INSTALLATION, OPERATION AND MAINTENANCE MANUAL

AIR TO AIR HEAT RECOVERY UNIT WITH BUILT-IN INVERTER DRIVEN COMPRESSOR HEAT PUMP

SERIES *HPH-HPR-HPS*

CE

Dear Customer,

Thank you for having purchased an LMF product. It is the result of many years of experience, research and has been made with top quality materials and highly advanced technologies. The CE mark guarantees that the machine meets the European Standards regarding safety.
The qualitative level is kept under constant surveillance. LMF products therefore offer SAFETY, QUALITY and RELIABILITY.

Thank you once again for your preference.

The manufacturer declines all responsibility for any inaccuracies in this manual due to printing or typing errors.
The manufacturer reserves the right to modify the products contents in this catalogue without previous notice.

DECLARATION OF CONFORMITY

The Legal Representative of LMF S.p.A., located in Meledo di Sarego, via Paradiso 33 (Vicenza- ITALY), declares that the unit belonging to **HPH, HPR** and **HPS** series complies to the prescriptions of the Machine Directive 2006/42/CE, Low Voltage Directive 2006/95/CE, EMC Directive 2004/108/CE, Ecodesign Directive 2009/125/CE and Directive 97/23/CE (Pressure Equipment Directive - Module A).
The unit belonging to the above series is designed according to the following main safety prescriptions:

- principals of safety integration;
- used materials free from risk;
- safety while transportation, handling and installation;
- protection against mechanical risks;
- protection against electrical risks;
- protection against fire risks;
- design and construction done so that noise emission is reduced to minimum level;
- protection against the risk to remain trapped inside the machine;
- CE indelible marking complete with the needed indications;
- supply of an "User manual"

Meledo di Sarego (VI)
10/12/2014

The Legal Representative

Ferraro Mauro

SYMBOLOGY	
	ATTENTION
	DANGER
	HIGH RISK OF ELECTRIC SHOCK
	ATTENTION: AUTHORIZED PERSONNEL ONLY

1 - INTRODUCTION

Dear Customer,

this heat recovery unit with built-in heat pump is designed and developed for civil, commercial and industrial applications and both allows the room air renewal and supplies tempered air with a sure energy saving. Unit must be used only for this purpose, LMF will not respond in case of different use of the unit.

In its basic working principle, it consists in :
1 – fans (supply and exhaust air)
2 – high efficiency heat recovery (crossflow for HPH, counterflow for HPS and thermal wheel type for HPR)
3 – high efficiency inverter driven air-to-air reversible heat pump
4 – filter sections (on fresh air and return air intakes)
5 – electrical board complete with electronic control

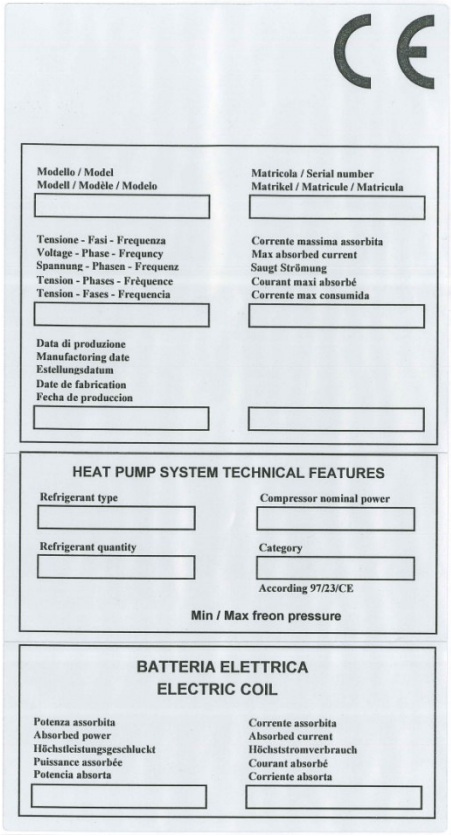
This unit may be integrated with traditional heating and cooling systems, but they can operate also autonomously.

• This manual together with separate wiring diagram and control instructions (supplied with the unit) must be kept in a dry place and ready to hand for future consultation when required.
• This manual has been compiled to ensure that the unit is installed in the correct way and to supply comprehensive information about how to correctly use and service the appliance. **Before proceeding with the installation phase, please carefully read all the information in this manual, which describes the procedures required to correctly install and use the unit.**
• Strictly comply with the instructions in this manual and conform to the current safety standards.
• The appliance must be installed in accordance with the laws in force in the country in which the unit is installed.
• Unauthorized tampering with the electrical and mechanical equipment will **VOID THE WARRANTY.**
• Check the electrical specifications on the identification plate before making the electrical connections. Read the instructions in the specific section where the electrical connections are described.
• If the unit must be repaired for any reason, this must only be done by a specialized assistance center recognized by the manufacturer and using genuine spare parts.
• The manufacturer also declines all liability for any damage to persons or property deriving from failure of the information in this manual to correspond to the actual machine in your possession.
• **Proper uses: this series of air to air heat recovery unit is designed to air renewal/conditioning purposes. Any use differing from this proper use or beyond the operating limits indicated in this manual is forbidden unless previously agreed with the manufacturer.**
• **The prevention of the risk of fire/injury at the installation site is the responsibility of the end user and/or installer.**

Verify, upon acquisition, that the apparatus is complete and supplied as described.
Any eventual disputes must be presented in writing within 8 days from the reception of the goods.

Each unit is provided with identification plate listing the following:

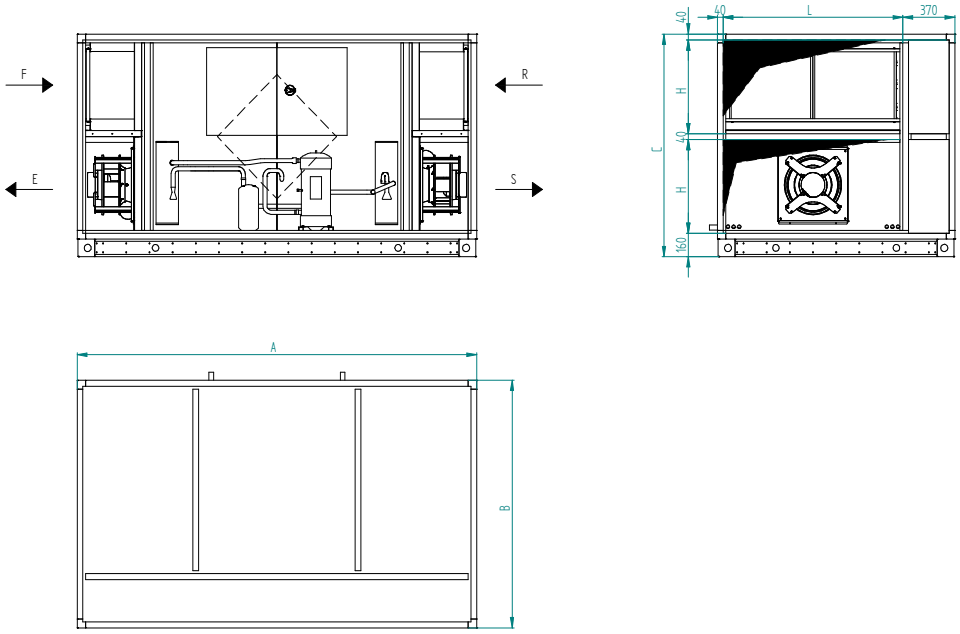
- Address of Manufacturer
- “CE” Mark
- Model
- Serial Number
- Power supply (V - ph - Hz)
- Maximum current (A)
- Manufacturing date
- Refrigerant type
- Compressor nominal power input (kW)
- Refrigerant quantity (kg)
- PED category
- Min/max refrigerant pressure (bar)
- Input power “kW” of electric heater (if present)
- Input current “A” of electric heater (if present)

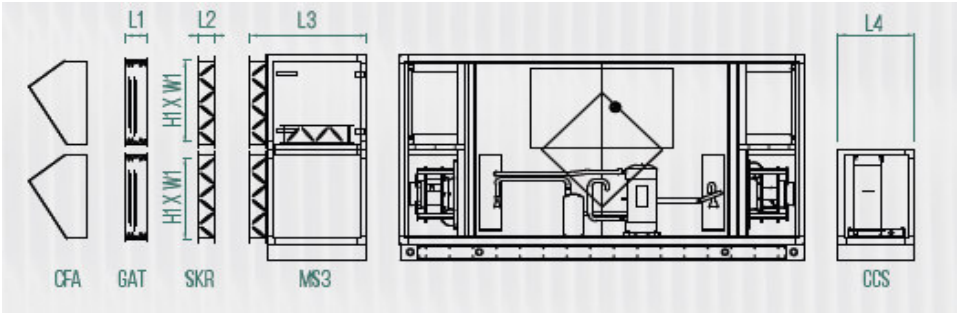


2 – DIMENSIONS AND WEIGHTS

Packing dimensions

The following table, referred to the **figure**, shows the characteristic dimensions of the series HPH and its accessories.



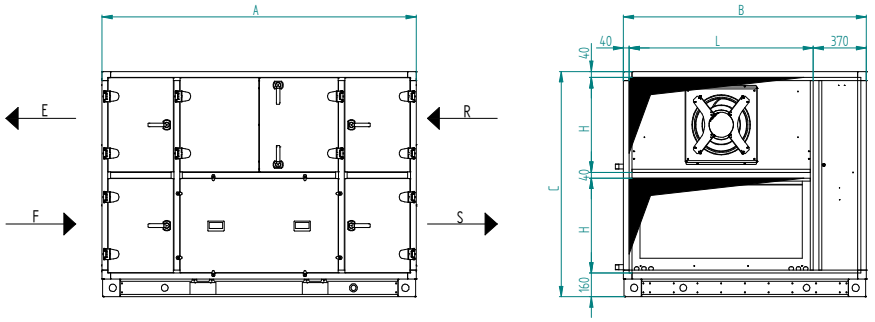


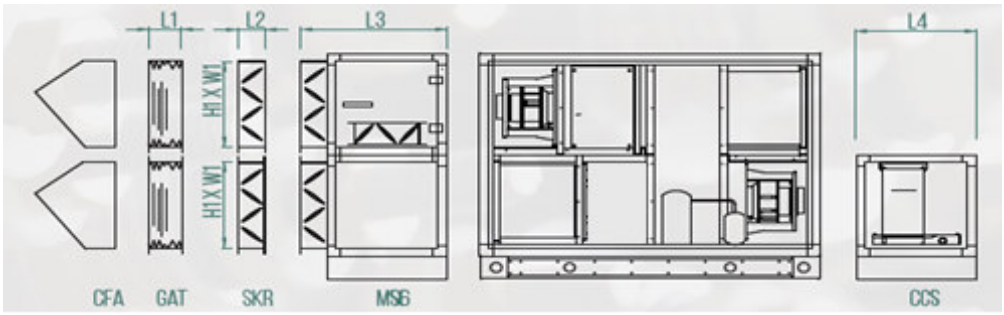
S = Supply, E = Exhaust, R = Return F = Fresh air

HPH		14	20	26	50	92	144	205
A	mm	2185	2185	2515	2845	3175	3505	3835
B		1030	1195	1360	1690	2020	2350	2350
C		1190	1190	1190	1520	1850	2180	2510
L		620	785	950	1280	1610	1940	1940
H		475	475	475	640	805	970	1135
L1		150						
L2		100						
L3		635	635	635	800	965	965	965
L4		535						
W1		620	785	950	1280	1610	1940	1940
H1		455	455	455	620	785	950	1115
Weight	kg	550	650	800	1000	1200	1550	1850

Packing dimensions

The following table, referred to the **figure**, shows the characteristic dimensions of the series HPR and its accessories.



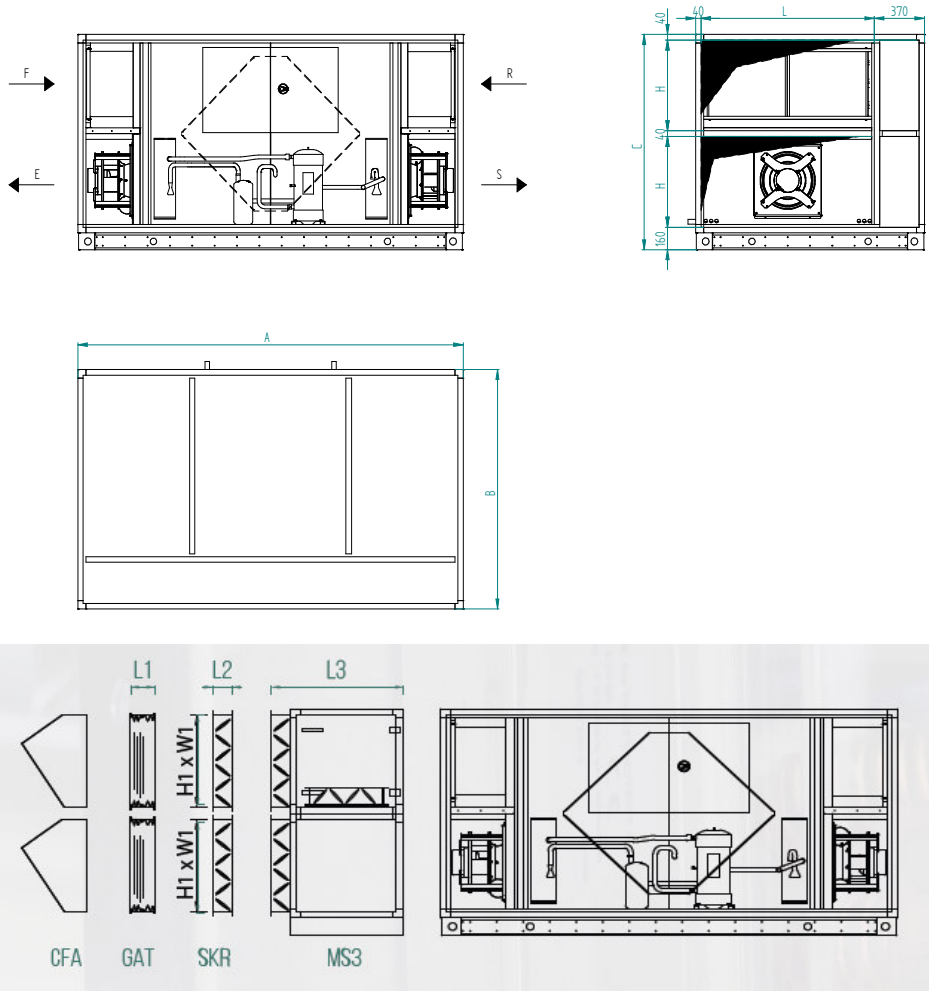


S = Supply, E = Exhaust, R = Return F = Fresh air

HPR		14	20	26	50	92	144	205
A	mm	2185	2185	2185	2185	2350	2350	2515
B		1030	1195	1360	1690	2020	2350	2350
C		1190	1190	1190	1520	1850	2180	2510
L		620	785	950	1280	1610	1940	1940
H		475	475	475	640	805	970	1135
L1		150						
L2		100						
L3		635	635	635	800	965	965	965
L4		535						
W1		620	785	950	1280	1610	1940	1940
H1		455	455	455	620	785	950	1115
Weight	kg	470	560	640	890	1120	1360	1630

Packing dimensions

The following table, referred to the **figure**, shows the characteristic dimensions of the series HPS and its accessories.



S = Supply, E = Exhaust, R = Return F = Fresh air

HPS		14	20	26	50	92	144	205
A	mm	2185	2185	2515	2845	3175	3505	3835
B		1030	1195	1360	1690	2020	2350	2350
C		1190	1190	1190	1520	1850	2180	2510
L		620	785	950	1280	1610	1940	1940
H		475	475	475	640	805	970	1135
L1		150						
L2		100						
L3		635	635	635	800	965	965	965
L4		535						
W1		620	785	950	1280	1610	1940	1940
H1		455	455	455	620	785	950	1115
Weight	kg	470	560	640	890	1120	1360	1630

3 – TRANSPORTATION, HANDLING AND STORAGE

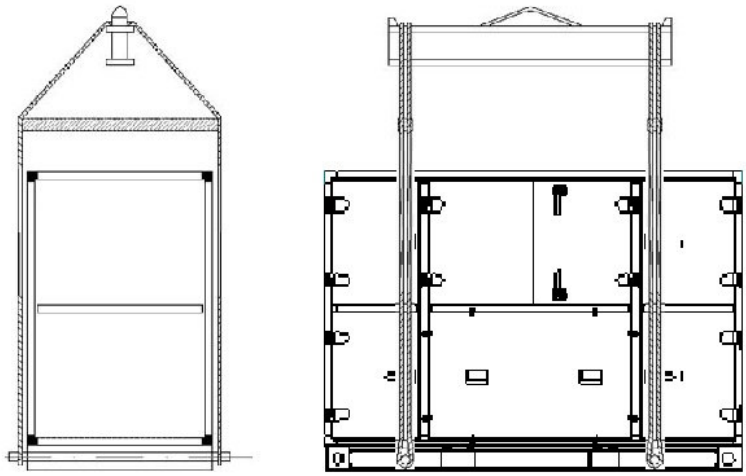
Packaging

Each unit is put on bench and protected with cellophane film; the protection must remain intact until the moment of installation.
The materials that are not mounted for technical motives are supplied in fitted packing fixed externally or internally to the unit.
Recycle and dispose of packing material in conformity with local regulations, be extremely careful not to damage the unit.

Handling

Comply with the current safety regulations concerning the equipment to use when handling the unit or the required ways of operating. Use single protection devices as goggles, gloves, helmets when handling the unit to avoid risk of injuries.

For the lifting and transportation of the unit, use adequate equipment, according to the 89/391/CEE regulations and further modifications. For lifting, use round bars crossing the baseframe in the prearranged holes and robust ropes as shown on the below figure.
Each individual unit weight is listed in this manual.
While moving, try to avoid rotation without control.



Check the weight of the unit before proceeding with the moving and handling operations. Make sure that the appliance is handled with care and without jolting as rough treatment could damage the functional parts
of the machine. To safeguard persons and property, read the information on the packing that covers the unit before handling.
Also make sure to:
• Handle the machine with care
• Do not stack other objects on top of the unit

Before positioning please consider the overall dimensions and the technical space requirements of the system and the unit, electric and hydraulic connections and any air pipes/ducts or free passages.
Neglecting these aspects may decrease performance and operational life of the unit and therefore increase the operating costs and maintenance.
Units are designed to be installed **INSIDE** or **PARTIALLY OUTSIDE** (roof cover needed) and in fixed positions.

Before placing the unit be sure that:
• the location is in a safe accessible place
• the framework or the floor or ceiling is adequate to support the weight of the unit, please refer to weight paragraph
• support points are leveled and aligned
• the place can not be subject to flooding
• the maximum level of the snow does not obstruct the airflow to the unit

To ensure the best air circulation to the unit and thus ensure a smooth operation it is recommended to:
• avoid obstructions to air flow near or above the unit
• protect the unit from high winds that can favor or not the airflow
• protect the unit from heat sources or pollutants (chimneys, extractors…)
• protect the unit from air stratification or recirculation (avoid bad ducting of the fans, containment structure, high walls or corners next to the unit)
These advises if not respected can lead to a lower efficiency of the unit and possible failures.

Checklist

Upon reception of the unit, we suggest that a complete control is carried out, to verify that the unit is intact and complete, and no damage has been sustained during transport. Any eventual damage revealed must be communicated to the carrier, demonstrating the reserve clause within the transport documents, specifying the type of damage.

Storage

The units must be stored in a dry place, sheltered from the sun, rain, sand and wind.
Comply with the storage conditions given below:
• Do not stack the units
• Maximum temperature = 60°C
• Minimum temperature = -20°C

The Manufacturer declines any responsibility for any damage as a result of negligence or lack of protection from atmospheric agents.

4 – INSTALLATION & CONNECTIONS

Definitions

CUSTOMER – The Customer is the person, activity or the society, that has bought or hired the unit, and intends to utilize the machinery for its intended use.

USER / **OPERATOR** – The User or Operator is the actual person that has been authorized by the Customer to utilize the unit.

QUALIFIED PERSONNEL - Defined as the person who has followed a relevant specific course of study, and so is able to understand the dangers derived from the use of the machinery, and in turn, due to this, are capable of solving major dilemmas.

Safety regulations

The Manufacturer declines any responsibility for failure to respect the Safety Regulations and the prevention as described below.
Furthermore, the Manufacturer declines any responsibility for damage caused by the improper use of the unit and/or modifications carried out without proper authorisation.

- **Qualified personnel must carry out the installation.**
- During the installation operation, use protective clothing, for example: glasses, gloves, etc. as indicated by 686/89/CEE and successive regulations.
- During the installation operate in absolute security, pollution free air and in an area free of obstructions.
- Respect the regulations in force in the country in which the apparatus is being installed. Specifically relative to its use, and to the disposal of packing and products used for the cleaning and maintenance of the unit. Respect the recommendations given by the producers of such products.
- Before placing in function the unit, check the perfect connection of the various components and the internal parts of the system.
- Avoid at all costs human contact with moving parts and contact with the parts themselves.
- **Do not commence with servicing or cleaning of the unit, before the unit has been disconnected from the main supply.**
- The maintenance and the substitution of damaged or consumed parts must be carried out only by specialized personnel, following the indications found within this manual.
- Spare parts must correspond to the requirements specified by Manufacturer.
- In case of dismantling of the unit**,** respect the anti-pollution regulations in force.

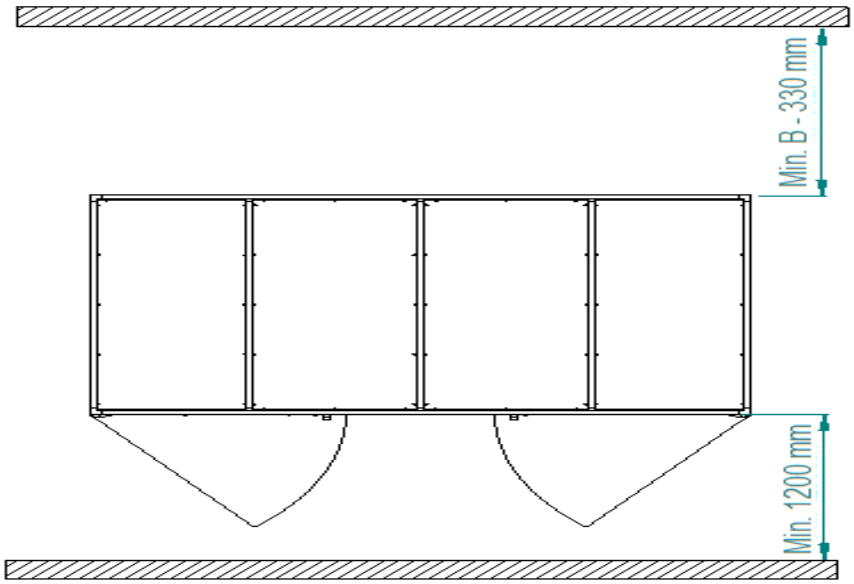
N.B. The installer and the user of the apparatus must take into account, and solve problems, connected with any other type of risk that may occur to the unit. For example, risks derived from the entrance of foreign bodies, or risks due to the presence of flammable or toxic gas.

Preliminary operations

- Check the perfect condition of the various components of the unit.
- Control that contained within the packing, there are the installation accessories, and documentation.
- Transport the packed section as close as is possible to the intended place of installation.
- Do not place tools or weight on top of the packed unit.

Choosing place of installation

- Position the unit on a solid structure, capable supporting the weight of the machine; on each support point install vibration damper device in order to reduce vibration transmission.
- Position the unit in a point where the condensation discharge may occur easily; tilt the machine towards the water discharge connection (3° min)
- Do not position the unit in an area in which flammable gases, acidic or corrosive substances are present. They may damage various components in an irreparable manner.
- Allow a minimum amount of free space as indicated in the following **figure**. This permits ease of installation and both scheduled and special maintenance (where B is the unit width).



Air duct connections

IMPORTANT: IT IS IMPORTANT NOT TO PLACE IN OPERATION THE UNIT IF THE FAN OUTLETS ARE NOT DUCTED OR NOT PROTECTED BY A SAFETY NET ACCORDING TO THE ACTUAL REGULATION.

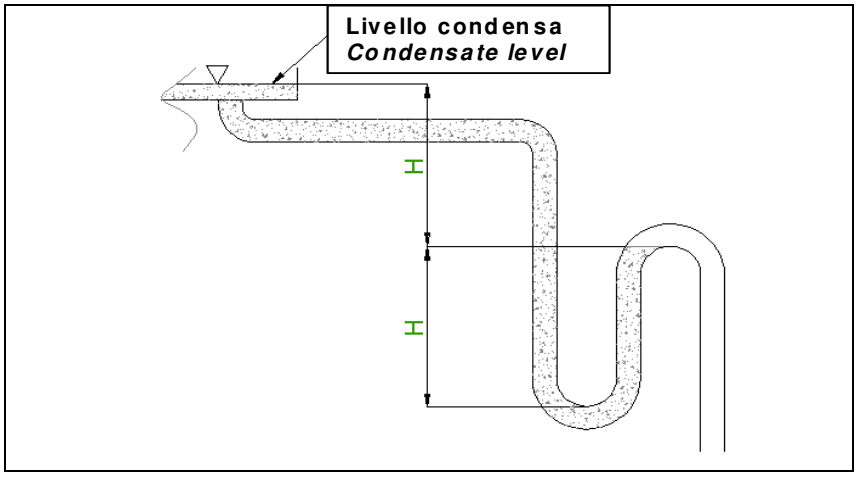
- The ducts must be correctly sized, in order to match unit external static pressure at duty airflow rate.
- To prevent the water condensation and cut down the sound level it is suggested to install insulated air ducts or provide a duct insulation.
- Between unit and air ducts always install suitable flexible joints; anyway, the electrical continuity must be ensured between air ducts (if metal type) and unit by a ground cable.

Water connections

The installation and connecting of the piping is an operation that must be done correctly, otherwise it may compromise the performance of the system. At worst it may cause irreversible damage to the machine. These operations are to be effectuated by **qualified personnel.**

Condensation outlet connection

- Condensation outlet connections are on the opposite side to that of compressor and electric box.
- The system of drainage must provide, for each outlet, an adequate trap able to allow the condensation run off on underpressure conditions.
- The trap must be designed as shown on the following **figure**, where H shall be > 50 mm
- The trap must have a tap for correct cleaning of the lower part, and must allow an easy disassembly.
- The path of the condensation drainage tube must always have a gradient toward external.
- Insure that the condensation run-off tube does not interfere with discharge of the unit.



Water coil connection (optional CCS section)

- The water heating or cooling coil (CCS) is supplied with GAS “male” threaded headers.
- The tightening must be carried out with extreme care to avoid damage to the copper collectors of the coil.
- The path of the tubes must be studied in a way to avoid obstacles should it be necessary to extract the unit coil.
- Inlet and outlet water must consent the thermal exchange against the current. Follow instructions found on the WATER INLET and WATER OUTLET plate.
- Provide an air valve at the top of the unit, and a water discharge valve at the bottom.
- Reinforce sufficiently the units external tubes to avoid offloading the weight onto the coil.
- Once connection has been effectuated, fix the external seal flush against the control panel, in this way avoiding the passing of air.
- The insulation must not rest against the paneling, as this may provoke burning.
- For control purposes, organize the interception of the tube side coil when the fan is off, to avoid internal overheating and possible damage to internal components.
- Provide an anti-freeze system.
- Provide a cut out switch to isolate the coil from the rest of the circuit in case of extensive maintenance needs.
- Should the unit be installed in particularly cold areas, drain completely before plant shut-off long periods.

Electrical connections

Before starting any operation, insure that the general power supply has been isolated.
All the electrical connections must be protected at the source by the installer.

Qualified personnel according to the supplied schemes must carry out the electrical connections at the control panel.

- Insure that the voltage and the frequency shown on the technical plate correspond to the connecting power supply.

Follow the connection of the unit and its accessories using adequate cabling for the power used, and respecting the country regulations. The dimensions of the cabling must be sufficient to support a voltage drop in start up phase inferior to 3% of the nominal.

- For the main power supply of the unit and its possible accessories, the use of adapters, multiple plugs and extension leads shall be avoided.
- **It is the responsibility of the installer to insure that the installation of the unit is as close as possible to the main power supply, or sufficiently close to protect the electrical parts.**
- Connect the unit to an efficient power point, by using the glands near the electric box panel; power supply terminals are screw type.

5 – WIRING DIAGRAMS

Follow wiring diagram attached to every unit inside the electrical board.

Unit model	Series / Document code	
	HPH & HPS	HPR
14-20-26	AMF0007823	AMF0007818-AMF0008055-AMF0008055
50	AMF0007473	AMF0007819
92	AMF0007824	AMF0007820
144	AMF0007825	AMF0007821
205	AMF0007826	AMF0007822

6 – ELECTRONIC CONTROL

Follow instructions on HP user manual attached to every unit and contained inside the electrical board (document code MC00005, valid for all sizes).

7 – SCHEDULED MAINTENANCE

BEFORE SERVICING THE UNIT, SWITCH OFF THE MAIN POWER SUPPLY.

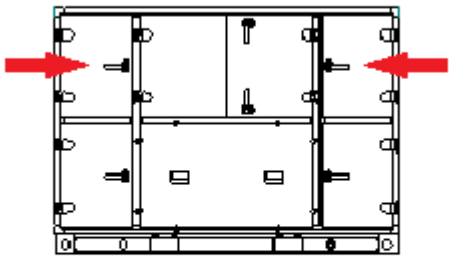
- It is the responsibility of the User to carry out all types of maintenance operations.
- Only personnel previously trained and qualified may carry out maintenance operations.
- Should the unit require disassembly, hand and body protections are required

Maintenance keeps unit efficiency, reduce the speed of deterioration over time and collect information and data to understand the efficiency of the unit and prevent failures. We suggest to prepare a booklet of installation according European legislation. Provide a machine book that allows you to track of the actions taken on the unit, so it will be easier to cadence adequately the various interventions and will facilitate a possible troubleshooting.
Please take note of: date, type of action, description of action, measurements performed, anomalies identified, alarms registered in the alarm history, etc.

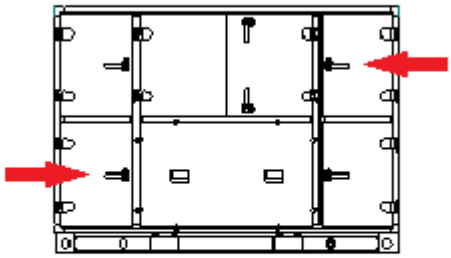
Monthly maintenance

Air filters

Each filter section can be entered through hinged side panel, provided with handle; once entered, filter can be removed by side after removing the vertical filter frame by an Allen key (1).
This unit is equipped with soft bag filters; since they are not cleanable, check them monthly and replace them when dirty.
For an automatic pressure drop limit control, installation of filter pressure switches is recommended.



HPH - HPS



HPR

Yearly maintenance

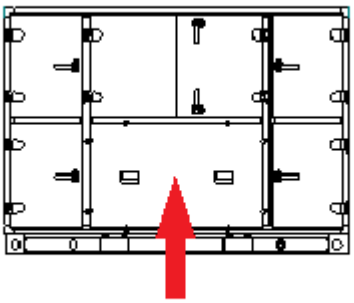
Check that all the electrical equipment, in particular the fixing of the electrical connections.
Check the tightness of all nuts, bolts, flanges and hydraulic connections; tighten if loose.

Heat recovery

It generally requires no maintenance; just for checking cleaning of heat exchange surface and by-pass device for HPH and HPS units or wheel driver (motor, pulley and belt) for HPR units, unscrew the fixing panels on the opposite side of that of compressor.

Refrigerant circuit

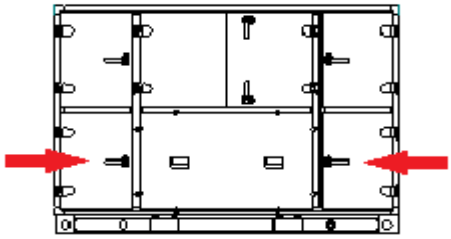
Check the whole circuit in order to find possible gas leakage. In case of leakage, previously empty the circuit and recover the refrigerant. Remove the lower panel with built-in handles, fixed by panel locks, to enter compressor compartment.



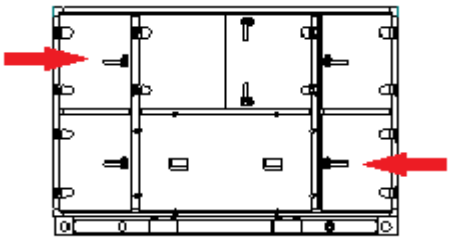
HPH - HPS - HPR

Fans

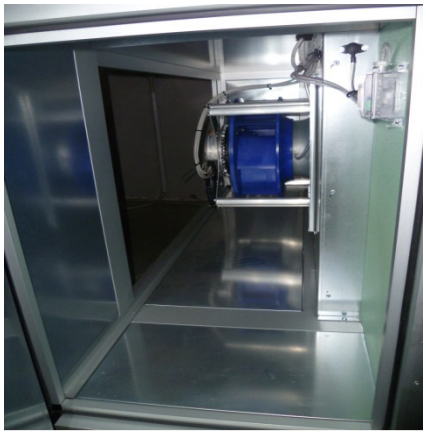
Each fan section can be entered through hinged side panel, provided with handle. Check that each impeller is clean and free to rotate.



HPH - HPS



HPR



Water coil (optional CCS section)

By unscrewing and removing the panel on the opposite side to that of water connection, check that the heat exchange surface is clean and fins are in perfect condition.

8 – TROUBLESHOOTING

Failure searching and problem solving schedule

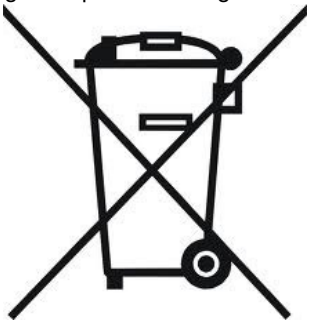
The following table is for possible failures of air plant system; for errors and alarms displayed by the control panel, see control user manual.

Founded failure	Probable cause	Possible solution
Fans are not running	• Power supply is switched off • Wrong or loose electrical connections • Motors on thermal protection mode • Fan signal missing	• Switch on the power supply • Restore the right connections • Check motor current • Check signal connections
Compressor is not running	• Thermal protection on • Too high or too low freon pressure	• Check compressor working conditions
Air performance decreasing	• Air filter dirty • Air duct blocked	• Clean or replace filter • Check air system (are dampers open ?)
Insufficient heating or cooling performance	• Temperature setpoint not correct • Refrigerant filling not correct • Refrigerant leakage • Required performance not met by compressor capacity • Unit on defrost mode • Compressor cooling capacity reduced because of too high condensing pressure	• Adjust the right temperature setpoint, compatibly with outdoor and indoor condition and compressor capacity limit • Check possible leakage points • Refill refrigerant
Too high defrost cycle frequency	• Too cold outdoor air and/or indoor air • Too low return airflow	• Preheat air • Start the unit after room is preheated • Check return air filter and return/exhaust air circuit
Condensate water stays inside the unit	• Condensate drainage blocked • Missing or not adequate trap	• Clean or free the drainage • Install a right trap

9 – MATERIAL DISPOSAL

At the end of unit's lifetime, its components must be dismantled and disposed of respecting the operational regulations present in its country of installation.
The materials that the unit is constructed of are:

- Precoated galvanized steel sheet metal
- Galvanized steel sheet metal
- Aluminum
- Copper
- Polyester
- Polyethylene
- Glass wool
- Plastic



During disconnection of the unit, avoid gas leakage or liquid spillage on environment, especially if the water has additives like glycol. For dismissing and disposal, deliver the units to specialized centers according to your national laws.