear clothes or accessories that can be entangled or sucked in by the air, collect and tie the hair to the head before accessing the inside of the machine;
- before opening a panelling of the machine, make sure that it is solidly connected to it by hinges;
- the fins of the heat exchangers, the edges of the components and the metal panels can generate cutting injuries;
- do not remove the guards on moving parts while the machine is operating;
- make sure that the protections to the moving parts are correctly positioned before restarting the machine;
- fans, motors and transmissions may be in motion: before accessing them, always wait for their shut down and take precautions to prevent their start;

- the machine and the pipes have very hot and very cold surfaces which cause the risk of burns;
- do not exceed the maximum admissible pressure (PS) of the water circuit of the machine as indicated;
- before removing elements along the pressurized water circuits, intercept the concerned section of piping and evacuate the fluid gradually until the pressure of the circuit is balanced to atmospheric pressure;
- do not use your hands to check for refrigerant leaks.

Prevention of residual electrical risks

- disconnect the machine from the mains using the external disconnector before opening the electrical panel;
- verify the correct grounding of the machine before starting it;
- the machine must be installed in a suitable place; if it is intended for indoor use, it cannot be installed outdoors;
- do not use cables with inadequate section or non-compliant connections even for limited periods or for emergencies;
- in case of a machine with power factor correction capacitors, wait 3 minutes, since the power supply to the machine has been removed, before accessing the electrical panel.

Prevention of residual environmental risks

The machine contains substances and components hazardous to the environment such as refrigerant gas and lubricating oil.
Maintenance and disposal operations must only be carried out by qualified personnel.

Refrigerant gas:
The refrigerant circuit contains fluorinated greenhouse gases covered by the Kyoto Protocol.
The fluorinated greenhouse gases contained in the refrigeration circuit cannot be discharged into the atmosphere.
The refrigerant gas must be recovered in accordance with the regulations in force.

Refrigerant	R134a	R410A	R407C
GWP100	1430	2088	1774

Lubricating oil:
The compressors and the refrigerant circuit contain lubricating oil.
The oil must be recovered in accordance with the regulations in force.
Do not dispose of oil in the environment.

Prevention of residual risks of different nature

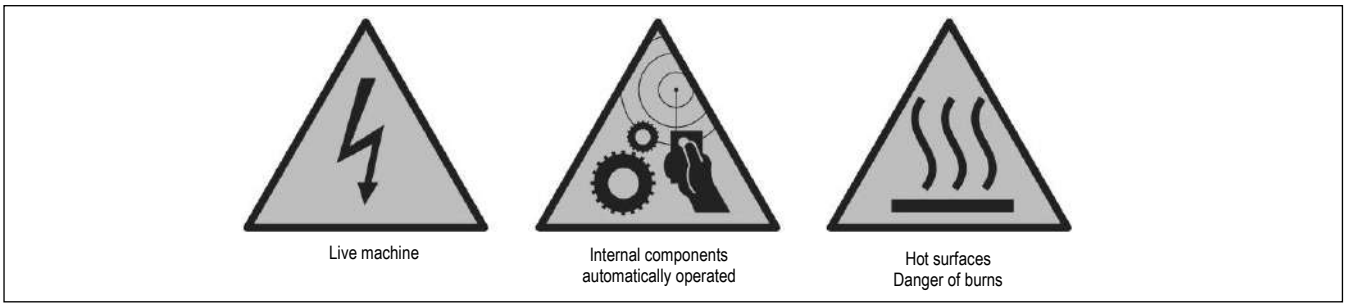
- the machine contains pressurized refrigerant gas: no operation must be carried out on pressure equipment except during maintenance performed by competent and qualified personnel;
- make the system connections to the machine following the instructions given in this manual and on the pictograms arranged on the panelling of the machine;
- the water circuit contains harmful substances. Do not drink from the water circuit and prevent the contents from coming into contact with the skin, eyes and clothes;
- to avoid an environmental risk, ensure that any fluid leaks are recovered in suitable devices in compliance with local regulations;
- in case of disassembly of a piece, make sure of its correct reassembly before restarting the machine;
- in the event that the current regulations require to set up fire protection systems near the machine, check that these are suitable for extinguishing fires on electrical equipment, compressor lubricating oil, refrigerant, as required by the safety data sheets of these fluids (for example a fire extinguisher CO_2);
- if the machine is equipped with overpressure release devices (safety valves): in case of intervention of these devices, the refrigerant gas is released at high temperature / speed; prevent the projection from damaging people or things; properly convey the discharges according to the provisions of EN 378-3 and local regulations, paying attention to convey fluids belonging to a safety group other than A1 to open and safe places.
- the safety devices must be maintained in efficiency and checked periodically as required by current regulations;
- keep all lubricants in duly marked containers;
- do not store flammable liquids near the system;
- perform brazing or welding only on empty pipes and cleaned from any residual lubricating oil; do not bring flames or other heat sources near the pipes containing refrigerant fluid;
- do not operate with open flames near the machine;
- the machines must be installed in structures protected from lightning as required by applicable laws and technical standards;
- do not bend or hit pipes containing pressurized fluids;
- on the machines it is not allowed neither to walk nor to support other bodies;
- the overall assessment of the fire risk of the place of installation (egg calculation of fire load) is the responsibility of the user;
- during any movement, firmly secure the machine to the means of transport to avoid shift and overturns;
- the machine must be transported in compliance with current regulations considering the characteristics of the fluids contained and their characterization described in the safety data sheet;
- inadequate transport can cause damage to the machine and generates refrigerant leaks. Before the first start-up, check whether the cooling circuit is under pressure;
- accidental expulsion of refrigerant in a closed area can cause lack of oxygen and therefore the risk of asphyxiation: install the machine in a suitably ventilated environment in accordance with EN 378-3 and the local regulations in force and provide, when necessary, refrigerant detectors;
- unless otherwise authorized by the Manufacturer, the machine must be installed in environments that are not classified as explosion-proof (SAFE AREA).

1.1.6 DISCONNECTOR EXTERNAL TO THE MACHINE (NOT SUPPLIED)

To isolate the machine from the main power source. As prescribed by the EN 60204-1 standard, the disconnector handle must be easily accessible and positioned at a height between 0.6 and 1.9 meters from the service level. At the place of installation, it must be considered how the machine will be positioned, because the machine could be placed on a raised base with respect to the walking surface and consequently the height of the disconnector could no longer meet the requirements of the standard. In this case the installer must provide a gangway or similar solution that will allow operators easy access to the safety device.

1.1.7 SAFETY SIGNS

Safety signs are provided on the internal panelling of the electrical panel as listed below:



1.1.8 REQUEST FOR ASSISTANCE

For any requirement, please contact an authorized centre (Italian Market) and Distributors (foreign market). For any request for technical assistance regarding the machine, please indicate the data specified on the identification plate, the serial number, the access conditions and the perimeter area of installation.
Indicate also the approximate hours of use and the type of defect identified.
In case of alarm, indicate the relevant number and the signalled message.

1.2 MACHINE IDENTIFICATION

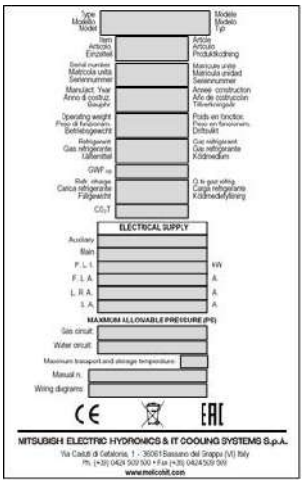
1.2.1 NOMENCLATURE / IDENTIFICATION LABEL

NOMENCLATURE: The alphanumeric code of the machine model, shown on the identification plate, represents precise technical specifications that are indicated in the figure shown.
IDENTIFICATION LABEL: The type of machine is shown on the label applied directly on the machine, normally inside the panel of the electrical panel.
It contains the references and all the information necessary for safe operation.

NOMENCLATURE

i-AX PRECISE	**Series identification – for laboratories and metrology rooms**
i-AX	direct expansion with remote air-cooled condenser
i-AW	direct expansion with built-in water-cooled condenser
00	**Cooling capacity (kW) at nominal conditions**
Version	
BASIC	I-AX unit with EC fans speed control of the matched remote condenser. I-AW unit with AC fans speed control of the matched remote condenser.
MOD.A	I-AW unit with AC fans speed control of the matched dry cooler.
MOD.B	I-AW unit for well-water application with condensation control with pressure control valve.
LT	I-AX unit for low ambient air temperature: (-45°C) matched with remote air-cooled condenser with axial fans with AC electric motors; (-35°C) matched with remote air-cooled condenser with axial fans with EC electric motors.

IDENTIFICATION LABEL



2 OPERATING LIMITS

The units are designed for operation within the following operating ranges (the limits are considered for new units that have been correctly installed and maintained):

ROOM return air conditions		**Min**	**Max**
PRECISE Configuration	Return air conditions	16°C	24°C
	Relative humidity	40%	70%
AMBIENT air temperature conditions		**Min**	**Max**
BASIC Version	Outdoor temperature	-20°C	46°C
LT Version matched with remote condenser with AC fans	Outdoor temperature	-45°C	46°C
LT Version matched with remote condenser with EC fans	Outdoor temperature	-35°C	46°C
MOD.A Version	Outdoor temperature	-20°C	46°C

2.1 MAIN CHARACTERISTICS OF THE MACHINES

2.1.1 GENERAL DESCRIPTION

The machines of this series are designed and manufactured for being used in Hi-Tech air conditioning plants. The machine must be installed inside the room or however protected by weathering.
The machines are equipped with a microprocessor control, that allows the monitoring of all functions and the communication with external supervision systems.
The machines are fully factory-assembled, provided with control equipment to reduce installation time and costs.
As a rule, the installation simply requires refrigerant, hydraulic and electrical connections.
To ensure top performance and safety for people, the product and the environment, before proceeding with the installation, prepare a complete project of the plant which the machine will belong to, analysing all the critical points predicted or predictable during its life, from installation to dismission.
The ducts shown in the diagrams are not provided. The plenums shown in the diagrams are accessories on request.
The machine can be installed on any type of flooring, provided it is stable and can support the weight of the machine

MANDATORY
For stability reasons, only one plenum can be installed on the machines

2.1.2 DIRECT EXPANSION UNIT FOR METROLOGY ROOMS

Especially suitable for air-conditioning of measuring rooms, laboratories, equipment rooms, archives and museums, and for textile, paper and tobacco processing plants.
Unit fitted with modulating hot gas reheating, which together with the inverter compressor and the humidification and dehumidification functions, ensures extremely precise and stable control of the temperature and humidity conditions, proving particularly efficient at low loads.
The combination of modulating hot gas reheating, modulation of cooling capacity by the inverter compressor, and accurate and continuous adjustment of steam production, the unit ensures precise temperature and humidity control (± 0.3 °C and ± 2 % RH).

In order to achieve this performance, several important conditions are required:
- Heat load must be constant or stable, with variations no greater than 25% per hour.
- The unit must be properly installed and ducted.
- The space needs to be suitably insulated against outside loads (especially doors, windows, etc.).

Return air conditions must be as shown in the table in the paragraph on OPERATING LIMITS.

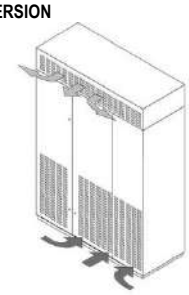
Available in the air-cooled (i-AX) and water-cooled versions (i-AW).

3 AIR FLOWS

The air-conditioners are available in different configurations, based on the air intake and outlet positions; the main distinction is between **OVER** and **UNDER** units.
The versions defined as **OVER** with air outlet from the top generally have the air intake at the front, rear and/or from the bottom, as required by the customer, and the air outlet from the top of the unit, in ducts, false-ceilings, or from outlet plenums at the front.

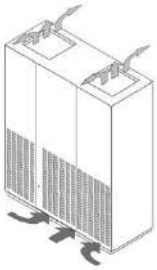
OVER VERSION

fig. 1



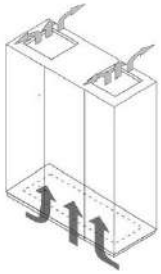
OVER units with intake from the front and air delivery plenum (optional)

fig. 2



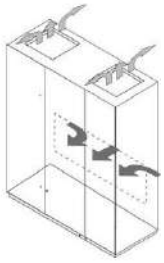
OVER units with intake from the front and outlet from the top

fig. 3



OVER units with intake from under the floor and outlet from the top

fig. 4



OVER units with intake from the rear and outlet from the top

The versions defined as **UNDER** with air outlet from under the floor have the air intake through the top of the unit directly from the environment, or via ducts and/or intake plenums.

3.1 AIR DISTRIBUTION (UNDER UNITS)

In the units with air outlet from the bottom, the following details must be ensured to allow for sufficient air flow-rate:

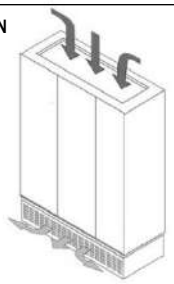
a) **connection opening between the unit and the raised floor;** make a hole in the raised floor and position the air-conditioner over the centre of the hole: the air outlet opening must not be blocked, even partially, by parts of panels, beams, pipes or other objects; insert an elastic gasket around the perimeter of the base to prevent the transmission of noise and vibrations;

b) **free air flow along the cavity of the raised floor;** the duct represented by the underfloor space must be sufficiently high (at least 200-250 mm of free space, net of the panels and the beams of the raised floor) and free of obstructions, especially near the air-conditioner;

c) **grills and air distribution openings in the room;** the air exits the underfloor space through openings or grills, the position and surface area of which must be proportional to the layout of the thermal load of the environment.

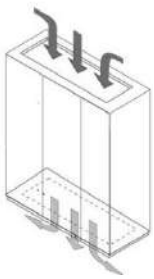
UNDER VERSION

fig. 5



UNDER units with intake from the top and front outlet base moulding (optional)

fig. 6



UNDER units with intake from the top and outlet under the floor

For units with air outlet from the bottom, the recommended air outlet speed from the raised floor is between 1 and 2.5 m/s; consequently, the cross-section of the grills should be sized based on this value. The total outflow area (sum of the areas of the openings and net space of the grills) required for each model must be calculated by dividing the total air flow-rate (in m3/s) by the required outlet speed (in m/s).

MANDATORY
The air outlet must be completely free, as an insufficient air outflow air will reduce the flow-rate, the performance of the air-conditioner and may affect reliability.

4 ACCESING TO MAIN COMPONENTS

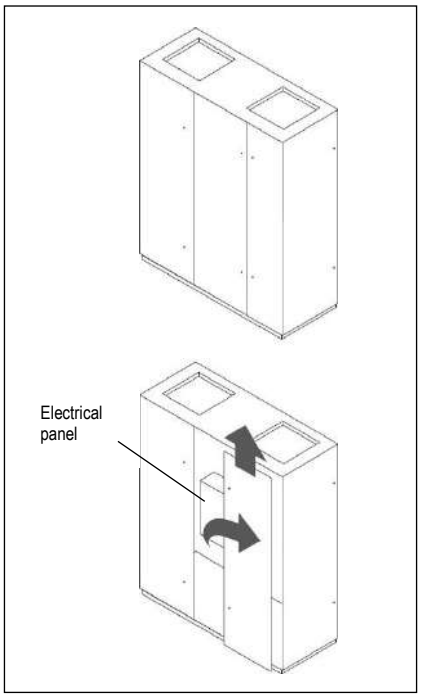
The air-conditioner is accessible from all sides by removing the various panels. The front and/or side panels are opened in 2 different ways:

FRONT PANELS
All the front panels are hinged and fitted with locking latches and seal. All the front panels are opened and closed using a tool (typically a screwdriver) to open and close the latches.
Once the latches have been opened, the front panels can be swung open and then removed vertically to simplify the service operations on the air-conditioner, especially where there is little space available. Opening the front panels provides access to all the components in the air-conditioner involved in routine maintenance.
The number of front panels depends on the capacity of the air-conditioner.

SIDE PANELS
All the side panels are accessible and removable.
Nonetheless, these do not need to be removed for routine maintenance operations. This means that, if necessary, a series of units can be installed next to each other. The side panels are fastened by screws.
These are accessible directly on the side panel by removing the black plastic caps.

BACK PANELS
Fastened by normal self-tapping screws, these are not accessible as when installed the back of the unit is against the wall.

INSIDE PANELS
The compartment that contains the fans and the heaters is protected and insulated by a metal plate.
This is for safety reasons, so as to not have to shut the unit down during normal maintenance operations.



DANGER
Before restarting the air-conditioner, always check that all the panels have been correctly replaced.

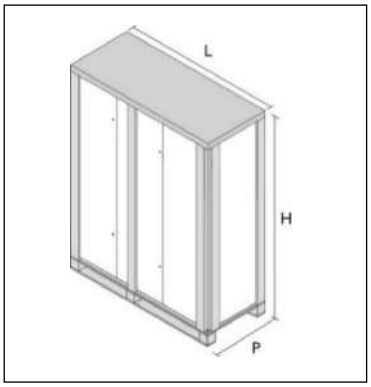
5 RECEIPT, TRANSPORT AND HANDLING

Move the air-conditioner, which must not be reclined or tipped over, nor exposed to the elements, as near as possible to the site of installation before removing the packaging and the pallet.

- using a forklift, sliding the forks through the openings in the pallet;
- using fabric slings underneath the unit, making sure that when the slings are in tension these do not apply pressure on the top edges.

The air-conditioner must be stored indoors, preferably in its own packaging, and protected against excessive humidity (<90% RH) and temperature (> -30°C, < 50°C for I-AX series; > -30°C, < 45°C for I-AW series).

STANDARD PACKAGING



Mod.	12	18
L mm	1060	1060
P mm	560	560
H mm	2250	2250

PACKAGING WITH WOODEN CRATE (OPTIONAL)

Mod.	12	18
L mm	1090	1090
P mm	590	590
H mm	2265	2265

5.1 RECEIVING THE UNIT

Check, upon delivery, that the air-conditioner is intact and in perfect condition; immediately notify the carrier in writing of any damage that may be due to transport.
In particular, check that the panel where the user terminal is fitted has not been damaged.
If the side panels have been damaged during transport, they must be replaced before installing the unit.

5.2 DIMENSIONS AND WEIGHT

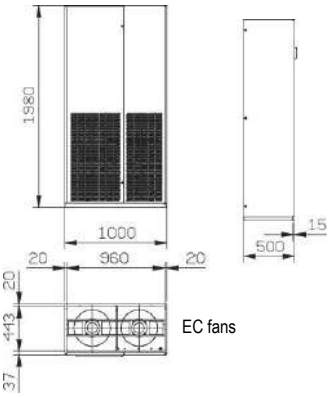
Net weight

Mod.		12	18
i-AX	kg	262	262
i-AW MOD_A	kg	263	263
i-AW MOD_B	kg	264	264

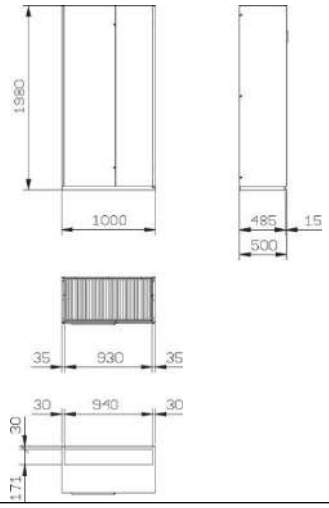
Weights with standard packaging

Mod.		12	18
i-AX	kg	267	267
i-AW MOD_A	kg	268	268
i-AW MOD_B	kg	269	269

Model 12-18 OVER

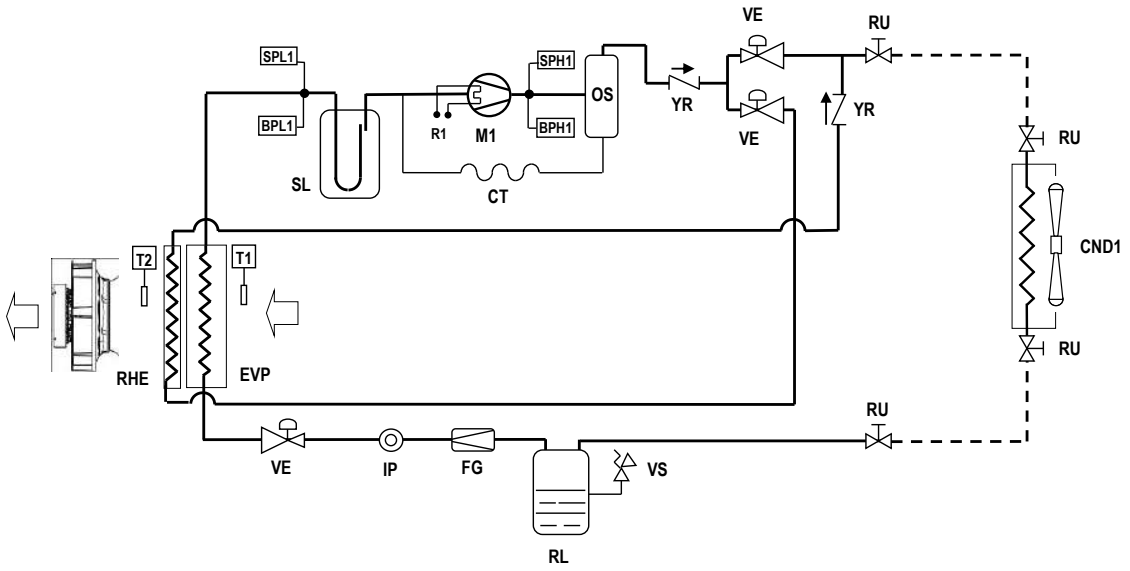


Model 12-18 UNDER



6 OVERVIEW DIAGRAM

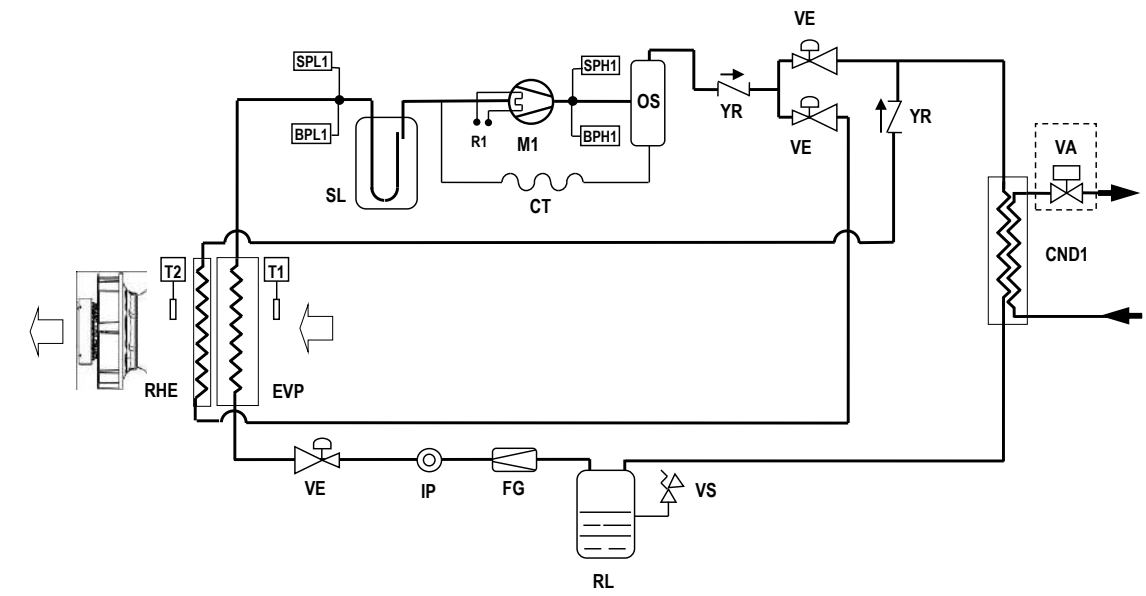
6.1 REFRIGERANT DIAGRAM – I-AX SERIES



LEGENDA

M1	BLDC inverter compressor	BPL	Low pressure transducer	VE	Expansion valve
R1	Crankcase heater	SPL	Low pressure switch	T	Temperature probes
EVP	Evaporator	OS	Oil separator	RU	Valves.
RHE	Hot gas post-heating coil	YR	Check valve	RL	Liquid receiver
BPH	High pressure transducer.	VS	Pressure relief valve (only model 12)	SL	Liquid separator
SPH	High pressure switch.	FG	Refrigerant filter	CND1	Remote condenser
CT	Capillary tube.	IP	Sight glass		

6.2 REFRIGERANT DIAGRAM – I-AW SERIES



LEGENDA

M1	BLDC inverter compressor	BPL	Low pressure transducer	VE	Expansion valve
R1	Crankcase heater	SPL	Low pressure switch	T	Temperature probes
EVP	Evaporator	OS	Oil separator	RU	Valves.
RHE	Hot gas post-heating coil	YR	Check valve	RL	Liquid receiver
BPH	High pressure transducer.	VS	Pressure relief valve (only model 12)	SL	Liquid separator
SPH	High pressure switch.	FG	Refrigerant filter	CND1	Condenser
CT	Capillary tube.	IP	Sight glass	VA	Pressure control valve for condensation control (only for MOD.B version)

7 INSTALLATION

7.1 POSITIONING THE AIR CONDITIONER

The air-conditioner can rest directly on the floor, perfectly level, with a maximum difference in height of 5 mm between the ends of the base: incorrect levelling may cause the condensate to leak from the collection pan.

MANDATORY
The air-conditioner must be installed indoors and in non-aggressive environments. Apply an elastic gasket around the perimeter of the base to prevent the transmission of noise and vibrations.

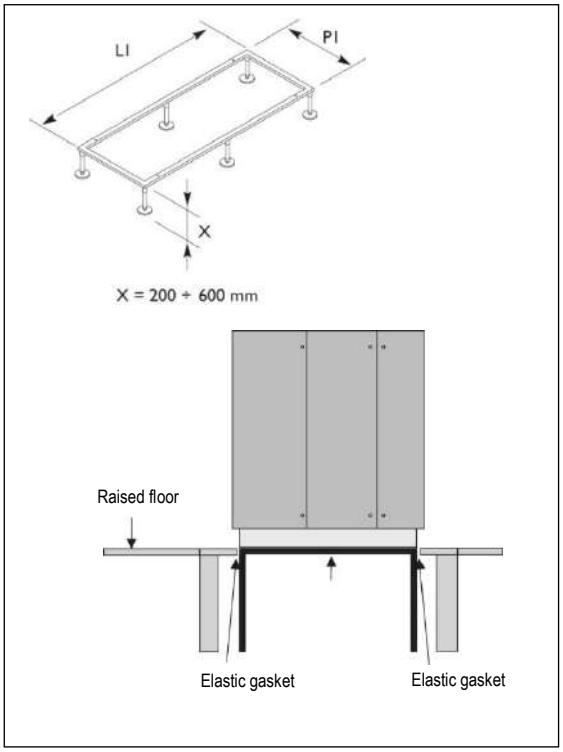
7.1.1 SUPPORT FRAME (OPTIONAL ACCESSORY)

A support frame is recommended:
- to allow the air-conditioner to be installed before assembling the raised floor;
- to totally dampen any mechanical vibrations;
- to assist the laying of pipes and cables.

The support frame is available as an accessory and is adjustable in height, indicated in the figure by the distance X, between 200 and 600 mm. To prevent the transmission of noise and vibrations, an elastic gasket, at least 5 mm thick, should be inserted between the panels of the raised floor and the frame, which must also be insulated from the metallic structure of the floor.

NOTE: the frame must be fitted by the installer following the instructions shown inside the packaging.

Mod.	12	18
L1 (mm)	1000	1000
P1 (mm)	485	485

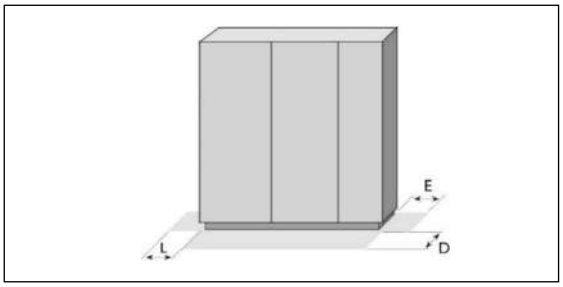


7.2 OPERATING SPACE

Access is from the front only for all models. This feature ensures easy access to all the main components in the unit for installation and periodical maintenance.
Thanks to this feature, the units can be installed next to one another, or alternatively fitted in racks. To ensure easy maintenance, a space of at least 600 mm must be left in front of the air-conditioner, as shown in the figure.

MANDATORY
Make sure that the air intake and outlet are never blocked, even partially.

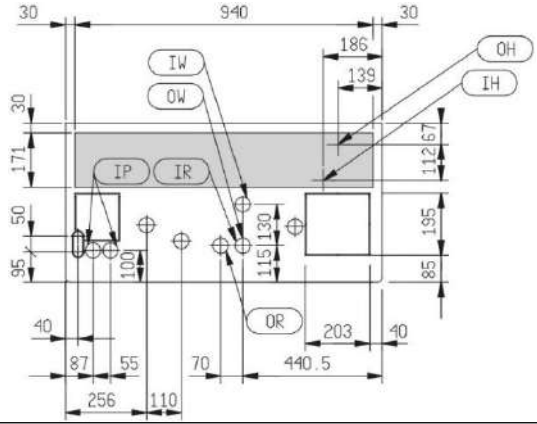
Model	12	18
D (mm)	>600	>600
E (mm)	0	0
L (mm)	0	0



7.3 POSITION AND DIAMETER OF THE CONNECTIONS

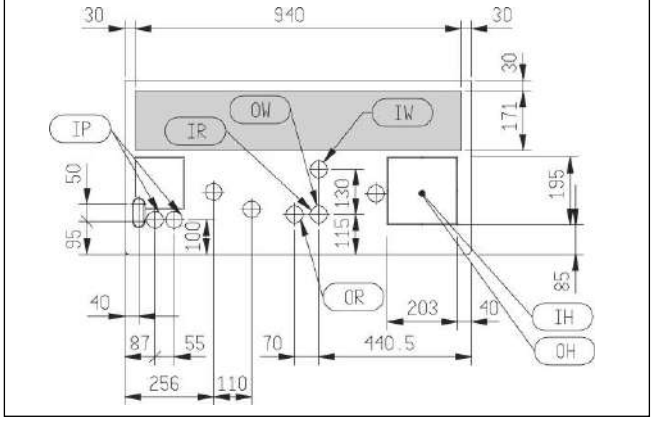
OVER CONNECTIONS (I-AX/I-AW) Size 12-18

IR	IN refrigerant I-AX
OR	OUT refrigerant I-AX
IW	IN water to the condenser I-AW
OW	OUT water from the condenser I-AW
IP	IN power supply
IH	IN humidifier water
OH	OUT humidifier water and condensate water drain



UNDER CONNECTIONS (I-AX/I-AW) Size 12-18

IR	IN refrigerant I-AX
OR	OUT refrigerant I-AX
IW	IN water to the condenser I-AW
OW	OUT water from the condenser I-AW
IP	IN power supply
IH	IN humidifier water
OH	OUT humidifier water and condensate water drain



8 WATER CONNECTIONS AND WATER CHARACTERISTICS

For all the water connections (with the exception of the condensate drain), the following are recommended:
- flexible connections to avoid transmitting vibrations and allow small movements of the air-conditioner;
- joints in three pieces, near the fittings, to simplify the removal of the unit;
- on-off valves to disconnect the unit from the water circuit: where possible use ball valves with full opening to minimise pressure drop.

For I-AW models check that the cross-section of the chilled water pipes and the characteristics of the circulating pump are suitable: an insufficient water flow-rate affects the performance of the air-conditioner. Check that the water inlet and outlet connections are correct. Insulate all the chilled water pipes with closed cell material (e.g.: Armaflex or equivalent), to prevent condensation; the insulation must allow access to the valves and the three-piece joints. For I-AW models check that the water circuit has been filled with an antifreeze mixture containing the right percentage of ethylene glycol.

To select the pipeline, refer to "Pressure Drops on stainless steel pipes"

Make sure that the water contained in the water circuit meets the following requirements throughout the entire life of the system:

ref.	Description	Symbol	Values
1	hydrogen ion concentration	pH	7.5÷9
2	calcium (Ca) and magnesium (Mg) content	Durezza	4÷8.5 °D
3	chloride ions	Cl^-	< 150 ppm
4	iron ions	Fe^{3+}	< 0.5 ppm
5	manganese ions	Mn^{2+}	< 0.05 ppm
6	carbon dioxide	CO_2	< 10 ppm
7	hydrogen sulphide	H_2S	< 50 ppb
8	oxygen	O_2	< 0.1 ppm
9	chlorine	Cl_2	< 0.5 ppm
10	ammonia	NH_3	< 0.5 ppm
11	carbonate-sulphate ratio	HCO_{3^-} / SO_4^{2-}	> 1

where: 1/1.78 °D=1 °Fr con 1°Fr= 10 gr $CaCO_3$ / m^3
ppm = parts per million; ppb = parts per billion

Explanations
ref. 1: a hydrogen ion concentration (pH) greater than 9 implies a high risk of fouling, while a pH less than 7 implies a high risk of corrosion
ref. 2: hardness refers to the quantity of Ca and Mg carbonate dissolved in the water at a temperature below 100 °C (temporary hardness). High hardness implies a high risk of fouling.
ref. 3: a chloride ion concentration higher than the value indicated will lead to corrosion
ref. 4-5-8: a presence of iron, manganese and oxygen irons will give rise to corrosion
ref. 6-7: carbon dioxide and hydrogen sulphide are impurities that lead to corrosion occurring more readily
ref. 9: the typical value in mains water is between 0.2 and 0.3 ppm. High values will cause corrosion
ref. 10: the presence of ammonia boosts the oxidation capacity of oxygen
ref. 11: at levels below the value shown in table, there is the risk of corrosion due to galvanic current running between the copper and the other less noble metals.

Values of the parameters outside the indicated ranges can lead to the formation of deposits and limescale and/or favour corrosive phenomena within the plant. For operating fluids other than water (mixtures of ethylene and propylene glycol) it is recommended to use specific inhibitors, designed to offer thermal stability within the operating temperature range and protection against corrosion. It is necessary that, in the presence of dirty and / or aggressive waters, an intermediate heat exchanger is installed upstream of the heat exchangers

8.1 CONNECTION TO BRAZED PLATE: SERIES I-AW

8.1.1 SERIES I-AW. WATER COOLED UNITS

The condenser must be connected to the cooling water circuit, making sure that the water inlet and outlet connections are correct.
If the water temperature falls below the dew point of the conditioned air, insulate the pipes with closed cell material (e.g.: Armaflex or equivalent) to prevent condensation; the insulation must allow access to the valves and the three-piece joints. Seal the holes where the pipes pass through the base of the air-conditioner to avoid the bypass of air.
For "open" circuits mechanical filters must be used to trap impurities and prevent blockage of the braze-welded plate heat exchanger.

N.B.: the water system of the unit is PN10

8.2 CORRECTION FACTORS

8.2.1 ETHYLENE GLYCOL SOLUTIONS

A mix of water plus glycol used has fluid instead of only water cause a cooling capacity reduction of the unit.
Multiply the cooling capacity for the values reported of the following tables.

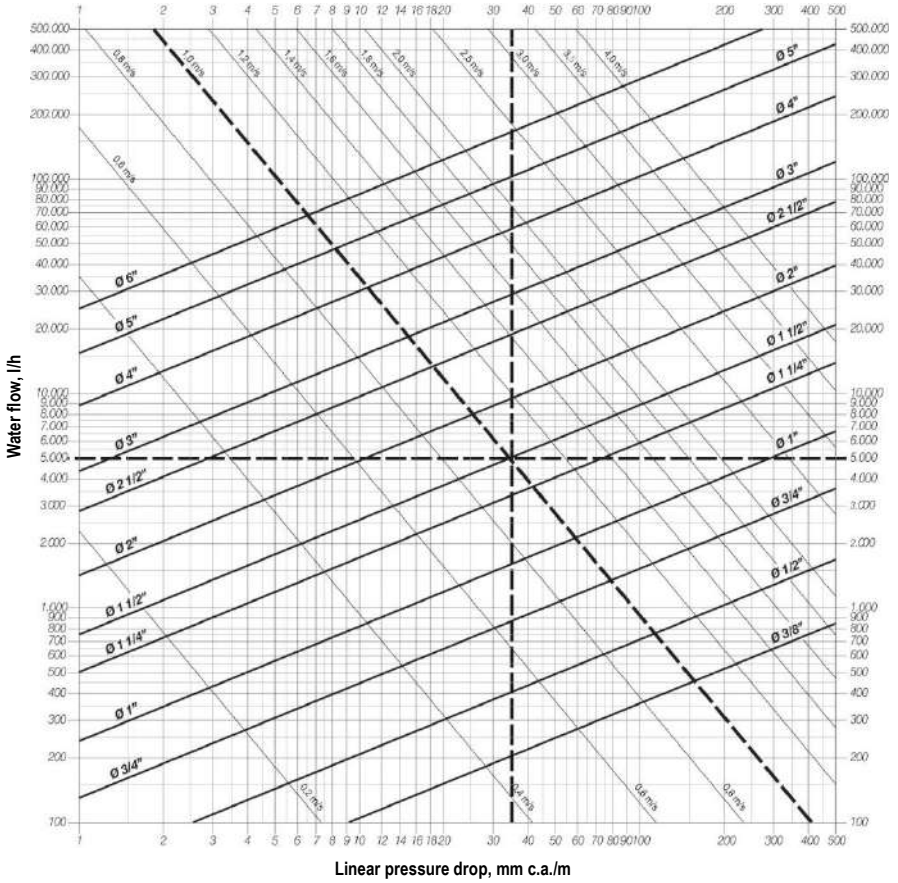
Icing temperature		**0**	**-5**	**-10**	**-15**	**-20**	**-25**
% of glycol on tot. charge		**0**	**12%**	**20%**	**28%**	**35%**	**40%**
Flow factor	**cQ**	1	1,02	1,04	1,075	1,11	1,14
P. drops factor	**cdp**	1	1,07	1,11	1,18	1,22	1,24

8.2.2 INCROSTATION FACTOR

All data reported are referred to a complete clean brazed blade condenser (incrostation factor = 1).
For different values of incrostation factor multiply all data reported on cooling capacity tables for factors reported on following table.

Incrostation factor	**(m^2°C/W)**	**4,4 x10-5**	**0,86x10-4**	**1,72x10-4**
Power factor	**f1**	---	0,96	0,93
Compressor factor	**fk1**	---	0,99	0,98
Total power factor	**fx1**	---	0,99	0,98

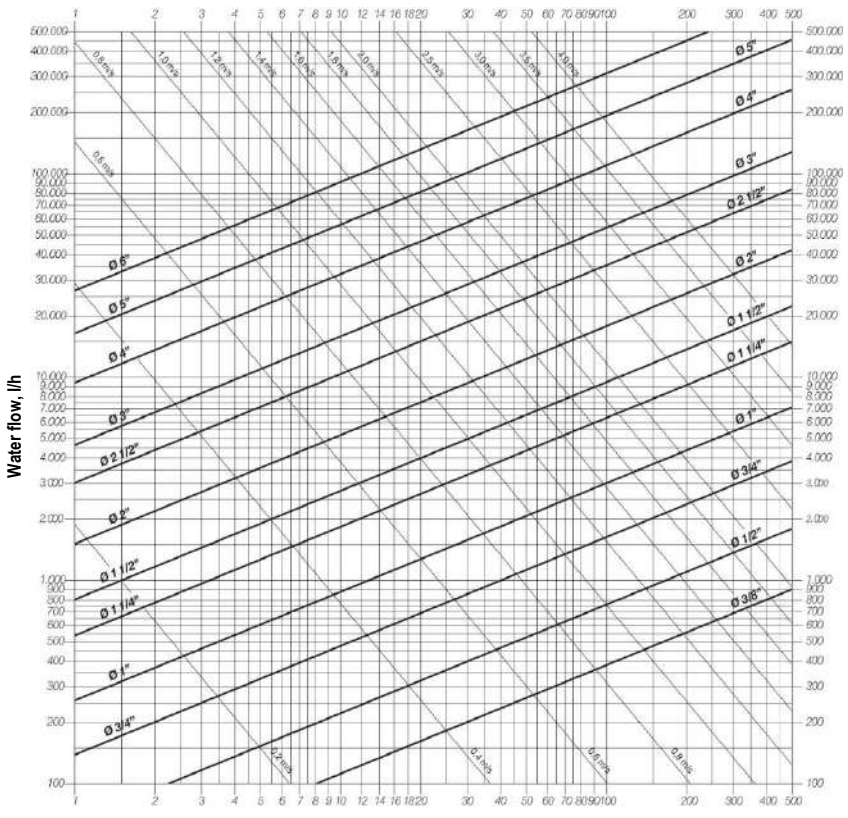
PRESSURE DROPS ON STAINLESS STEEL PIPES (INCH.) - WATER T.= 10°C



EXAMPLE OF SELECTION:

- consider a water speed limit inside the pipeline of 1-1,2m/s
- cross the water flow value requested (in the example 5.000l/h)
- extract the pressure drop value of pipe diameter selected (in example 35mm w.c./m)

PRESSURE DROPS ON STAINLESS STEEL PIPES (INCH.) - WATER T.= 50°C



9 REFRIGERANT CONNECTIONS (I-AX)

MANDATORY
All work must be performed, components selected and materials used in complete accordance with the legislation in force in material in the country concerned, and considering the operating conditions and intended uses of the system, by qualified personnel.
The diameter of connecting pipes between the conditioner and condensing unit must be respected, otherwise the guarantee becomes invalid. Always use large radius curve (bending radius at least equal to pipe diameter)

9.1 RECOMMENDED REFRIGERANT LINES

Diameter of the recommended refrigerant lines for connection to MEHITS S.p.A. air conditioners and referred to "EQUIVALENT LENGHT".
Please always refer to the "INSTALLATION DIAGRAM" to properly select all necessary components
Verify the need to use pressure limiting devices (safety valves) where not already provided for by Directive 2014/68 / EU.
Nominal diameter: Refrigerant connection of the indoor unit. In some cases, the diameter of the refrigerant lines may not correspond with the nominal diameter. This is completely normal. It is enough to provide a reduction fitting to adjust the diameter.

"SI" INTERNATIONAL SYSTEM PIPES DIAMETERS

SI system	Diameter	mm	6	8	10	12	16	18	22	28	35
	Thickness	mm	1	1	1	1	1	1	1	1,5	1,5

Model	Line	Nominal diameter Ø [mm]	EQUIVALENT LENGHT [m] FOR INVERTER COMPRESSOR R410A																			
			5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
12	Gas	**12**	12	12	12	12	12	12	16	16	16	16	16	16	16	16	16	16	16	16	16	16
	Liquid	**12**	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
18	Gas	**16**	16	16	16	16	16	16	18	18	18	18	18	18	18	18	18	18	18	18	18	18
	Liquid	**12**	12	12	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16

For equivalent lengths over 100m please contact the Manufacturer's Sales Office.

"IMPERIAL" SYSTEM PIPES DIAMETERS

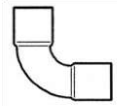
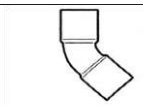
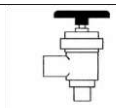
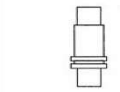
IMPERIAL system	Diameter	inch	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/8"	1 3/8"
		mm	6,35	9,52	12,7	15,87	19,05	22,22	25,4	28,57	34,92
	Thickness	mm	1	1	1	1	1	1	1	1,25	1,25

Model	Line	Nominal diameter Ø [mm]	EQUIVALENT LENGHT [ft] FOR INVERTER COMPRESSOR R410A																			
			15	35	50	65	80	100	115	130	150	165	180	195	215	230	245	260	280	295	310	330
12	Gas	**12**	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"
	Liquid	**12**	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
18	Gas	**16**	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"
	Liquid	**12**	1/2"	1/2"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"

For equivalent lengths over 330ft please contact the Manufacturer's Sales Office

NOTE: Check and make sure that the internal heat load to be dissipated is never less than 30-35% of the capacity of air conditioning installed. Special care must be paid to the insulation of the hot gas pipes under the raised floor.

9.2 EQUIVALENT LENGHT IN METERS OF: CURVE, SHUT-OFF AND NON -RETURN VALVE

Nominal diameter (mm)	 90°	 45°	 180°	 90°	
12	0,50	0,25	0,75	2,10	1,90
14	0,53	0,26	0,80	2,20	2,00
16	0,55	0,27	0,85	2,40	2,10
18	0,60	0,30	0,95	2,70	2,40
22	0,70	0,35	1,10	3,20	2,80
28	0,80	0,45	1,30	4,00	3,30
35	1,10	0,55	1,75	5,00	4,50

9.3 OIL SEPARATOR

The circuit with INVERTER-DRIVEN compressor is already fitted with an oil separator, while I-AX units implement a LONG PIPE DISTANCE function that allows correct lubrication of the inverter-driven compressor even at low speeds (<50 Hz) using brief cycles at higher frequency (70 Hz).

9.4 VOLUME

9.4.1 THEORETICAL GAS CHARGES

Models	Indicative gas content (kg) R410A
i-AX 12	2,2
i-AX 18	3

Model	Indicative gas content (kg) R410A
i-AW 12	2,5
i-AW 18	3,4

INFORMATION
The refrigerant circuits of the water-cooled air-conditioners (I-AW) are already charged with refrigerant, either R410A (check the rating plate on the unit and the compressors to see which type of refrigerant is used).
The air cooled air conditioners (I-AX) are delivered with a minimum R410A refrigerant charge. The refrigerant charge must be carried out on site by the customer.
The remote condensers are delivered with seal charge (nitrogen). Discharge the cooling circuit of the condenser through the Schrader valve located on the coil manifold. The refrigerant charge must be carried out on site by the customer.

9.4.2 REMOTE CONDENSERS THEORETICAL GAS CHARGES

Model Standard	A B 013	A B 015	A B 024	A B 027	A B 034	E B 013	E B 015	E B 024	E B 027	E B 034
Refrigerant charge (kg)	0,5	0,5	0,85	0,85	1,3	0,5	0,5	0,85	0,85	1,3
Model Low Noise	A L 011	A L 018	A L 021	A L 025	A L 036	E L 011	E L 018	E L 021	E L 025	E L 036
Refrigerant charge (kg)	0,5	0,85	0,85	1,3	2,07	0,5	0,85	0,85	1,3	2,07

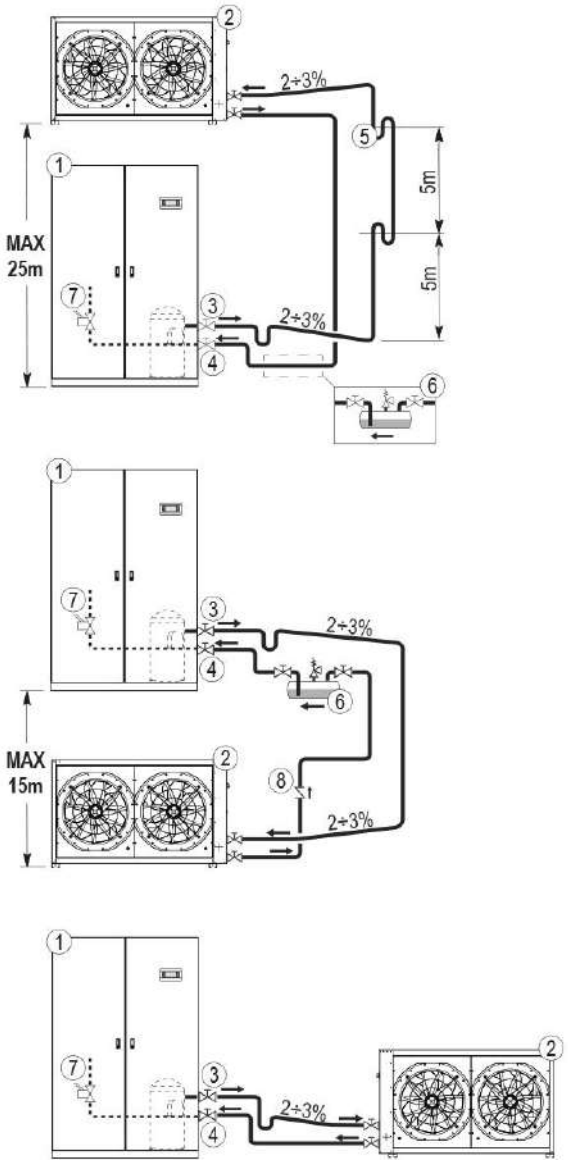
9.4.3 GAS CONTENT FOR LINEAR METER

External pipe diameter	mm	6	8	10	12	14	16	18	22	28	35
Liquid (1)	gr/m	12	26	47	73	105	143	186	291	---	---
Gas (2)	gr/m	---	---	---	7	10	13	18	28	43	71

External pipe diameter	inch	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/8"	1 3/8"
Liquid (1)	gr/m	14	66	83	140	211	297	398	---	---
Gas (2)	gr/m	---	---	8	13	20	28	38	45	70

N.B. Important: when gas is added, lubrication oil must also be added in a ratio of 10% weight of the refrigerant gas added.

9.5 AIR CONDENSER INSTALLATION DIAGRAM



MANDATORY
Carry out piping with slopes indicated to favor the return of the lubricant oil to the compressor

Apply the diagram to any refrigerant circuit of the machine.

Difference in height between the machines in absolute value.

Maximum equivalent length of the connecting pipes: 100m

LEGENDA
1. Air conditioner
2. Remote air-cooled condenser
3. Gas discharge line
4. Liquid return line
5. Trap. Foresee a trap every 5m of the rising pipe
6. Additional liquid receiver, external to the machine – By the Installer.
   It is suggested for:
   a. plants with refrigerant lines with an equivalent length of more than 25 meters
   b. systems with refrigerant lines of any length and operating at outdoor temperatures below 0°C.
7. Solenoid valve for liquid line. Optional accessory of the machine suggested for plants with refrigerant pipe longer than 10m.
8. Check valve – By the Installer. The valve must be installed on the liquid line close the condenser. The valve prevents the return of liquid in the condenser, particularly in the case of plant shutdown during the winter season.

MANDATORY
INSULATE THE LIQUID PIPE IF IT COMES IN CONTACT WITH THE GAS DELIVERY PIPE OR EXPOSED TO HIGH HEAT SOURCES.

9.6 REFRIGERANT CHARGING PROCEDURE

Refrigerant	Model	Type of oil
R410A	12-18	POE FV50S

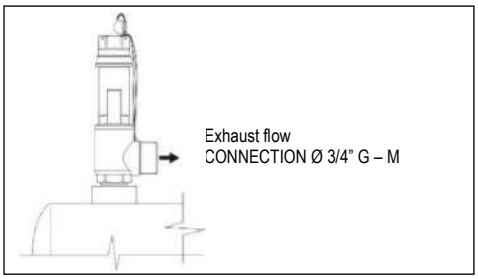
THE REFRIGERANT CHARGING PROCEDURE MUST BE PERFORMED IN COMPLIANCE WITH LOCAL STANDARDS AND MUST BE COMPLETED BY AN EXPERT REFRIGERATION TECHNICIAN. THE INFORMATION SHOWN BELOW IS INTENDED TO ILLUSTRATE "GOOD PRACTICES" TO BE APPLIED ONLY IN THE ABSENCE OF SPECIFIC STANDARDS IN THE COUNTRY WHERE THE UNIT IS INSTALLED.

1. Open any valves or solenoid valves in the unit or in the system to ensure that all the components are involved in the emptying operation;
2. Connect a high efficiency vacuum pump to the Schrader fittings or to the 1/4" SAE fittings on the compressor suction and discharge side;
3. Connect a cylinder of refrigerant to the charge fittings.
4. Empty the system, ensuring an absolute pressure of less than 0.3 mbars for an extended period. This guarantees removal of all the air and any traces of moisture.
5. The circuit should be emptied slowly and maintained for an extended period, rather than performed too quickly. Wait 100 seconds and check that the absolute pressure does not rise above 0.5 mbars. If the circuit is not emptied completely it means there are leaks.
6. In general, if there is the chance of significant moisture content in the circuit or for very large systems, the vacuum must be "broken" with nitrogen dioxide and then repeat the emptying operations as described.
7. Break the vacuum by pre-charging from the cylinder of refrigerant.
8. Inspect all the connections/joints using a leak detector. If a leak is found, empty the system of refrigerant, repair the leak and repeat the procedure.
9. After having started the compressor, complete the charge slowly, until the pressure stabilises in the lines and the gas bubbles disappear from the flow indicator;
10. The charge must be checked at the environmental design conditions and with a discharge pressure of around 28 bar (R410A); for units with on-off condenser control, partially close the intake to stop the condenser fan from repeatedly starting-stopping
11. Tightening torque for the caps of the Schrader valves = 10Nm

Make sure that the subcooling of the liquid at the thermostatic valve inlet is between 3 and 5°C and that the superheat of the vapour at the evaporator outlet is around 5-8°C.
If a circuit already charged with refrigerant needs to be emptied, the first operation required is the removal of the refrigerant from the circuit using a special appliance with dry compressor for recovering the refrigerant. If available, also switch on the sump heaters during the emptying operation.

9.7 SAFETY VALVE VOR DIRECT EXPANSION MACHINE

The safety valve of the refrigerant circuit is installed in the direct expansion machines (I-AX and I-AW versions), when required by Directive 2014/68/EU.
The valve is installed on liquid receiver of each refrigerant circuit of the machine with the purpose of protecting the circuit from overpressure.



DANGER
The intervention of the valve implies the discharge of refrigerant fluid under pressure and, eventually, at high temperature.
It is necessary to provide an exhaust pipe, appropriately sized according to the regulations in force, to convey the refrigerant fluid to the outside.

The safety valves guarantee the repeatability of intervention, this means that after the valve has intervened, the initial calibration conditions are restored (recommended to check with equipment for leaks). However, it is advisable to replace the valves after an intervention because, during the discharge, it is possible to accumulate working residues of the components and of the pipes on the valve gasket. This can cause a valve re-closure faulty.

MANDATORY
Machines in two sections (I-AX version) without safety valve.
It is up to the installer to check whether the system complies with the 2014/68 / EU standard regarding the installation of the safety valve.
By plant we mean the complete system that includes the internal machine, the remote condenser and the connecting pipes.

The installer must calculate the amount of refrigerant contained in the system and, if the refrigerant charge is higher than 10 kg, he must install the safety valve.

MANDATORY
Install the safety valve on the refrigerant circuit connecting the internal machine to the remote condenser.
DO NOT INSTALL THE SAFETY VALVE INSIDE THE MACHINE.

9.7.1 SAFETY VALVE FOR DIRECT EXPANSION MACHINES IN TWO SECTIONS (I-AX) AND RISK OVERPRESSURE IN CASE OF FIRE

MANDATORY
In accordance with the provisions of Directive 2014/68 / EU, the risk of overpressure due to an external heat source (e.g. fire) is evaluated during the design phase. For machines in two sections (indoor unit + remote condenser), where the use of pressure limiting devices has not already been foreseen (indoor unit refrigerant quantity higher than 10 kg), it is the responsibility of the installer to verify and, if necessary, equip the system (indoor unit + remote condenser) with the appropriate safety devices.
Even if the appropriate pressure limitation devices have already been provided by the manufacturer (indoor unit refrigerant quantity higher than 10 kg), it is the installer's duty to ensure that the sizing carried out during the design phase guarantees the same degree of protection of the system (indoor unit + remote condenser). The sizing of the safety valve is a function of the amount of refrigerant present inside the system.

10 CONDENSATE DRAIN

The condensate is removed from the pan located underneath the coil through a hose with drain trap, already fitted in the unit; the end of the hose should be connected to the sewerage system in the building via a rubber or plastic hose with an inside diameter of 20 mm.
If the air-conditioner is fitted with a humidifier, the condensate is drained from the humidifier pan, excluding Over units (see the following paragraph).
During installation, pour water into the condensate collection pan so as to fill the drain trap inside the unit with water.

11 ELECTRICAL CONNECTIONS

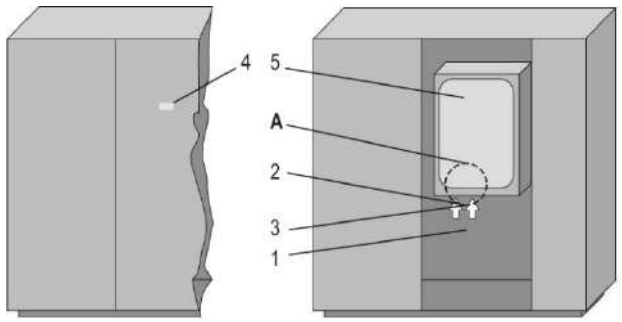
MANDATORY
All work must be performed, components selected and materials used in complete accordance with the legislation in force in material in the country concerned, and considering the operating conditions and intended uses of the system, by qualified personnel.

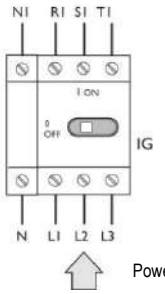
If local and national standards require installation of a residual current circuit breaker upstream, use a type B device with threshold Id=300 mA.
Choose a model that features:
- **High frequency current filtering**
- **Timer to help prevent disconnection due to the load of stray capacitance on start-up.**

Before starting the unit, check the tightness of all the electrical connections and cables on the unit, as these may have come loose during handling and transport.

11.1 ACCESS TO THE ELECTRICAL PANEL AND CABLE INLETS

Before performing any work on the electrical parts, make sure that there is no live voltage and that the disconnecting switch is open (position "O"); The power section of the electrical panel is protected by a plastic screen; to remove the screen, open the main switch and remove the fastening screws.





Detail A: connection of the power cable to the main disconnecting switch IG

1	Shielded RS485 or LAN cable outlet;
2	Mains power supply inlet;
3	Remote control and alarm signal cable inlet.
4	Local user terminal
5	Electrical panel

Power cable (provided by the customer)

11.2 CONNECTION TO THE MAINS – CROSS-SECTION OF THE CABLES – PROTECTION DEVICES

- **Check that the mains voltage** corresponds to the rated values for the unit (voltage, no. of phases, frequency) shown on the electrical panel.
- **The power supply voltage** must be between ± 10% of the rated value: operation at voltages outside of these limits may void the warranty.
- **Fasten the ends of the power cable** to the terminals on the main switch inside the electrical panel; fully tighten the screws. Connect the yellow-green earth wire to the special terminal marked 'PE'.

11.3 ACCESS TO THE BOARD

To access the board, open the front panel and the thermoformed cover on the electrical panel.
The electronic components are sensitive to discharges of static electricity from the human body. Touch an earthed object before handling any electronic component.

11.4 MINIMUM CROSS-SECTION OF THE POWER CABLES

The cross-section of the power cable must be chosen according to the length of the cable and the type of installation, based on the maximum current input of the air-conditioner (FLA) and so as to prevent excessive voltage drops (the power supply voltage must be between ± 10% of the rated value).
A backup fuse should be fitted upstream of the power line for short-circuit current up to 10 kA.

12 ELECTRICAL SPECIFICATIONS

12.1 TOTAL UNIT POWER INPUT - REFRIGERANT R410A

Version		B			R			H			T		
Model	V/ph/Hz	FLI (kW)	FLA (A)	SA (A)	FLI (kW)	FLA (A)	SA (A)	FLI (kW)	FLA (A)	SA (A)	FLI (kW)	FLA (A)	SA (A)
12	230/1/50	5,0	29,1	12	10,4	52,6	12	7,2	38,9	21	10,4	52,6	21
18	400/3N/50	11,1	19,4	20	19,2	31,1	20	14,8	24,9	26	19,2	31,1	26
Version		B			R			H			T		
Model	V/ph/Hz	FLI (kW)	FLA (A)	SA (A)	FLI (kW)	FLA (A)	SA (A)	FLI (kW)	FLA (A)	SA (A)	FLI (kW)	FLA (A)	SA (A)
12	460/3/60	/	/	/	/	/	/	/	/	/	/	/	/
18	460/3/60	11,2	17,4	20	19,3	27,6	20	14,9	22,1	25	19,3	27,6	25
Version		B			R			H			T		
Model	V/ph/Hz	FLI (kW)	FLA (A)	SA (A)	FLI (kW)	FLA (A)	SA (A)	FLI (kW)	FLA (A)	SA (A)	FLI (kW)	FLA (A)	SA (A)
12	380/3/60	/	/	/	/	/	/	/	/	/	/	/	/
18	380/3/60	11,1	19,9	20	19,2	32,2	20	14,6	25,6	26	19,2	32,2	26

B = cooling only; R = cooling only + BASIC heaters (Dehumidification function); H = cooling only + humidifier; T = cooling only + BASIC heaters + humidifier

INFORMATION
The above reported values don't include the external unit (if any).
Since external unit with axial fans is powered by the internal unit, absorption data of external unit must be added to the maximum loads listed above.

12.2 POWER CONSUMPTION OF INDIVIDUAL COMPONENTS (COMPRESSOR)

Version	Unit power supply	Compressor INVERTER						Compressor ON/OFF				
Model	V/ph/Hz	V/ph/Hz	Q.ty	FLI (kW)	FLA (A)	LRA (A)	I@ 30Hz	V/ph/Hz	Q.ty	FLI (kW)	FLA (A)	LRA (A)
12	230/1/50	230/1/50	1	4	25,1	7,6	12,1	/	/	/	/	/
18	400/3N/50	400/3/50	1	10,1	15,4	16	3	/	/	/	/	/
Version	Unit power supply	Compressor INVERTER						Compressor ON/OFF				
Model	V/ph/Hz	V/ph/Hz	Q.ty	FLI (kW)	FLA (A)	LRA (A)	I@ 30Hz	V/ph/Hz	Q.ty	FLI (kW)	FLA (A)	LRA (A)
12	460/3/60	/	/	/	/	/	/	/	/	/	/	/
18	460/3/60	460/3/60	1	10,2	13,4	16	3	/	/	/	/	/
Version	Unit power supply	Compressor INVERTER						Compressor ON/OFF				
Model	V/ph/Hz	V/ph/Hz	Q.ty	FLI (kW)	FLA (A)	LRA (A)	I@ 30Hz	V/ph/Hz	Q.ty	FLI (kW)	FLA (A)	LRA (A)
12	380/3/60	/	/	/	/	/	/	/	/	/	/	/
18	380/3/60	380/3/60	1	10,1	15,93	16	3	/	/	/	/	/

Values for individual component - FLI = Maximum power consumption; FLA = Max current; LRA = Locked rotor current

12.3 POWER CONSUMPTION OF INDIVIDUAL COMPONENTS (FAN)

Version	Unit power supply	Standard fan EC BASIC				Fans EC HP			
Model	V/ph/Hz	V/ph/Hz	Q.tà	FLI (kW)	FLA (A)	V/ph/Hz	Q.tà	FLI (kW)	FLA (A)
12	230/1/50	230/1/50	2	0,48	2	230/1/50	2	0,5	3,15
18	400/3N/50	230/1/50	2	0,48	2	230/1/50	2	0,5	3,15
Version	Unit power supply	Standard fan EC BASIC				Fans EC HP			
Model	V/ph/Hz	V/ph/Hz	Q.tà	FLI (kW)	FLA (A)	V/ph/Hz	Q.tà	FLI (kW)	FLA (A)
12	/	/	/	/	/	/	/	/	/
18	460/3/60	230/1/60	2	0,48	2	230/1/60	2	0,5	3,15
Version	Unit power supply	Standard fan EC BASIC				Fans EC HP			
Model	V/ph/Hz	V/ph/Hz	Q.tà	FLI (kW)	FLA (A)	V/ph/Hz	Q.tà	FLI (kW)	FLA (A)
12	/	/	/	/	/	/	/	/	/
18	380/3/60	230/1/60	2	0,48	2	230/1/60	2	0,5	3,15

Values for individual component - FLI = Maximum power consumption; FLA = Max current

12.4 POWER CONSUMPTION OF INDIVIDUAL COMPONENTS (HEATERS)

Version	Unit power supply	BASIC electric heaters				HIGH POWER electric heaters			
Model	V/ph/Hz	V/ph/Hz	Q.ty	FLI (kW)	FLA (A)	V/ph/Hz	Q.ty	FLI (kW)	FLA (A)
12	230/1/50	230/1/50	2	5,4	23,5	230/1/50	3	8	34,8
18	400/3N/50	400/3/50	3	8,1	11,7	400/3/50	3	12	17,3
Version	Unit power supply	BASIC electric heaters				HIGH POWER electric heaters			
Model	V/ph/Hz	V/ph/Hz	Q.ty	FLI (kW)	FLA (A)	V/ph/Hz	Q.ty	FLI (kW)	FLA (A)
12	/	/	/	/	/	/	/	/	/
18	460/3/60	460/3/60	2	8,1	10,2	460/3/60	3	12	15,1
Version	Unit power supply	BASIC electric heaters				HIGH POWER electric heaters			
Model	V/ph/Hz	V/ph/Hz	Q.ty	FLI (kW)	FLA (A)	V/ph/Hz	Q.ty	FLI (kW)	FLA (A)
12	/	/	/	/	/	/	/	/	/
18	380/3/60	380/3/60	2	8,1	12,3	380/3/60	3	12	18,3

FLI = Maximum power consumption; FLA = Max current

12.5 POWER CONSUMPTION OF INDIVIDUAL COMPONENTS (HUMIDIFIER)

Version	Unit power supply	Humidifier modulating				
Model	V/ph/Hz	V/ph/Hz	Q.tà	FLI (kW)	FLA (A)	kg/h
12	230/1/50	230/1/50	1	2,25	9,8	3
18	400/3N/50	400/3/50	1	3,75	5,5	5
Version	Unit power supply	Humidifier modulating				
Model	V/ph/Hz	V/ph/Hz	Q.tà	FLI (kW)	FLA (A)	kg/h
12	/	/	/	/	/	/
18	460/3/60	460/3/60	1	3,75	4,7	5
Version	Unit power supply	Humidifier modulating				
Model	V/ph/Hz	V/ph/Hz	Q.tà	FLI (kW)	FLA (A)	kg/h
12	/	/	/	/	/	/
18	380/3/60	380/3/60	1	3,55	5,7	4,7

Values for individual component - FLI = Maximum power consumption; FLA = Max current

13 EXTERNAL CONNECTION OF THE OUTDOOR AIR-COOLED CONDENSERS AND OUTDOOR DRY COOLERS

MANDATORY
All work must be performed, components selected and materials used in complete accordance with the legislation in force in material in the country concerned, and considering the operating conditions and intended uses of the system, by qualified personnel.

Remote condensers have as standard:

- Condenser fan speed controller;
- Main switch.

Dry coolers have:

- Fan speed controller;

All outdoor units (remote condensers and dry coolers) have independent power supply and can be powered:

- Directly;
- from the electrical board of the indoor unit.

The instructions on the connection of the power cables are provided by the manufacturer on the wiring diagram on the unit.

14 COMMISSIONING AND TESTING

14.1 COMMISSIONING PROCEDURE

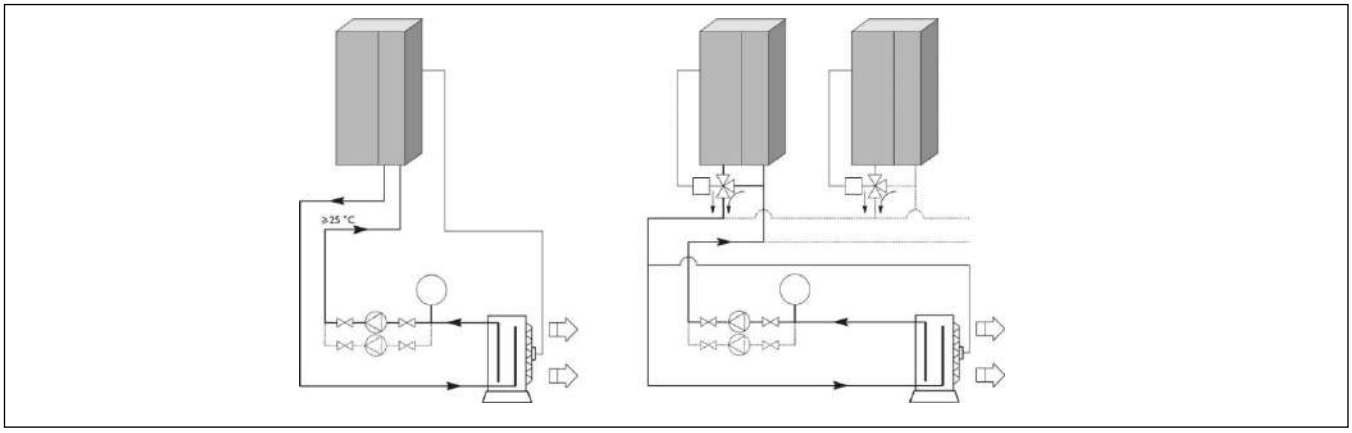
Arm the cut-out in the auxiliary circuits;
Arm all the cut-outs on the electrical panel;
Power up the air-conditioner electrical panel and close the main disconnecting switch on the unit (position 'I');
Check that the control board is powered;
Check that both the LEDs relating to the phase sequence relay (RSF) are on; the yellow LED indicates power; the green LED indicates that the sequence of phases is correct.
If the green LED is off, disconnect power supply from the units, reverse two phases of the power cable and restart the commissioning procedure. (In the units with sump heaters)
After having powered up the air-conditioner, wait at least 8 hours before starting so as to suitably heat the oil in the compressors. During extended shutdown there may be spontaneous migration of refrigerant to the compressor sump, which at the start may cause the oil to foam and consequent damage due to insufficient lubrication.
As a result, do not disconnect power during weekly pauses;
Open the on-off valves in the refrigerant circuits and check that the air-cooled remote condensers are connected (air-cooled models); Check that the external radiators are connected and make sure there is water flow for cooling (water-cooled models);
Check that the sections of corrugated pipe with the function of drain trap (both inside and outside of the air-conditioner) have been filled with water during installation.
AT LEAST 8 HOURS AFTER POWER UP:
Start the air-conditioner using the buttons on the user terminal;
If an alarm is activated refer to the controller instruction manual.

15 OPERATION AND CONTROL

WATER-COOLED UNITS Water in an open circuit (Version MOD.B)
If the temperature of the cooling water is not controlled and may fall below 25°C, a pressure control valve is supplied for each condenser; in this case, the supply pressure must not be less than 200 kPa (2 bar).
IMPORTANT: for systems in which the water is cooled using a cooling tower, make sure suitable filters are used, to prevent the plate condensers from fouling quite quickly.
Remember that the units are supplied without the system circulating pump.

Water in a closed circuit
The condensers on the units are supplied with water pumped in a closed circuit and cooled by external radiators; check that the cross-section of the pipes and that the characteristics of the circulating pump are suitable: an insufficient water flow-rate affects the performance of the air-conditioner. The temperature of the cooling water must be controlled so as to not fall below 25°C, preferably according to the diagram shown in the figure. **Remember that the units are supplied without the system circulating pump.**

MANDATORY
The cooling water must contain a percentage of ethylene glycol (passivated and consequently non-corrosive) according to the minimum expected outside temperature. In the Energy Saving models, the use of glycol is always required.



15.1 ELECTRONIC EXPANSION VALVE

The INVERTER units come with electronic expansion valves as standard.
These valves have a much wider modulation capacity than traditional mechanical thermostatic valves; this feature is essential in applications with operation at part load.
The electronic expansion valve does not require calibration in the field, as all the parameters are set directly in the factory.

16 INSTRUMENTS AND ALARMS

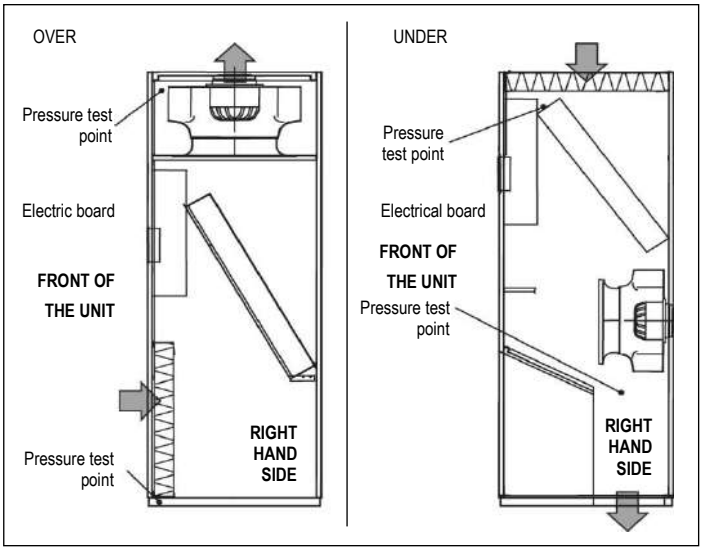
The air-conditioner is fitted with the following instruments:
- **High pressure switch/switches** with manual reset (one on each refrigerant circuit);
- **Low pressure switch/switches** with automatic reset (one on each refrigerant circuit);
- **Air flow sensor** and dirty filter sensor (differential pressure switches);
- **Temperature sensor or room temperature and humidity sensor** (on the units with humidity control);
- **Outlet air limit temperature sensor**
- **Safety valve**

Some versions, in addition, have the following sensors:
- **Safety thermostat** (in the versions with electric heaters), with reset through software.

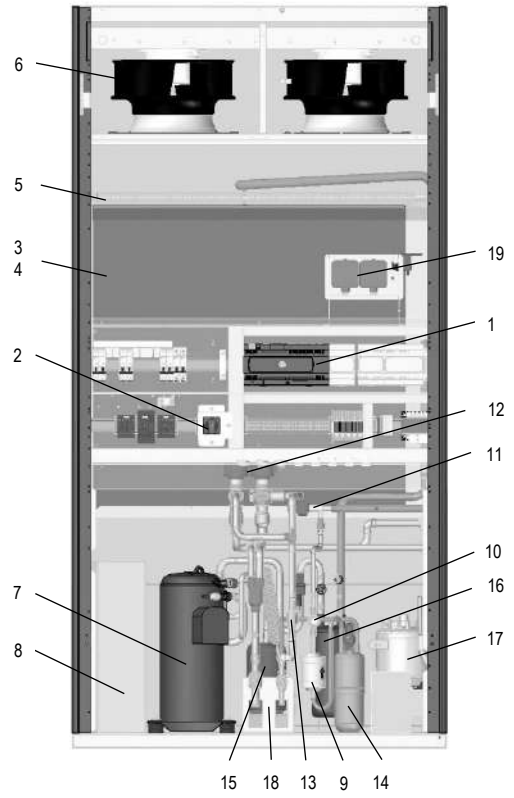
In addition, the following optional devices may be available:
- **Flood sensor** made of:
  a) device to be inserted in the special socket on the electrical panel;
  b) Floor sensor (or sensors, connected in parallel) to be positioned at the points **monitored;**
- **Fire and smoke sensors;**
- **Hot water temperature sensor,** for reading and enabling post-heating with hot water;

The pressure test points for the air flow and dirty filter differential pressure switches are connected in parallel.
On OVER units:
- the positive pressure test point is located on the right-hand side of the base of the unit;
- the negative pressure test point is located in a position for measuring the pressure upstream of the fan;

On UNDER units:
- the positive pressure test point is located behind the electrical panel, upstream of the air filter;
- the negative pressure test point is located in a position for measuring the pressure upstream of the fan.



MAIN COMPONENTS



LEGENDA

1 Microprocessor control
2 Main switch
3 Main cooling coil
4 Hot gas re-heating coil (behind the main cooling coil)
5 Electric heater (optional accessory) (behind the main cooling coil)
6 Plug fan
7 Compressor
8 Inverter for compressor
9 Reftigerant filter
10 Sight glass
11 Electronic expansion valve
12 Modulating valves (for hot-gas reheating control)
13 Check valve
14 Liquid receiver
15 Liquid separator
16 Oil separator
17 Humidifier (optional accessory)
18 Refrigerant connections
19 Air flow sensor
Clogged filter sensor (optional accessory)

17 CALIBRATING THE CONTROL AND SAFETY DEVICES

After starting the air-conditioner, make the following adjustments
- Room temperature (cooling and heating set point).
- Relative humidity (set point for humidification and dehumidification);
- Dirty filter differential pressure switch: see the paragraph on “CALIBRATING THE DIRTY FILTER SENSOR”.

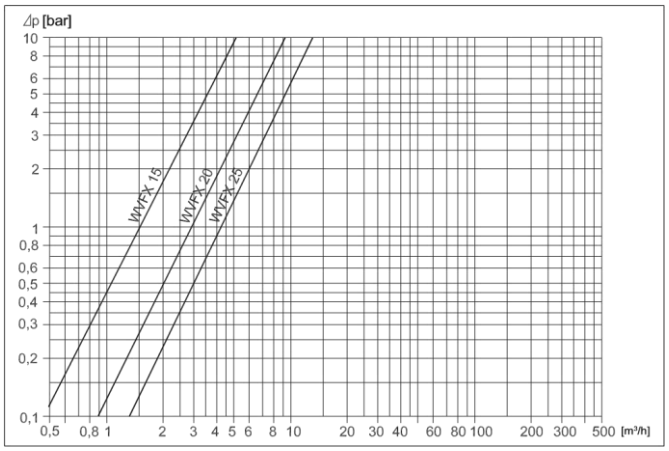
The calibration values of the control and safety devices must not be altered.

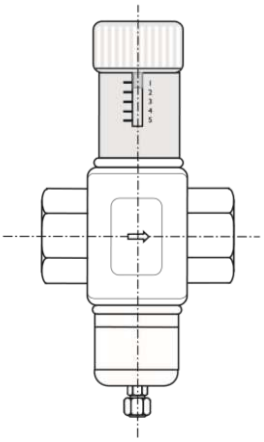
Symbol	Description	Model	Activation	Differential	Reset
F1	High pressure switch	12	37,4 bar (opening)	-	Manual reset
		18			
F2	Low pressure switch	All	3,0 bar (opening)	0,9 bar	3,9 bar (automatic)
F3	Air flow sensor	All	According to following indications	-	Automatic Reset
F4	Clogged filter sensor	All	According to following indications	-	Automatic Reset
TH1	Safety thermostat (versions T and H)	All	55 °C (opening)	-	Manual Reset
VS	Safety valve	12	41,5 bar	-	-
		18	-	-	-

17.1 CALIBRATING THE PRESSURE CONTROL VALVE

(Supplied with water cooled model for well-water application MOD.B)

The pressure control valve, by managing the flow of water, prevents the condensing pressure from lowering excessively and, at the same time, saves water consumption.
If the pressure control valve needs to be calibrated, use the adjustment knob (the pressure increases when turning it clockwise) until the condensing pressure stabilises at the recommended value of 27 bars (equivalent to a temperature of around 45°C with R410A), checked using a pressure gauge connected to the pressure test point on the outlet valve.





VALVE COMBINATIONS		
Version MOD.B model	**12**	**18**
Pressure control valve	1xWVFX 15	1xWVFX 15

17.2 CALIBRATING THE AIR FLOW SENSOR

The differential pressure switch F3 must be activated if the fan is not working (when there is one fan) or one of the fans is not working. As the difference in pressure between the fan intake and outlet depends on the air flow-rate, the instrument may need to be recalibrated after installation, checking that the contact closes when the fan is operating normally.
To calibrate the pressure switch:

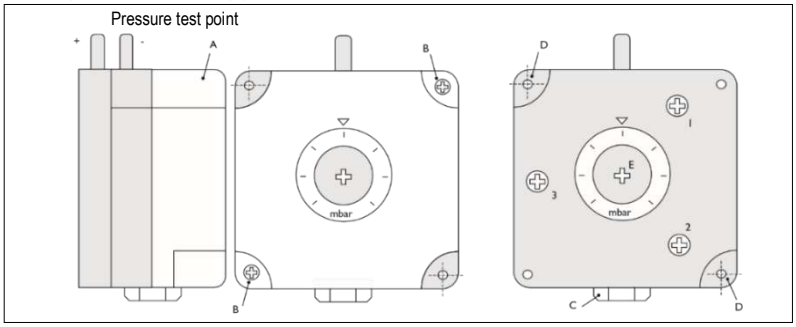
- simulate a fault in the fan system (stop the fan - if there is just one - or one of the fans on the unit) and check that the pressure switch is activated;
- if the device is not activated, progressively increase the calibration value of the pressure switch.

To calibrate the pressure switch, remove the plastic cover (A) by unscrewing the two screws (B).
Use the adjustment screw (E) to calibrate the differential pressure switch on a scale from 0.5 to 4.0 mbar (50 to 400Pa).
If having to replace the pressure switch, unscrew the two fastening screws (D), remove the rubber hoses connected to the pressure test points (+) and (-) and remove the electrical cables connected to terminals 1, 2 and 3.
To install the new pressure switch, perform the same operations in the reverse order, inserting the cables from point (C).

17.3 CALIBRATING THE DIRTY FILTER SENSOR

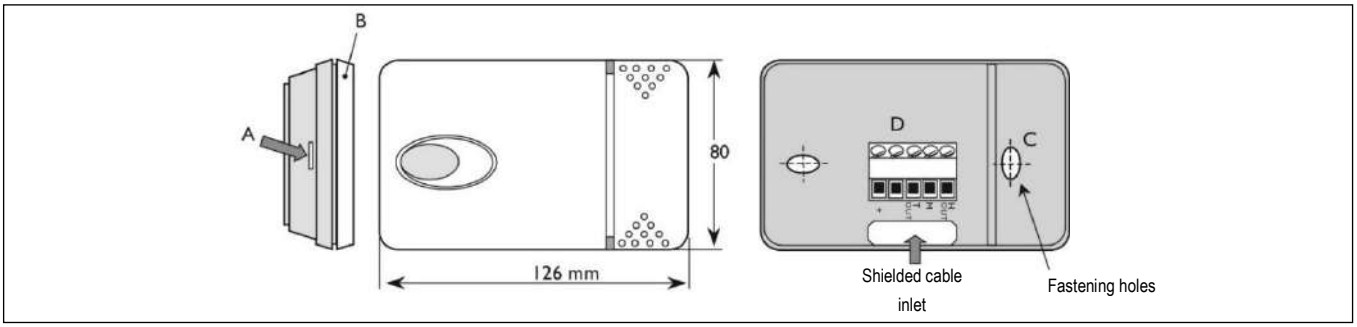
Pressure switch F4 must be calibrated according to the pressure drop, which depends not only on the filter being dirty, but also on the air flow-rate.
The calibration must be performed with a clean filter, as follows:

- switch the unit on
- progressively cover the surface of the air filter and make sure that the pressure switch is activated when around 50-60% covered;
- if the device is not activated, progressively reduce the calibration of the pressure switch;
- if the device is activated too early, increase the calibration.



17.4 TEMPERATURE AND HUMIDITY PROBE (OPTIONAL ACCESSORY)

The figure shows the optional temperature and humidity probe. If having to replace the probe, release the white plastic cover by pressing point (A) with a screwdriver or a pointed object; lift the cover (B) to access the fastening screws (C) and the terminals (D). For the probe electrical connection use a shielded cable; the connections to the terminals on the board are shown on the wiring diagram.



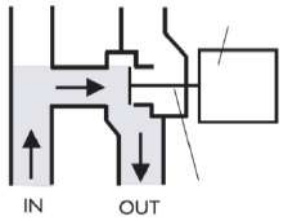
17.5 SERVOMOTOR AND WATER VALVE

WARNING
Disconnect power before working on the servomotor

On the controllers units the position of the servomotor is proportional to the control voltage, between 0 and 10 Vdc.
The servomotor stops:
- automatically at the end of its travel;
- in the position of equilibrium, corresponding to the control voltage;
- in the current position, when cutting off power.

OPERATION OF THE MVX52 - 0÷10V SERVOMOTORS
The opening of the valve can be controlled by checking the position using the indicator located on the top of the servomotor

EMERGENCY MANUAL OPERATION
The valve can be operated manually, in the event of faults to the servomotor or the control system, using the manual control knob (not supplied)

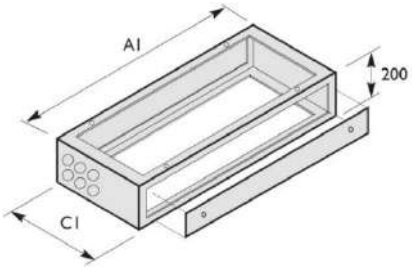


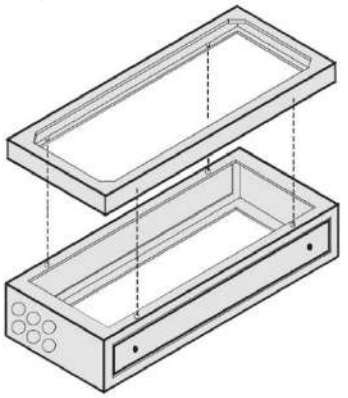

18 OPTIONAL

18.1 OPTIONAL BASE MOULDING (OVER UNITS)

The "OVER" units are designed for the connections to pass through the base of the unit; nonetheless, if there is no raised floor (units with intake from the rear or front**), to simplify the connection of the pipes and cables, a base moulding must be used.**
The base moulding, available as an accessory, is epoxy-polyester powder painted, in the same colour as the external panels on the air-conditioner, measures 200 mm in height and is fitted with an inspection panel. On the right- and left-hand sides of the base moulding are six pre-cut sections for passing the cables and pipes;
The moulding must be fastened to the air-conditioner using the M6 threaded inserts already arranged on the base.

Models	12	18
A1 (mm)	1000	1000
A2 (mm)	485	485

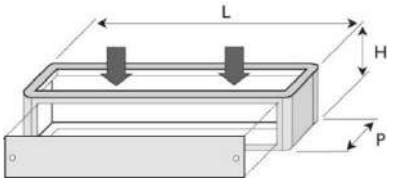




18.2 INTAKE PLENUM (UNDER UNITS)

For ducting the air intake, plenums are available to be fitted between the top of the unit and the air return duct or the false-ceiling.

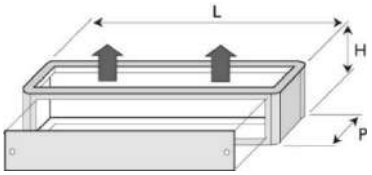
Model	12	18
L (mm)	1000	1000
P (mm)	500	500
H (mm)	350	350



18.3 AIR DELIVERY PLENUM (OVER UNIT)

For ducting the air delivery, plenums are available to be fitted between the top of the unit and the air return duct or the false-ceiling.

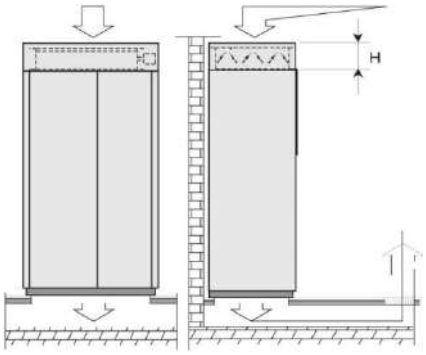
Model	12	18
L (mm)	1000	1000
P (mm)	500	500
H (mm)	350	350



18.4 MOTOR-DRIVEN DAMPER OVER/UNDER (UNIT OVER/UNDER)

The motor-driven damper, available as an optional accessory, is located inside a plenum measuring 150 mm high.
The OVER and UNDER units, models 12-18, are delivered with the damper already fitted, at the top of the unit, as shown in the figure.

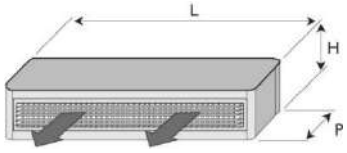
Model	12	18
H (mm)	150	150



18.5 FRONTAL AIR DELIVERY PLENUM (OVER UNITS)

The figure shows the frontal air delivery plenum (optional for OVER units).

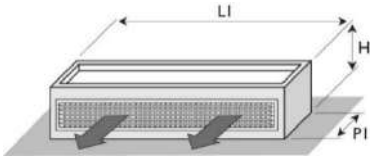
Model	12	18
L (mm)	1000	1000
P (mm)	500	500
H (mm)	350	350



18.6 ZOCCOLO DI MANDATA FRONTALE (UNDER UNITS)

The figure shows the moulding for the front air outlet (optional for UNDER units).

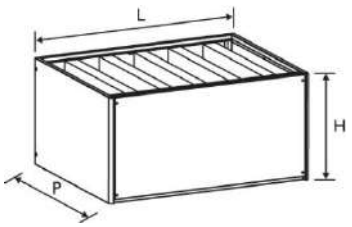
Model	12	18
L (mm)	1000	1000
P (mm)	500	500
H (mm)	350	350



18.7 SOUNDPROOF AIR INTAKE OR AIR DELIVERY PLENUM

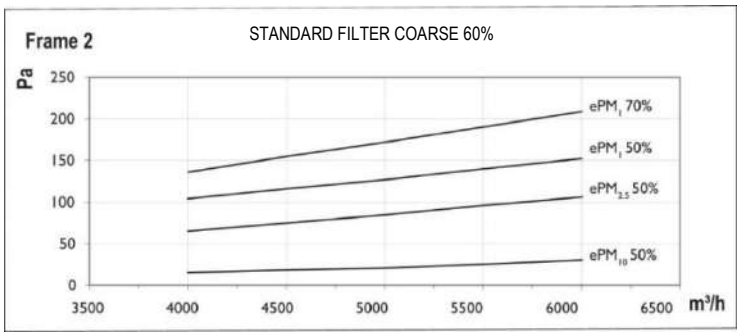
The figure shows the soundproof plenum to be installed on the top of the unit.

Model	12	18
L (mm)	1000	1000
P (mm)	500	500
H (mm)	350	350



18.8 OPTIONAL AIR FILTERS

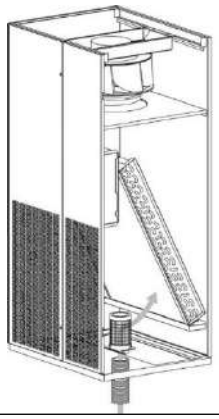
The standard filter COARSE 60% efficiency (according to ISO EN 16890) and optional (ePM10 50% / ePM2.5 50% / ePM1 50% / ePM1 70% efficiency, according to ISO EN 16890) are installed inside the conditioning unit before the finned coil. Additional pressure drop:



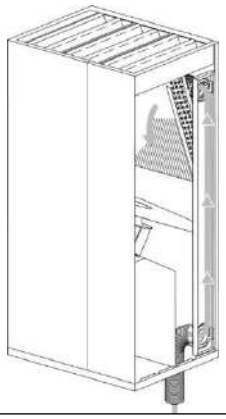
18.9 FRESH AIR KIT

The fresh air kit is supplied with COARSE 50% (according to ISO EN 16890) filter installed in suction side of fan, allowing to mix the fresh air with recirculating air. Connect a flexible pipe diameter 100mm (not supplied) as shown in the image below. The fresh air volume is around 5% of nominal air flow of unit.

OVER



UNDER



18.10 ELECTRIC HEATERS

The overall power of the electric heaters is divided into a number of elements.
The colour of the wires on each element has the following meaning:

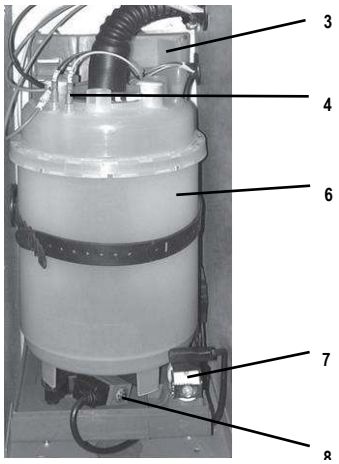
- BLACK wire = low power element;
- WHITE wire = high power element;
- RED wire = common.

The wires for each element are connected to two contactors on the electrical panel so as to balance the load between the phases and create three stages of power (see the wiring diagrams on the unit).
If having to replace the electric heaters, disconnect power to the air-conditioner and wait until the heating elements have cooled down. After having replaced the heaters, make sure the earth is connected.

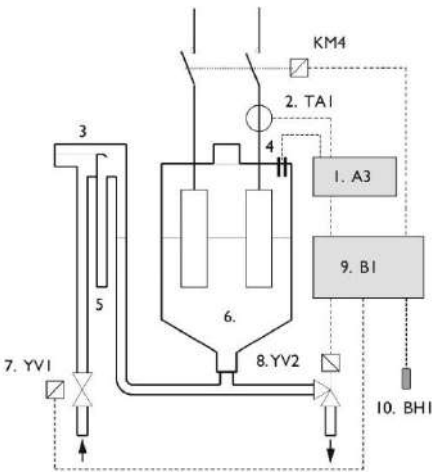
18.11 HUMIDIFIER

18.11.1 SYSTEM COMPONENTS

Upon request, the air-conditioning unit can be fitted with an immersed electrode humidifier (versions D and H).



1 Humidifier interface board: A3; (inside the electrical panel).
2 Current transformer TA1 (inside the electrical panel) for measuring the current input of the steam cylinder.
3 Water fill tank.
4 High water level electrodes in the steam cylinder.
5 Overflow pipe (BEHIND THE CYLINDER).
6 Boiler cylinder (or steam cylinder).
7 Water fill solenoid valve: YV1.
8 Cylinder drain solenoid valve:YV2.
9 Microprocessor control board:A1.
10 Temperature and humidity probe: BH1.



18.11.2 HUMIDIFIER OPERATING PRINCIPLE

In the immersed electrode humidifier, the current that runs between the electrodes, through the water contained in the boiler cylinder, generates the heat required to boil the water. By controlling the level of the water and the concentration of salts inside the steam cylinder (6) using the fill (7) and drain (8) solenoid valves, the amount of current delivered can be regulated, and measured using a current transformer (2). When steam production is required, the humidifier contactor CU closes (see the wiring diagram) so as to supply power to the immersed electrodes. When the current falls below the set value due to the lowering of the water level, the fill valve (7) is opened. The drain valve (8) is activated cyclically, depending on the characteristics of the supply water, so as to maintain the optimum salt concentration inside the cylinder (6). The only periodical maintenance operations required are the inspection and cleaning of the parts in the steam production unit. The operations indicated below should be performed annually, preferably before shutting down the unit in summer.

18.11.3 STEAM CYLINDER

The steam cylinder requires periodical cleaning to remove the scale deposits that form on the surface of the electrodes and the flakes that deposit on the filter at the base of the cylinder.
To remove the cylinder, proceed as follows:

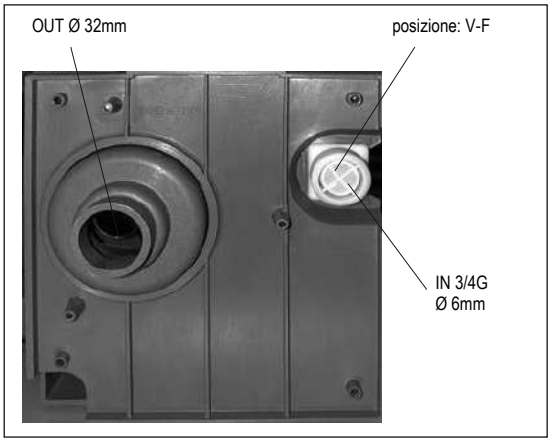
- completely drain the water from the boiler; to do this, see the paragraph “MANUAL CONTROL” in the controller instruction manual;
- disconnect the power supply by opening the main switch on the electrical panel;
- remove, from the top of the cylinder, the hose that carries the steam to the distributor;
- disconnect the power connections by unscrewing the knobs on the cable ends and remove the plugs from the level electrodes;
- release the strap that secures the cylinder to the unit;
- slide the cylinder out upwards.

The steam cylinder can be reused a number of times after cleaning the electrodes: if, however, the wear on the grills of electrodes is such that these cannot be regenerated, they must be replaced.
The only spare part is the complete cylinder body (with filter included).

18.11.4 FILL AND DRAIN ASSEMBLIES

To ensure the correct operation of the humidifier, the supply/fill and drain assemblies need to be inspected periodically.
Proceed as follows:

- completely drain the water from the boiler using the MANUAL CONTROLS on the controller A1;
- disconnect the power supply by opening the main switch on the electrical panel;
- remove the fill pipe from the 3/4 GAS fitting on the fill solenoid valve;
- remove and clean the filter located inside the solenoid valve fitting;
- dismantle the drain assembly, clean the pipes and remove any flakes of scale from the cup-drain trap.



18.11.5 HUMIDIFIER POWER SUPPLY

Underneath the fill solenoid valve on the steam production unit is the threaded male fitting (V) for the humidifier water supply. This must be fitted with a 6 mm diameter plastic hose, not supplied, for connection to the building’s domestic water supply (see the figure, point F).
V: Steam production unit - inlet connection (threaded male fitting 3/4”G);
F: Rubber hose, diameter: Ø 6mm.
To supply the humidifier, use drinking water without any chemical treatment or demineralisation.
The characteristics of the water that supplies the humidifier must be within the following values:

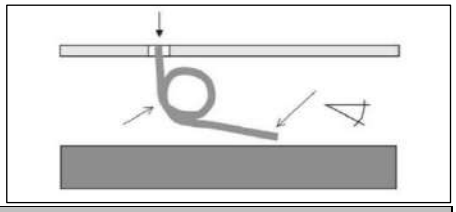
LIMIT VALUES FOR IMMERSED ELECTRODE HUMIDIFIER FEED WATER				Normal water		Water with low salt content	
				Min	Max	Min	Max
Mains pressure			bar	1	8	1	8
Hydrogen ions	pH	-		7	8,5	7	8,5
Specific conductivity at 20°C	$\sigma_{R,\ 20\ °C}$	-	µS/cm	350	1250	75	350
Total dissolved solids	TDS	-	mg/l	(1)	(1)	(1)	(1)
Dry residue at 180°C	R_{180}	-	mg/l	(1)	(1)	(1)	(1)
Total hardness	TH	-	mg/l $CaCO_3$	100(2)	400	50	160
Temporary hardness		-	mg/l $CaCO_3$	60(3)	300	30	100
Iron + Manganese		-	mg/l Fe+ Mn	0	0,2	0	0,2
Chlorides		-	ppm Cl	0	30	0	20
Silica		-	mg/l SiO_2	0	20	0	20
Residual chlorine		-	mg/l Cl^-	0	0,2	0	0,2
Calcium sulphate		-	mg/l $CaSO_4$	0	100	0	60
Metallic impurities		-	mg/l	0	0	0	0
Solvents, diluents, soaps, lubricants		-	mg/l	0	0	0	0

(1) Values depending on specific conductivity; in general: TDS ≅ 0,93 * σ20; R180 ≅ 0,65 * σ20
(2) not lower than 200% of the chloride content in mg/l of Cl-
(3) not lower than 300% of the chloride content in mg/l of Cl-

CILINDER CONDUCTIVITY		LOW CONDUCTIVITY CYLINDER		MEDIUM CONDUCTIVITY CYLINDER		HIGH CONDUCTIVITY CYLINDER	
Operating status		min	max	min	max	min	max
Specific conductivity at 20°C (σR, 20°C)	µS/cm	75	350	350	750	750	1250

18.11.6 HUMIDIFIER AND CONDENSATE DRAIN

Underneath the drain solenoid valve on the steam production unit is an attachment for draining the water.
This is already fitted with a hose coupling for connecting the hose running to the sewerage system in the building.
A rubber or plastic hose should be used, resistant to 100°C, with an inside diameter of 32 mm.
Fit a trap in the section of the hose outside of the unit to avoid bad odours and to prevent water from overflowing from the humidifier pan. During installation, pour water into the condensate collection pan and the humidifier pan, so as to fill the drain traps outside and inside the unit with water. Downstream of the drain trap ensure a minimum slope of 1%.



DANGER
The water exiting the steam cylinder is very hot. The humidifier drain hose must not be fastened to electrical cables and must run down vertically so as to avoid any contact with these cables

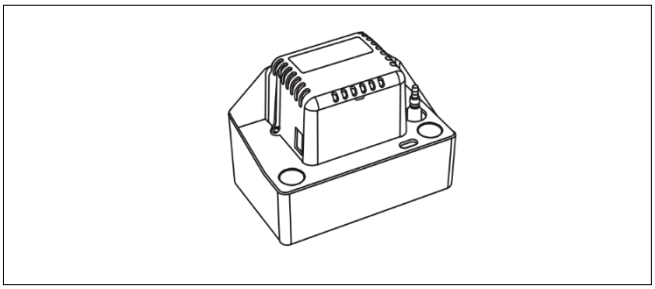
18.12 CONDENSATE DRAIN PUMP AND HUMIDIFIER DRAIN PUMP

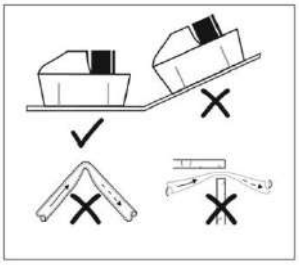
Depending on the version, a condensate drain pump is available (for versions B and R) or a humidifier drain pump (for versions H and T) with mechanical features such as to be able to resist the high temperatures of the water exiting the steam cylinder.
The pump must be located below the drain fitting, according to the instructions contained in the packaging.
Where possible, the pump can be located inside the unit, otherwise the pump must be installed outside of the unit. Check that the head is sufficient to lift the condensate to the point of drainage.
The pump is supplied with the unit but not installed.
The installer is responsible for connecting and positioning the pump.

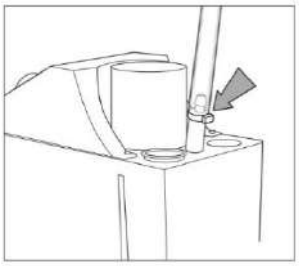
18.12.1 CONDENSATE DRAIN PUMP LOW WATER TEMPERATURE

The pumps with tank are designed to collect the condensate produced by the air-conditioning unit. These start automatically when the float rises and have a discharge head of 4 metres.
The pump is fitted with two switches, activated by a float system. One is used to start the centrifugal pump, and the other is used as a high level safety switch.
The top part of the pump is made from transparent plastic, for quick and easy inspection of the internal components, and is supplied with a 2 metre long cable with push-in quick coupling to simplify installation and maintenance. In any case, the pump with tank must be installed below the source of condensate.

TECHNICAL SPECIFICATION	
Tank capacity	2 litres
Recommended maximum head	4.6 m
Maximum water flow-rate With zero head	288 l/h
Rate power	0.6A, 230V AC
Noise level	≤ 60 dB with maximum head
Shutdown protection on overheating	with auto-reset thermal relay
Maximum drain water temperature	50°C
Non-return valve	As standard
Power cable and alarm cable supplied	(2 m long)
Frame with drilled rear plate for wall mounting	
Two inlet openings to connect multiple units (25 mm)	
Transparent cover for quick inspection	
Made from fire resistant plastic	
Safety switch	4A max
Dimensions	
Height	170 mm
Width	235 mm
Depth	140 mm
Weight	1,75 kg
Electrical connections	
Brown	Line
Blue	Neutral
Green/yellow	Earth
Black	N/C
Black	Common



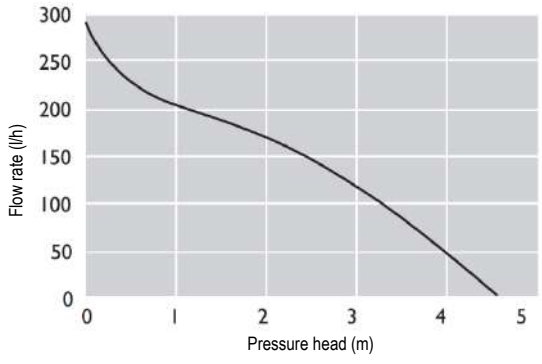




Installation notes:
This pump is designed to be installed only horizontally, resting the base on a perfectly flat, horizontal surface or fastening it horizontally to the wall through the holes provided on the frame.
The pump requires a drain hose with an inside diameter of 9 mm.
Make sure the hoses are not choked or twisted along the path between the pump and the point of drainage.
Securely fasten the hoses with a clamp to the pump outlet fitting, to prevent them from coming loose and consequently causing water to be released at high pressure.

INFORMATION
The safety switch should always be used
The drain pump should be powered separately from the unit that produces the condensate, so as to allow the pump to continue draining the water even if the unit itself shuts down.

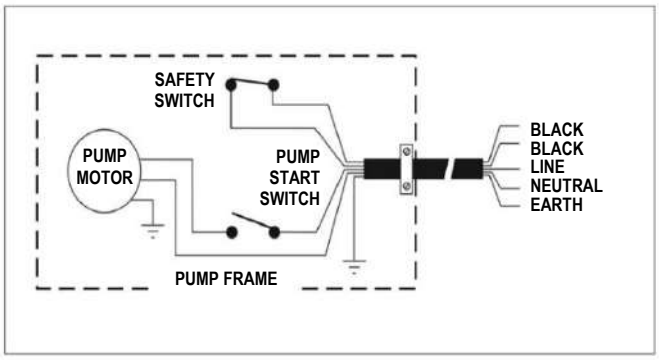
CONDENSATE PUMP PERFORMANCE



Maintenance guide
At least once every 6 months, pour a bactericidal solution into the tank, to prevent accumulation of residues and sludge at the bottom.
These substances may cause the float to malfunction or block the non-return valve that the drained water flows through.

MANDATORY
Users must check that any chemicals contained in the condensate are compatible with operation of the pump.
- **Do not use the pump to drain water at temperatures exceeding 50 °C.**
- **Do not use with demineralised water (this has been proven to damage the mechanical parts of the pump).**

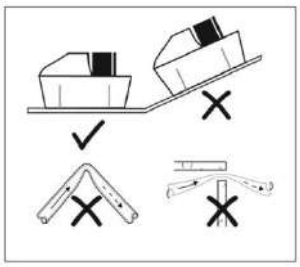
Test pump operation by filling it with water until the motor starts, to check for any leaks and verify correct drainage of the water.

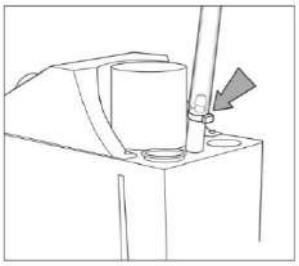


18.12.2 CONDENSATE DRAIN PUMP FOR HIGH WATER TEMPERATURE (FOR HUMIDIFIER)

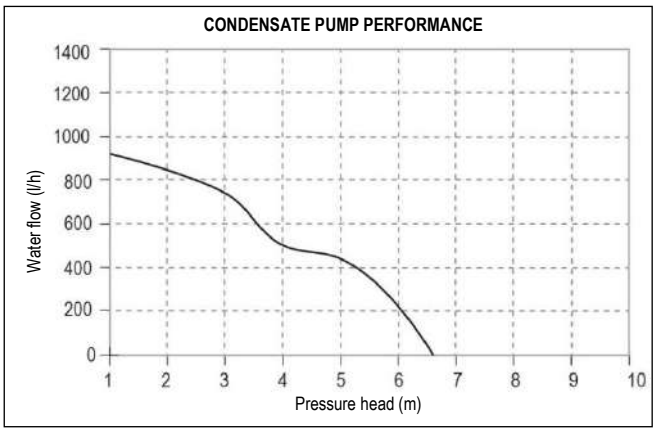
These pumps are designed to collect the hot water produced by the humidifier drain cycles, as well as the condensate produced.
The pump body is made from Cycoloy, a heat-resistant material, the pre-wired safety float is a low voltage switch used to stop the drain cycle in the unlikely event where the pump malfunctions.
The pump is started by internal float switches.

TECHNICAL SPECIFICATIONS	
Tank capacity	4 litres
Recommended maximum head	6 m
Maximum water flow-rate: With zero head	900 l/h
Rated power	0.6A, 230V AC
Power cable	(2 m long)
Safety switch	4A max
Power supply voltage	220/240 AC
Current draw	0,7A
Power consumption	175W
Dimensions	
Height	205 mm
Width	300 mm
Depth	150 mm
Weight	3,6 kg
Electrical connections	
Brown	Line
Blue	Neutral
Green/Yellow	Earth
2xBlack	Safety switch





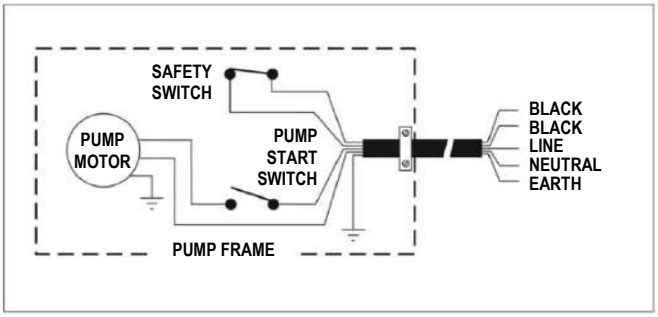
Installation notes:
This pump is designed to be installed only horizontally, resting the base on a perfectly flat, horizontal surface or fastening it horizontally to the wall through the holes provided on the frame.
The pump requires a drain hose with an inside diameter of 9 mm.
Make sure the hoses are not choked or twisted along the path between the pump and the point of drainage. Securely fasten the hoses with a clamp to the pump outlet fitting, to prevent them from coming loose and consequently causing water to be released at high pressure.



Maintenance guide
At least once every 6 months, pour a bactericidal solution into the tank, to prevent accumulation of residues and sludge at the bottom that may cause the pump to malfunction.

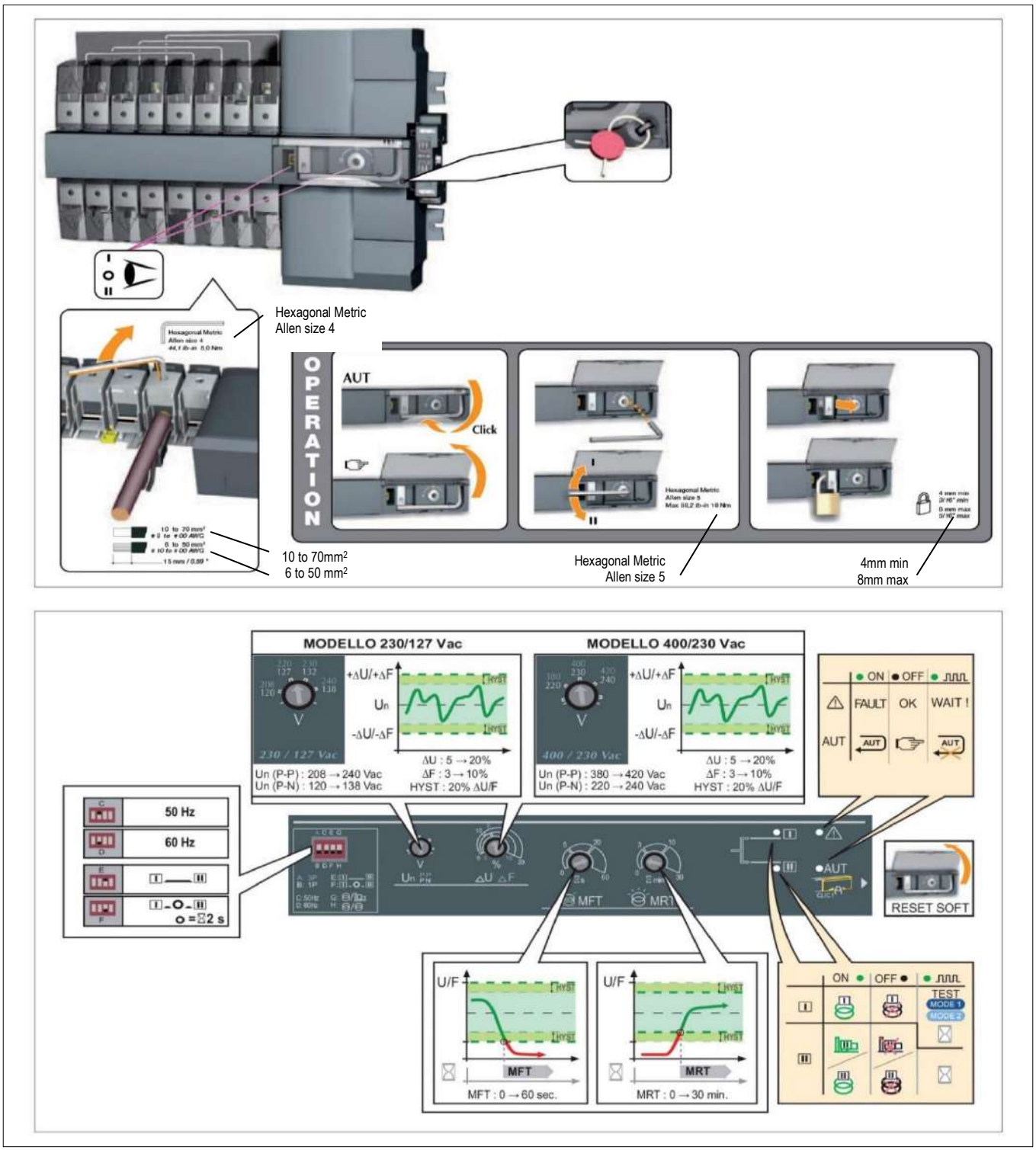
INFORMATION
The pre-wired safety switch must always be used.

MANDATORY
Users must check that any chemicals contained in the condensate are compatible with operation of the pump.
Test pump operation by filling it with water until the motor starts, to check for any leaks and verify correct drainage of the water.



18.13 DOUBLE POWER SUPPLY WITH AUTOMATIC SWITCHING

The motorised changeover switches automatically manage changeover under load between two single-phase or three-phase power supplies, or manually for emergency operations.
These transfer switching (TSE) devices are suitable for low voltage systems with interruption of the supply to the load during transfer. The model supplied in the automatic version checks the source and switches over automatically, based on the configurable para-meters indicated below:

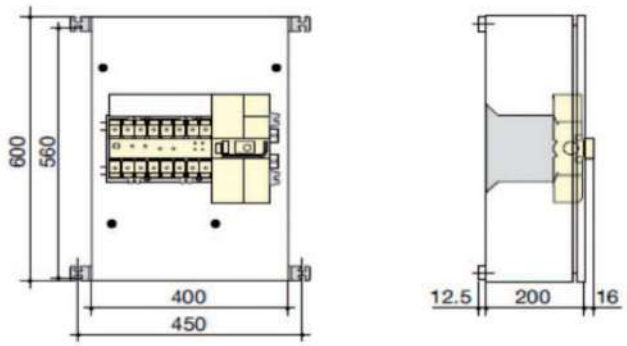


18.13.1 ATS INSTALLATION

POWER SUPPLY 230/1/50, 400/3N/50		
Model	Power supply (V/Ph/Hz)	ATS installation
12	230/1/50	EXTERNAL
18	400/3N/50	EXTERNAL

POWER SUPPLY 380/3/60, 460/3/60		
Model	Power supply (V/Ph/Hz)	ATS Installation
18	380/3/60 460/3/60	EXTERNAL

For EXTERNAL installation, ATS is supplied in special box with IP 3X ingress protection, with the dimensions shown in the figure below



19 MAINTEINANCE

Every components replacement (compressor, safety pressostat, liquid receiver, etc.) have to consider the main component list enclosed in the unit.
This section, aimed above all for the end user, is extremely important for the correct operation of the appliance.
Just a few operations completed scrupulously and regularly will avoid serious damage to the components.

DANGER
Only authorized and specialist personnel can operate into the units.

The maintenance operations can be summarised as follows:
- Clean the air filter.
- Check and clean the condenser coils
- Check the water-cooled condensers for fouling.
- Check and clean the drains.
- Check the humidification system.
- General examination of the overall operation of the appliance.
- Visual check of the condition of the pressurised containers.

Cleaning the air filter
The gradual fouling of the filters reduces the flow-rate of the conditioned air, with a consequent reduction in cooling capacity.
In the direct expansion units, a reduction in the air flow-rate may cause the activation of the low pressure switch and/or cause serious damage to the compressor.
This can be avoided by the periodical cleaning of the filters.
The frequency at which the filters must be checked exclusively depends on the amount of dust in the environment.
In any case, the following are recommended:
- Every week check that the filters are clean
- Every two weeks clean the filters with a vacuum cleaner
- Every month wash the filters with soapy water
- Every 6 months replace the filters.

It is clear that the recommended times are purely indicative, and in some cases it may be necessary to increase the frequency of the checks and maintenance operations.
These operations must be carried out with the unit off and after having made sure that the appliance is disconnected from the power supply.

Checking and cleaning the condenser coils
In the hotter period, when the unit operates at maximum capacity, the condensing coils must be able to offer the maximum heat exchange. Normally installed outside or communicating with the outside, these may pick up dirt such as paper, dry leaves and dust, thus reducing the heat exchange. Make sure that this situation does not arise. Failure to perform maintenance will cause the activation of the high pressure switch and the unit to shut down. Frequently check the condition of the heat exchanger during the poplar pollination period or the autumn (falling leaves). Remove any objects accumulated on the coil and wash with a jet of water. These operations must be carried out with the unit off and after having made sure that the appliance is disconnected from the power supply.

Checking the water-cooled condensers for fouling
To check the water-cooled condensers for fouling, simply check the water inlet and outlet temperature and compare it against the condensing temperature.
Normally, for good heat exchange, the difference between the water outlet temperature and the condensing temperature must be 5.8°C. Increases in these values, over time, indicate a reduction in efficiency and consequently the fouling of the condenser.
The condenser is cleaned by chemical washing and must be performed by specialist personnel. This operation must be carried out with the unit off and after having made sure that the appliance is disconnected from the power supply).

Checking and cleaning the drains
All the water drains (humidifier and condensate) must ensure perfect drainage, to avoid flooding in the room.
When the humidifiers drain the water, they discharge a quantity of lime scale that depends on the hardness of the supply water.
This lime scale may accumulate in the bottom of the drain hose and block the flow of water. If cleaning is required, add ordinary descaler to the section of circuit involved. This operation must be carried out with the unit off and after having made sure that the appliance is disconnected from the power supply.

General examination of operation
This is a general examination aimed at comparing the operation of the appliance with the last check performed. Consequently, any differences in the operating characteristics over time can be highlighted. A detailed and periodical visual check of the appliance and general cleaning are always important to ensure correct operation. The above-mentioned operations can in general be performed once a month. Naturally, in special situations and specific installations the frequency may change. A well maintained system is unlikely to cause disruptions and stoppages to the production cycles. After 10 years working a complete checking is recommended.

Visual check of the condition of the pressurised containers
Check the condition of the pressurised containers at least once a year (if these are fitted). It is very important to check that rust does not form on the surface, that there is no corrosion and that there are no visible deformations. If not controlled and stopped, surface oxidation and corrosion will over time cause a decrease in the thickness of the container and a consequent reduction in its mechanical strength. Protect with paint and/or corrosion proofing products. In the event of visible deformations, stop the unit and contact the nearest service centre.

20 DISPOSAL OF THE MACHINE

In the event of disposal of the machine, contact a Service Centre authorized by the Manufacturer beforehand.

MANDATORY

The machine contains fluorinated greenhouse gases governed by the Kyoto protocol. The law prohibits the dispersion in the environment and obliges the recovery and delivery to the dealer or collection centre.

When components are removed to be replaced or when the entire machine reaches the end of its life and it is necessary to remove it from the installation, to minimize the environmental impact, comply with the following disposal regulations:

- **the refrigerant gas must be fully recovered by specialized personnel and equipped with the necessary qualifications and be transferred to the collection centres;**
- **the lubricating oil contained in the compressors and in the refrigerant circuit must be recovered and transferred to the collection centres;**
- **the structure, the electrical and electronic equipment and the components must be subdivided according to their product type and type of material and given to the collection centres;**
- **if the water circuit contains mixtures with antifreezes, the contents must be collected and transferred to the collection centres**
- **comply with the national laws in force**

MANDATORY

THE MACHINE CONTAINS ELECTRIC AND ELECTRONIC EQUIPMENT WHICH MAY IN TURN CONTAIN SUBSTANCES THAT ARE HARMFUL TO THE ENVIRONMENT AND HUMAN HEALTH, AND CANNOT BE DISPOSED OF IN MIXED URBAN WASTE.

The following symbol is affixed to the machine

to indicate disposal of the machine as separate waste.

Buyers play an important role in the reuse, recycling and other forms of recovery of the machine.

The machine is classified as PROFESSIONAL for the purposes of the WEEE Directive 2012/19/EU. When it is disposed of, the User must manage it as waste and may contact the dealer to have it collected, or take it to a collection centre.

21 TROUBLESHOOTING

Troubleshooting is simplified by the information provided by the microprocessor controller: if an alarm is signalled, refer to the control panel instruction manual. If required, contact the nearest service centre, indicating the probable causes of the fault.

FAULT	CAUSE	SOLUTION
THE AIR-CONDITIONER DOESN'T START	The electrical panel is not powered	Check for voltage; close the main switch.
	The auxiliary circuits are not powered	Check that the cutout IM in the auxiliary circuits is armed. Check the fuse on the main board.
	The control panel does not start the air-conditioner.	Check for DC power.
ROOM TEMPERATURE TOO HIGH	The parameter settings on the microprocessor controller are not correct.	See the controller manual.
	The air flow-rate is too low or null.	See "LOW OR NO AIR FLOW".
	The probe isn't working.	Check the electrical connections and the configuration of the controller.
	Thermal load higher than expected.	Check the thermal load in the room being air-conditioned.
	The compressor/compressors don't start, despite being activated by the controller.	See "THE COMPRESSOR/COMPRESSORS DON'T START".
ROOM TEMPERATURE TOO LOW	The parameter settings on the microprocessor controller are not correct.	See the controller manual.
	The power of the heaters is not sufficient or the heaters aren't working.	Check that the heater thermal cutout is armed. Check the power supply to the electric heaters. If the heater safety thermostat is activated, resolve the causes and reset the alarm.
	The hot water coil isn't working correctly.	Check the flow-rate and the temperature of the water hot. Check the operation of the control valve and the servomotor.
	The hot gas post-heating system isn't working during the dehumidification plus post-heating phase	Check the operation of the hot gas three-way valve; Check the operation of the compressor used for post-heating: in this case, see "THE COMPRESSOR/COMPRESSORS DON'T START".

FAULT	CAUSE	SOLUTION
AMBIENT HUMIDITY TOO HIGH	The parameter settings on the microprocessor controller are not correct.	See the controller manual.
	Latent load higher than expected	Check and calculate the latent load; check the flow-rate and the conditions of the outside air; check the inflow of outside air.
	The compressor isn't working during the dehumidification phase.	See "THE COMPRESSOR/COMPRESSORS DON'T START".
	The dehumidification valve doesn't close.	Check the operation of the solenoid valve that controls the dehumidification circuit.
	The control system isn't working.	See the controller manual; check the operation of the panel and/or the probe.
AMBIENT HUMIDITY TOO LOW	The parameter settings on the microprocessor controller are not correct.	Check the room temperature setting (see the control panel manual).
	Latent load lower than expected.	Verificare la consistenza del carico latente.
	The humidifier isn't working.	Check the pressure of the supply water; Check the operation of the manual control system and the steam production unit (see the control panel manual)
	The control system isn't working.	See the control panel manual; check the operation of the panel and/or the probe.
LOW OR NO AIR FLOW	The fans are not powered.	Check the power supply to the fans.
	The filters are blocked (possible activation of the dirty filter alarm).	Clean the filter using a vacuum cleaner after having shaken off the larger particles of dust. Replace the filter if excessively clogged. Check the correct calibration of the dirty filter differential pressure switch F4.
	Obstructions to the air flow.	See the paragraph on AIR DISTRIBUTION
	The fan thermal cutout has tripped.	Check the resistance of the fan windings; after resetting, measure the voltage and power input.
	EC radial fan speed set too low	
	Excessive pressure drop in the air distribution system.	Check the sizing of the air distribution system (ducting, false-ceiling, underfloor plenum, grills)

FAULT	CAUSE	SOLUTION
HEATER SAFETY THERMOSTAT ACTIVATED	Insufficient air flow-rate	See "LOW OR NO AIR FLOW".
	Thermostat connection wire cut or broken	Check the continuity of the connection from the safety thermostat to the control system.
	Faulty thermostat	Replace the heater safety thermostat.
HIGH COMPRESSOR DISCHARGE PRESSURE	A) Air or incondensable gas in the refrigerant circuit, seen by the presence of bubbles, despite measuring a high subcooling.	Empty and recharge the circuit.
	B) Insufficient air flow-rate to the remote heat exchanger or air too hot	Check the operation and the correct direction of rotation of the fans on the outdoor heat exchanger. Check that the exchanger is not dirty and remove any material that may be blocking it (leaves, paper, seeds, dust, etc.) with a jet of compressed air or with a brush; Check the outdoor unit for any obstacles to the flow of air and any recirculation of the cooling air; Check that the temperature of the cooling air does not exceed the design value.
	Insufficient water flow-rate to the condenser or water too hot.	Check the flow-rate, the pressure and the temperature of the cooling water in the closed circuit; Check the calibration and the operation of the pressure control valve.
	Excessive refrigerant charge; condenser partially flooded. Excessive subcooling of the liquid at the condenser outlet.	Remove refrigerant from the circuit.
	Valves on the high pressure side of the circuit partially closed.	Check the opening of the valves.
HIGH PRESSURE SWITCH ACTIVATED (high compressor discharge pressure)	The condensing pressure control system isn't working.	Check the operation of the condenser fans and the corresponding protection device; repair or replace the faulty fans; Check the calibration and the operation of the remote condenser fan pressure switch or the speed controller. (See CONTROLLING THE CONDENSING PRESSURE)
	The system is affected by an excessive discharge pressure	See "HIGH COMPRESSOR DISCHARGE PRESSURE".

FAULT	CAUSE	SOLUTION
LOW COMPRESSOR DISCHARGE PRESSURE	The condensing pressure control system isn't working (see the control panel manual).	Check the calibration and the operation of the condenser fan pressure switch or the speed controller;
	Excessive water flow-rate to the condenser or water too cold.	Check the temperature of the cooling water. Check the calibration and the operation of the pressure control valve (if fitted). Install a pressure control valve to manage the flow-rate of water according to the condensing pressure.
	Suction pressure too low	See "LOW COMPRESSOR SUCTION PRESSURE".
HIGH COMPRESSOR SUCTION PRESSURE	Thermal load higher than expected	Check the ambient thermal load; check, above all for intense dehumidification, the flow-rate and the conditions of the outside air; check the inflow of outside air.
	The system is affected by an excessive discharge pressure	See "HIGH COMPRESSOR DISCHARGE PRESSURE".
	Too much refrigerant in the circuit.	Remove refrigerant from the circuit
	Return of liquid refrigerant to the compressor intake	Check that the thermostatic valve superheating value is correct; check that the valve sensor bulb is not discharged and that it is correctly positioned, secured and insulated".a
LOW COMPRESSOR SUCTION PRESSURE (and possible defrosting of the coil)	Room temperature too low	See "ROOM TEMPERATURE TOO LOW".
	The air flow-rate is too low or null	See "LOW OR NO AIR FLOW".
	Liquid receiver outlet valve not completely open	Check the opening of the valve.
	Refrigerant filter blocked	Check that the thermostatic valve superheating value is correct; check that the valve sensor bulb is not discharged and that it is correctly positioned, secured and insulated".
	Insufficient refrigerant charge	Check the liquid subcooling at the condenser outlet; if necessary, restore the charge.
LOW PRESSURE SWITCH ACTIVATED (low compressor suction pressure)	Thermostatic valve not correctly calibrated or faulty	Check that the thermostatic valve superheating value is correct (around 5°C).
	Dewatering filter cartridge dirty	Check and if necessary replace the dewatering filter cartridge; the temperature difference measured upstream and downstream of the filter must be less than 2°C.
	The system is affected by an excessively low discharge pressure	See "LOW COMPRESSOR DISCHARGE PRESSURE".

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