Installation, Operation, and Maintenance

Trane CXC (models CXC 007 - 017)

Air-sourced Heat Pumps with
Inverter Scroll Compressor
23 – 60 kW
R454B

October 2025

CG-SVXO70B-GB

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CHAPTER 1

GENERAL INFORMATION

1.1 Description

The machines described in this manual may hereinafter be referred to as “HEAT PUMPS”.
This manual is written for those responsible for the installation, use and maintenance of the unit.
These units are designed solely for civil applications, for cooling (when working as chillers - “SUMMER” mode) or heating (when working as heat pumps - “WINTER” mode) the liquid flow.
All the observations concerning the machine component usually (in SUMMER mode) called a “condenser” also hold true for WINTER mode, bearing in mind that in the latter case the cooling cycle is inverted and that same component works as an evaporator.
In these conditions, the same applies also to the evaporator.
Primary brand components were used and the entire process of design, production and control of the machines was carried out in accordance with ISO 9001 and IEC EN 60335-1 standards.
The liquid to be cooled must be compatible with the materials used. This analysis must be made before purchasing or installing the unit.
Here below the term “PRESSURE” will be used to indicate the gauge pressure.

CAUTION

⚠ This manual provides the user, the installer and the maintenance technician with all the technical information required to install, operate the machine and carry out routine maintenance operations that ensure a long service life.
Use only original spare parts for repairs and replacements. Failure to comply with this requirement cannot guarantee the safety of the machine.
Requests for SPARE PARTS and for any INFORMATION concerning the unit must be sent to the distributor or to the nearest service centre, providing the MODEL and SERIAL NUMBER shown on the machine data plate and in this manual.

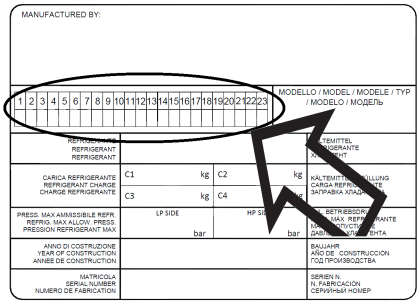
1.2 Data plate

The data plate attached to the machine shows the main technical data:

MODEL and CODE	The model number and the code identify the size of the unit and the type of construction.
MANUAL	Code number of the manual.
SERIAL NUMBER	Construction number of the unit.
YEAR OF CONSTRUCTION	The year of the final machine test.
VOLTAGES/PHASES/FREQUENCY	Electrical power supply characteristics.
MAX. CONSUMPTION	Unit current input in limit working conditions.
POWER INSTALLED	Unit power input in limit working conditions.
PROTECTION LEVEL	Protection level of the entire machine, according to European Standard EN 60529.
ELECTRICAL DIAGRAM	Indicates the electrical diagram number.
REFRIGERANT	This is the refrigerant fluid in the unit.
GLOBAL WARMING POTENTIAL	Global warming potential.
REFRIGERANT CHARGE	Quantity of refrigerant fluid contained in the unit.
PRESS. PERMISSIBLE HP SIDE (PS)	This is the design pressure of the HP side refrigeration circuit.
PRESS. PERMISSIBLE LP SIDE (PS)	This is the design pressure of the LP side refrigeration circuit.
PERMITTED TEMP. HP SIDE (TS)	Cooling circuit design temperature (high pressure side).
PERMITTED TEMP. LP SIDE (TS)	Cooling circuit design temperature (low pressure side).
FLUID CIRC. OF USE	Fluid cooled or heated by the machine (usually: water).
PRESS. MAX. ALLOWED (PS)	Max. design pressure of the user circuit.
PERMITTED TEMPERATURE (TS)	Min. and max. design temperature of the user circuit, not to be confused with the maximum operating temperature, defined at the project quote stage.
SOUND PRESSURE LEVEL	Free field sound pressure level in hemispherical radiation conditions (open field) at a distance of 1m from the condenser side of the unit and a height of 1.6m from the ground.
AMBIENT TEMPERATURE	Minimum and maximum value of the cooling or heating air temperature.
WEIGHT	Weight of the unit.

1.3 How to interpret the alphanumeric string

The alphanumeric string-code is reproduced on the metallic plate on the manual.



The empty alphanumerical string is circled in the adjacent figure. Each position will be defined by an alphanumeric value (0, 1, 2, A, B, etc.). Specific unit features are established by the position and the alphanumeric values.
Please find below each alphanumeric values position explained, which can be used.

	POS.	VALUE	DESCRIPTION
VERSION	1-2-3	STD	STD
		SSN	Super-Silenced XLN
VOLTAGE	4	0	400/3/50
REFRIGERANT	5	A	R454B
SYSTEM COOLANT LOAD	6	0	LOAD COMPLETE
		1	PRESSURISATION IN NITROGEN
HYDRAULIC UNIT	7	0	NONE
		1	P2
		3	TANK + P2
		B	TANK + P1
		L	P1
		S	VF P1
		T	VF P2
		W	TANK + VF P1
		X	TANK + VF P2
FAN CONTROL	8	4	EC BRUSHLESS FANS
		6	EC HIGH PRESSURE FANS
EVAP. ANTIFREEZE PROTECTION	9	1	EVAP. ONLY
		2	EVAP. + HYDRAULIC UNIT
CONDENSATE TRAY RESISTANCE	10	0	NO
		1	YES
CONDENSING BTR PROTECTION	11	0	NONE
		3	GRID
PREPAINTED CONDENSING BTRS	12	0	NO
		1	YES
WATER FLOW METER	13	0	NO
		1	YES
LEAK DETECTOR	14	0	NO
		1	YES
PRODUCT TYPE	15	0	STANDARD
		X	SPECIAL

1.4 Performance

Unit performance depends mainly on the flow rate and temperature of the chilled water and on the ambient temperature.
These data are specified in the quote, and constitute the reference values.

1.5 Sound level measurements

CAUTION

⚠ In case of sound pressure levels exceeding 80dB(A) during maintenance of the installation, the maintenance technician must be provided with appropriate PPE.

CH operation

Model	Fan	Lp dB(A) *		Lw dB(A) **	
Version		STD	XLN	STD	XLN
IGHP 007	EC Brushless	69,8	66,8	82,8	79,8
	high pressure	71,3	68,3	84,3	81,3
IGHP 009	EC Brushless	70,5	67,5	83,5	80,5
	high pressure	72,0	69,0	85,0	82,0
IGHP 011	EC Brushless	74,2	71,2	87,2	84,2
	high pressure	77,2	74,2	90,2	87,2
IGHP 013	EC Brushless	73,5	70,5	86,5	83,5
	high pressure	76,5	73,5	89,5	86,5
IGHP 017	EC Brushless	74,7	71,7	87,7	84,7
	high pressure	77,7	74,7	90,7	87,7

* at a distance of 1m
** global

Test conditions
The sound levels refer to the operation of the unit (in CH mode) at full load under nominal conditions.
Sound pressure level in hemispherical irradiation conditions at a distance of 1m from the condenser side of the unit and height of 1.6m from the ground. Values with tolerance of ± 2 dB.
Sound pressure level: according to ISO 3744.

CHAPTER 2

SAFETY

This system is designed for safety in its intended use, provided it is installed, commissioned, and serviced in compliance with the instructions given in the present manual.
The company excludes any contractual and non-contractual liability for damage caused to people, animals or property, due to installation, adjustment and maintenance errors, improper use or partial or superficial reading of the information contained in this manual.

CAUTION

⚠ All persons who interact with the system must be informed of the indications, regulations and prescriptions given in this manual.

Pay special attention when working on the unit: the unit contains electrical components that operate at mains voltage and also moving parts such as fan units.
It must therefore be isolated from the electricity supply network before being opened.

WARNING

⚠ The motors contain DC bus capacitors that can remain charged even when the frequency converter is not powered. Failure to comply with the indicated waiting time after disconnecting the power supply and before carrying out maintenance or repair work, may cause serious or fatal injuries.
1. Stop the engine.
2. Disconnect the AC network.
3. Wait for the capacitors to discharge completely before performing any maintenance or repair work. The waiting time is 15 minutes.

Any maintenance operation that is outside the usual interventions must be carried out by authorised operators that are informed and trained on the specific risks of flammable gases according to good practices and/or current standards in accordance with ANNEX HH IEC 60335-2-40.
Keep unauthorized persons (e.g. children) away from the place of installation of the unit.

2.1 General information

When handling or servicing the unit, personnel must work safely and comply with the prescriptions concerning health and safety in the installation site.

CAUTION

⚠ Personnel must be authorised, informed and trained on the specific risks from flammable gases according to good practices and/or current regulations in accordance with ANNEX HH IEC 60335-2-40.

CAUTION

⚠ Numerous accidents that occur during operation and maintenance of the units are caused by failure to comply with basic safety rules or precautions.

An accident can often be avoided by recognising a situation that is potentially hazardous.
The user must ensure that all personnel involved in operating and servicing the unit **have read and understood** all the warnings, precautions, prohibitions and notes given in this manual and attached to the machine.
Improper operation or maintenance of the unit and auxiliary equipment could be dangerous and result in an accident causing injury or death.
It is not possible to cover all possible circumstances that could feasibly give rise to potential hazards for persons.
The warnings in this manual are therefore not all-inclusive.
If the user adopts operational procedures or uses tools or working procedures that are not specifically recommended, care must be taken to ensure that the unit and the auxiliary equipment are not damaged or made unsafe and that no risks emerge in relation to persons or property.

CAUTION

⚠ Use exclusively suitable methods that offer the maximum environmental respect in daily operation, routine or supplementary maintenance, and at the time of decommissioning of the system.

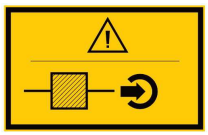
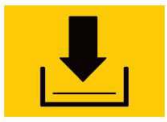
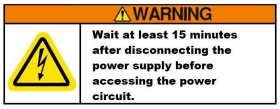
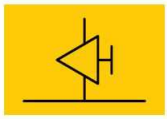
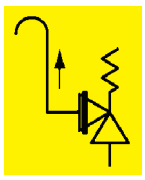
Any improper conduct or incorrect use of the unit by the user automatically releases the manufacturer from all liability for possible damage, injury and/or accidents affecting persons or property.
Arbitrary modifications made to the unit will automatically invalidate all forms of guarantee provided by the manufacturer.

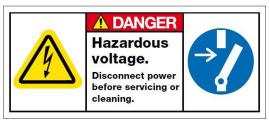
WARNING

⚠ The hot / cold water produced by the units cannot be used directly for hygienic-sanitary or food purposes. In the case of such applications, the installer is responsible for fitting an intermediate exchanger.
If the intermediate exchanger is not fitted, the installer should affix a notice stating “non-drinking water”.

2.2 Symbols

The following symbols are shown on the stickers on the unit as well as on the overall dimension drawing and refrigeration circuits in this manual. Their meaning is the following:

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	Machine water inlet **Install an adequate water filter on the inlet piping**		Machine water outlet
	Condensate drain		Drain point to empty the unit of water
	Indication of the axis of reference for lifting operations		Risk of injury due to sharp edges
	The frequency converter contains DC bus capacitors that can remain charged even when the frequency converter is not powered. After disconnecting the electricity supply, wait at least 15 minutes before accessing the power circuit.		Air bleed valve
	If the product is marked with this symbol, this means that the electric and electronic products cannot be disposed of together with non-separated domestic waste.		Risk of burns from contact with high-temperature surfaces
	Moving parts can crush and cut. Do not operate with guard removed. Follow lockout procedure before servicing.		Safety valve discharge

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	Hazardous voltage. Disconnect power before servicing or cleaning.		Attention: the unit contains R290 flammable refrigerant (propane)
	Machines with inflammable refrigerant gases (present if load exceeds or equal to 12 kg)		Unit with nitrogen pre-charge (see 10.2.3 “Coolant charging procedure”)

2.3 Safety aspects relating to maintenance

WARNING

⚠ Maintainers working on the electrical components or on the components of the refrigerant circuit must be authorised, informed and trained on the specific risks from flammable gases according to good practices and/or current standards in accordance with ANNEX HH IEC 60335-2-40.

Electrostatic charge may build up if refrigerant is leaked into a potentially explosive atmosphere.
To avoid this build-up, antistatic clothing (complying with Standard EN 1149-5) must be worn during machine inspection and maintenance.

DANGER

⚠ **Never use sharp tools to clean the condensing coil. The chiller contains flammable refrigerant.**

Do not clean the chiller with detergent liquid at temperatures greater than 50°C. A temperature greater than that which has been indicated could result in excess pressure inside the cooling circuit, which in turn could cause the refrigerant safety valve to open.
All repairs of the refrigerant circuit must be carried out by authorised, informed and trained operators on the specific risks of flammable gases according to good practices and/or current standards in accordance with ANNEX HH IEC 60335-2-40.
The maintenance operator must also be:

- aware of the potential risks present in explosive atmospheres, and therefore able to prevent them;
- knowledgeable of the work procedure, in order to avoid - as far as possible - the risk of inflammable refrigerant being leaked into the atmosphere.

In the case of extraordinary maintenance operations, the refrigerant circuit must be emptied using a machine suitable for recovering the type of flammable refrigerant in question. During the course of these operations, the surrounding area must be properly ventilated and monitored with the aid of a leak detection device.
In order to avoid creating potential ignition sources, only roller pipe cutters should be used to open the refrigerant circuit.
All subsequent brazing operations must be carried out by authorised operators, informed, trained and trained on the specific risks of flammable gases according to good practices and/or current standards in accordance with Annex HH IEC 60335-2-40 and taking care to flush the refrigeration circuit with nitrogen. The maintenance operations must be carried out in accordance with the national standards and regulations relating to explosive atmospheres (e.g. reference to the **EN 1127-1 standard**).

2.4 Essential safety rules for the inverter

Before carrying out any maintenance / replacement of the inverter:

- **Disconnect the inverter and external control circuits from the mains power supply by setting the main switch to 0 and wait at least 15 minutes.**
- Always use a multimeter to make sure there is no dangerous voltage on the heads of the terminals.
- Always make sure the motor is completely idle; a freely rotating motor may produce dangerous voltage on the inverter terminals, even when the inverter isn't powered.
- Make sure the dissipator temperature isn't high: risk of serious burns from contact with the dissipator.
- When the inverter is connected to the mains supply, the U, V, W motor terminals are live even if the motor isn't running.
- Do not take insulation resistance or dielectric rigidity measurements while the inverter is connected.
- The control terminals are insulated from the mains potential. There may, however, be dangerous voltage on the relay outputs even when the inverter isn't connected to the mains.

- The inverter must only be used for the purposes specified by the manufacturer. Do not make any unauthorised repair or alteration to the component.

WARNING

⚠ The frequency converter contains DC bus capacitors that can remain charged even when the frequency converter is not powered. Failure to comply with the indicated waiting time after disconnecting the power supply and before carrying out maintenance or repair work, may cause serious or fatal injuries.
1. Stop the engine.
2. Disconnect the AC network.
3. Wait for the capacitors to discharge completely before performing any maintenance or repair work. The waiting time is 15 minutes.

2.5 General precautions

2.5.1 Liquids in the user circuit

The user circuit liquids must be compatible with the materials used for the construction of the unit's hydraulic circuit.
The use of suitable chemical additives (contact your glycol supplier) is very important even in the case of glycol mixtures, to protect the machine materials from the risk of corrosion caused by the chemical deterioration that glycol is susceptible to.
If the liquids in the circuit contain dangerous substances (e.g. ethylene glycol), any leaking liquid must be collected up to prevent any harm to the environment.
Furthermore, when the unit will not be used for a long period, dangerous liquids must be disposed of by firms specialised and authorised for treating them.

2.5.2 Transporting the unit

The unit must be transported in full compliance with local legislation. The maximum quantity of refrigerant that can be transported will be determined by the applicable transport regulations.
For shipping methods, the international directives ADR, IMDG and IATA are of reference. For road transport in Europe the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) shall apply. This regulation allows a partial exemption provided that the total amount of refrigerant carried on the same truck does not exceed 1000 points (1 kg of A3 or A2L corresponds to 3 points, 1 kg of A1 corresponds to 1 point). For example, a truck could be loaded as follows:

- 10 units with 100 kg of R410 per unit => Total Points: 1000
- 10 units with 33 kg of R290 or R454B per unit => Total Points: 990≤1000
- 4 units with 200 kg of R410 per unit + 2 units with 33 kg of R290 or R454B per unit => Total Points: 998≤1000

To take advantage of this partial exemption from ADR, some simple requirements must be respected, including (non-exhaustive list):

- that the means of transport is equipped with a fire extinguisher of at least 2 kg of powder
- that the means of transport is equipped with a non-sparking torch
- that the correct ADR marking and labelling is placed on the outer packaging of the equipment (a red class 2 label with a minimum side of 10 cm and the number UN 3358 with characters of minimum height of 12 mm)

Refrigerating machines and refrigerating machine components are not subject to ADR requirements if they contain less than 12 kg of gas or if the units are charged with nitrogen under pressure of less than 2 barg.
The unit, if equipped with pressure relief valves, could release refrigerant if exposed to high temperatures. The transport temperature must not exceed 50°C.
In the case of road-sea shipments, the ADR Agreement for road transport and the IMDG code for maritime transport are applicable. The provisions of the IMDG generally prevail over those of the ADR. For maritime transport some limitations may apply and the partial exemption of 1,000 points provided for by the ADR is not applicable, please contact the shipping company.
Transport of refrigerant-laden units by area is not allowed.

2.5.3 Precautions upon receipt of the machine

Upon receipt, check the integrity of the machine considering that the machine has been shipped in perfect condition.
Check the supply of all the accessories supplied.
In case of shortages or damage, inform the sales department as soon as possible and fill out a written report complete with photographs.

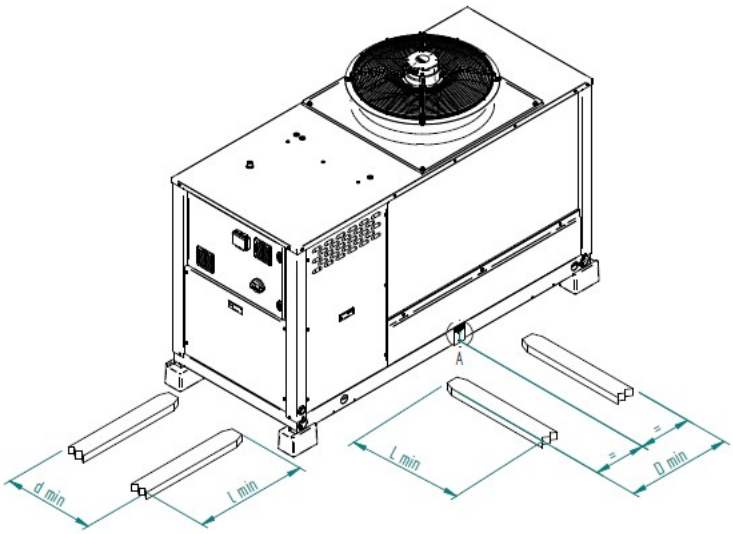
2.5.4 Lifting and transport precautions

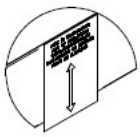
The lifting and transport operations must be carried out by properly qualified expert personnel, with all necessary precautions and protections (active and passive, such as protective gloves, protective helmet) in order to work in complete safety.
Avoid injury by using a hoist to lift heavy loads.
Check all chains, hooks, shackles and slings are in good condition and are of the correct capacity.
They must be tested and approved according to local safety regulations.
Cables, chains or ropes must never be applied directly to lifting eyes.

NOTE
The lifting material is not furnished with the unit.

Always use an appropriate shackle or hook properly positioned.
Make sure the lifting cables don't form sharp bends.
Use a spreader bar to avoid side loads on hooks, eyes and shackles.
When a load is lifted from the ground, keep well clear of the area beneath it and the surrounding area.
Keep lifting acceleration and speed within safe limits and never leave a load hanging on a hoist for longer than is necessary.
All unit models have different weights according to the model.
Please see Technical Catalogue or the data plate applied on the casing for weight data.
Systems equipped with pallet must be handled using a forklift, as shown in the diagram below.

IGHP 007 - 009

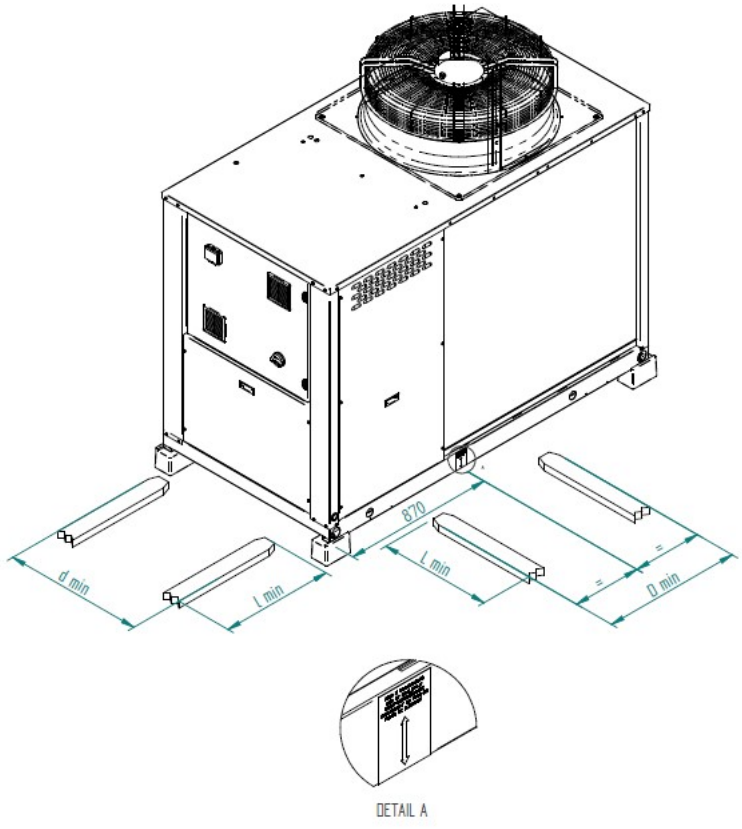



DETAIL A

L min	D min	l min	d min
900 mm	600 mm	1400 mm	600 mm

IGHP 011 - 013 - 017

L min	D min	l min	d min
1200 mm	800 mm	2000 mm	700 mm



All unit models have different weights according to the model.
Please see Technical Catalogue or the data plate applied on the casing for weight data.

CAUTION

⚠ The images are purely representative, therefore the correct position of lifting lugs is the one indicated on the unit.
NEVER MOVE THE LIFTING LUGS.

2.5.5 Storage precautions

If the units need to be kept in storage, make sure the maximum ambient temperature is no higher than the values indicated in the following table:

Maximum ambient storage temperature

Refrigerant	Class	Maximum temperature (°C)
R134a	A1	<= 50°C
R513A	A1	<= 50°C
R410A	A1	<= 50°C
R454B	A2L	<= 50°C

2.5.6 Precautions during operation

Operation must be carried out by competent personnel under a qualified supervisor.
All connections of the refrigerant circuit, electrical system and control unit wiring must be easily identifiable, painted or marked clearly in compliance with local safety prescriptions in force in the place of installation.

DANGER

⚠ **Do not remove or tamper with safety devices, protections, or the insulating materials installed in the unit or in the auxiliary equipment.**

All electrical connections must comply with the local prescriptions in the installation place.
The machine and the auxiliary apparatus must be earthen and protected against short-circuits and overloading.

When the main switch is closed the voltage in the electrical circuit reaches lethal values.
The maximum precautions must be adopted if work is to be carried out on the electrical circuit.
Do not open any protection panels on the electrical equipment while it is live, unless it is necessary for measurements, tests or adjustments.
This work should only be carried out by authorised operators, informed, trained and trained on the specific risks of flammable gases according to good practices and/or current standards in accordance with Annex HH IEC 60335-2-40, equipped with adequate equipment and wearing protections against electrical hazards.
In units where the variable frequency inverter pump (VF) is present, consider the following.

Faults to electronic devices due to electromagnetic fields

Electromagnetic fields are created when using motors with a frequency converter. This can disrupt electronic equipment. The consequence can be a malfunction of the device that can cause damage to people's health and even death, e.g. in the wearers of implanted active or passive medical devices. For this reason, people fitted with devices such as pacemakers must not stand near the system and/or the circulator during machine operation. In the case of magnetic or electronic data support devices, data may be lost.

DANGER

⚠ **Danger due to high magnetic field!**

A high magnetic field is always created in the pump, and this can cause injury or damage if the device is improperly disassembled.
- As a general rule, the rotor should only be removed from the motor by specialised, authorised personnel!
- Risk of getting crushing. When taking the rotor out of the motor, there is a risk that the strong magnetic field pulls it back sharply into its starting position.
- The extraction of the impeller, shield and rotor unit from the engine is very dangerous, especially for people using medical aids, such as pacemakers, insulin pumps, hearing aids, implants or the like. This may result in death, serious bodily injury and property damage. The workplace doctor must issue a declaration for people in this category.
- The strong magnetic field of the rotor may affect the operation of electronic devices, or damage them.
- If the rotor is outside the motor, magnetic objects may be violently attracted. This could lead to injury or material damage.
Once the installation is complete, the magnetic field of the rotor is brought back within the metallic circuit of the motor. In this way, outside the machine there is no magnetic field that may be harmful for people's health.

2.5.7 Precautions for maintenance and repair

Accumulations of electrostatic charges can generate, in the event of loss of refrigerant, a trigger in the event of a potentially explosive atmosphere; to avoid accumulation, antistatic clothing complying with EN 1149-5 must be used during maintenance and inspection of the machine. Antistatic clothing bears the following symbol:


EN 1149-5

WARNING

⚠ Maintainers working on the electrical components or on the components of the refrigerant circuit must be authorised, informed and trained on the specific risks from flammable gases according to good practices and/or current standards in accordance with ANNEX HH IEC 60335-2-40.

CAUTION

⚠ When it is necessary to discharge waste material do not pollute water pipelines, groundwater or watercourses. Avoid the combustion of materials that could cause atmospheric pollution. Protect the environment by using only approved storage methods.

Keep a written record of all maintenance and repair work carried out on the unit and auxiliary equipment. The frequency and nature of the work required of the unit must not cause abnormal operating conditions.

WARNING

⚠ Use exclusively the refrigerant specified on the unit's data plate.

Make sure that all the instructions concerning operation and maintenance are followed scrupulously and that the entire unit and all the accessories and safety devices are maintained in proper working order.
Maintenance and repairs must only be carried out by service technicians experienced in the handling of inflammable refrigerants and with the skills defined in EN 13313. Make the regular check of the refrigerant circuit seal as per the F-GAS directive.
The accuracy of pressure and temperature gauges must be regularly checked. If values exceeding the permitted tolerances are detected, the gauges must be replaced.
With the aid of tools suitable for use with inflammable refrigerants, inspect all the cooling system joints including the pipe unions and flared connections, and more generally all critical points (open joints) to prevent any possible leakage of refrigerant gas.
Before starting any work on refrigerant circuits, follow this procedure:

- drain the system (collecting the refrigerant) using tools suitable for use with inflammable refrigerants
- flush the cooling circuit with an inert gas such as nitrogen
- expel at an absolute pressure level of 30 kPa (0.03 MPa)
- flush again with inert gas
- open the circuit using pipe cutters (do not braze the pipes or components containing refrigerant)

All the operations must be carried out in a well aired place, with the aid of devices suitable for use with inflammable refrigerants.
If compressors or compressor oils need to be replaced, expel to an acceptable level to ensure no inflammable refrigerant is left in the lubricant.
Do not allow a concentration of explosive inflammable refrigerant to build up near sources of ignition, nor to penetrate into buildings.
When the repairs have been made, check there are no refrigerant leaks with the aid of tools suitable for use with inflammable refrigerants.
Check the safety devices and mechanical ventilation systems are working properly.

The above operations can only be carried out after checking that:

- maintenance personnel have been informed about the characteristics of the refrigerant
- maintenance personnel have been supplied with the necessary personal protective equipment
- the possibility of electrostatic discharge has been eliminated by wearing suitable clothing
- there are no ignition sources nearby
- there is good ventilation in the area for any braze-welding work that needs to be done
- suitable warning signs have been put up (for instance "no smoking" and "no access")

CAUTION

⚠ Never weld or carry out any heat generating task close to a system containing inflammable refrigerant.

Coloured tracers can be used in service-maintenance operations.

CAUTION

⚠ Do not weld or perform work that generates heat close to a system that contains oil or inflammable liquids. Systems that may contain oil or inflammable liquids must be completely drained and cleaned, for example with steam, before performing any such operations.

To prevent an increase in working temperature and pressure values clean the heat exchange surfaces (e.g. the fins of condensers) regularly. For all units establish a suitable time interval for cleaning procedures.

WARNING

⚠ DO NOT damage the pressure relief valves and other pressure limiting devices.

Do not clog these devices with paint, oil, or accumulated dirt.
Use exclusively original spare parts.
Never use an open flame as a light source to inspect parts of the unit.
When a repair has been completed make sure that no tools or detached parts are left in the unit.

The pipes of the cooling circuit, and generally speaking all cooling circuit components, are not designed to be used in any way other than that specified. Do not use the pipes as a support surface or a step for climbing up.

WARNING

⚠ Check the direction of rotation of the motors when starting the unit for the first time and after work has been performed on the electrical connections or on the power supply sectioning device.

All the protections must be refitted following maintenance or repair work.
Do not use flammable liquid to clean any component during operation.
If non-inflammable hydrocarbons containing chloride are used all the relevant safety precautions must be adopted to protect against the toxic fumes that may be given off.

CAUTION

⚠ Before removing any panels or dismantling any parts of the unit perform the following steps:

- Isolate the unit from the electrical power supply by disconnecting the supply upstream of the power feeding line.
- Lock the disconnector (where present) in the “OFF” position using a padlock.
Attach a tag to the disconnecting switch, stating “WORK IN PROGRESS - DO NOT SWITCH ON”.
- Do not switch on electrical power or attempt to start the unit if a warning label is attached.
- Wait at least 15 minutes before carrying out any operation, to allow the discharging of the condensers inside the inverter.
- Make sure the motor is completely idle. A freely rotating motor may produce dangerous voltage on the inverter terminals, even when the inverter isn't powered.
- Always use a multimeter to make sure there is no dangerous voltage present.

Coloured tracers can be used in service-maintenance operations.
Inspect all refrigerant circuit unions including connectors, flanges, and more generally all critical points (open unions) in order to prevent possible leakage of refrigerant gas.
Maintenance and repair must only be carried out by authorised operators, that are informed and trained on the specific risks of flammable gases according to good practices and/or current standards in accordance with ANNEX HH IEC 60335-2-40.
Inspect all the cooling system joints including connectors, flanges and more generally all critical points (open joints) in order to prevent possible leakage of refrigerant gas using specific tools suited for use with flammable refrigerants.

2.5.8 Warnings for extraordinary maintenance and repair

It does not give anyone else the authority to carry out maintenance work on the unit.

- Switch the unit off, disconnecting it from the mains supply.
- Check there are no flammable materials stored in the work area, and no ignition sources such as naked flames, electric heaters, etc.
- Make sure the work area is **well aired** before doing any work on the refrigerant circuit or carrying out any welding or brazing tasks.
- Drain off the refrigerant, using a recovery machine suitable for this type of flammable refrigerant. In the meantime, monitor the area with a gas leak detector.
- Flush the circuit with inert gas (e.g. nitrogen).
- Drain the circuit with a suitable vacuum pump.
- Flush again with inert gas (e.g. nitrogen).
- Open the circuit.
- Using a pipe cutter, cut the cooling circuit components that need to be replaced. DO NOT debraze.



2.5.9 Disposal, disassembly and recycling

The product was designed and built with recyclable materials.
The correct waste sorting for the subsequent start-up of the equipment disposed of for recycling, treatment and for compatible environmental disposal, contributes to prevent possible negative consequences on the environment and health. It also favour the recycling of the materials the equipment is made up with.
The unit may include all or some of the materials listed below:

- refrigerant fluid R454B
- copper parts
- aluminium parts
- carbon steel parts
- stainless steel parts
- PVC parts
- CFC-free synthetic insulating material
- polystyrene parts
- PVE oil
- brass

During dismantling, the compressor, pumps, fans, exchangers (if working) can be recovered for possible re-use thanks to specialised centres. All materials must be recycled or disposed of in compliance with the corresponding national regulations.
Refrigerant, oil and possible anti-freeze solutions recycling must be done by specialised companies in compliance with the corresponding local and national legislation.
Electrical and electronic materials cannot not be disposed of together with domestic general waste. They must be disposed of in special collection centres.
Units must be treated at a centre specialised in re-conditioning, recycling and recovery of materials.
The waste sorting of this equipment that reached the end of its useful life is organized and managed by the manufacturer of the newly purchased equipment replacing the present one, if applicable, or, in all other cases by the manufacturer of this equipment.
Therefore, the user who wishes to discard this equipment and has decided to purchase a new equivalent one to replace the present one, must refer to the manufacturer of the new equipment and follow the procedures established by the latter in terms of selective collection of the equipment that has reached the end of its useful life.
Conversely, the user who wishes to discard this equipment and has not decided to purchase a new equivalent one to replace the present one, must refer to the manufacturer of this equipment and follow the procedures established by the latter in terms of selective collection of the equipment that has reached the end of its useful life.

2.6 Refrigerant gases

R454B refrigerant is classified as group 1 “dangerous” on the basis of the criteria of the pressurised equipment directive 2014/68 / EU.
This product contains fluorinated greenhouse gases covered by the Kyoto protocol (1997) and subject to the reporting obligations of the substances listed in annex II of the European F-gas regulation 2024/573:

- Type of refrigerant: R454B
- Global Warming Potential GWP: 465

In accordance with Standard ISO-817, R454B (E), it is classified in safety group A2L: low flammability
The refrigerant generates toxic gases when placed in contact with open flames.
In order to ensure proper installation, the local regulations and the specified safety standards must be respected. In their absence, reference must be made to the EN-378 standard, with particular regard to the sections concerning flammable refrigerants. The end user must check whether approval is required from the competent authorities for the installation of the unit.
These units may be charged exclusively with R454B.
Never attempt to mix refrigerant gases.
To clean a heavily contaminated refrigerant circuit, e.g. after the burning of a compressor, it is necessary that the work is carried out by authorised operators, that are informed and trained on the specific risks of flammable gases according to good practices and/or current standards in accordance with ANNEX HH IEC 60335-2-40.
The use and storage of cylinders containing refrigerants must be in compliance with the prescriptions of the manufacturers of the cylinders and in compliance with the applicable safety laws and prescriptions in force in the place of installation.

CAUTION

⚠ Maintainers working on the electrical components or on the components of the refrigerant circuit must be authorised, informed and trained on the specific risks from flammable gases according to good practices and/or current standards in accordance with ANNEX HH IEC 60335-2-40.

2.6.1 Refrigerants safety datasheet

Designation:	R454B (R1234yf 31.1%, R32 68.9% [kg/kg]).

INDICATION OF HAZARDS

Main hazards:	Asphyxia. Highly inflammable gas.
Specific hazards:	Rapid evaporation can cause frost burns. May explode if heated.

FIRST AID PROCEDURES

General information:	In high concentrations, it can cause asphyxiation. The symptoms may include loss of mobility and/or consciousness. Using self-contained breathing apparatus, move the victims to a ventilated area; lay them down and keep them warm. Call a doctor. Only practice artificial respiration if they have stopped breathing.
Inhalation:	Using self-contained breathing apparatus, move the victims to a ventilated area; lay them down and keep them warm. Call a doctor.
Contact with the eyes:	Wash thoroughly with plenty of clean water for at least 15 minutes and seek medical assistance.
Contact with the skin:	Contact with the evaporating liquid can cause the freezing of the skin. In the event of cold burns, rinse with water for at least 15 minutes. Apply a sterile dressing. Consult a doctor.

FIRE PROTECTION MEASURES

General fire risks:	Heat may cause the containers to explode.
Extinguishing media:	Water vapour or spray. Dry powder. Foam.
Inappropriate extinguishing media:	Carbon dioxide.
Specific hazards:	The vapours may form a flammable mixture with the air. Owing to the high pressure of the vapour, an increase in temperature may cause the containers to explode.
Specific methods:	In the event of fire: stem the leakage if this can be done with no danger. Do not put out the flames on the leakage itself, as there is a risk of an uncontrolled explosive reignition. Continue to apply water from a protected position until the container has cooled down. Use extinguishers to put out the fire. Isolate the source of the fire, or leave it to burn out.

MEASURES IN THE EVENT OF ACCIDENTAL ESCAPE

Individual precautions:	Evacuate the area. Ensure adequate ventilation. Assess the risk of a potentially explosive atmosphere. In the event of a leakage, eliminate every possible source of ignition. Monitor the concentration of the leaked product. Prevent it from running into drains, cellars, excavation areas or places where the accumulation may be dangerous. If it has not been proven that the air is breathable, use self-contained breathing apparatus to enter the area involved.
Environmental precautions:	Avoid spillages or leaks.

HANDLING AND STORAGE

Handling Technical measures/precautions:	Only suitably trained and experienced personnel are permitted to handle pressurised gases. Use only specific equipment suitable for the product, the pressure level and the operating temperature. Purge the system with dry inert gas (e.g. helium or nitrogen) and disconnect it before inserting the product. Bleed all the air from the system before inserting the gas. Containers with inflammable or explosive substances (or which have held such substances) must not be made inert using liquid carbon dioxide. Assess the risk of a potentially explosive atmosphere and the need for anti-explosion equipment. Avoid the build-up of an electrostatic charge. Keep away from ignition sources (including electrostatic charges). Make sure the electrical equipment used in an explosive atmosphere has an earth connection. Use non-sparking tools. Refer to the supplier's instructions for details of how to handle the container. The substance must be handled in accordance with good industrial hygiene and safety procedures. Before using, make sure the entire system has been (or is regularly) checked for leaks. Protect the containers from physical damage: do not drag or roll them, or let them slide or fall. Do not remove or damage the labels provided by the manufacturer to identify the contents of the cylinders. When moving the cylinders, even over a short distance, use equipment suitable for the purpose (pallet truck, cylinder-holder carriage, etc.). Always fix them in a vertical position, closing all the valves if not used. Ensure adequate ventilation. Avoid any water flowback into the container. Prevent the flowback of gas into the container. Avoid any flowback of water, acids and alkalis. Keep the containers in cool, well aired places at a temperature lower than 50°C. Respect all the local regulations and laws regarding the storage of the containers. Do not eat, drink or smoke while using the product. Do not use naked flames or electric heating devices to increase the pressure of the container. Do not remove the valve protection cap until the container has been firmly fixed in place (attached to a wall, drum, etc.) and is ready to be used. Damaged valves must be send back to the supplier straight away. Close the valve of the container after every use and when it is empty (even if still connected to the equipment). Never attempt to repair or alter the valves or safety devices of the containers. Replace the valve outlet seal or the connections and the cap (if fitted) when the container is disconnected from the equipment. Keep the container valve outlet clean and free of contaminants, especially oil and water. If the user has any difficulty in using the cylinder, close the valve and contact the supplier. Never attempt to transfer the gases from one container to another. The safety guards or tulip screw caps of the container valves must be in place.
Recommendations for safe use:	Do not breath fumes or aerosol.
Storage:	All the electrical equipment in the storage areas must be compatible with the risk of potentially explosive atmospheres. Do not store near oxidising gases or other oxidants in general. The containers must not be stored in conditions that facilitate corrosion. The stored containers should be checked regularly to assess the general conditions and identify any leaks. The safety guards or tulip screw caps of the container valves must be in place. Keep the containers in a place free of any fire risk and away from heat and ignition sources. Keep away from combustible substances.

CONTROL OF INDIVIDUAL EXPOSURE/PROTECTION

Control parameters:	DNEL: R32 7035 mg/m³, R1234yf 950 mg/m³.
Respiratory protection:	Not requested.
Protection of the eyes:	Safety spectacles.
Protection of the hands:	Gloves resistant to low temperatures and mechanical risks.

PHYSICAL AND CHEMICAL PROPERTIES

Colour:	Colourless.
Odour:	Light, similar to ether.
Boiling point:	-50.9°C at atmospheric press.
Flammability or explosiveness limit:	11.25 - 22 vol%.
Relative density:	0,98 (25°C)
Vapour density (air=1):	2,2 (15°C)
Solubility in water:	Negligible.

STABILITY AND REACTIVITY	
Stability:	Not classified as dangerous for reactivity.
Possibility of dangerous reactions:	May form a potentially explosive atmosphere in the air. May react violently with oxidants.
Materials to avoid:	Air and oxidants. For the compatibility with the materials, refer to the latest version of ISO-1114. Strong alkalis. Strong oxides. Earthy alkaline metals. Chemically reactive metals (such as calcium, aluminium powder, zinc and magnesium).
Hazardous decomposition by-products:	No known hazardous decomposition compounds.

TOXICOLOGICAL INFORMATION	
Acute toxicity:	Not classifiable on the basis of the information available.
Local effects:	Light hydrocarbons like this one have been associated with heart problems in situations of misuse. Hypoxia or the injection of substances such as adrenaline mitigates these effects.
Long term toxicity:	No carcinogenic, teratogenic, or mutagenic effects observed in laboratory animals.

ECOLOGICAL INFORMATION	
Global warming potential GWP (EN378-1:2021):	465
Ozone depletion potential ODP (R11=1):	0
Considerations on disposal:	Avoid direct drainage in the environment. Do not drain the product in places where accumulation may be harmful. Request recovery/recycling information from the manufacturer or supplier.

CHAPTER 3

DESCRIPTION

3.1 General information

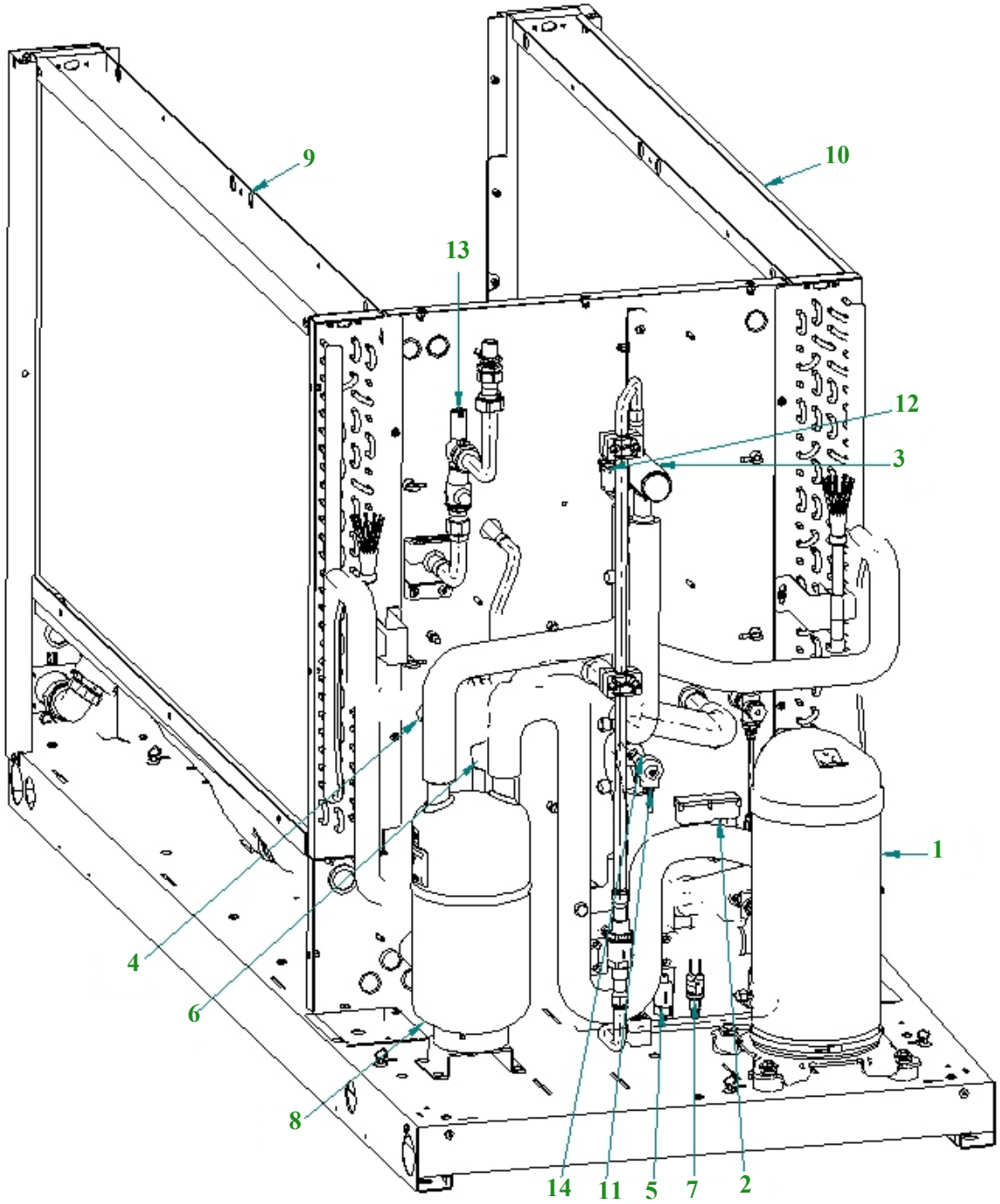
They are monobloc units with air condensation equipped with scroll hermetic compressors with variable speed, water unit consisting of plate evaporator, storage tank (optional), pump (optional) and condenser formed by finned batteries and axial fans.
The management of each chiller is entrusted to a microprocessor control that manages all the main functions including adjustments, alarms and external interface.
The coolant used is R454B.
All machines are made using premium brand components, and are designed, manufactured and controlled in accordance with ISO 9001 standards.

3.2 Water and refrigerator circuit

(See the attached diagrams.)
The descriptions in the following paragraphs refer to machines that work in CHILLER mode (i.e. to cool the user water).
The cooling cycle can be switched to HEAT PUMP mode by means of an electrically commanded 4-way valve that reverses the coolant flow, thereby heating the water in the evaporator.
For this reason, the same observations made for CHILLER mode operation will hold true, bearing in mind that the evaporator will work as a condenser and the condenser (of HEAT PUMP mode operation) will work as an evaporator.
All the units described in this manual use the same operating principle.
The refrigerant is pumped from the hermetic cooling compressor into the condenser.
The condenser is a heat exchanger of the finned pack type, skimmed by an air flow produced by one fan.
After leaving the compressor, the refrigerant passes through the reverse cycle valve before it reaches the condenser.
After the condenser, the refrigerant passes through an expansion valve.
It then enters the evaporator, which is of the plate type.
When it leaves the evaporator, it enters the liquid separator and returns to the compressor, then the cycle is repeated.
All the braze-welding for connecting the various components of the cooling circuit is made with silver alloy.
Below is information relating to the components of standard machines.
Components other than standard ones may be used to meet particular requirements.
In this case, refer to the project quote data.
The IGHP inverter range is equipped with the following components (see images):
1. Scroll compressor
2. Water differential pressure switch
3. Cycle reversing valve
4. Low pressure transducer
5. High pressure transducer
6. Bi-flow filter
7. High pressure switch
8. Liquid separator
9. Left battery
10. Right battery
11. Unipolar stator for electronic thermostatic valves
12. Coil
13. Refrigerant safety valve
14. Electronic thermostatic valve
15. Liquid receiver
16. Inverter
17. Safety valve
18. Air vent valve
19. Electrical panel
20. Expansion vessel (option)
21. Pump (option)
22. Water pressure gauge
23. Accumulation tank (option)
24. Plate exchanger
25. EC axial fan
26. Water outlet connection plate

27. Water inlet connection plate

IGHP 007-009



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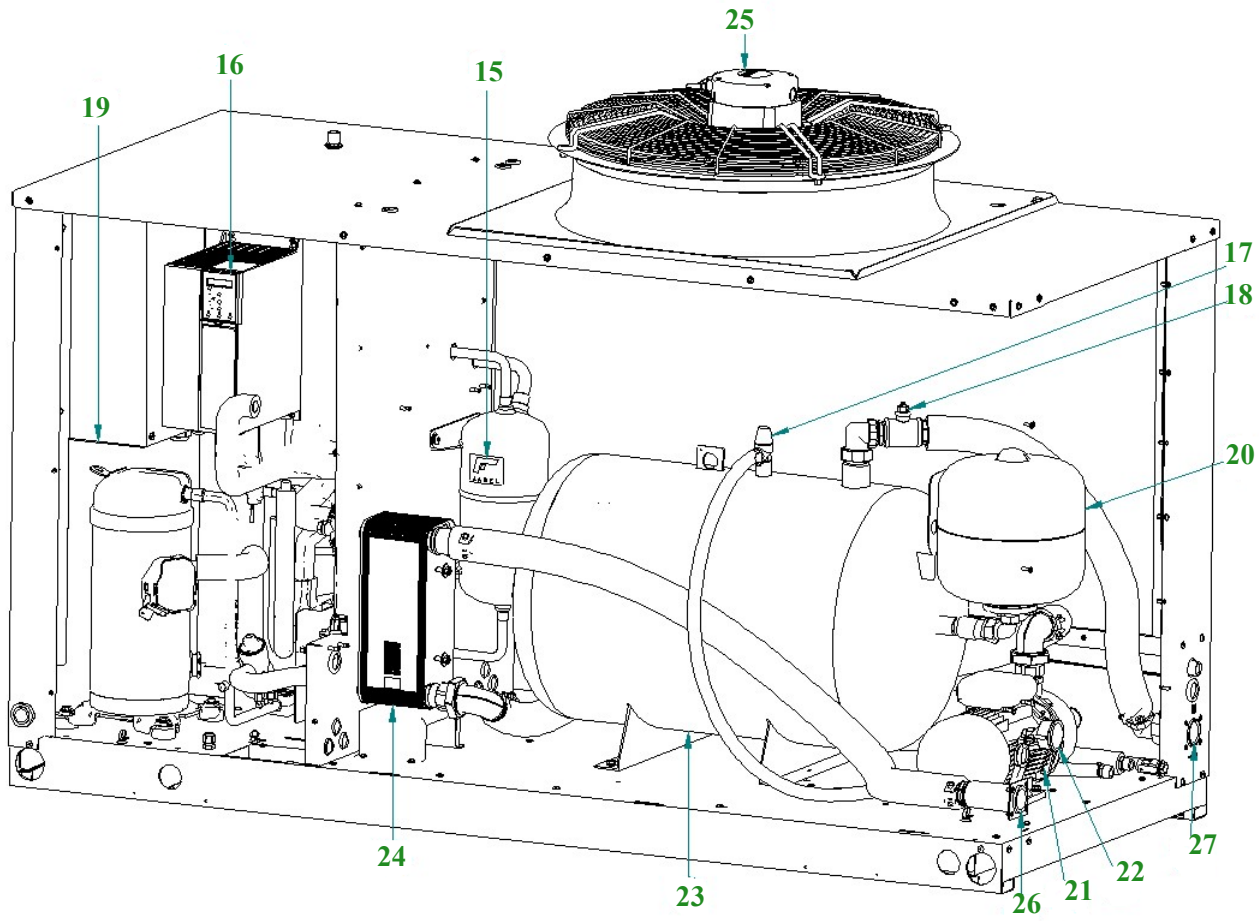

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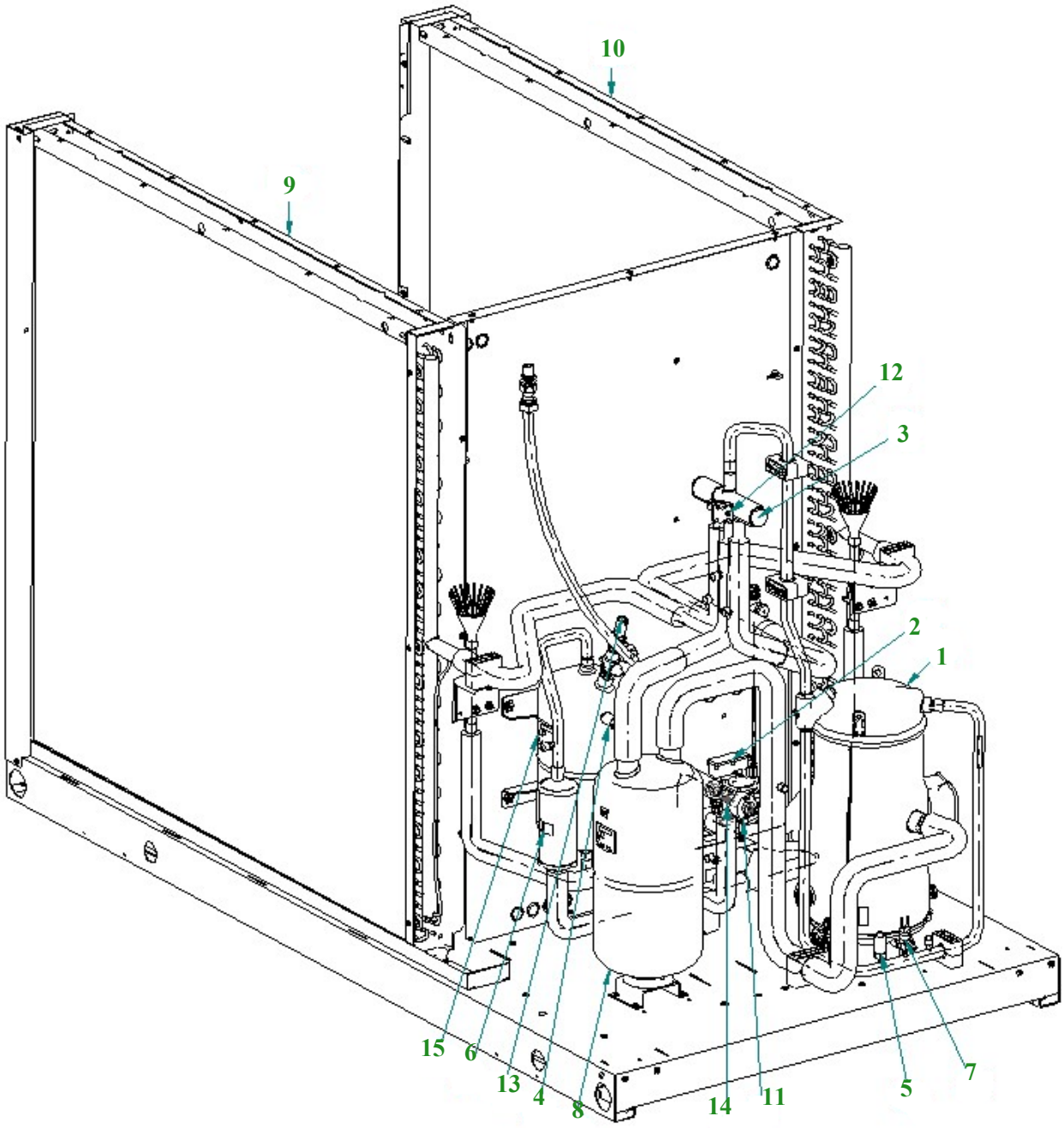
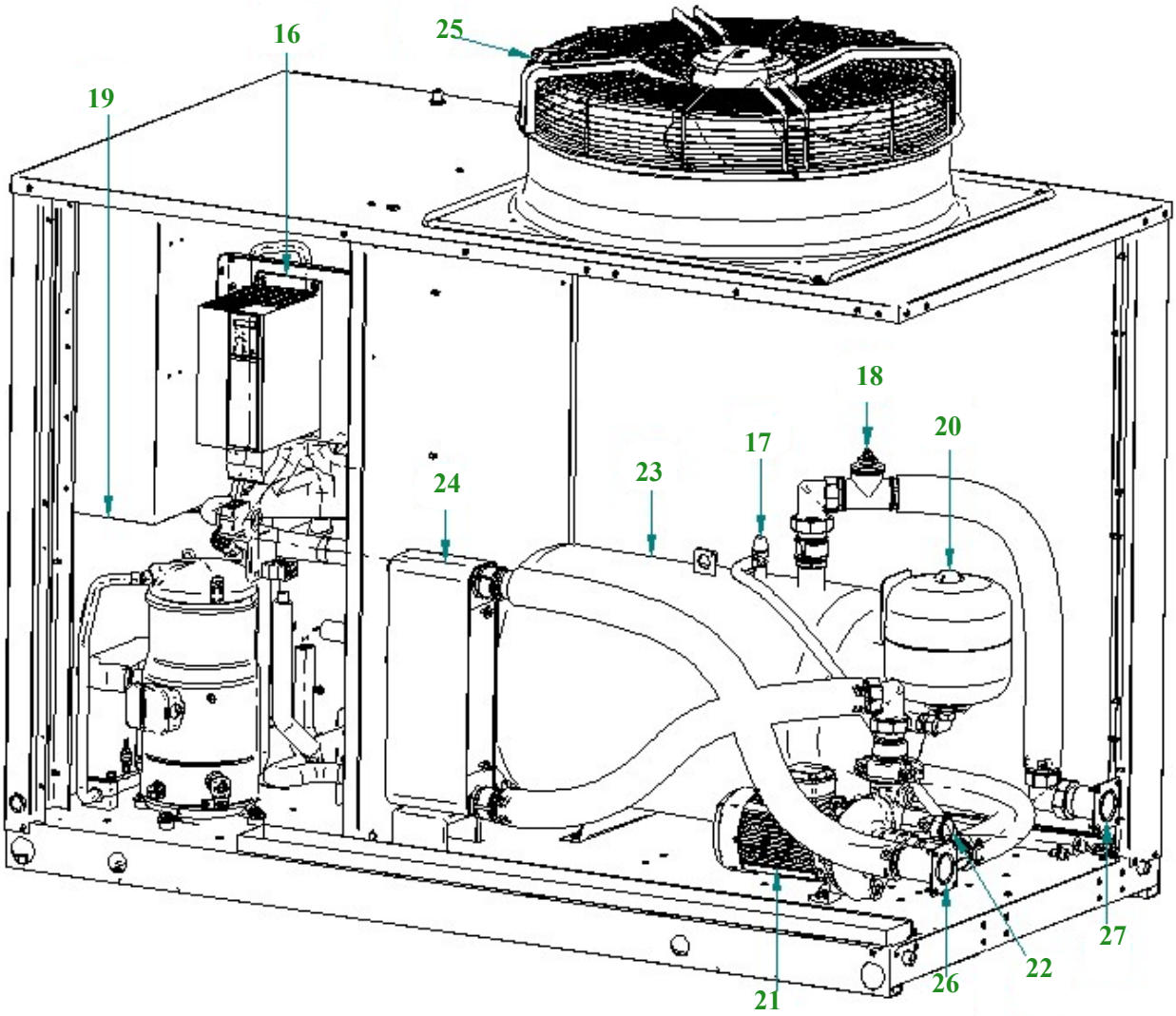


IGHP 011-017



Depending on the operating mode (CH or HP), the cooling circuit cools or heats the water flow by means of a plate evaporator in which the coolant evaporates on one side and the liquid to be cooled flows on the other side.
The cooling compressor is commanded by an electronic control unit that regulates the water outlet temperature from the machine in order to keep it within the predefined limits.

WARNING

⚠ The pump must never operate in the absence of water.

3.2.1 Water circuit

When the hydraulic unit is not present, the water circuit will consist only of the plate heat exchanger, where the water flows and exchanges heat with the refrigerant liquid in evaporation phase (CH operation) or in condensing phase (HP operation). If the hydraulic unit is present, a pump sucks up water from the inlet connection or from the accumulation tank (if present) and pushes it into the plate exchanger.

CAUTION

⚠ For correct operation, install the filter (supplied with the unit) close to the unit's water inlet connection (with 0.4 mm mesh). Failure to comply with this requirement may cause irreparable damage to the evaporator.
In the case of plate evaporators, the clogging of even a few plates (or gaps) can cause the plate to seize (clogging), leading to damage of part of the exchanger, even if water flow seems regular and operation is apparently normal.
For this purpose there is a plate showing the standard water filter symbol affixed to the unit alongside the water inlet connection.

NOTE

For the correct operation of the heat pump, it is necessary to guarantee the availability of a minimum amount of water in the system equal to 10 liters/kW of nominal thermal power, such as to avoid frequent ignition cycles and allow the execution of defrosting cycles.
However, greater amounts of water are always preferable, to further reduce the on and off cycles of the compressors and to increase the efficiency of the system.

3.3 Materials

Data for materials are referred to standard units.
Non-standard materials may be used in order to meet specific requirements.
In this case, refer to the project quote data.

3.3.1 Casing

The entire base, the uprights and the buffer panels are made of galvanised carbon steel sheet and are screwed together.
All panels undergo phosphor degreasing treatment followed by epoxy polyester power coating.
The structure is designed to ensure easy access to all the machine components.
In Super-Silenced units (XLN), the compressor compartment is lined with sound-absorbing material to reduce the noise levels.

3.3.2 Materials in contact with the liquid of the user circuit

The following description refers to the machine operating in CHILLER mode; bear in mind that, after the reversal of the cooling cycle (when the unit is working as a heat pump - HEAT PUMP mode), the evaporator will work as a condenser.
The evaporator is of the plate type, in braze-welded stainless steel with copper. The tank is made of carbon steel and the pipes are copper.

3.3.3 Hydraulic unit (optional)

Upon request, these units can be equipped with a hydraulic unit that may consist of:

- pump P1
- tank + pump P1
- pump P1 VF
- tank + pump P1 VF
- pump P2
- tank + pump P2
- pump P2 VF
- tank + pump P2 VF

Pump P1:
With a working head of approx. 10 m.c.a. The pump is already connected to the evaporator and the water inlets/outlets (see overall dimension diagrams in the manual). The electronic control unit commands the pump and manages the thermal protection alarm.
Pump P2:
With a working head of approx. 20 m.c.a. The pump is already connected to the evaporator and the water inlets/outlets (see overall dimension diagrams in the manual). The electronic control unit commands the pump and manages the thermal protection alarm.
Pump P1 VF:
Inverter pump with a working head of approx. 10 m.c.a. The pump is already connected to the evaporator and the water inlets/outlets (see overall dimension diagrams in the manual). The electronic control unit commands the pump and manages the thermal protection alarm.
The speed is fixed. The default rpm parameters are set at the factory and correspond to the nominal design conditions. For any changes, please contact the Service Centre.
Pump P2 VF:
Inverter pump with a working head of approx. 20 m.c.a. The pump is already connected to the evaporator and the water inlets/outlets (see overall dimension diagrams in the manual). The electronic control unit commands the pump and manages the thermal protection alarm.
The speed is fixed. The default rpm parameters are set at the factory and correspond to the nominal design conditions. For any changes, please contact the Service Centre.

CAUTION

⚠ The frequency converter contains DC bus capacitors that can remain charged even when the frequency converter is not powered.
Wait for the capacitors to discharge completely before performing any maintenance or repair work. The waiting time is 15 minutes.

Tank and pump unit:
A horizontal, cylindrical tank made of carbon steel with an aluminium-plated, anti-condensate insulating layer. For the description of P1 and P2 pump, see above. The tank and pump are installed on the machine base and connected to each other, via EPDM pipes insulated with armaflex. The connections between the evaporator, pumps and machine connection points are made with tubes insulated with armaflex. This option also includes:

- an expansion tank
- an automatic air vent valve
- a drainage tap
- a safety valve

WARNING

⚠ The pump must never operate in the absence of water.

3.3.4 Fan(s)

All the machines are fitted with axial fans.
The units are equipped with fans with plastic blades and suitably radiated high-density polystyrene conveyors.
All the units have fans that are electronically adjusted with an integrated inverter motor and EC technology (permanent magnets and electronic switchover).
The protection level is IP55 with insulation class F, to enable outdoor operation in all climates.
The assembly is completed by an external fan support grille to prevent accidents.

CAUTION

⚠ In the event of maintenance work on the EC fans, the fact that condensers are used means it is necessary to wait at least 15 minutes after disconnecting the power supply to the unit before opening the box containing the electrical contacts.
- To avoid condensation the drive must be continuously energized due to the application of heat, with interruptions such that cooling to the point of condensation does not occur.

3.3.5 Compressor

The units are equipped with a Scroll compressor type with variable speed.
In Super-Silenced units (XLN), these components are positioned in the compressor site, sound isolated with a sound-absorbent mattress positioned on the side panels, compressor site - fan site separating panel and compressor site closing front panel.

3.3.6 Flow meter (optional)

The units can be equipped with a volumetric flow meter. The flow rate is shown on the display and it can be found in the Modbus parameters.

CHAPTER 4

INSTALLATION

CAUTION

⚠ Before installing or operating these machines, make sure that all personnel have read and understood Chapter 2 “Safety“ of this manual. The unit must be installed in accordance with current national legislation in the country of use.

4.1 Overall dimensions

See the enclosed diagrams.

4.2 Installation precautions

Always perform maximum preparatory work before the unit arrives on site: drilling holes and penetrations, installing cable walkways, installing water piping, etc.
Before transporting the unit to its final location, perform a complete leak detection.
It is also strongly recommended to repeat the detection during the different phases of installation, especially if commissioning takes several days.
Installation work must be carried out by competent personnel under a qualified supervisor.
The connections to be made concern the process water circuit. For the connection to the mains power supply consult the technical documentation attached to the machine.

DANGER

⚠ **The unit must be positioned in an area where there are no continuous ignition sources (e.g. naked flames).**

4.3 Location

1. Maximum height above sea level 2000 metres.
2. The machine must only be installed outdoors and in places where natural ventilation is not hampered.
3. In fact, it is strictly forbidden to install the machine within Atex environments generated by other machinery/ plants. If the machine is installed on the roof of a building, the place of installation must be inspected in order to ensure that it is protected against lightning (evaluation of the risk of lightning according to EN 62305).
4. The refrigerant is heavier than air, so even a small leakage may cause a build-up of gas if it seeps into closed areas and stagnates; For this reason, it is important to ensure natural ventilation in the area where the unit is installed.
5. Install the unit so that, in the event of a leakage, the refrigerant cannot seep into buildings; this means guaranteeing that it cannot penetrate via doors, windows or any ventilation opening, and ensuring there is no underground infiltration leading to pockets of refrigerant. The technical rule states the need to maintain minimum installation distances from underground rooms, sewage traps, rainwater traps and any other accessible opening or empty underground container. The distance is determined on the basis of the deposit volume. This problem can be managed by applying the technical fire prevention rule in the place where the machine is installed.
6. The safety valves (if present) must be directed to the outside of the unit in a safe area and away from possible sources of ignition. The discharge must be conveyed at least 1 metre from the ground, and facing upwards. The cross section and length of the discharge pipe must comply with the national laws and the directives applicable in the place of installation.
   To avoid any possible clogging of the pressure discharge pipe, fit a cover to keep out rainwater.
7. The ambient air must be clean, avoid sea ambients (brackish air), and not contain flammable gas or corrosive solvents.
8. The minimum and maximum working ambient temperature are specified on the unit data plate. Ensure that the unit is not installed in flows of hot air emitted by other equipment.
   In extreme temperature conditions, the protection devices may be triggered.
9. Do not obstruct or interfere with the air flow produced by the unit; comply strictly with the minimum spaces/ distances specified in the installation drawings.
10. The machine must be installed on a perfectly horizontal flat surface, built and calculated to withstand the machine’s operating weight, especially in the contact points highlighted in the installation drawing. **Installations which fail to comply with the above requirements will immediately render the manufacturer’s warranty cover null and void, and could cause machine malfunctioning or even lockout.**

11. The units are shipped from the factory with polypropylene supports positioned under the base that must be removed during installation. It is advisable, however, to insert a stiff rubber belt between the main frame and the support surface. If greater insulation is needed, anti-vibration supports should be used.
12. Leave some clearance around the machine for access during service interventions (see Annexes).
13. While the heat pump is in operation, the air in contact with the finned coil may reach the dew point, causing the moisture contained in the air to condense. The quantity of condensate water produced depends on ambient conditions. The installation of the unit must allow the correct drainage and outflow of the condensate water.
14. Install a water tank if necessary. This will help reduce the extent of the temperature swings of the chilled water (DT).

4.4 EMI filter kit (optional)

When the unit is connected to a public power grid, an EMI filter must be installed to ensure correct electromagnetic emission levels and to prevent the system from interfering with other electrical devices on the power line.
To meet this requirement, a dedicated kit is available. It must be ordered separately and installed inside the electrical panel according to the instructions in the wiring diagram.

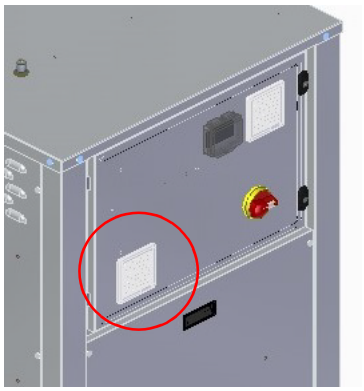
WARNING

⚠ The kit must be installed by authorised personnel who are trained, informed, and instructed on specific electrical risks and on the specific risks of flammable gases.

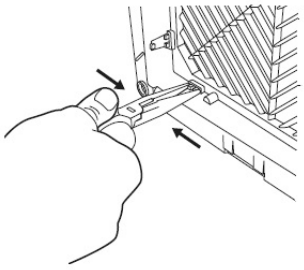
CAUTION

⚠ Always ensure that the power to the unit has been disconnected using the disconnect switch and that the minimum time necessary to discharge the capacitors inside the inverters has been permitted (at least 15 minutes).

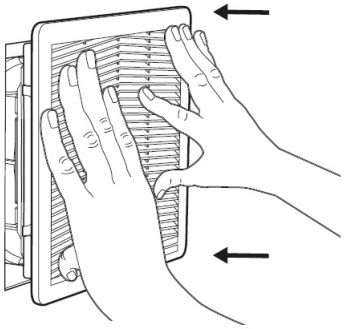
4.4.1 Electrical panel cooling fan



For models **IGHP 007** and **IGHP 009** only, it is also necessary to install the electrical panel cooling fan supplied in the EMI Filter Kit in place of the air filter shown in the figure.
To install the cooling fan, remove the air filter attached to the electrical panel door.
For positioning and wiring, refer to the wiring diagram.



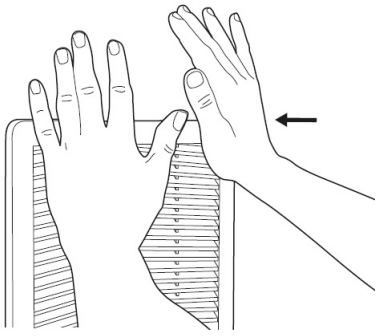
Dismounting of the air filter
If the filter cannot be removed from its seat, please follow the instruction below: using fine-nose pliers, apply light pressure to the clips while pushing inwards towards the enclosure. This will release the clips from the base.



Mounting the filter fan
Insert the filter fan into the mounting hole.

NOTE
The bottom side is marked by the logo plate down on the right.

Push on each corner of the cover so that the filter fan is correctly clamped.



CAUTION

⚠ Press on the filter fan up to the required depth so that the clips return to their original position.

We recommend the wearing of suitable protective clothing: gloves EN 420 and EN 388, safety glasses EN 166 - 170

CHAPTER 5

HYDRAULIC CONNECTIONS

5.1 Evaporator water limit features

Contents		Concentration mg/l or ppm	Material	
			AISI 316L	Copper
pH		<6	or	or
		6-7.5	or	or
		7.5-9	+	+
		>9	+	or
Alkalinity	HCO_3^-	<70	+	or
		70-300	+	+
		>300	+	or
Sulphate	SO_4^{2-}	**<70**	+	+
		70-300	+	-
		>300	+	-
Alkalinity/Sulfate	HCO_3^-/SO_4^{2-}	**>1**	+	+
		<1	+	-
Electrical conductivity	µS/cm	<10	+	or
		10-500	+	+
		>500	+	or
Ammonium	NH_4	**<2**	+	+
		2-20	+	or
		>20	+	-
Free chlorine	Cl_2	**<1**	+	+
		1-5	-	or
		>5	-	-
Hydrogen sulphide	H_2S	**<0.05**	+	+
		>0.05	+	-
Free carbon dioxide (aggressive)	CO_2	**<5**	+	+
		5-20	+	or
		>20	+	-
Nitrate	NO_3^-	**<100**	+	+
		>100	+	or
Iron	Fe	**<0.2**	+	+
		>0.2	+	or
Aluminium	Al	**<0.2**	+	+
		>0.2	+	or
Manganese	Mn	**<0.1**	+	+
		>0.1	+	or

Chloride content (Cl^-)	Maximum temperature			
	60°C	80°C	120°C	130°C
< 10 ppm	AISI 304L	AISI 304L	AISI 304L	AISI 316L
≤ 25 ppm	AISI 304L	AISI 304L	AISI 316L	AISI 316L
≤ 50 ppm	AISI 304L	AISI 316L	AISI 316L	
≤ 80 ppm	AISI 316L	AISI 316L	AISI 316L	
≤ 150 ppm	AISI 316L	AISI 316L		
≤ 300 ppm	AISI 316L			

+	Good resistance
or	When multiple factors are “or” corrosion can occur
-	Not recommended

WARNING

⚠ Note: It is important to note that this water specification is not a guarantee against corrosion, but should be considered a tool to avoid the most critical water applications.

CAUTION

⚠ For correct operation, install the filter (supplied with the unit) close to the unit's water inlet connection (with 0.4 mm mesh). Failure to comply with this requirement may cause irreparable damage to the evaporator.
In the case of plate evaporators, the clogging of even a few plates (or gaps) can cause the plate to seize (clogging), leading to damage of part of the exchanger, even if water flow seems regular and operation is apparently normal.
For this purpose there is a plate showing the standard water filter symbol affixed to the unit alongside the water inlet connection.

5.2 Expansion vessel

Models with a hydraulic unit are already equipped with an expansion tank.
If the customer is handling the installation, or an additional expansion tank needs to be installed, it must always be connected to the pump.
To calculate the minimum volume of the expansion tank necessary for a given installation, the following calculation can be used, valid if the pressure in the circuit is less than or equal to 0.5 bar when the pump is stopped and the maximum operating pressure of the expansion tank is greater than or equal to 6 bar.
The volume of expansion vessel V in litres is provided by the formula:
$V = 2 \cdot Vt \cdot (Ptmin - Ptmax)$
where:

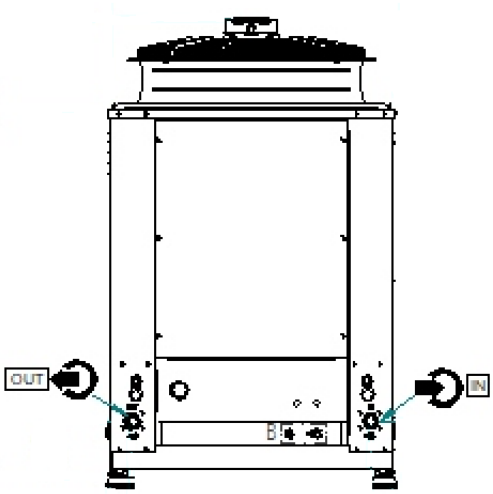
Vt=	Total circuit volume in litres
Ptmin=	Specific weight at the minimum temperature that the water can reach during the year °C (even with the system idle)
Ptmax=	Specific weight at the maximum temperature reachable by water during the year in °C (even when the system is stopped)

Calculation example:
Vt=200 litres
percent ethylene glycol by volume=30%
tmin = 5°C from the table **Ptmin** = (1.045+1.041)/2 = 1.043
tmax = 40°C from the table **Ptmax** = 1.0282
$V=2 \cdot 200 \cdot (1.043 - 1.0282)=5.92$ litres

Specific densities table P

	% Glycol	0%	10%	20%	30%	40%
Temperature [°C]	-20	1.0036	1.0195	1.0353	1.0511	1.0669
	-10	1.0024	1.0177	1.033	1.0483	1.0635
	0	1.0008	1.0155	1.0303	1.045	1.0598
	10	0.9988	1.013	1.0272	1.0414	1.0556
	20	0.9964	1.0101	1.0237	1.0374	1.051
	30	0.9936	1.0067	1.0199	1.033	1.0461
	40	0.9905	1.003	1.0156	1.0282	1.0408

5.3 Hydraulic connections



The units have threaded water connections (refer to the figure). The pipe diameters are shown in the table below.

1. When connecting the machine to the water pipes, respect the direction of the water (as shown in the figure or in the overall dimension drawings attached).
2. Provide two valves (one at the inlet, one at the outlet) to isolate the unit in the case of maintenance work without having to empty the user water circuit.
3. Fill the tank (if installed) with water, using a remote filling system.
   In this case, the air must be manually vented from the tank by means of the manual valve (*).
   If air frequently gets into the water circuit, you are advised to fit an automatic air vent valve.

(*): Use the pressure gauge to check the tank pressure while the pump is idle, making sure the pressure in the water circuit is about 0.5 bar to ensure that the pump - when operating - doesn't depressurise the tank and thereby let air in, or in any case prevent the use of the venting systems (whether manual or automatic).

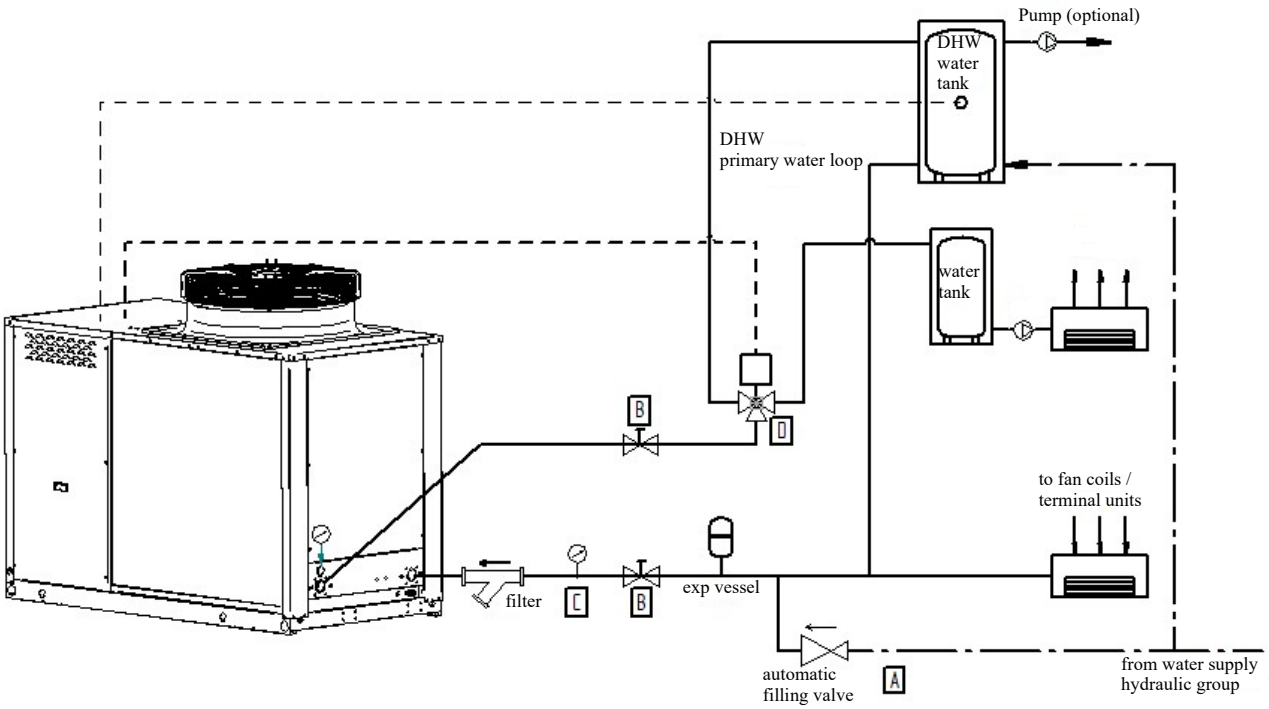
CAUTION

⚠ For correct operation, install the filter (supplied with the unit) close to the unit's water inlet connection (with 0.4 mm mesh). Failure to comply with this requirement may cause irreparable damage to the evaporator.

The hydraulic system must be sized so that the pressure values of the water flowing into the machine are no higher than those shown in the table:

Model	IN/OUT water connection diameter	Max. pressure [bar]
IGHP 007	1 1/4”	6
IGHP 009	1 1/4”	6
IGHP 011	2”	6
IGHP 013	2”	6
IGHP 017	2”	6

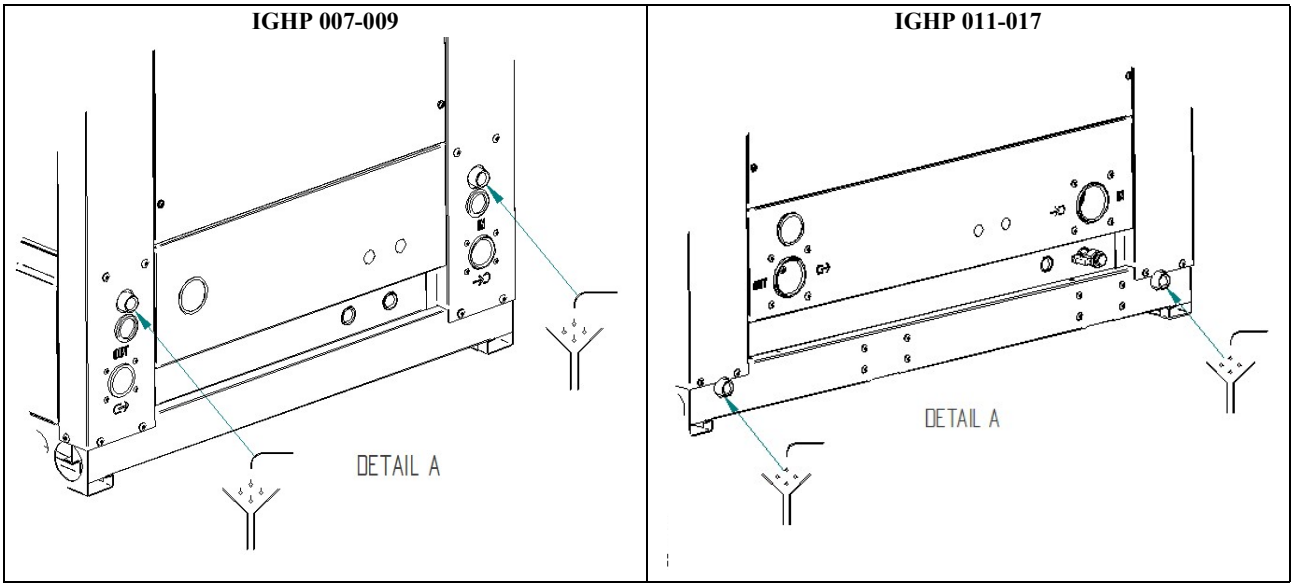
Below is an example of a functional diagram



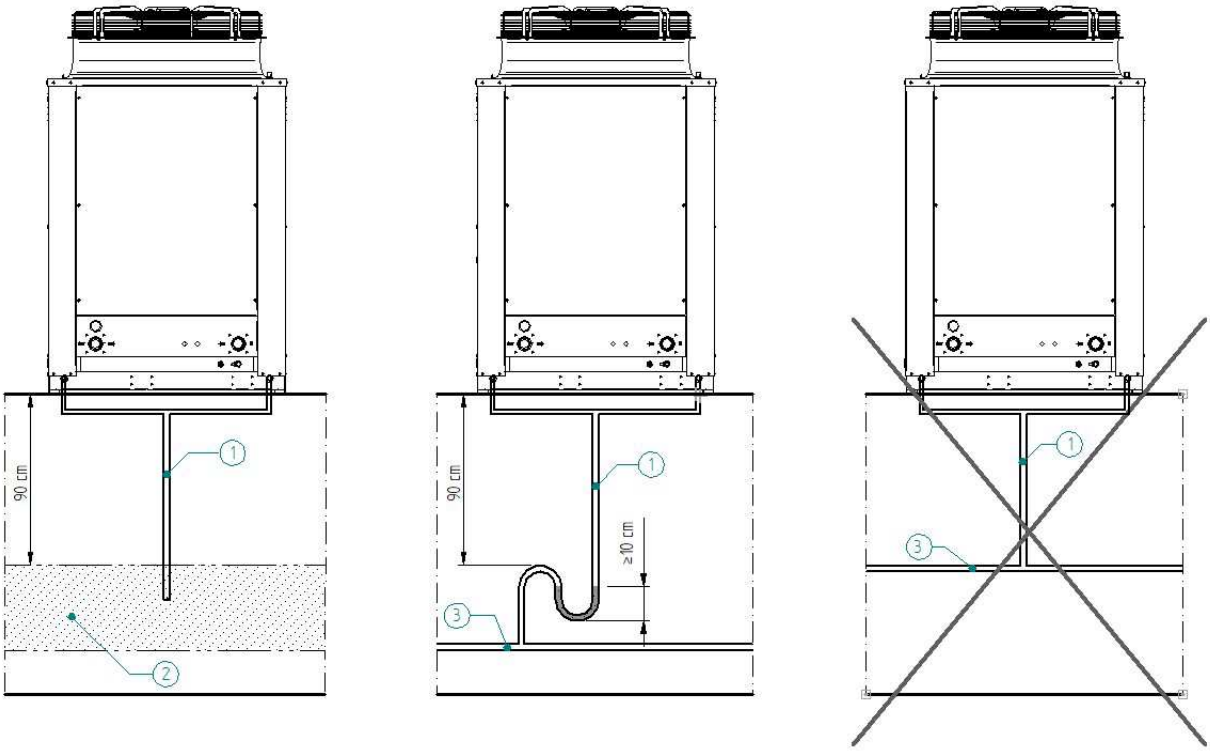
A	automatic filling valve	**C**	pressure gauge
B	tap	**D**	3-way valve

5.4 Condensate drain

All units are equipped with a drainage system at the base of the condensate collection tank located under the battery.
If draining is prolonged to convey water, prevent the pipes from freezing.
The condensate drain must not be conveyed into drains where the gas, in case of leakage, can accumulate.
In heat pump operation, the air flow that invests the battery can condense and the water that forms is collected in the basin and from here it must be conveyed to the outside to avoid filling. The conveying can be done by connecting a pipe to the drain fitting to drain the water away from the machine. The condensate drain fitting at the base of the basin must not be obstructed or modified.
For applications in harsh climates, the water that forms inside the condensate drain pan could freeze leading to a worsening of the operation of the machine, to avoid this it is advisable to install the electrical resistance, provided as an option, in order to avoid freezing.
In case of need, the antifreeze heating elements (one heating element per tray) can be replaced quite easily, because they are of the wire type with very flexible silicone insulation.
In the case of models **IGHP 007** and **IGHP 009**, the heating element is located in a holder placed under the tray and accessible by removing the lower side panel.
In the case of models **IGHP 011**, **IGHP 013** and **IGHP 017**, on the other hand, the heating element is located inside the tray and it is also accessible through the condensate drain connection on the back of the machine.
In all cases, it may be useful to use a cable pulling rod to insert it.
For the position of the condensate drain please refer to the drawings below.



How to drain condensation:



1. Condensate drain pipe DN 50 insulated between floor and heat pump.
2. Gravel layer in the frost-free area to absorb condensation (up to 50 litres per day).
3. Waste water or rain water duct or drainage pipe.

- If inserted into a duct or drainage pipe: take into account the slope of the pipe and opt for a frost-free installation.
- Alternative: let the condensation flow into the building and use a siphon to introduce it directly into the duct. Lifting systems are not allowed.

5.5 Anti-freeze protection

Even if the minimum ambient operating temperature is higher than 0°C, the temperature in the place of installation may be lower than this during the winter, when the machine is not used.
In these cases, and if the machine has not been drained, an anti-freeze solution (ethylene/propylene glycol) must be added in the following percentages to avoid the formation of ice:

Ambient T up to [°C]	Ethylene Glycol [% by weight]	Propylene Glycol [% by weight]
0	0	0
-5	15	20
-10	25	30
-15	30	35
-20	40	40

During the summer, when the machine is working to cool the liquid flow (CHILLER mode - “SUMMER”), an anti-freeze solution (ethylene/propylene glycol) must be added in the following percentages to avoid the formation of ice (depending on the chilled water outlet temperature):

T water outlet up to [°C]	Ethylene or Propylene Glycol [% by weight]
6	0
3	20
0	25
-5	30
-7	35
-10	40

NOTE
The unit is equipped with an antifreeze function that starts the pump if the water temperature drops below a set temperature value and activates the antifreeze resistance.

CAUTION
⚠ In the event that the unit must remain de-energised for a certain period of time in an environment whose temperature can reach freezing values of the water contained in the evaporator (risk of evaporator breakage), the antifreeze protection can be implemented following the instructions in paragraph 10.2.2 “Filling / draining the water circuit” .

WARNING
⚠ If the machine is de-energised there is a danger of ice formation, in this case the antifreeze protections are removed.

CAUTION
⚠ To lower the anti-freeze setting, access parameter **A028** of the system menu with the service password.

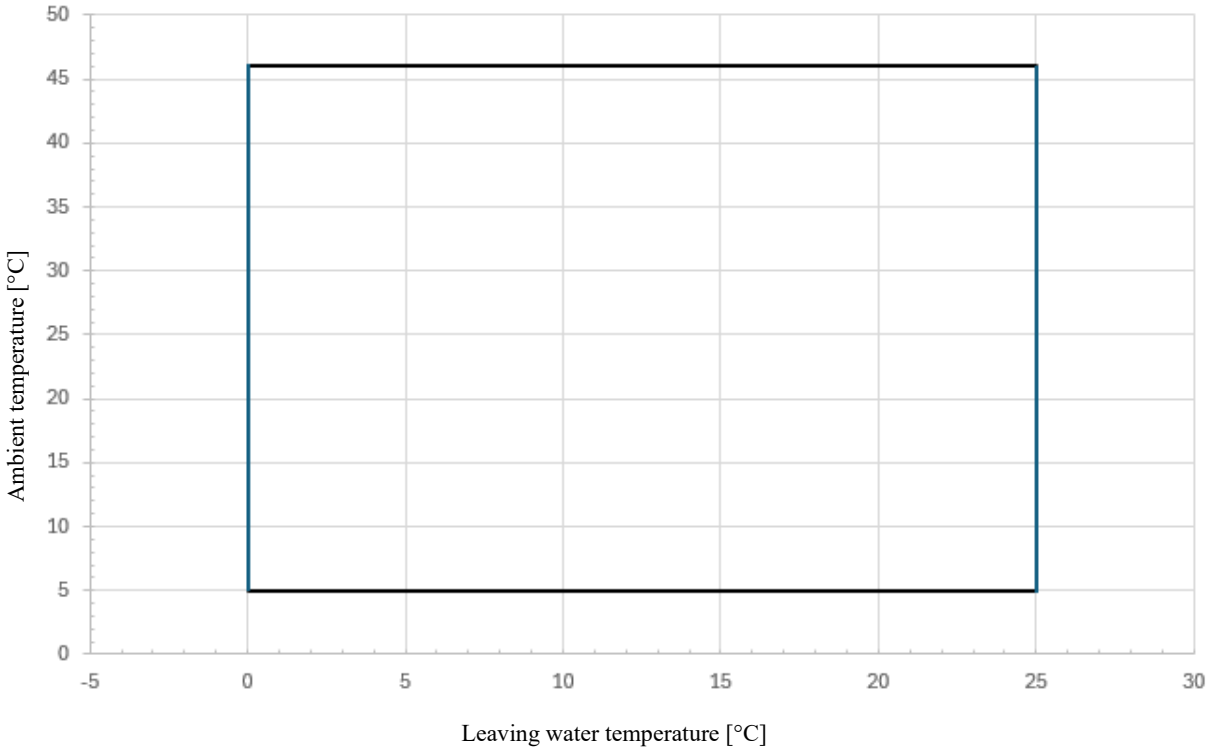
The following are the minimum and maximum flow values during chiller operation:

Model	Flow rate (m^3/h)		
	Min	Nom	Max
IGHP 007	2,05	3,20	9,50
IGHP 009	2,50	4,00	10,50
IGHP 011	2,95	5,20	11,00
IGHP 013	3,80	6,40	11,50
IGHP 017	3,80	8,50	14,40

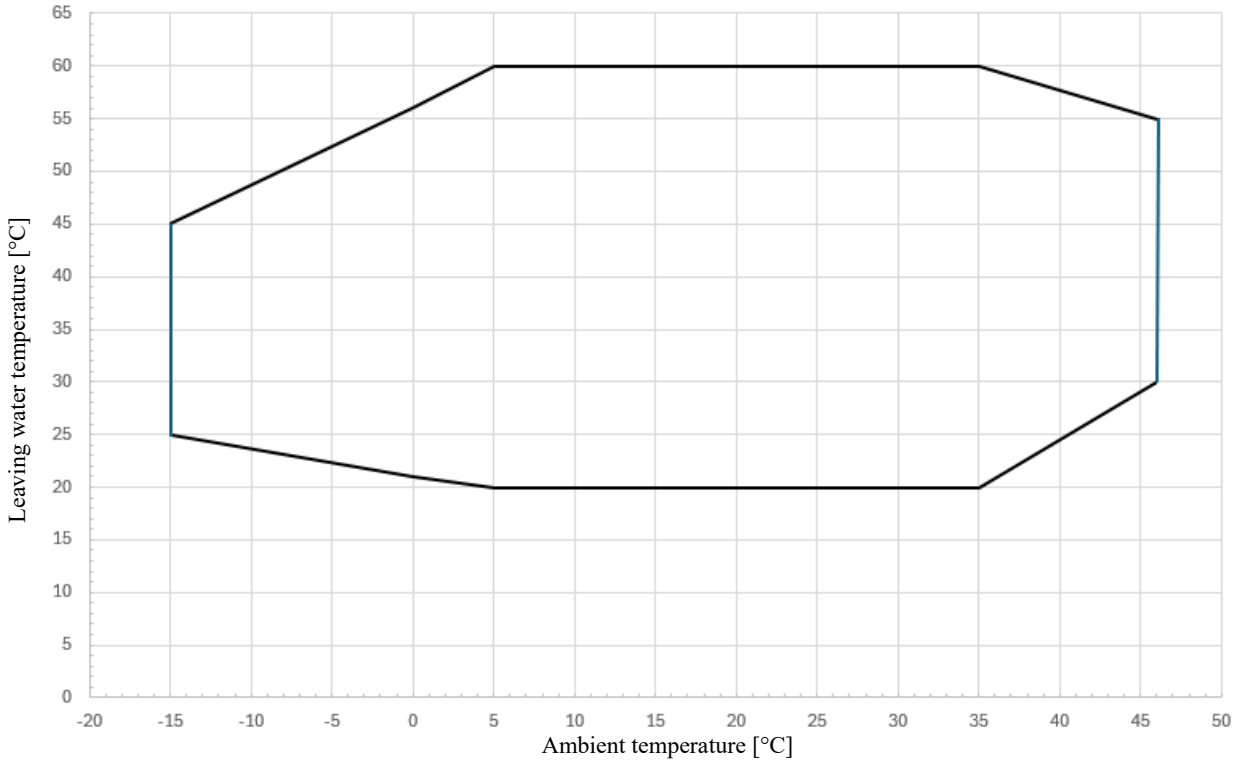
The operating temperature limits are as follows:
air min. -15°C / max. +46°C
water min. 0°C / max. +60°C

Operational map

CH mode



HP mode



CHAPTER 6

ELECTRICAL CONNECTIONS

6.1 Electrical circuit

The electrical circuit schematic is given in the annexed diagrams.

6.2 Electrical connections

The connection of the machine to the electricity supply must be made in compliance with the laws and regulations in force in the place of installation.
The voltage, frequency and number of phases must comply with the information on the machine data plate.
The power supply voltage must not be outside the tolerance range shown on the electrical diagram, even for short periods.
Unless otherwise specified, the frequency tolerance is +/-1% of the nominal value (+/-2% for short periods).
With a three-phase power supply, the voltage must be symmetrical (the effective values of phase to phase voltages and consecutive phase angles must be identical).
In particular, unless otherwise indicated, the maximum permissible phase imbalance is 2%, calculated for each phase according to the formula:

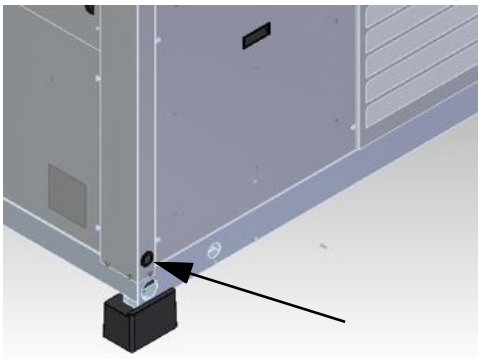
$$\frac{MaxDifferenceOfPhaseVoltageFromVavg}{Vavg} \bullet 100$$

Vavg= average phase voltage

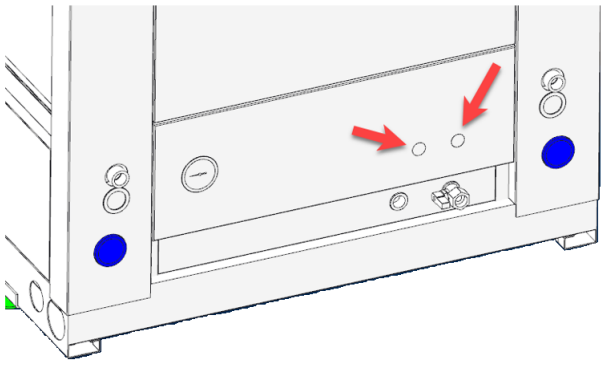
Example: electricity mains 400V/3Ph/50Hz
L1-L2 = 410; L2-L3 = 400V; L1-L3 = 398V
Vavg= (410+ 400 + 398) / 3 = 403V

$$\frac{(410 - 403)}{403} \times 100 = 1.73$$

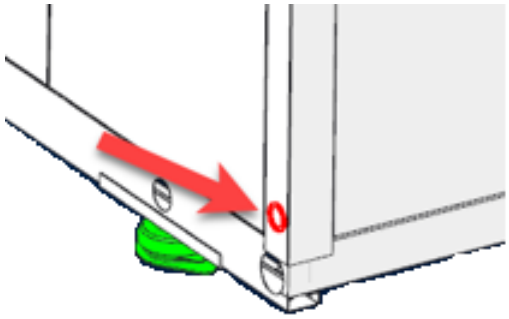
For the entry of the power cable, use the hole, as suggested in the drawing below.



For the entry of the cables of the kits and probes, use the knockouts on the back of the machine, as suggested in the drawing below.



For the entry of the cables of any optional accessories, use the knockout on the left upright at the front of the machine, as suggested in the drawing below.



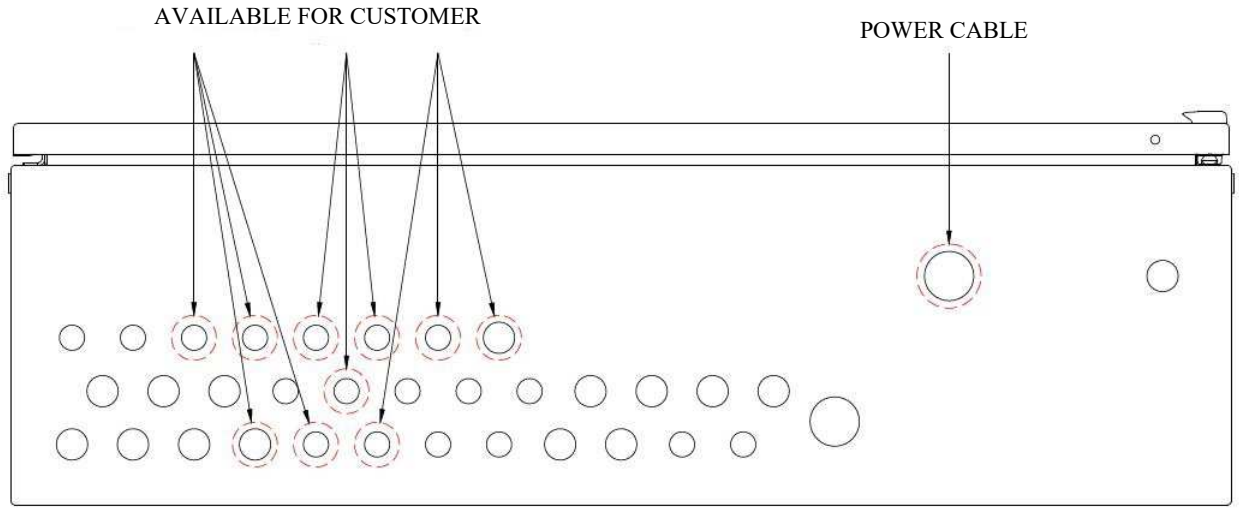
HOLES ON THE ELECTRICAL PANEL CASING

The surrounding holes are at the customer's disposal for managing the options (see ch. Chapter 8 “Electronic control“):

- 3 way solenoid valve for ACS
- general alarm
- external tank heater
- remote display kit
- Modbus supervision
- expansion card kit
- remote on/off
- remote CH/HP
- second setpoint
- ACS Light request
- Smart Grid
- Leak Detector signal

IGHP 007-009

IGHP 011-013-017



For the electricity supply:

1. Connect the machine (PE terminal in the electrical panel) to the grounding system of the building.
2. Guarantee the automatic interruption of the power supply in the event of insulation failure (protection against indirect contacts according to the requirements of IEC 60364) by means of a type B **differential current device**.
3. Make sure the level of protection against direct contact at the power cable source is at least IP2X or IPXXB (reference CEI EN 60529).
4. Install a device at the origin of the power cable that protects it from overcurrents (short circuit).
5. Use conductors that bring the required max current to the max operating ambient temperature, according to the type of installation chosen (IEC 60364-5-523).
6. Protective devices must be installed that limit the short-circuit current to 17 kA peak in correspondence with the rated breaking capacity if the short-circuit current in the point of installation is greater than an effective value of 10 kA.

Indications on the electrical diagram:

- Maximum permitted sized of the type gG fuse.
  In general, the fuses can be replaced by an automatic circuit breaker set in relation to the maximum machine current input (consult the manufacturer if necessary)
- Section and type of power cable (if not already supplied).
  Installation: insulated conductors, multi-pole cable in a cable duct installed overhead or fixed to a masonry structure (type C in accordance with IEC 364-5-523 1983), or without any other cables in contact
  Type of cable: copper conductors, 70°C PVC insulation (unless otherwise specified) or EPR 90°C insulation

The wiring of the electricity power cable is the responsibility of the customer.
Remove the machine panels (see paragraph 10.2.1 “Accessing the machine”).

CAUTION

⚠ To check the machine is properly connected to the electricity mains, refer to Chapter 7 “Start-up“.

CHAPTER 7

START-UP

CAUTION

⚠ The first commissioning must be carried out by personnel trained in authorised service centres.

CAUTION

⚠ Before starting up these machines, make sure all personnel have read and understood Chapter 2 “Safety“.

WARNING

⚠ After powering the machine, if the environmental conditions require it, a phase of forced heating of the compressor oil (which can last a maximum of 5 min.) could be activated, which inhibits its start.
Feed the machine a few hours before turning on the compressor.

CAUTION

⚠ On system start-up:

If the high pressure alarm is triggered when the compressor hasn't been activated, block the machine straight away by pressing OFF on the control.
Now check the refrigerant circuit high pressure value.

Before the start-up procedure, check that the system is correctly loaded (see ch. 10.2.2 “Filling / draining the water circuit”).

1. Check the unit shut-off valves are open.
2. Check that the circuit is completely filled with water and properly vented from the air.
   Check that the ambient temperature is within the limits indicated on the machine data plate.
3. Check that the main switch (where present) is in the open position (“O”).
4. Check that the power supply voltage is correct.
5. Power the machine by means of the supply line protection device (machine in standby).
6. Close the main switch (where present) of the machine by putting it in the closed position (“1”).
7. Start up the unit using the defined procedure (see 8.4 “Main operations”).
   After powering the machine, if the environmental conditions require it, a phase of forced heating of the compressor oil (which can last a maximum of 5 min.) could be activated, which inhibits its start.
   Feed the machine a few hours before turning on the compressor.
8. In machines with a three-phase power supply, make sure the compressor is working properly (it must not be noisy), that the circulator rotation direction is correct, and that the fan rotation direction is correct (it's “correct” if it takes the air from inside the machine).
   The machines are manufactured and tested in such a way that the three aforementioned components have a sense of rotation in agreement. Therefore, if one component turns in the correct direction, the others are also correctly connected.
   Check the rotation direction of all the above-mentioned components at the first start-up and after every maintenance intervention.
   If an AC motor is rotating in the wrong direction, invert two phases on the main supply terminals of the control panel.
9. It is possible to check that the flow rate is within the limits by checking it on the appropriate display screen.
   The flow rate can be adjusted with a valve. If it is too low, it is recommended to install a gate for flow regulation.
   Consider then that an adjustment of the flow rate can be made by acting on the PLC (number of revolutions settable).

10. **If, at the first start-up,** the ambient temperature is high and the hydraulic circuit water temperature is much higher than the working value **(e.g. 25-30°C)**, this means that the unit starts up overloaded, and the **protection devices might trip**.
    To lessen this overload, an inlet valve from the machine can be gradually (but not totally!) **closed to reduce the flow of water passing through it.**
    Open the valve as the water temperature in the hydraulic circuit gradually reaches the working value.
11. If the alarm light on the front of the panel is off and the machine display is off, but the disconnecting device is ON, there may be an alarm condition with relative coolant loss. **In this case, contact technical support immediately.**
12. The machine is now ready to start operating.

CAUTION

⚠ **TO SWITCH THE UNIT OFF, USE THE ELECTRONIC CONTROL UNIT AS EXPLAINED IN THE MANUAL (Chapter 8 "Electronic control").**

The unit must not be switched off by disconnecting the electricity supply (do not turn off the disconnecting switch or any other disconnection device upstream of the machine).
When disconnecting the power supply, first of all make sure the machine has been switched Off via the electronic control unit, and that the compressor, circulator and fan are OFF.

CHAPTER 8

ELECTRONIC CONTROL

8.1 Display

All models are furnished with the display PLDPRO.

If requested, it is possible to supply a kit for the remote display of pGDN type.

PLEASE NOTE	
uPC3	Main electronic board for machine control
c.pCOe	External expansion board for managing special functions (ACS, etc.)
PLDPRO	On-board display
pGDN	Remote display (if requested)

8.2 Remote display

A second display can be connected to the electronic control unit, as a remote display. To connect it, refer to the electrical diagram.
The remote display must have the address 31. To apply the address, proceed as follows:

1. Press the  buttons simultaneously for 5 seconds;
   the cursor will start flashing in the top left corner.

2. To change the address, press  ; the cursor will move to the address field (**nn**).

3. Press the  buttons to modify the address, then  to store it.

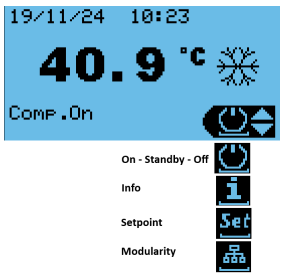
If the setting is different from the one previously stored, the new value will be stored in the permanent memory of the display.

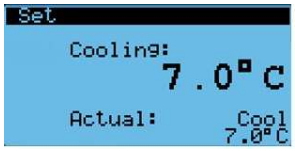
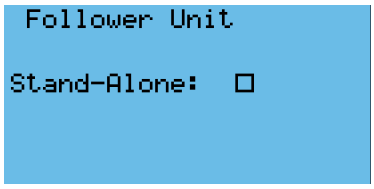
8.3 Keys

KEY	ACTION
	Visualisation/Reset of active alarms (see 8.10 “Alarms”). With pGDN remote display: • If flashing red there is at least one alarm present. • If steady red, there are alarms already displayed. With on-board display (PLDPRO), there are no visual indications but you can hear the buzzer sound.
	Access to the reserved menu.
	Return to the previous mask.
	Navigation between masks. Increase/decrease of a parameter. Select chiller / heat pump mode (in the **Setpoint** menu).
	Activation of a parameter modification. Confirmation of the modification.

8.4 Main operations

Oil heating at start-up	• After the machine has been electrically powered, it keeps the compressor off and heats the oil until the delivery temperature is sufficiently high (see 8.9.1 “Oil heating procedure”) • In the display main page appears the message: “**OIL HEATING**” • After a short blackout it does not reactivate

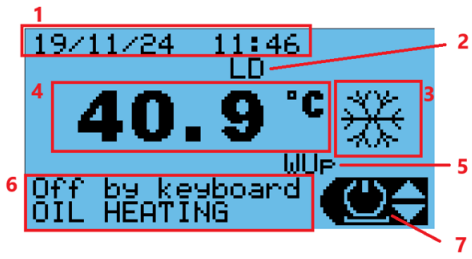
Machine On/Off	After powering the unit, the electronic control unit will display the start-up message and then (after about 10s) the main menu (see 8.5 “Main menu”). Use the keys to select the function, then press to access the On-Off mask.  In the On-Off mask, switch the unit on or off using the keys.    Use to return to the main menu. The main menu shows the unit status (see 8.5 “Main menu”). The machine can be switched on at service level depending on the tank temperature.
Chiller/Heat Pump	**ON/OFF menu** is used to switch the unit on and off. For switch-on to be enabled, there must be consent from: Use to select the Set function, then confirm with . Use the keys to scroll to **MODE**, and press . Scroll between chiller/heat pump mode and confirm your choice with . Use to return to the main menu. The change-over takes place with a delay set at the service level.

Changing the setpoint and modification of the ACS sanitary hot water setpoint (if present)	From **Setpoint menu** Set , you can see the current setpoints in chiller and heat pump mode. Also used to define the setpoint of the chiller and heat pump. The value must be within the predefined limits. You can use this menu to define the setpoint for the domestic hot water, if this function is enabled (see 8.9.12 “Domestic hot water (ACS)”).  Use the procedure explained above in “**ON/OFF menu**” to select the setpoint for the chiller and heat pump. Use to enable the modification and confirm the setpoint, and to alter the value. Use to return to the main menu. **Stand-Alone** The option is present in the screens relating to the setpoint change. With enabled modularity it allows to put in stand-alone one follower module (see 8.9.16 “Modularity”). 
Displaying/Resetting an Alarm	Press to access the alarms menu. If there is at least one active alarm, that alarm mask will appear, followed by the masks of any others (see 8.10.2 “Alarm table”). From any alarm mask, press to display the alarm log. **Manual reset** Once the cause of the alarm has been resolved, use the key to reset the buzzer and then press the same key again to reset the alarm itself. The specific action of the alarm will also be reset, and the machine can resume operation.

User menu access	Press the access key to access the user menu with the default password **0000**. **Entering the password** Press Prg to access the reserved menu.  Use ↵ to enable the modification and confirm the password fields, and ↑ ↓ to alter the values. After accessing the user level, scrolling the menu, it is possible to access some parameters and settings: • Selection of the climate curve • Setting of a scheduler for unit on/off, economi modality and low-noise modality • Changing the second setpoints (from digital input or scheduler, if enabled by the service parameter) • Resetting the total used energy log • Selection of the language • Selection of the unit of measurement • Changing the date/time and the time band • Setting the unit TCP/IP configuration • Changing the user password
Changing date/time	• Inside the used menu, select "**Settings**" and press ↵. • Select "**Date / time**" and press ↵ • Change the desired values • If you change the time zone, it is necessary to confirm it by selecting "**Update**" and press ↵
Return to main menu	Press Esc until returning to the main screen

8.5 Main menu

The main menu is the first mask that appears when the display is activated.
It shows the main unit information:



1. Date (DD/MM/YY) and time.
2. Unit type in modularity (visible only for units in a modular system), it can be:
   LD = Leader unit
   F1 = Follower 1 unit
   F2 = Follower 2 unit
   F3 = Follower 3 unit

3. Operating mode:

 = Chiller

 = Heat pump

 = Defrosting procedure start / end

 = Defrosting in progress

 = Domestic hot water active. The flashing OFF message, under the icon, will appear when the domestic hot water function is starting or ending.

4. Water temperature currently used for regulation. Depending on the unit configuration, this can be the water outlet temperature or domestic hot water temperature.
5. Warm Up in progress (it appears only at unit starting for 30s).
6. Unit status:
   Stand by: unit in stand-by
   Off by alarm: unit off due to an alarm
   Off by keyboard: unit off by keyboard command
   Off by chg-over: unit off due to a modality change
   Comp. On: compressor on
   Defrost: defrost in progress
   Shutting Down: unit stopping
   Off by Leader: Off by Leader command
   Leader in Backup: leader unit in back-up modality
   Conditional On: unit on due to external commands (on by digital input, scheduler, supervision, domestic hot water, anti-legionella, request by tank)
   Off by Boiler: unit off due to boiler starting
   Antifreeze On: antifreeze action in progress (antifreeze heater or pump starting).
   When the unit starts **OIL HEATING** message can appear. It indicates the oil heating procedure is in progress and the unit can not start until the procedure is not finished.
7. Use  to select one of the following sub-menus:

 : ON-OFF

 : INFO

 : SETPONT

 : Modularity Info

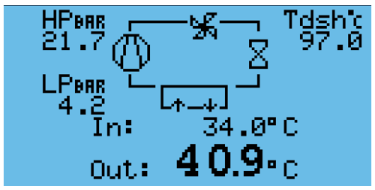
Access with  .

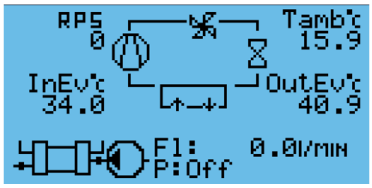
NOTE

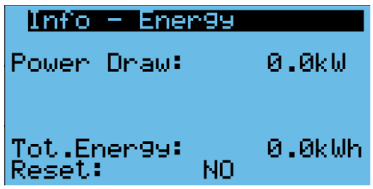
After 5 minutes of the display on without touch input, the brightness decreases almost to a minimum and you exit any logins made. Pressing any area of the display reactivates it.

8.6 Synoptic

On the main screen, it is possible to access the synoptic screens by pressing the INFO key.
Some data on the operation of the unit is displayed. Moreover, there is a screen with a log of the energy used (estimated), which can be reset.
If the unit is equipped with a flow meter, the flow rate in l/min is also displayed, otherwise only the water flow presence status is shown.
Finally, there is an information screen indicating the installed software version.

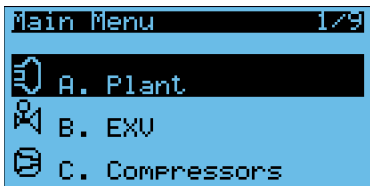




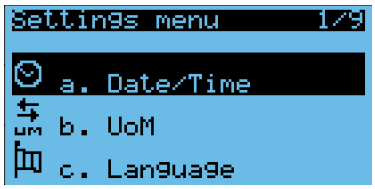


8.7 User menu

The user menu allows access to some parameters useful for configuring certain functions such as:



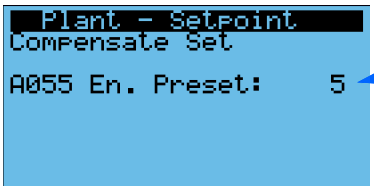
- Climate curve (see 8.7.1 “Climate Curve”)
- Scheduler On/Off, Economy and Low-noise (see 8.7.2 “Scheduler”)
- Settings (date/time, unit of measurement, IP address) (see 8.7.3 “Settings”)
- Used energy Log Reset Log (see 8.7.4 “Energy log resetting”)



To reach the settings of date/time, unit of measurement, language, IP address or configure the weekly scheduler it is necessary to open the setting menu.
Enter the user menu and scroll until section “**G. Setting**” then press  .

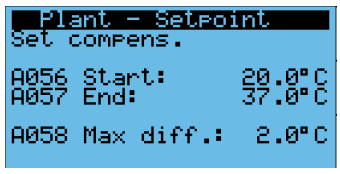
8.7.1 Climate Curve

The climate curve allows you to set the machine setpoint as a function of a reference temperature.
There are four preset curves (A, B, C, D) and a custom modifiable curve (see 8.9.3 “Climatic curves”).
The reference temperature is set in the reserved Service menu.



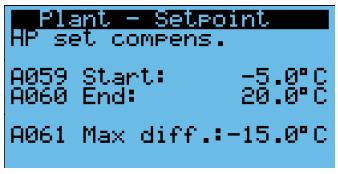
It allows to select a climate curve.
Selection of the climate curve:
0 = Disabled
1 = Curve A
2 = Curve B
3 = Curve C
4 = Curve D
5 = Custom curve

It displays the parameters of the custom climate curve set:

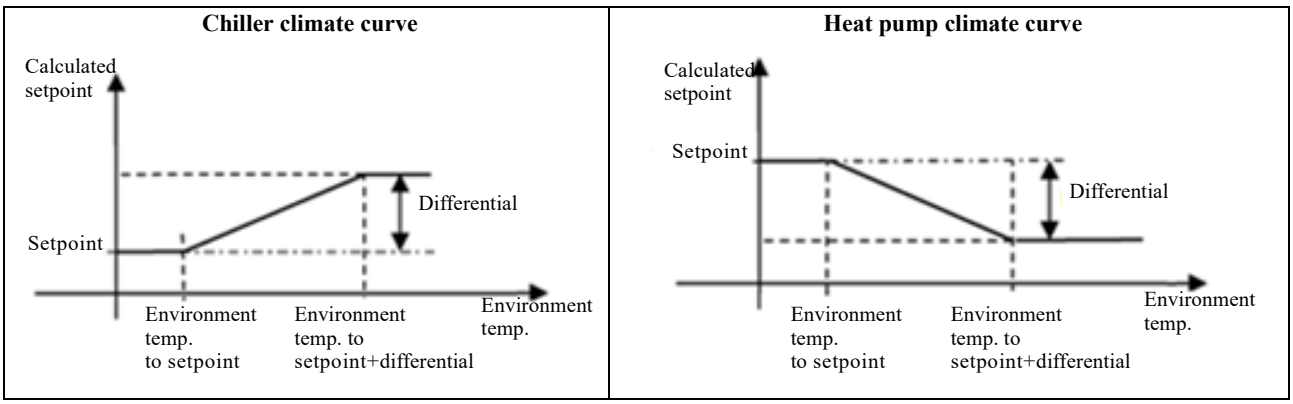


A058 - **A061**: Chiller and heat pump differentials

A056 - **A059**: Reference ambient temperature at the chiller and heat pump setpoints, preset from setpoint menu



A057 - **A060**: Reference ambient temperature at the chiller and heat pump setpoints, preset from setpoint menu plus differential



8.7.2 Scheduler

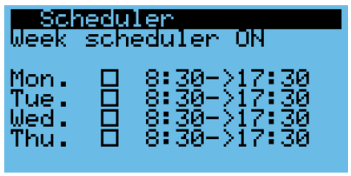
It is possible to use three types of scheduler: Weekly scheduler, Economy and Low-noise.
The configuration of the scheduler is accessible from the setting menu inside the user menu, at **Date/Time** indication.

8.7.2.1 Weekly Scheduler

The weekly scheduler can be as follows:

- **On/Off**: it allows to schedule the unit's on and off times (this type of scheduler is enabled by default).
- **Setpoint**: it allows to plan a setpoint change during daily time bands (this type of scheduler must be enabled by parameter **A062** because the "second setpoint" function is normally implemented by an available digital input).

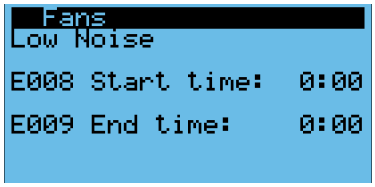
The parameter **Ga05** allows to enable the scheduler, the parameter **Ga06** allows to select the ON/Off modality or the setpoint (the setpoint can be selected only after the parameter **A062** is correcly set).



To set the time bands, modify the start and end times using  and, after selecting the desired value, press  .
To enable the time band it is also necessary to check the box next to the times for each desired day.

8.7.2.2 Silent mode

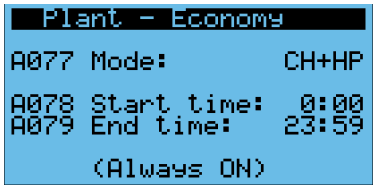
(see 8.9.11.1 "Low-noise")



It can be reached from user menu under the section **E. Fans**.
To enable the low-noise modality it is necessary to set a time band by means of parameters **E008** and **E009**.
If the time bands are of type 0:00 and 23:59 the function will be enabled for the whole day, while with both parameters set to 0:00 the function will be completely disabled.

8.7.2.3 Economy modality

(see 8.9.7 "Economy").
It can be accessed by user menu under the section "**A. Plant**".
The Economy function limits the maximum power output of the unit to a factory-set value.



The function can be enabled by setting a time band.
Time band:
A078 start hour
A079 end hour
With **A078** = 0:00 and **A079** = 23:59 --> "**Always ON**"
With both parameters = 0:00 --> the function will always be disabled

With parameter **A077** it is possible to choose how to activate the Economy function:

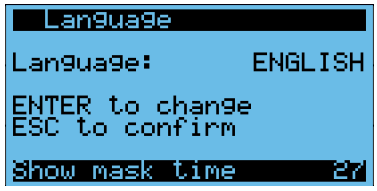
- CH
- HP
- CH+HP

With Economy function enabled, ECO will appear in the main mask.

8.7.3 Settings

8.7.3.1 Language

The language selection screen is accessed from "**G. Settings**" menu in the user menu.



Set the display language between:

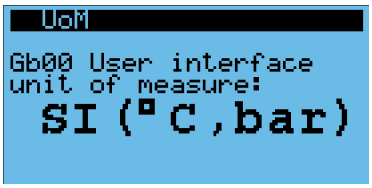
- English
- Italian
- German
- French
- Spanish

In this screed press  to change the language, press 

to confirm the selected language.

8.7.3.2 Unit of measurement

The unit of measurement selection screen is accessed from "**G. Settings**" menu in the user menu.



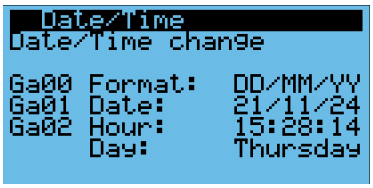
Sets the unit of measurement of the display between:

- USA (°F psi)
- SI (°C bar)

Select the desired unit of measurement by means of  key.

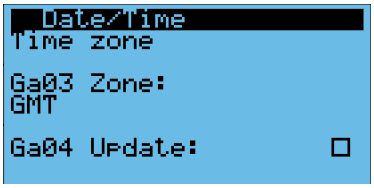
8.7.3.3 Date/Time

Set date and time



In the sub-menu "**G. Settings**" inside the user menu the indication "**Date/Time**" is present.
Inside this indication it is possible to fix a time (**Ga02**) and a date (**Ga01**) and the format (**Ga00**).

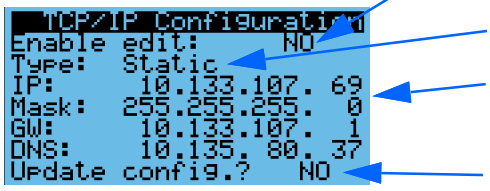
Set time zone



In the screen after the time change it is possible to set a time zone with parameter **Ga03**.
Enter parameter **Ga04** to confirm the changing.

8.7.3.4 Network

The screen can be accessed from the sub-menu "**G. Settings**" from the user menu at the indication "**Serial ports**".
Set the IP address of the machine's electronic control .



Enable the network parameter changing

Enable static IP or DHCP

Set the network parameters for the fixed IP

After entering the desired values, you must confirm the changes.

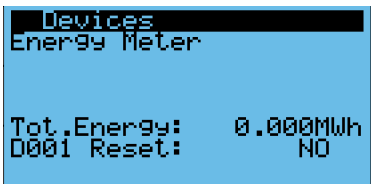
Once you have completed your changes and saved, reset to "**NO**".

CAUTION

⚠ If there are incompatible values in the entered network parameters, they will be automatically changed to make them consistent.

8.7.4 Energy log resetting

It is possible to reset the estimated energy consumed log.



To access the function, reach the sub-menu "**D. Devices**" and set parameter **D001** to "**Yes**".

8.8 Reserved service menu

It contains all the parameters important for the operation of the unit and accessible only with the Service password.
The menu is organized in sub-menus for the different functions of the machine.

8.9 Machine operation

The functions of the machine are described below.

8.9.1 Oil heating procedure

The oil heating procedure serves to prevent the migration of coolant to the compressor when it is not switched on and automatically activates, if necessary, whenever the compressor is switched off to maintain the oil temperature above 8K (according to the actual evaporation temperature).

8.9.1.1 Oil heating at start-up

The oil heating function at start-up involves, when the machine is switched on, keeping the compressor start-up blocked and activating oil heating until a deactivation condition is true (expected set reached).
As long as the function is active, the following appears:
pGDN:

- "**OIL HEATING**" on the main screen.

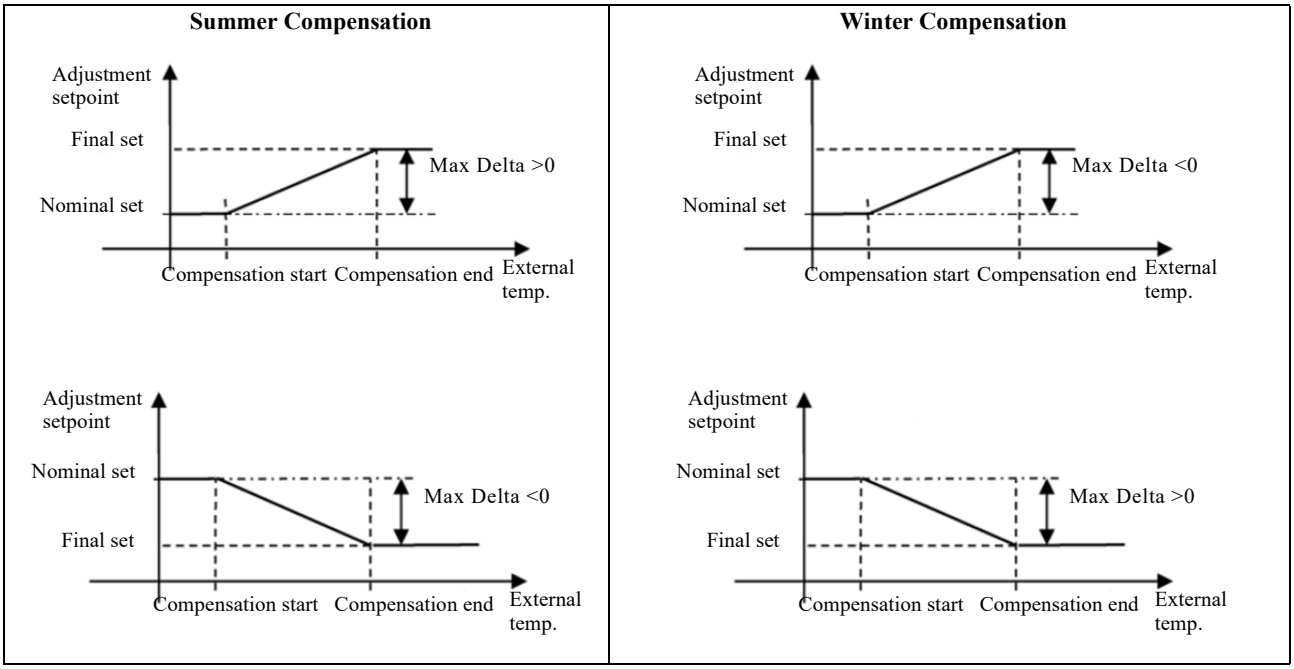
If there has been a power failure lasting less that the time in hours set at the service level, and previously the oil heating procedure had been successfully completed then the machine, after the power failure, can restart the compressor even if the deactivation condition of the oil heating function at start-up is not true.

8.9.2 Setpoint

The setpoint is the temperature value to which the machine is brought during its operation. There is one setpoint for chiller mode and one for heat pump mode. The reference probe for the temperature can be set from parameter to service level.
It is possible to set a second setpoint for both operating modes. By default, the secondary setpoint can only be activated via the digital inputs, whereas to make it usable only via the time slot/weekly scheduling function, it is necessary to intervene at the service level.

8.9.3 Climatic curves

The climatic curves give the possibility to set the setpoint of the machine as a function of a reference temperature that can be the temperature of the external ambient probe or the temperature probe of the remote display (if present), as a function of a parameter. There are four pre-established climate curves A,B,C,D and there is the possibility of setting a custom curve (**A055** (A = 1, B = 2, C = 3, D = 4, Custom = 5). The custom curve is defined by the following graphs for chiller (summer compensation) and heat pump (winter compensation) modes:



The predefined climate curves include the following values for the previous graphs:

Summer Compensation	A	B	C	D
Compensation start	20.0°C	20.0°C	20.0°C	20.0°C
Compensation end	37.0°C	40.0°C	37.0°C	40.0°C
Max Delta	-5.0°C	-5.0°C	-8.0°C	-8.0°C
Winter Compensation	**A**	**B**	**C**	**D**
Compensation start	-5.0°C	-7.0°C	-8.0°C	-5.0°C
Compensation end	20.0°C	20.0°C	20.0°C	20.0°C
Max Delta	-13.0°C	-18.0°C	-10.0°C	-15.0°C

The climatic curves can be set by the user (see 8.7.1 “Climate Curve”).
The setpoint also takes into account Scheduler and second setpoint.

8.9.4 PID and compressor adjustment

Temperature control takes place with a PID adjustment.
There are two PID regulators, one at start-up and one at full capacity, each with its own parameters: reference probe, proportional band, integral time and derivative time.
The start adjustment prevents an excess of call power. Since the load status is not known at startup but only the temperature value, it is necessary to enter the power little by little while waiting for the system reaction. The full speed adjustment is fast to follow any load changes and keep the outlet water temperature as close as possible to the setpoint value.
The compressor is activated and adjusted by the inverter according to the PID adjustment. The minimum on, off and inter-ignition times are provided at service level to protect the number of starts per hour of the compressor and the possibility of turning it on “manually”.

8.9.4.1 Supplementary resistance

Supplementary resistance allows to increase the production of hot water during the heat pump mode. In machines with a tank, the supplementary resistance on the tank, if provided, can be enabled by a service level parameter.

8.9.4.2 Boiler consent

It is possible to enable at the service level the consent to the alternative activation of a boiler during operation in heat pump mode. The function requires the installation of the external expansion board c.pCOe.

8.9.5 Operating limits

The machine's operating limits must be checked. The limits are given by a maximum and a minimum ambient temperature allowed to start the machine in chiller mode and in heat pump mode. If the ambient temperature is outside these limits then the **AL027** automatic reset alarm is generated, which blocks the compressor but not the pump. The lock condition disappears if the exceeded limit falls within at least one differential.

8.9.6 Smart-Grid

Smart-Grid means the possibility of optimising the distribution of electricity, decentralising the production of energy and minimising overloads and variations in the electrical voltage in the energy distribution network. It is possible to enable the Smart-Grid function in the unit in order to integrate it into an electrical network of this type. The function is enabled from the display at service level and through the combination of two digital inputs (DI5 and DI7) of the main electronic board (uPC3) which, as per standard, must be connected to the power grid control device, defines four types of operation:

ID5	ID7	SMART-GRID	DESCRIPTION
CLOSED	OPEN	1 - BLOCK	Machine Off. Antifreeze and alarms can be activated.
OPEN	OPEN	2 - NORMAL	Normal operation. The supplementary resistors can be switched on (if provided).
OPEN	CLOSED	3 - BOOST1	Increased ACS setpoint. The ACS resistor can be switched on, if provided. If the machine is in stand-by mode, it can be switched on (if the service level is enabled, the machine can be switched on to produce ACS). The ECONOMY function is disabled.
CLOSED	CLOSED	4 - BLOCK	This combination performs the same function as “1 - BLOCK”.

The Smart Grid is implemented in its version 1.1.

8.9.7 Economy

The **Economy** function allows to reduce the speed of the compressor by a predetermined percentage, consequently reducing the energy consumption of the machine. It can be enabled by display and works from key to screen or from time slot. The activation time slot is daily.
If the two parameters are equal, Economy from time slot is disabled. Economy can be enabled for operation in chiller mode, heat pump mode, or both.

NOTE
The Economy function can be used in the Quick Menu. It can be activated by button in both chiller and heat pump.

8.9.8 Pump

A water pump is controlled on the evaporator.
The pump turns on when the machine is switched on and, after a delay, the compressor turns on and PID temperature control takes place.
There is a delay between the compressor shutdown and pump shutdown. If at the time of unit shutdown the compressor is shut down for more than the delay time between compressor shutdown and pump shutdown then the pump shuts down immediately. In the domestic hot water activation and deactivation phase, the pump remains off for a set time. The pump always remains on until the unit is turned on but it is possible to set the pump to turn off after the compressor is turned off also for thermoregulation that occurs after a delay since the compressor was turned off. It restarts immediately when the compressor restarts for thermoregulation. In this mode, the sniffing function turns on the pump at predetermined intervals (parameters).
A warning (**AL012**) is provided to signal that the working hours of the pump have been exceeded. The working hours counter with the possibility of reset , the threshold for the maintenance warning and the manual activation procedureof the pump are available at service level.
It is possible to enable at the service level a sniffing function that turns on the pump at scheduled intervals when the machine is in stand-by for a predetermined time.

8.9.9 Antifreeze

When the machine is switched off, the antifreeze function is provided to prevent water from freezing by means of a pump and/or antifreeze resistance according to a service level parameter.
It is possible to manage, in machines where it is provided, a heating element in the condensate collection trays under the finned coils. When the ambient temperature is less than or equal to the Set, the heating element is turned on. The heating element turns off when the ambient temperature becomes greater than or equal to Set + differential.

8.9.10 Electronic thermostatic valve (EEV)

The electronic thermostatic valve regulates the flow of refrigerant gas as a function of the superheat value so that the evaporation process is completed in the total length of the evaporator. Overheating is the difference between the temperature of the superheated gas and the saturated evaporative dew temperature. It is possible at the service level to control the valve "manually" or to modify the overheating set and the parameters of the valve adjustment PID in chiller and heat pump modes.
The control features a set of parameters, at the service level, for adjustment depending on the operating mode:

- Superheat parameters (Setpoint and PID);
- Low superheat alarm thresholds.

8.9.11 Fans

The fans of the machine allow the adjustment of condensation in chiller mode and evaporation in heat pump mode. In both operating modes, the adjustment is made by means of a 0..10V signal as a function of a curve within a minimum and maximum speed value that depends on the condensation temperature in chiller mode and the evaporation temperature in heat pump mode. The parameters of the fans are defined by the manufacturer and cannot be modified by the display.
A warning (**AL024**) is provided to indicate that the working hours of the fans have been exceeded. The working hours counter with the possibility to reset, the threshold for the maintenance warning and the manual activation procedure of the fans are available at service level.
Frost protection is provided when fans are switched off and the ambient temperature is particularly low. The fans are forcibly switched on at a speed if the temperature is lower than a set set at service level.
The function is deactivated if the ambient temperature is higher than the value of 2°C.

8.9.11.1 Low-noise

It is possible to set a low-noise range within which it is possible to reduce the power and therefore the noise of the fans and the compressor. The low-noise is enabled from the menu as always active or by setting the start time and minutes and the end time and minutes of the mode.

8.9.12 Domestic hot water (ACS)

The domestic hot water (ACS) function allows to heat a water tank for sanitary purposes. For the production of domestic hot water, the unit is automatically set to heat pump mode with a suitable setpoint and then returns to the expected operation once the procedure is finished. The ACS function can be enabled from the display in the service menu to be activated by digital input or as a function of a setpoint. Both modes can be enabled.
There are two versions of the DHW function: DHW Light and DHW Full, which can be selected via a service parameter. By default, DHW Light is set in the machine.
The DHW Light function does not require the c.pCOe expansion, controls the position of the 3-way valve but does not allow for its position to be checked, does not manage the supplementary heating element on the DHW tank and does not allow for the management of the DHW pump.
The DHW Full function also includes the c.pCOe expansion kit, which allows for the functions not provided for DHW Light.

8.9.12.1 ACS from digital input

The ACS request is made externally via a digital input in the machine. When the digital input is closed, the ACS is requested; when the input is opened, the ACS request is deactivated.

8.9.12.2 ACS from setpoint

The ACS request occurs if the ACS tank temperature is less than or equal to the **ACS SET** parameter minus a service level differential. The request ends if the temperature becomes greater than or equal to **ACS SET**.
If the ACS tank probe fails, then the production of domestic hot water is interrupted.

8.9.12.3 ACS activation logic

The logic for activating the ACS at the time of the request (from digital input or setpoint) includes the following phases:

- Shutdown of the compressor respecting its minimum on and off times
- Shutting down the pump after a delay
- Switching the ACS three-way valve
- Waiting for the pump off time in ACS
- Change-over of the 4-way valve in heat pump if the machine was in chiller mode
- Restart the compressor (and pump) respecting the minimum off time, in heat pump mode with setpoint suitable for ACS.

If the request is made with the machine in stand-by, then the three-way valve is switched and then the machine is turned on in the heat pump. The activation of the ACS with the machine in stand-by must be enabled by the service parameter.

8.9.12.4 ACS deactivation logic

The ACS deactivation logic at the end of the request (from digital input or setpoint) includes the following phases:

- Shut-down of the compressor respecting the minimum times
- Shutting down the pump after a delay
- Switching the ACS three-way valve
- Waiting for the pump off time in ACS
- Change-over of the 4-way valve in chiller if the machine prior to ACS was in chiller mode
- Restart the compressor (and pump) respecting the minimum off time in the mode prior to the ACS request.

If the ACS request was made with the machine in stand-by mode, then after switching the three-way valve the machine returns to stand-by mode. The activation of the ACS with the machine in stand-by must be enabled by the service parameter.

8.9.12.5 Maximum ACS duration

There is a maximum service level duration of operation in ACS after which the machine returns to normal operation. In case of ACS termination for maximum duration, the **AL086** automatic reset alarm is activated. There is a time interval at service level during which the ACS is kept disabled each time it ends for a maximum duration.

8.9.12.6 Defrost in ACS

In the event of defrost during ACS, the switching of the three-way valve takes place without switching off the pump, causing a reduction in the water flow and a possible consequent flow alarm. It is possible at the service level to set a time interval to disable the flow switch alarm at this stage.

8.9.12.7 ACS operating limits

It is possible to reduce the duration of ACS cycles as much as possible by limiting the minimum power to which the machine can be operated in ACS mode by setting a minimum power percentage at service level beyond which the machine cannot work during ACS.
It is possible to prioritise energy savings by reducing the maximum power at which the machine operates in ACS mode by setting a percentage of maximum power at service level beyond which the machine cannot work during ACS.

8.9.12.8 ACS valve position control

It is possible to enable at service level the position control of the ACS three-way valve (after electrical connection) to activate an alarm (**AL031**) after a set delay in case the valve is not in the correct position.

8.9.12.9 ACS pump

It is possible to enable the management of an auxiliary pump on the ACS at service level. The pump operates daily according to a time slot defined at service level. For the ACS pump, there is a threshold of working hours beyond which the maintenance warning (**AL091**) intervenes. The working hours are resettable at service level.

8.9.12.10 ACS supplementary resistance

The ACS supplementary resistance allows to increase the production of sanitary water. If required, it can be enabled by parameter at service level.
The function is not available with ACS controlled by the machine's electronic board and not with external expansion (c.pCOe).

8.9.13 Anti-legionella function

CAUTION

⚠ For this unit, the use of an integrative resistance for ACS is mandatory in order to reach the temperature required for the correct execution of the anti-legionella procedure.

The anti-legionella function (available only with optional expansion card) allows the machine to disinfect the ACS tank water, forcing the production of high-temperature ACS water.
The function can be enabled at service level and can take place weekly either with the machine switched on or in stand-by mode or exclusively only with the machine switched on according to another parameter at service level. In the first case, if the machine is in stand-by, then it will turn on temporarily to perform the procedure.

8.9.13.1 Anti-legionella setpoint

The machine setpoint during the anti-legionella procedure is defined at service level and the one at the evaporator outlet is set as the adjustment probe.

8.9.13.2 Anti-legionella Scheduler

The anti-legionella procedure is activated weekly depending on the service level parameters set.

8.9.13.3 Water heating mode

The way to heat the water for anti-legionella procedure can be chosen from a parameter at service level and can be:

- **HP + Resistance**
- **Resistance only**

CAUTION

⚠ To use the resistance for the anti-legionella procedure it is necessary to enable it by means of a service parameter.

8.9.13.4 Termination of the anti-legionella procedure

When the temperature of the ACS tank exceeds 60°C, a countdown begins, at the end of which the disinfection procedure is successfully completed. The countdown is inversely proportional to the water temperature of the ACS tank; the higher it is, the shorter the time to consider the procedure finished.
If the temperature does not remain above 60°C for the necessary time, the procedure will fail and will not be repeated until the next request. A service level parameter defines the number of failed procedures in a row before the **AL089** (manual reset) warning is generated.

8.9.13.5 Anti-legionella and defrost

Defrost has priority over the activation of the heat pump mode for anti-legionella, while the resistance of the ACS tank, if enabled, can be activated independently of the defrost. If a defrost is in progress at the time of activation of the anti-legionella, then the heat pump mode will be activated only at the end of the defrost while the ACS resistance (if present and enabled) will be activated immediately even with defrost in progress.

8.9.14 Defrost

Operating in heat pump mode with very low ambient temperatures and high humidity rates can lead to the formation of ice on the battery of the machine, reducing its performance. The defrost function allows to clean the machine battery from the ice and restore normal performance.
The activation of the defrost depends on a function of time calculated by the control system of the machine which depends on the type of evaporator and the temperature difference between ambient and evaporation. The defrost is inhibited until the ambient temperature is too high and the water temperature is too low compared to the sets set at service level.

8.9.14.1 Safety defrost

There is a safety defrost that is activated without respecting the activation conditions and without respecting the waiting time between defrost but which depends only on the evaporation pressure and the service level settings.
Each time the safety defrost is activated, a time counter is incremented. An **AL029** manual reset alarm is generated in the safety room in one hour, which blocks the machine.

8.9.14.2 Operating logic

The defrost function is activated when, during normal machine operation in heat pump mode, all the described conditions occur simultaneously and it involves:

1. Reduction of the compressor speed to the minimum speed
2. Reversal of the four-way valve
   - After a delay from when the compressor is idling (or off), the four-way valve switching occurs.
   - The fan turns off when the 4-way valve is switched.
3. Defrost
   - The compressor accelerates to a specific speed (defined by the Manufacturer) for defrost operation.
   - The fan remains off from the instant the valve is reversed and can only turn on if the condensing pressure exceeds a switch-on set defined by the Manufacturer.
   - The minimum and maximum durations of this phase are defined by the Manufacturer.
4. Defrost end
   - Defrost continues until the condensation reaches a defined defrost end value or the maximum time ends.
   - At the defrost end time, the speed of the compressor is decreased to the minimum value and, after a delay, the 4-way valve is switched.
5. Dripping
   - During the dripping phase, if dripping is enabled via parameter, the fan runs at maximum speed.

If there is an additional resistance in the tank, then it is possible to enable its activation at service level during defrost. This way, if the water temperature during deforestation drops below the configured set, then the resistor is turned on.
With the economy function active, it is possible to set a delay at service level to reactivate it at the end of the defrost. During the defrost phase, the economy function is disabled to be rehabilitated after a delay from the end of defrost.

8.9.15 Leak Detector

The Leak Detector is a refrigerant gas detector that allows to stop the machine in case of R454B gas leaks. The leak detector is an option and can be installed if requested.

8.9.16 Modularity

Modularity represents the possibility of putting several machines in communication with each other to increase the total cooling power of a system.
Communication between the machines is carried out via Modbus-TCP connection and each one must have a different IP address. The maximum number of machines that can be present in a modular system is 4, even of different sizes.
In a modular system one machine acts as Leader and takes care of the operation of the system, the others act as Followers and receive commands from the Leader. When there is communication between the Leader module and the Followers, it is possible to:

- turn the entire system on and off by the Leader (by button, by digital input, by supervision or by time slot). All Followers must be switched on in advance by button;
- change the operating mode (chiller or heat pump) of the entire system by the Leader;
- change the setpoint value for the adjustment of the entire system by the Leader;
- display on the Leader's display the main information of the Followers and their possible alarm status.

8.9.16.1 Operating logic

The temperature adjustment takes place according to the PID and the adjustment probe set in the Leader machine. The regulating probe can be the one entering, the one leaving the evaporator or the one in the tank (if present). In the case of an incoming or outgoing probe, the weighted average of the probes of all the machines is calculated, in the case of a tank probe, then the tank probe of the Leader machine is used. The machines are switched on with FIFO logic, so the first machine to switch on is the last one that had switched off. Each machine reaches its maximum power before the next one is switched on.

8.9.16.2 Leader machine configuration

In the Leader machine it is necessary to display, at the service level, the IP addresses of all the machines and the configuration parameters of the modular system.

8.9.16.3 Configuration of the Follower machine

In each Follower machine, it is necessary to display, at service level, its IP address and its index in the modular system.
In the network settings menu, it is possible to force the stand-alone operation of a Follower machine (see 8.7.3.4 "Network").

8.9.16.4 Communication control

The letters **LD** displayed on the main screen indicate that the unit is configured as Leader, while **F1**, **F2** and **F3** represent follower modules. In addition to this, if the followers have been temporarily disabled via the keypad, **F1D**, **F2D** or **F3D** will be displayed on the main screen. In this way, a unit is identified that, despite being configured as a follower, is in stand-alone operation with respect to the modular system of which it is a part.
In case of lack of communication in the display of the Follower machines, the warning **AL166** appears, in the display of the Leader machine the warnings **AL167**, **AL168**, **AL169** appear, which also indicate which Leader machine is not connected (see 8.10.2 "Alarm table"). An unconnected machine operates in stand-alone mode and uses its own probes for temperature regulation.

8.9.16.5 Back-up and Overboost

It is possible to configure the modular system at service level, so that a machine operates in back-up mode. In this way, a machine remains switched off and is only switched on to replace another in the event of an alarm or disconnection. At the end of a set time interval, however, the modules are rotated to move the back-up status to another module.
With the back-up module configured, the overboost function can also be enabled at service level. The function is to turn on the module in back-up if all other modules are working at their maximum power and the adjustment temperature continues to stay away from the setpoint beyond a set time. The module just switched on returns to back-up if the temperature reaches setpoint.

8.9.16.6 Pre-antifreeze warning

The pre-antifreeze warning is used to avoid that by adjusting the temperature in the modular system in chiller mode, in a single machine the evaporator outlet temperature does not become too low and the antifreeze alarm is activated.

8.9.16.7 Defrost

In order not to reduce the production of hot water by the modular system too much, defrosting one machine at a time is allowed. The safety defrost (see 8.9.14.1 "Safety defrost") remains enabled and can intervene if necessary at any time.

8.9.16.8 Domestic hot water (ACS)

The demand for domestic hot water (ACS) in a modular system occurs only in the Leader machine in one of the modes provided (probe or digital input).
In a modular system, the production of domestic hot water occurs in all machines with ACS. Machines without ACS are put on stand-by during the production of domestic hot water.

8.10 Alarms

8.10.1 Display and reset of alarms

When there is at least one alarm in the machine, the panel display buzzer sounds and, if the remote display is present, the "**Alarm**" key flashes red. Depending on the type of alarm, the machine provides for a certain action (see 8.10.2 "Alarm table").

To display the menu of active alarms, press the key "**Alarm**" in the upper left. The active alarm codes appear on the screen (see 8.10.2 "Alarm table").

The automatic reset alarms reset when the alarm condition disappears.

The manual reset alarms are reset by holding pressed the key "**Alarm**" for 5s.

Non-resettable alarms still remain active.

The alarm relay allows to have a remote signal of the status of the machine alarms. It is possible to set the operation of the alarm relay according to the severity of the alarm from parameter to service level.

8.10.2 Alarm table

Below is the alarm table of the machine. The first column shows the alarm code shown on the display, in the second column the type of alarm action, in the third the type of reset (**Auto**= automatic, **User**= manual, **Auto/User**= manual after a number of automatic interventions in one hour), in the fourth the description of the alarm and in the last any notes.

Cod.	Action	Reset type	Description	Notes
AL001	Circuit block	User	Fan overload	Check the status of the fans
AL002	Warning	User	Error number of writings in retention memory	Restart the unit
AL003	Warning	User	Error in writings in retention memory	Replace electronic control
AL004	Unit block/ No pump	Auto	Faulty water inlet temperature probe	Check the sensor
AL005	Unit block/ No pump	Auto	Faulty water outlet temperature probe	Check the sensor
AL006	Circuit block	Auto	Ambient temperature probe alarm	Check the sensor
AL007	Unit block*	User	Evaporator 1 pump overload	Check the pump status
AL009	Unit lock	User	Flow switch alarm	Check water flow
AL012	Warning	Auto	Pump 1 maintenance	Check working hours
AL022	Unit block/ No pump	User	Evaporator antifreeze temperature alarm	Check working conditions
AL023	Warning	Auto	Compressor maintenance	Check working hours
AL024	Warning	Auto	Fan maintenance	Check working hours
AL025	Circuit block	User	High pressure alarm by pressure switch	Check working conditions
AL026	Circuit block	User	Low pressure alarm	Check the evaporation pressure
AL027	Compressor block/ No relay	Auto	Outdoor temperature outside operating limits	Check working conditions
AL028	Circuit block	Auto/User	Water antifreeze alarm	Check water temperature
AL029	Circuit block	User	Maximum number of emergency defrost	Check battery condition
AL030	ACS Block/ No relay	Auto	ACS probe faulty	Check the sensor
AL031	Circuit block	User	ACS valve not switched	Check the status of the ACS valve
AL032	Circuit block	User	Oil temperature probe faulty	Check the sensor
AL036	Warning / Yes relay	Auto	Electrical panel temperature probe faulty	Check the sensor
AL081	Unit lock	User	Water circuit pressure switch alarm	Check the working conditions
AL083	Unit lock	Auto	Faulty tank temperature probe	Check the sensor
AL084	Unit lock	Auto/User	c.pCOe offline	Check the communication with the expansion c.pCOe
AL085	Circuit block	User	Configuration error cpCOe/cpCOe probe disconnected	Check the c.pCOe expansion probes
AL086	Warning	Auto	Alert for maximum ACS time	Check the operation of domestic hot water

Cod.	Action	Reset type	Description	Notes
AL087	Unit lock	Auto	Tank temperature probe faulty on c.pCOe	Check the sensor
AL088	Warning	Auto	Probe temperature alarm on faulty pGDx or offline pGDx	Check the connection of pGDx remote touch display
AL089	Warning	User	Maximum number of consecutive failures of the anti-legionella procedure exceeded	Check the operation of the anti-legionella procedure
AL090	Circuit block	User	Leak Detector Calibration Expired Warning	Record on the display the successful calibration of the leak detector
AL091	Warning	Auto	ACS pump maintenance	Check working hours
AL166	Warning	Auto	Communication error with the Leader unit	Check the communication between the modules On the “Network” page of the display, you can temporarily disable the modularity of the Follower unit to allow it to work independently.
AL167	Warning	Auto	Communication error with the Follower 2 unit	Check the communication between the modules
AL168	Warning	Auto	Communication error with the Follower 3 unit	Check the communication between the modules
AL169	Warning	Auto	Communication error with the Follower 4 unit	Check the communication between the modules
AL176	Circuit block	Auto	Suction temperature probe faulty or disconnected	Check the sensor
AL178	Unit block	Auto	Inverter offline	Check the inverter connection
AL179	Warning	Auto	General warning of the inverter	Check the working conditions / inverter status
AL180	Unit block	Auto	General alarm of the inverter	Check the working conditions / inverter status
AL181	Circuit block	Auto	EEV - Low overheating protection	Check the working conditions
AL182	Circuit block	Auto	EEV - Low evaporation temperature protection	Check the working conditions
AL183	Circuit block	Auto	EEV – High evaporation temperature protection	Check the working conditions
AL185	Circuit block	Auto	EEV – Low suction temperature	Check the working conditions
AL188	Circuit block	Auto	EEV – EEV emergency closing alarm	Check the working conditions / EEV status
AL193	Circuit block	User	Envelope - Time out of envelope when compressor starts	Check the working conditions
AL194	Circuit block	User	Envelope - Too low temperature difference between condensation and evaporation	Check the working conditions
AL195	Circuit block	User	Envelope - Time out of envelope	Check the working conditions
AL197	Warning	Auto	Time out below the oil overheating setpoint	Check the working conditions / Check the carter resistance status
AL198	Unit block	User	Low pressure alarm from transducer below emergency threshold without delay	Check the working conditions
AL199	Warning	User	Check the positioning of the water inlet and outlet probes / possible refrigerant leak	Check the water inlet and outlet probes and their positioning
AL201	Unit block	Auto	High discharge temperature from probe	Check the working conditions
AL202	Unit block	Auto	High condensation pressure from transducer	Check the working conditions

Cod.	Action	Reset type	Description	Notes
AL203	Warning / Circuit block	Auto	Fan 1 modbus offline With 1 fan, an alarm is generated and the circuit is blocked with the fan offline or in alarm. With 2 fans, a warning is generated when the first fan is offline or in alarm and then the circuit is blocked if the second alarm enters a warning state at the same time.	Check the fan connection
AL204	Warning / Circuit block	Auto	Generic alarm fan 1 modbus With 1 fan, an alarm is generated and the circuit is blocked with the fan offline or in alarm. With 2 fans, a warning is generated when the first fan is offline or in alarm and then the circuit is blocked if the second alarm enters a warning state at the same time.	Check the working conditions
AL205	Warning / Circuit block	Auto	Fan 2 modbus offline With 1 fan, an alarm is generated and the circuit is blocked with the fan offline or in alarm. With 2 fans, a warning is generated when the first fan is offline or in alarm and then the circuit is blocked if the second alarm enters a warning state at the same time.	Check the fan connection
AL206	Warning / Circuit block	Auto	Generic alarm fan 2 modbus With 1 fan, an alarm is generated and the circuit is blocked with the fan offline or in alarm. With 2 fans, a warning is generated when the first fan is offline or in alarm and then the circuit is blocked if the second alarm enters a warning state at the same time.	Check the working conditions
AL207	Unit block	Auto	Inverter start consent missing	Check inverter wiring (inverter terminal 27)

8.11 Modbus variable list

The parameters for communication with a BMS system via Modbus can be set at the service level.
Below are the Modbus variables of the machine.

Types	Index	Variable Description	DataType	UoM	NoteDirection
Coil	14	Unit On/Off by BMS ((0=Off; 1=On)	Bool	NoUnits	ReadWrite
Coil	18	Chiller/HeatPump mode by Keyboard	Bool	NoUnits	ReadWrite
Coil	20	Type of scheduling (0=Switch Off/On; 1=Change setpoint) (available only if enabled by service))	Bool	NoUnits	ReadWrite
Coil	67	Enable Friday on week scheduling function	Bool	NoUnits	ReadWrite
Coil	68	Enable Monday on week scheduling function	Bool	NoUnits	ReadWrite
Coil	69	Enable Saturday on week scheduling function	Bool	NoUnits	ReadWrite
Coil	70	Enable Sunday on week scheduling function	Bool	NoUnits	ReadWrite
Coil	71	Enable Tuesday on week scheduling function	Bool	NoUnits	ReadWrite
Coil	72	Enable Tuesday on week scheduling function	Bool	NoUnits	ReadWrite
Coil	73	Enable Wednesday on week scheduling function	Bool	NoUnits	ReadWrite

Types	Index	Variable Description	DataType	UoM	NoteDirection
Coil	74	Enable week scheduling function	Bool	NoUnits	ReadWrite
Coil	166	AL166	Bool	NoUnits	Read
Coil	167	AL167	Bool	NoUnits	Read
Coil	168	AL168	Bool	NoUnits	Read
Coil	169	AL169	Bool	NoUnits	Read
DiscreteInput	0	Global Alarm	Bool	NoUnits	Read
DiscreteInput	25	AL001	Bool	NoUnits	Read
DiscreteInput	26	AL002	Bool	NoUnits	Read
DiscreteInput	27	AL003	Bool	NoUnits	Read
DiscreteInput	28	AL004	Bool	NoUnits	Read
DiscreteInput	29	AL005	Bool	NoUnits	Read
DiscreteInput	30	AL006	Bool	NoUnits	Read
DiscreteInput	31	AL007	Bool	NoUnits	Read
DiscreteInput	32	AL009	Bool	NoUnits	Read
DiscreteInput	42	AL022	Bool	NoUnits	Read
DiscreteInput	43	AL025	Bool	NoUnits	Read
DiscreteInput	44	AL026	Bool	NoUnits	Read
DiscreteInput	49	AL012	Bool	NoUnits	Read
DiscreteInput	50	AL023	Bool	NoUnits	Read
DiscreteInput	51	AL024	Bool	NoUnits	Read
DiscreteInput	52	AL028	Bool	NoUnits	Read
DiscreteInput	53	AL031	Bool	NoUnits	Read
DiscreteInput	54	AL030	Bool	NoUnits	Read
DiscreteInput	119	AL029	Bool	NoUnits	Read
DiscreteInput	120	AL027	Bool	NoUnits	Read
DiscreteInput	121	AL036	Bool	NoUnits	Read
DiscreteInput	166	AL032	Bool	NoUnits	Read
DiscreteInput	170	AL081	Bool	NoUnits	Read
DiscreteInput	172	AL083	Bool	NoUnits	Read
DiscreteInput	173	AL091	Bool	NoUnits	Read
DiscreteInput	185	AL084	Bool	NoUnits	Read
DiscreteInput	186	AL085	Bool	NoUnits	Read
DiscreteInput	187	AL086	Bool	NoUnits	Read
DiscreteInput	188	AL087	Bool	NoUnits	Read
DiscreteInput	189	AL088	Bool	NoUnits	Read
DiscreteInput	190	AL089	Bool	NoUnits	Read
DiscreteInput	191	AL090	Bool	NoUnits	Read
DiscreteInput	196	The antilegionella procedure is running	Bool	NoUnits	Read
DiscreteInput	201	AL188	Bool	NoUnits	Read
DiscreteInput	202	AL194	Bool	NoUnits	Read
DiscreteInput	207	AL180	Bool	NoUnits	Read
DiscreteInput	208	AL179	Bool	NoUnits	Read
DiscreteInput	209	AL178	Bool	NoUnits	Read
DiscreteInput	210	AL182	Bool	NoUnits	Read
DiscreteInput	211	AL181	Bool	NoUnits	Read
DiscreteInput	212	AL185	Bool	NoUnits	Read
DiscreteInput	214	AL198	Bool	NoUnits	Read
DiscreteInput	215	AL183	Bool	NoUnits	Read

Types	Index	Variable Description	DataType	UoM	NoteDirection
DiscreteInput	221	AL193	Bool	NoUnits	Read
DiscreteInput	222	AL176	Bool	NoUnits	Read
DiscreteInput	224	AL195	Bool	NoUnits	Read
DiscreteInput	226	AL199	Bool	NoUnits	Read
DiscreteInput	227	AL197	Bool	NoUnits	Read
DiscreteInput	228	AL201	Bool	NoUnits	Read
DiscreteInput	229	AL202	Bool	NoUnits	Read
DiscreteInput	230	AL203	Bool	NoUnits	Read
DiscreteInput	231	AL204	Bool	NoUnits	Read
DiscreteInput	237	AL207	Bool	NoUnits	Read
DiscreteInput	238	AL208	Bool	NoUnits	Read
HoldingRegister	8	Cooling mode setpoint	Real	DegreesCelsius	ReadWrite
HoldingRegister	26	Second setpoint in cooling	Real	DegreesCelsius	ReadWrite
HoldingRegister	247	Setpoint DHW	Real	DegreesCelsius	ReadWrite
HoldingRegister	255	Heating mode setpoint	Real	DegreesCelsius	ReadWrite
HoldingRegister	256	Second setpoint in heating	Real	DegreesCelsius	ReadWrite
HoldingRegister	259	Preset Climatic Curve (0=No, 1=Custom, 2=PresetA, 3=PresetB, 4=PresetC, 5=PresetD)	Int	NoUnits	ReadWrite
HoldingRegister	309	Scheduler Friday end hour time band	Int	Hours	ReadWrite
HoldingRegister	310	Scheduler Friday end minute time band	Int	Minutes	ReadWrite
HoldingRegister	311	Scheduler Friday start hour time band	Int	Hours	ReadWrite
HoldingRegister	312	Scheduler Friday start minute time band	Int	Minutes	ReadWrite
HoldingRegister	313	Scheduler Monday end hour time band	Int	Hours	ReadWrite
HoldingRegister	314	Scheduler Monday end minute time band	Int	Minutes	ReadWrite
HoldingRegister	315	Scheduler Monday start hour time band	Int	Hours	ReadWrite
HoldingRegister	316	Scheduler Monday start minute time band	Int	Minutes	ReadWrite
HoldingRegister	317	Scheduler Saturday end hour time band	Int	Hours	ReadWrite
HoldingRegister	318	Scheduler Saturday end minute time band	Int	Minutes	ReadWrite
HoldingRegister	319	Scheduler Saturday start hour time band	Int	Hours	ReadWrite
HoldingRegister	320	Scheduler Saturday start minute time band	Int	Minutes	ReadWrite
HoldingRegister	321	Scheduler Sunday end hour time band	Int	Hours	ReadWrite
HoldingRegister	322	Scheduler Sunday end minute time band	Int	Minutes	ReadWrite
HoldingRegister	323	Scheduler Sunday start hour time band	Int	Hours	ReadWrite
HoldingRegister	324	Scheduler Sunday start minute time band	Int	Minutes	ReadWrite
HoldingRegister	325	Scheduler Thursday end hour time band	Int	Hours	ReadWrite
HoldingRegister	326	Scheduler Thursday end minute time band	Int	Minutes	ReadWrite
HoldingRegister	327	Scheduler Thursday start hour time band	Int	Hours	ReadWrite
HoldingRegister	328	Scheduler Thursday start minute time band	Int	Minutes	ReadWrite
HoldingRegister	329	Scheduler Tuesday end hour time band	Int	Hours	ReadWrite
HoldingRegister	330	Scheduler Tuesday end minute time band	Int	Minutes	ReadWrite
HoldingRegister	331	Scheduler Tuesday start hour time band	Int	Hours	ReadWrite
HoldingRegister	332	Scheduler Tuesday start minute time band	Int	Minutes	ReadWrite
HoldingRegister	333	Scheduler Wednesday end hour time band	Int	Hours	ReadWrite
HoldingRegister	334	Scheduler Wednesday end minute time band	Int	Minutes	ReadWrite
HoldingRegister	335	Scheduler Wednesday start hour time band	Int	Hours	ReadWrite
HoldingRegister	336	Scheduler Wednesday start minute time band	Int	Minutes	ReadWrite

Types	Index	Variable Description	DataType	UoM	NoteDirection
HoldingRegister	342	Water Flowmeter - Value	Real	NoUnits	Read
HoldingRegister	343	User water outlet tank probe	Real	DegreesCelsius	Read
HoldingRegister	353	Water tank probe (expansion)	Real	DegreesCelsius	Read
InputRegister	2	User water inlet probe	Real	DegreesCelsius	Read
InputRegister	3	User water outlet probe	Real	DegreesCelsius	Read
InputRegister	8	Actual compressor power	Real	Percent	Read
InputRegister	9	Discharge pressure probe circuit 1	Real	Bars	Read
InputRegister	10	Condensing temperature probe circuit 1	Real	DegreesCelsius	Read
InputRegister	11	Discharge temperature probe circuit 1	Real	DegreesCelsius	Read
InputRegister	14	Suction temperature probe circuit 1	Real	DegreesCelsius	Read
InputRegister	15	Suction pressure probe circuit 1	Real	Bars	Read
InputRegister	16	Evaporating temperature circuit 1	Real	DegreesCelsius	Read
InputRegister	28	External temperature	Real	DegreesCelsius	Read
InputRegister	31	Inverter request source fan circuit 1	Real	Percent	Read
InputRegister	90	Electrical equipment temperature	Real	DegreesCelsius	Read
InputRegister	97	DHW Temperature	Real	DegreesCelsius	Read
InputRegister	127	Oil Sump Temperature	Real	DegreesCelsius	Read
InputRegister	134	Percentual opening of the EXV	Real	NoUnits	Read

8.12 Probe key

For the positions of the probes listed below, refer to the cooling diagram.
The following table describes the probes:

Probe shown in the manual	Terminal name	Description
-BEWIT	**B1**	PLATE TYPE HEAT EXCHANGER WATER INLET PROBE
-BEWOT	**B2**	PLATE TYPE HEAT EXCHANGER WATER OUTLET PROBE
-BDT	**B3**	COMPRESSOR OUTLET TEMPERATURE
-BAT2	**B4**	ELECTRICAL PANEL TEMPERATURE
-BHP1	**B5**	CONDENSING TEMPERATURE
-BAT1	**B6**	AMBIENT TEMPERATURE
-BEV11	**B7**	EVAPORATING TEMPERATURE
-BOT1	**B9**	OIL TEMPERATURE
-BLP1	**B10**	EVAPORATING PRESSURE
-BTWOT	**B11**	EXTERNAL TANK TEMPERATURE (AVAILABLE)
-BTSW	**B12**	ACCUMULATION DOMESTIC WATER TEMPERATURE (AVAILABLE)

With external ACS kit c.pCOe

Probe shown in the manual	Terminal name	Description
-BTWOT1	**U4**	PROBE ON THE EXTERNAL TANK
-BTSW1	**U1**	ACCUMULATION DOMESTIC WATER TEMPERATURE PROBE

CHAPTER 9

CALIBRATIONS OF OTHER COMPONENTS

9.1 Refrigerant high pressure switch

The machines are equipped with a high pressure switch (HP)
This monitors the refrigerant compressor discharge pressure and prevents it from increasing to potentially hazardous values that could harm the compressor and people within the vicinity.
It is of the “automatic reset” type.
Its intervention is detected by the electronic control unit, which opens the compressor supply circuit and visualises the **high pressure alarm** signal. When the compressor delivery pressure falls below the reset point, the pressure switch is reset.
The unit can be restarted by following the alarms reset procedure described in Chapter 8 “Electronic control“.
If the cause of the pressure switch trip has not been remedied this cycle will be repeated continuously.
The TRIP and RESET values of the pressure switches depend on the type of refrigerant and are shown in the following table:

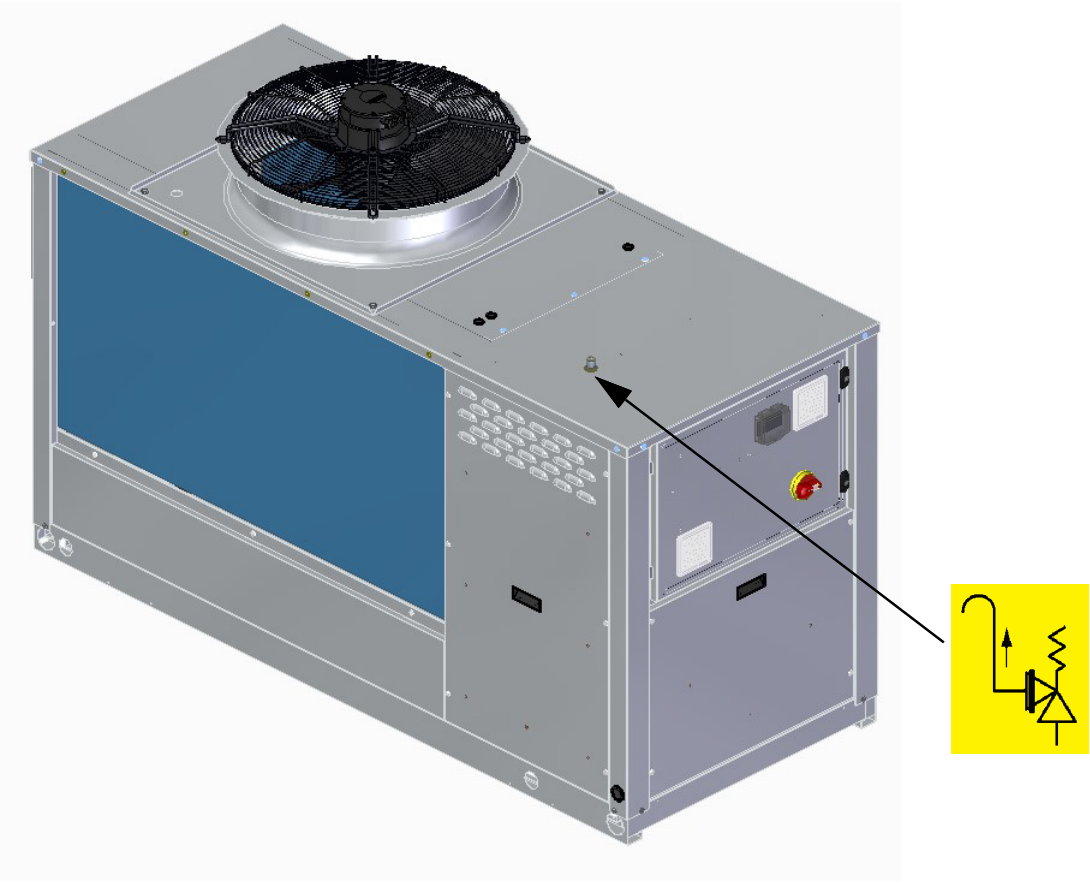
COMPONENT	REFRIGERANT	Intervention		Restore	
		bar	°C	bar	°C
High pressure switch HP	R454B	40.5	67.3	33.0	58.2

9.2 Safety valve

Its task is to protect the system from pressures so high as to cause serious damage to the machine and surrounding things in the event of failure to intervene with other protections.
When the pressure of the refrigerant fluid exceeds the intervention value of the valve (see table below), the latter opens the circuit and lets the gas discharge until the pressure has reached values lower than those set.
Under those conditions, the valve will automatically return to closing.
It is of the fixed calibration type and its calibration is in relation to the design pressure of the weakest component of the circuit.
The valve must be checked regularly, as laid down by the regulations in force.
Upstream of the safety valve, a shut-off valve is installed. Before removing the safety valve (for example, for periodic verification), make sure that the shut-off valve is in the closed position. After repositioning the safety valve, before starting the machine, check that the shut-off valve is in the open position and has been correctly plunged.
The unloading of the safety valve must be conveyed to the outside of the unit in a safe area according to the requirements of EN378-3 and the regulations in force at the place of installation.
The exhaust of the safety valve must be conveyed to the outside of the unit in a safe area and away from possible sources of ignition. The discharge must be positioned at least 1 metre from the ground, and facing upwards.
The cross-section and length of the drain pipe must be sized in accordance with national laws and directives applicable in the country of installation.
The image below shows the unloading of the safety valve, whose position is indicated by the relative adhesive (see 2.2 “Symbols”)

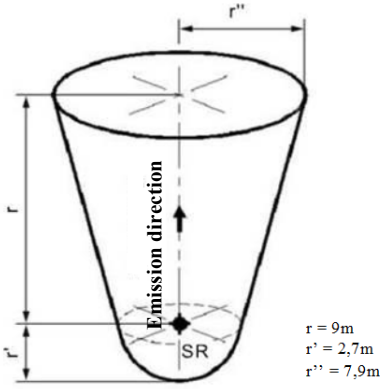
CAUTION

⚠ Remove the safety valve drain protection cap.



Convey the unloading of the safety valve (to be borne by the end user). Size the conveyor according to standard 13136:2019. To avoid any possible clogging of the pressure discharge pipe, fit a cover to keep out rainwater.

The potentially explosive area created by the discharge of the safety valve has the following shape and dimensions:



WARNING

⚠ DO NOT remove or tamper with the safety valve.

COMPONENT	REFRIGERANT	Intervention	
		bar	°C
HP Safety Valve	R454B	44.5	71.7

WARNING

⚠ The intervention of the safety valve indicates a anomalous operation of the unit.

Identify the cause of the anomaly as soon as possible and restore normal conditions.

9.3 Water differential pressure switch

The machine is fitted with a differential pressure switch that measures the water pressure difference between the inlet and outlet manifolds of the evaporator.

When the pressure switch detects a Δp lower than 50 mbar (500 H2O), it sends an alarm signal to the board, which in turn shuts down the machine after the delay time defined in the manufacturer/service parameter.

When the Δp rises above 50 mbar, the alarm condition is eliminated and the machine restarts automatically.

This switch protects the evaporator from the formation of ice if there is little or no flow in the water circuit.

It also protects the pump, which must never be operated without fluid.

9.4 Forced panel ventilation

The machines can be fitted with a thermostat system for control panel and/or inverter compartment ventilation.

For adequate ventilation, it is necessary to provide for a regular cleaning of the filter cloth present both on the ventilation system and on the ventilation grille.

Replacing and cleaning the filter cloth:

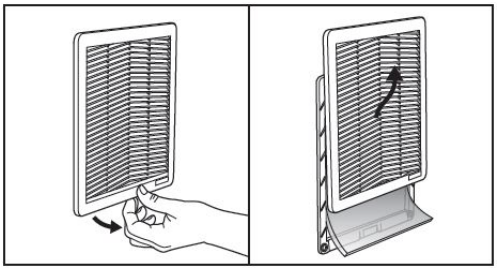
To replace the filter cloth, slide the cover over the base by lifting the lower tab and pushing upwards.

Then reposition the cover.

The filter cloth can be cleaned by rinsing, water jet treatment or tapping.

NOTE

The frequency of its cleaning varies depending on the amount of dust present and the operating time; it must therefore be determined from time to time by the user for each individual use.



DANGER

⚠ **The dirty filter cloth decreases the efficiency of the filter unit causing insufficient or even a total lack of ventilation.**

9.5 Coolant leak detector (option)

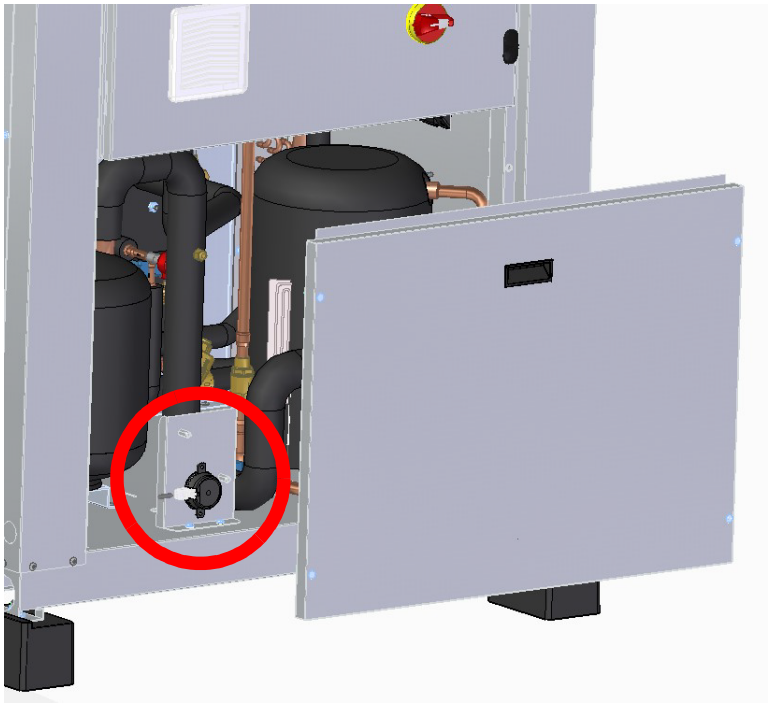
DANGER

⚠ **Before starting the machine, make sure that all the panels have been correctly installed.**

On board the units a refrigerant leak detector (Leak Detector) is installed with catalytic sensor that allows the immediate identification of refrigerant leaks (see imagine below). Upon exceeding 15% of the LFL (Lower Flammable Limit), the detector closes an alarm contact present inside it (remote contact in the terminal block -XC present inside the electrical panel).
The system manager is responsible for defining the necessary actions to be taken on the machine in the event of a refrigerant leak in accordance with local regulations and, in Europe, with the EN378-4 and EN13313 standards.
There is an LED on the detector; below is the meaning:
Flashing green light (20% On, 80% Off) - normal operation
Steady red light - alarm condition
Green light 25% and amber light 25% flashing alternately – near end of life
Flashing red light (50% On, 50% Off)– end of life, replace the sensor

WARNING

⚠ For remote transmission of the Leak Detector signal, see the wiring diagram.



CHAPTER 10

OPERATION AND MAINTENANCE

10.1 Operation

Operation of the unit is fully automatic.
It's not necessary to turn it off when there is no thermal load, as it will turn off automatically when the pre-set outlet water temperature is reached.

10.2 Maintenance

WARNING

⚠ The maintenance operations, for which the intervention inside the machine is foreseen, must be carried out by authorised operators, informed and trained on the specific risks from flammable gases according to good practices and/or current standards in compliance with ANNEX HH IEC 60335-2-40, equipped with the appropriate precautions and protections (active and passive e.g. work gloves) in order to be able to operate in maximum safety.
Refer to the provisions of local laws and, in Europe, standard EN378-4 and standard EN13313.

WARNING

⚠ Before installing or operating these machines, make sure that all personnel have read and understood Chapter 2 “Safety“.

WARNING

⚠ This unit will give many years of trouble-free service if properly maintained and serviced.

10.2.1 Accessing the machine

DANGER

⚠ **The control panel must only be opened when the machine is switched off.**

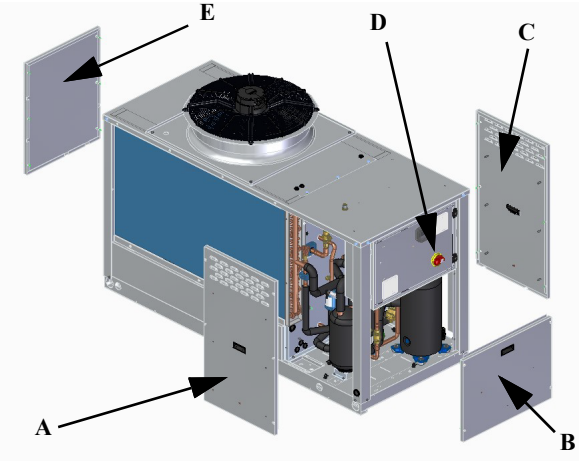
DANGER

⚠ **Before starting the machine, make sure that all the panels have been correctly installed.**

The protective panels can be removed when maintenance needs to be carried out.
To remove the panels, use a screwdriver to unscrew the fixing screws.
Here below you can see the panel you can remove.

- To access the refrigerant circuit components remove the panels (**A**) (**B**) and (**C**).
- To access the electric board components set the main switch on “O” and remove the panel (**D**).
- To access the water circuit components remove the back panel (**E**).

IGHP 007-009



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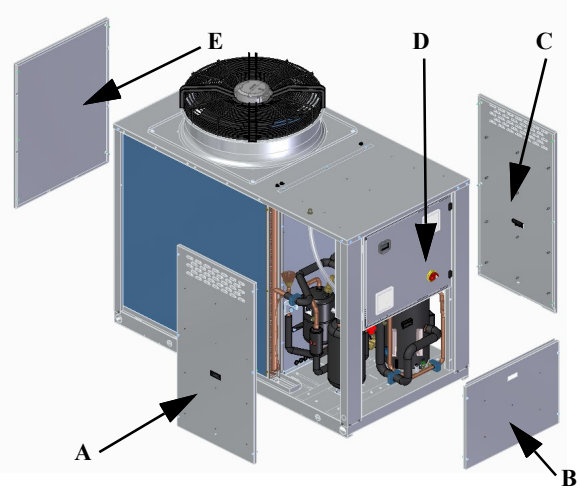


WARNING

⚠ The motors contain DC bus capacitors that can remain charged even when the frequency converter is not powered. Failure to comply with the indicated waiting time after disconnecting the power supply and before carrying out maintenance or repair work, may cause serious or fatal injuries.
1. Stop the engine.
2. Disconnect the AC network.
3. Wait for the capacitors to discharge completely before performing any maintenance or repair work. The waiting time is 15 minutes.

10.2.2 Filling / draining the water circuit

Filling procedure:

1. Connect the water pipes to the machine, respecting the inlet and outlet (see 5.3 “Hydraulic connections”).
2. Connect the mains water supply to point (**A**) of the functional diagram shown in chapter 5.3 “Hydraulic connections” .
3. Make sure there are vents on the highest points of the hydraulic circuit, where air may collect.
4. Open the vent in the unit (see figures below).
5. Open the tap (**B**) of the functional diagram shown in chapter 5.3 “Hydraulic connections” to load the system with water. You are advised to fill the system very slowly, to ensure all the air is vented in the meantime.
6. Close the vent in the unit and the vents installed in the hydraulic circuit when the air flow has ceased and only water is coming out.
7. Stop charging when the pressure gauge indicates that a circuit pressure compatible with the expansion vessel has been reached.
8. Start up the pump without activating the compressor, to fully bleed the system, and continue filling if necessary.

Draining procedure:

CAUTION

⚠ If you need to carry out maintenance tasks requiring the drainage of the water circuit, bear in mind that the units are fitted with specific drainage taps.

If the system needs to be drained, proceed as follows:

1. Switch off the machine.
2. Close any shut-off valves installed on the system IN-OUT connections.
3. Open the vent in the unit (see figures below).
4. Open the drain point to drain off the water.

NOTE

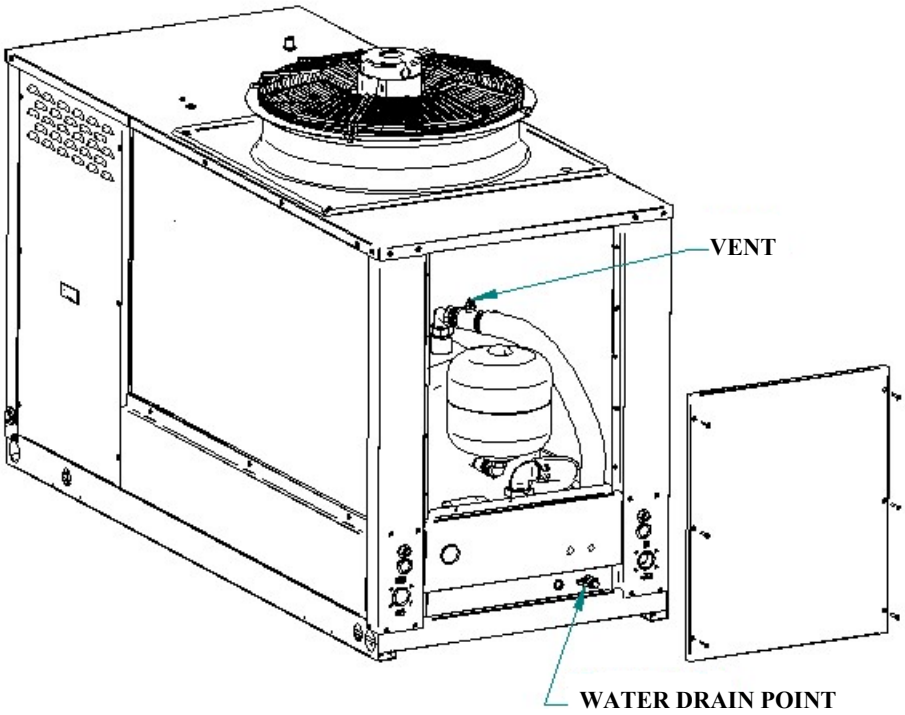
To fully drain the circuit, it's a good idea to blow compressed air into the plate heat exchanger.

CAUTION

⚠ The water circuit drainage operation is indispensable when the machine must remain OFF for a long time in a place where low temperatures could freeze the water in the evaporator (causing it to break).

WITH TANK + PUMP

IGHP 007-009



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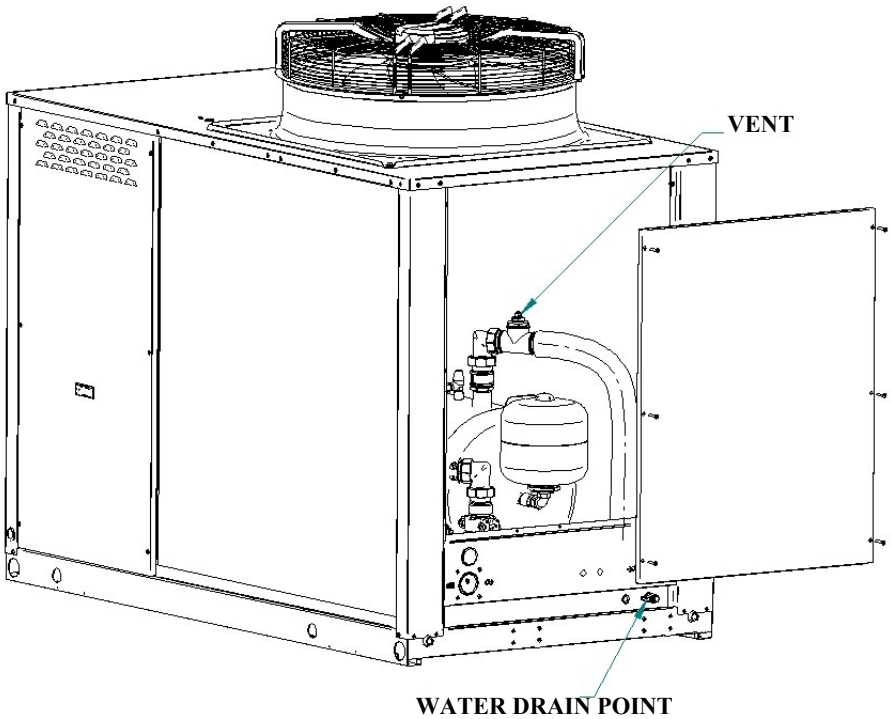

WITHOUT TANK OR WITH SIGLE PUMP

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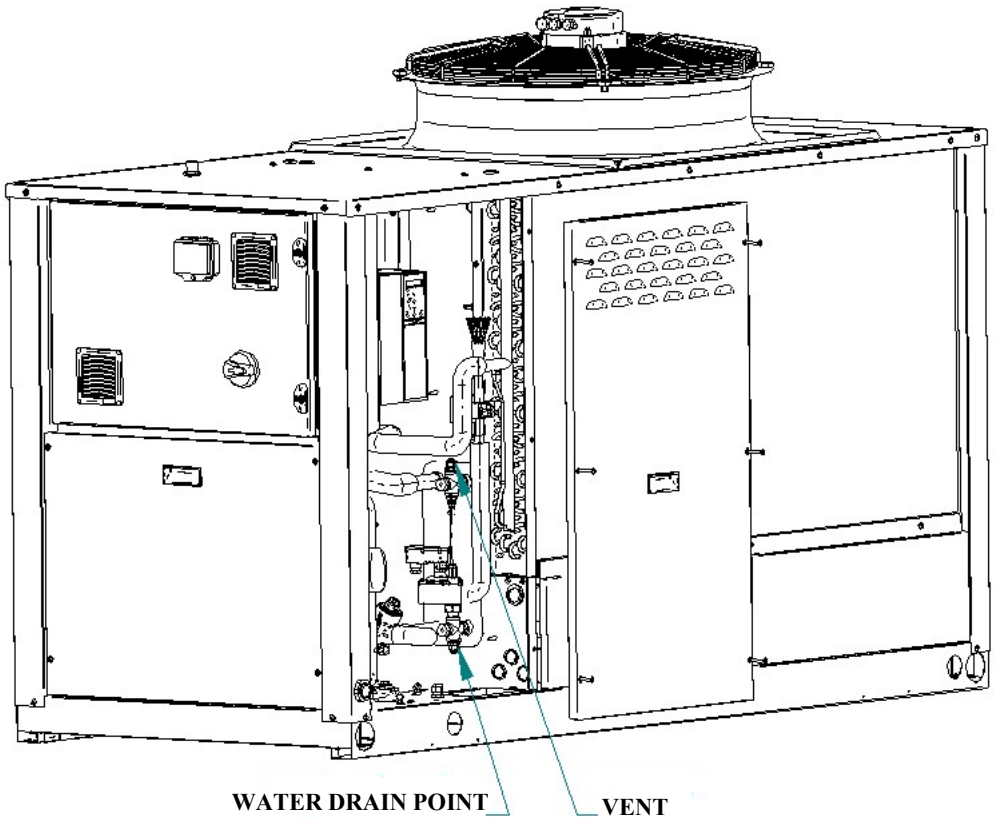

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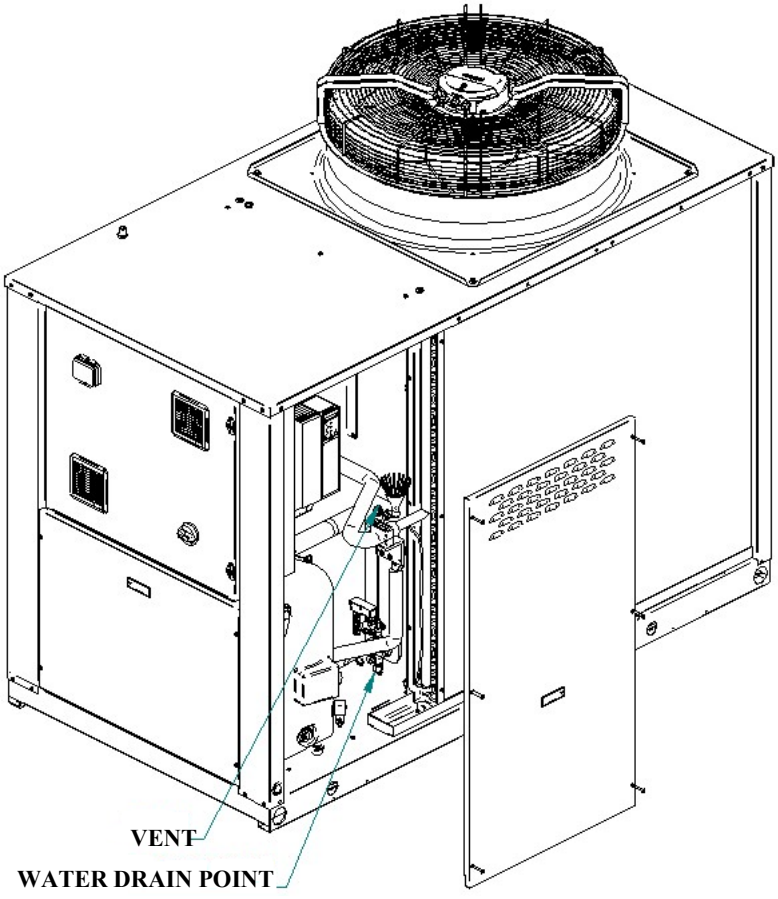


10.2.3 Coolant charging procedure

The systems with container shipment are supplied with a nitrogen pre-charge of 1bar (indicated by the sticker below).

When the machine is put into operation this sticker must be removed.
To allow the machine to start up, it is necessary to charge the R290 refrigerant.

NOTE
The quantity of refrigerant per circuit is indicated on the data plate.

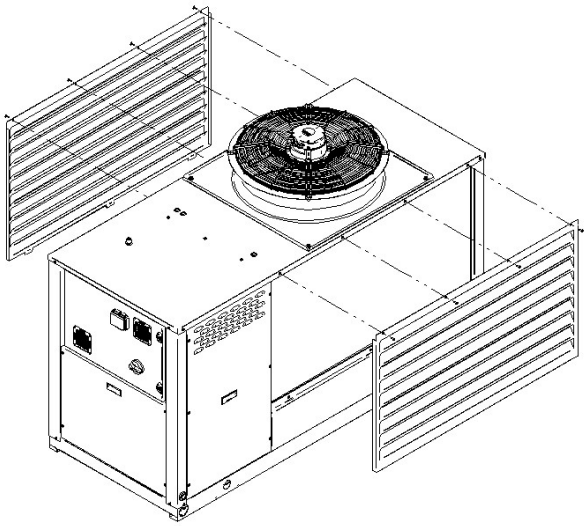
CAUTION

⚠ Vacuum / refrigerant gas filling procedures can only be performed by authorised operators, informed and trained on the specific risks of flammable gases according to good practices and/or current standards in accordance with ANNEX HH IEC 60335-2-40.

10.2.4 Cleaning procedure for condensing batteries

To clean the condensing coils, remove the screws that secure the grilles (if any).

IGHP 007-009



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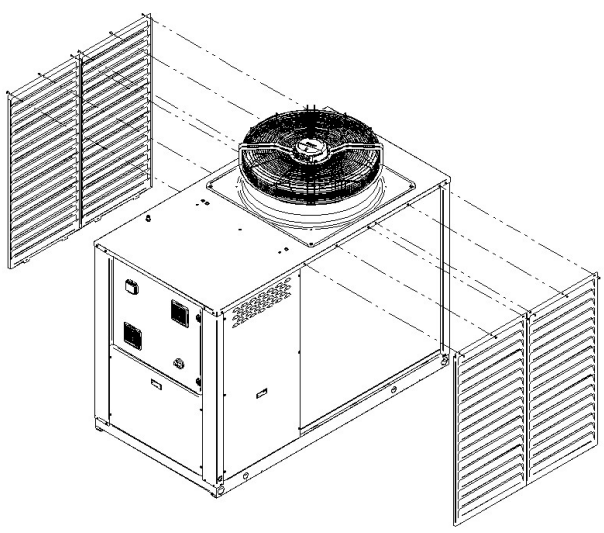


1. Make sure that the unit is switched off and the disconnecting device is padlocked in position “0”.
2. If necessary, clean the area around the unit to ensure that leaves or debris are not blown into the condensing battery.
3. Remove dirt on the surface:
   The dirt on the surface must be removed before cleaning and/or rinsing with water to avoid further airflow restrictions.
   If it is not possible to backwash the side of the battery opposite to that of the air inlet, remove the dirt on the surface with a vacuum cleaner.
   If a vacuum cleaner is not available, a soft non-metallic bristle brush can be used, generally vertically. Battery surfaces can be easily damaged (folded tab edges) if the brush is applied to the tabs.
4. When cleaning, avoid directing the water jet so that it can damage the aluminium fins of the battery.

NOTE
Using a water flow against a battery will push dirt into the battery. This will make cleaning efforts more difficult. The dirt on the surface must be completely removed before completing the cleaning.

5. Rinse with drinking water to remove excess soap residue.
   Starting from the top of the battery, start rinsing it from one side to the other until it reaches the bottom.
   Repeat the operation as many times as necessary to ensure that all sections/panels of the battery have been completed and thoroughly rinsed.
   Any excess soap residue mixed with removed dirt, salt and any material deposited on the batteries can constitute a potential problem and an environment suitable for battery corrosion or degradation.

10.3 Control and maintenance schedule

OPERATION	Daily	Monthly	Every 6 months	Yearly
Check there are no alarm signals.	◊			
Check the water outlet temperature is within the correct range.	◊			
Check that water inlet temperature is in compliance with the value used for selection of the unit.		◊		
Check that the pressure in the hydraulic circuit with the pump stopped is greater than about 0.5 bar.		◊		
In units equipped with a hydraulic unit check that the difference between the pump outlet pressure and suction pressure (measured on the pressure gauge with pump stopped) is within the prescribed range and not lower than the pump maximum flow rate value.		◊		
Clean the water filter. In any case, you are advised to clean the filter one week after the initial machine start-up.		◊		
Check the liquid sight glass (if installed) is full - or shows only a minimum amount of bubbles - when the compressor is running.			◊	
Check that the unit current absorption is within the data plate values.			◊	
Carry out visual inspection of refrigerant circuit, looking out for any deterioration of the piping or any traces of oil which might indicate a refrigerant leak.			◊	
Make the regular check of the refrigerant circuit seal as per the F-GAS directive.				
Check the condition and firmness of the pipe connections.			◊	
Check the condition and security of wiring and electrical connections.			◊	
Using a spanner, check that any ring nuts on the refrigerant compressor intake and delivery pipes have not slackened.			◊	
Make sure the ambient temperature complies with the value used to select the machine (usually 30-35°C). Check that the environment is well ventilated.		◊		
Check that the fan is activated automatically. Check they are not noisy. Check that the grilles of the unit are free from dirt and any other obstructions.			◊	
Clean the fins of the condensing batteries with soap or neutral detergent (see ch. 10.2.4 “Cleaning procedure for condensing batteries”).				◊
Check the condensate drainage holes are not obstructed.		◊		

CAUTION

⚠ The above maintenance schedule is based on normal use.

In some cases it may be necessary to increase maintenance frequency.

CHAPTER 11

TROUBLESHOOTING

CHILLER MODE

PROBLEM	CAUSE	MANIFESTATION	REMEDY
A Water outlet temperature higher than envisaged.	**A1** Thermal load too high.	**A1.1** Temperature higher than the value envisaged.	Reduce the thermal load to within preset limits.
	A2 Ambient temperature too high.	**A2.1** See A1.1.	Check the correct installation of the machine and the correct ventilation.
	A3 Condenser fins fouled.	**A3.1** See A1.1.	Clean the condenser fins.
	A4 Front surface of the condenser blocked.	**A4.1** See A1.1.	Remove the obstruction from the front surface of the condenser.
	A5 Circuit has insufficient refrigerant charge.	**A5.1** • See A1.1; • Low evaporation pressure; • If there is a sight glass, check if there are a lot of bubbles; • High delivery temperature.	Call in a qualified refrigeration engineer to check for leaks and eliminate them. Fill the plant.
	A6 Compressor protection trips.	**A6.1** The compressor stops and attempts to restart after a short time (even few seconds).	Call in a qualified refrigeration engineer to check for leaks and eliminate them. Fill the plant.
B Insufficient pressure head (water pressure) at the pump outlet.	**B1** Excessively high water flow rate. The pump is running outside its operating limits (high flow rate, low pressure head, high power consumption).	**B1.1** • Possible increase in outlet temperature (see A1.1); • Possible pump thermal trip.	Bring the flow rate back within the preset limits, for example, change the control rpm. Reset pump thermal cutout and check electrical power consumption.
	B2 See point C. Before ice obstructs the whole evaporator, there is an increase in the pressure drop.	**B2.1** See point C.	See point C.
	B3 Evaporator clogged by impurities conveyed by the user circuit water.	**B3.1** High temperature difference between water inlet and outlet.	Depending on the type of dirt, clean the evaporator.

PROBLEM	CAUSE	MANIFESTATION	REMEDY
C High pressure switch (HP) trip Alarm displayed: **AL025**	**C1** The fan doesn't work.	**C1.1** Refrigerant compressor stops.	Repair or replace the fan. Where fitted, check the circuit breaker of the fan. Perform the alarm reset procedure to restart the unit (see 8.10.1 “Display and reset of alarms”).
	C2 Ambient air temperature too high.	**C2.1** • Ambient air temperature higher than maximum permitted value; • See C1.1.	If the unit is installed in an enclosed place, reduce ambient temperature to within the prescribed limits, for example by increasing room ventilation. Perform the alarm reset procedure to restart the unit (see 8.10.1 “Display and reset of alarms”).
	C3 Recirculation of warm air due to incorrect installation.	**C3.1** • Condenser cooling air temperature higher than maximum permitted value; • See C1.1.	Change the position of the unit or the position of any adjacent obstructions to avoid recirculation. Perform the alarm reset procedure to restart the unit (see 8.10.1 “Display and reset of alarms”).
	C4 See A3.	**C4.1** See C1.1.	Clean the condenser fins. Perform the alarm reset procedure to restart the unit (see 8.10.1 “Display and reset of alarms”).
	C5 See A4.	**C5.1** See C1.1.	Remove the obstruction from the front surface of the condenser. Perform the alarm reset procedure to restart the unit (see 8.10.1 “Display and reset of alarms”).
	C6 Thermal load too high.	**C6.1** • Water outlet temperature too high; • Refrigerant compressor stops; • Intervention of general alarm relay.	Restore thermal load to within prescribed limits if possible. Perform the alarm reset procedure to restart the unit (see 8.10.1 “Display and reset of alarms”).
D The compressor protection devices are triggered.	**D1** Over-high thermal load when the cooling circuit is empty.	**D1.1** • High delivery temperature; • The compressor stops and attempts to restart after a short time (even few seconds); • Intervention of general alarm relay.	Call in a qualified refrigeration engineer to check for leaks and eliminate them. Fill the plant.
	D2 Compressor out of operating limits. The causes can't all be listed.	**D2.1** Working area outside the permitted envelope.	Contact the MTA technical assistance service. Make sure the heat exchangers are clean. Unit working outside the design conditions. Various solutions, depending on the type of alarm.
	D3 Compressor start-up failure.	**D3.1** The compressor does not start.	Contact the MTA technical assistance service.

PROBLEM	CAUSE	MANIFESTATION	REMEDY
E Display disabled with the main switch P1 ON (I).	**E1** Control circuit fuse has blown.	**E1.1** Using a tester, no voltage reading is obtained on the transformer secondary winding terminals.	Check the possible causes for blowing of the fuse. Change the fuse.
	E2 Abnormal power consumption by one or more of the control board components.	**E2.1** Despite the presence of power on the board terminals the display remains blank and the LEDs remain off.	Try powering off the unit and then powering it on again. If this fails to solve the problem contact an authorised service centre.
F Alarm displayed: **Probe ... faulty or disconnected**	**F1** Probe damaged.	**F1.1** • See problem; • Intervention of general alarm relay.	Check that the probe in question is correctly connected to the board terminals, and that the wire is not damaged. Replace the probe if necessary.
G Alarm displayed: **AL028**	**G1** Low water outlet temperature. The set value is higher than the value measured by the probe.	**G1.1** • See problem; • Compressor stops and then restarts; • Intervention of general alarm relay.	Identify and remove the cause that lowered the temperature.
	G2 Water flow rate too low.	**G2.1** • See problem; • Compressor stops and then restarts; • Intervention of general alarm relay.	Increase the water flow rate.
H Refrigerant leak alarm.	**H1** Possible propane leakage.	**H1.1** The machine stops and the red light on the panel door comes on.	Check for leaks and call technical support.
I Pressure transducer faulty or disconnected.	**I1** Transducer open or shorted.	**I1.1** Intervention of general alarm relay.	Check that the transducer is correctly connected to the control board terminals and the cable is undamaged. If necessary, replace the transducer with a genuine original replacement part.

HEAT PUMP MODE

PROBLEM	CAUSE	MANIFESTATION	REMEDY
J Water outlet temperature lower than envisaged.	**J1** Thermal load too high.	**J1.1** Temperature lower than the value envisaged.	Reduce the thermal load to within preset limits.
	J2 Condenser (working as an evaporator) has dirty fins.	**J2.1** See J1.1.	Clean the fins of the condenser (working as an evaporator).
	J3 Front surface of the condenser (working as an evaporator) obstructed.	**J3.1** See J1.1.	Free the front surface of the condenser (working as an evaporator).
	J4 Circuit has insufficient refrigerant charge.	**J4.1** • See J1.1; • Low evaporation pressure; • If there is a sight glass, check if there are a lot of bubbles; • High delivery temperature.	Call in a qualified refrigeration engineer to check for leaks and eliminate them. Fill the plant.
	J5 Compressor protection trips.	**J5.1** The compressor stops and attempts to restart after a short time (even few seconds).	Call in a qualified refrigeration engineer to check for leaks and eliminate them. Fill the plant.
K Insufficient pressure head (water pressure) at the pump outlet.	**K1** Excessively high water flow rate. The pump is running outside its operating limits (high flow rate, low pressure head, high power consumption).	**K1.1** • With pump installed on the machine: pressure difference (read on the pressure gauge) too low with pump running and pump idle; • Possible pump thermal trip.	Reduce water flow within design limits, for example by partially closing a pump outlet cock. Reset the pump thermoswitch and check the electric absorption levels.
	K2 Evaporator (working as a condenser) obstructed because of dirt transported by the water in the user circuit.	**K2.1** High temperature difference between water outlet and inlet.	In relation to the type of fouling: • Clean the evaporator (working as a condenser) with a detergent solution that's not aggressive for steel, aluminium and copper; • Supply a high flow rate of water in counter-current conditions.

PROBLEM	CAUSE	MANIFESTATION	REMEDY
L High pressure switch (HP) trip Alarm displayed: **AL025**	**L1** Thermal load too high.	**L1.1** • Water outlet temperature too high; • Refrigerant compressor stops; • Intervention of general alarm relay.	Restore thermal load to within prescribed limits if possible. Perform the alarm reset procedure to restart the unit (see 8.10.1 “Display and reset of alarms”).
	L2 Evaporator (working as a condenser) obstructed because of dirt transported by the water in the user circuit.	**L2.1** High temperature difference between water outlet and inlet.	In relation to the type of fouling: • Clean the evaporator (working as a condenser) with a detergent solution that's not aggressive for steel, aluminium and copper; • Supply a high flow rate of water in counter-current conditions.
	L3 SET-POINT calibration too high (beyond the maximum limit).	**L3.1** • The compressors stop; • General alarm relay trip.	Bring the water temperature back within the predefined limits. Follow the alarm reset procedure to restart the machine (see 8.10.1 “Display and reset of alarms”)
M The compressor protection devices are triggered.	**M1** Thermal load too high with insufficient refrigerant charge in circuit (see also J5).	**M1.1** • High delivery temperature; • The compressor stops and attempts to restart after a short time (even few seconds); • Intervention of general alarm relay.	Call in a qualified refrigeration engineer to check for leaks and eliminate them. Fill the plant.
	M2 Compressor out of operating limits. The causes can't all be listed.	**M2.1** Working area outside the permitted envelope.	Contact the MTA technical assistance service. Make sure the heat exchangers are clean. Unit working outside the design conditions. Various solutions, depending on the type of alarm.
	M3 Compressor start-up failure.	**M3.1** The compressor does not start.	Contact the MTA technical assistance service.
N Display disabled with the main switch P1 ON (I).	**N1** Control circuit fuse has blown.	**N1.1** Using a tester, no voltage reading is obtained on the transformer secondary winding terminals.	Check the possible causes for blowing of the fuse. Change the fuse.
	N2 Abnormal power consumption by one or more of the control board components.	**N2.1** Despite the presence of power on the board terminals the display remains blank and the LEDs remain off.	Try powering off the unit and then powering it on again. If this fails to solve the problem contact an authorised service centre.
O Alarm displayed: **Probe ... faulty or disconnected**	**O1** Probe damaged.	**O1.1** • See problem; • Intervention of general alarm relay.	Check that the probe in question is correctly connected to the board terminals, and that the wire is not damaged. Replace the probe if necessary.

PROBLEM	CAUSE	MANIFESTATION	REMEDY
P Refrigerant leak alarm.	**P1** Possible propane leakage.	**P1.1** The machine stops and the red light on the panel door comes on.	Check for leaks and call technical support.
Q Pressure transducer faulty or disconnected.	**Q1** Transducer open or shorted.	**Q1.1** Intervention of general alarm relay.	Check that the transducer is correctly connected to the control board terminals and the cable is undamaged. If necessary, replace the transducer with a genuine original replacement part.

CHAPTER 12

RISK ANALYSIS: RESIDUAL RISK

Description of risk:	Effect:	User instructions:
1. Risk of crushing.	Machine falling onto persons and/or limbs crushed.	Use lifting equipment suitable for the task, to be performed by qualified personnel referring to the labelling instructions and manual.
2. Risk of cutting and detachment caused by sheets or profiles in general.	Risk of cuts to upper limbs on sharp edges created by the shearing of sheets or saw cutting of profiles.	Strictly observe all manual instructions. Chapter 2 “Safety“; Chapter 4 “Installation“ and Chapter 10 “Operation and maintenance“.
3. Risk of cutting or detachment due to the finned surface of air-cooled condensers.	Risk of cutting upper limbs.	Strictly observe all manual instructions. Chapter 1 “General information“; Chapter 2 “Safety“ and Chapter 10 “Operation and maintenance“.
4. Risk of cutting or detachment due to fan blades.	Cuts or dissection.	Strictly observe all manual instructions. Chapter 1 “General information“; Chapter 2 “Safety“ and Chapter 10 “Operation and maintenance“.
5. Risk of high pressure fluid ejection from pipelines and/or pressure tanks in cooling circuit due to accidental bursting.	Contact of body parts with refrigerant gas or parts of cooling circuit pipelines launched at high speed.	Strictly observe all manual instructions. Chapter 2 “Safety“, Chapter 4 “Installation“ and Chapter 9 “Calibrations of other components“.
6. Risk of high pressure fluid ejection from pipelines and/or pressure tanks in cooling circuit due to design pressure values being exceeded.	Contact of body parts with refrigerant gas or parts of cooling circuit pipelines launched at high speed.	Strictly observe all manual instructions. Chapter 2 “Safety“;Chapter 4 “Installation“, Chapter 9 “Calibrations of other components“ and Chapter 10 “Operation and maintenance“.
7. Risk of high pressure fluid ejection from pipelines and/or pressure tanks in the hydraulic circuit, due to accidental explosions.	Contact of body parts with fluids or residual parts of hydraulic circuit pipelines launched at high speed.	Disconnect the machine from the electricity supply during interventions on the hydraulic circuit. Strictly observe all manual instructions. Chapter 2 “Safety“; Chapter 4 “Installation“ and Chapter 10 “Operation and maintenance“.
8. Risk of high pressure fluid ejection from pipes and/or pressure tanks in the hydraulic circuit, if the project pressure values are exceeded.	Contact of body parts with fluids or residual parts of circuit pipes launched at high speed.	Depressurise the machine before intervening on the hydraulic circuit. Strictly observe all manual instructions. Chapter 2 “Safety“; Chapter 4 “Installation“ and Chapter 10 “Operation and maintenance“.
9. Electrical hazards due to direct contact with live parts.	Risk of electrocution and burns.	Strictly observe all manual instructions. Chapter 2 “Safety“ and 6.2 “Electrical connections” .

Description of risk:	Effect:	User instructions:
10. Electrical hazards due to indirect contact with parts that are live due to faults, in particular due to an insulation fault.	Risk of electrocution and burns.	Strictly observe all manual instructions. Chapter 2 “Safety“ and 6.2 “Electrical connections” .
11. Electrical hazards: electrostatic phenomena.	Uncontrolled movements by victim of electrostatic discharge due to contact.	Strictly observe all manual instructions. 6.2 “Electrical connections” .
12. Electrical hazards: heat radiation or other phenomena such as the projection of melted particles, and chemical effects deriving from short circuits, overloads.	Risk of electrocution with live parts due to short-circuits, scalding on contact with hot components due to overload.	Strictly observe all manual instructions. Chapter 2 “Safety“ and 6.2 “Electrical connections” .
13. Heat-associated risk: burns and/or scalding.	Scalding on contact with pipes at temperatures over 65°C and/or freezing due to contact with surfaces at temperatures below 0°C.	Strictly observe all manual instructions. Chapter 2 “Safety“.
14. Hazards generated by noise levels that may impair hearing capacity (deafness) and other physical disorders (such as loss of balance, consciousness).	Loss of hearing capacity by operator.	Secure all components correctly after interventions and maintenance.
15. Hazards generated by materials or substances handled, used, produced or offloaded from the machine, and by the materials used to construct the machine: inhalation of refrigerant gases.	Inhalation of refrigerant gas.	Strictly observe all manual instructions. Chapter 2 “Safety“.
16. Hazards generated by materials or substances handled, used, produced or offloaded from the machine, and by the materials used to construct the machine: discharge of polluting cooling fluids.	Risk of environmental pollution caused by the drainage of water-glycol mixtures.	Strictly observe all manual instructions. Chapter 2 “Safety“.
17. Hazards generated by materials or substances handled, used, produced or offloaded from the machine and materials used to construct the machine: fire or explosion.	Risk of fire or explosion.	Install the system in an environment fitted with adequate fire fighting equipment. Strictly observe all manual instructions. Chapter 4 “Installation“.
18. Hazards generated by failure to use personal protective equipment.	Lacerations to upper limbs during maintenance or installation.	Use adequate personal protective equipment and observe all the instructions given in the manual. Chapter 1 “General information“; Chapter 2 “Safety“; Chapter 4 “Installation“ and Chapter 10 “Operation and maintenance“.
19. Hazards generated by failure to observe principles of ergonomics during machine design, caused, for example, by: unsuitable design, layout or identification of manual controls.	Hazards associated with failure to correctly identify manual controls.	Consult all sections of the manual.

Description of risk:	Effect:	User instructions:
20. Hazards generated by failure to observe principles of ergonomics during machine design, caused, for example, by: inadequate design or layout of visual display units.	Hazards associated with failure to correctly understand the visual display units.	Consult all sections of the manual.
21. Inadvertent start-up, unexpected overstroke/excess speed (or any other similar malfunction) caused by: a fault or malfunction of the command system.	Electrical or mechanical hazard due to incorrect settings of operating parameters or settings.	Strictly observe all manual instructions. Chapter 2 “Safety“; Chapter 10 “Operation and maintenance“; 6.2 “Electrical connections” and Chapter 4 “Installation“.
22. Inadvertent start-up, unexpected overstroke/excess speed (or any other similar malfunction) caused by: fault or malfunction of control system with possibility of disabling safety devices.	Electrical hazard during interventions on machine with safety devices inhibited.	Strictly observe all manual instructions. Chapter 2 “Safety“; 6.2 “Electrical connections” ; Chapter 4 “Installation“ and Chapter 10 “Operation and maintenance“.
23. Inadvertent start-up, unexpected overstroke/excess speed (or any other similar malfunction) caused by: a fault or malfunction of the command system.	Electrical hazards associated with environmental work conditions.	Strictly observe all manual instructions. Chapter 2 “Safety“ and 6.2 “Electrical connections” .
24. Inadvertent start-up, unexpected overstroke/excess speed (or any other similar malfunction) caused by: the return of the electricity supply after a failure.	Hazards associated with inadvertent start-up of the machine when electric power supply is restored.	Strictly observe all manual instructions. Chapter 2 “Safety“; 6.2 “Electrical connections” and Chapter 7 “Start-up“.
25. Inadvertent start-up, unexpected overstroke/excess speed (or any other similar malfunction) caused by external factors on the electrical equipment (EMC).	Electrical hazards associated with electric stress faults on internal machine components, short-circuits and overloads.	Strictly observe all manual instructions. Chapter 2 “Safety“; 6.2 “Electrical connections” and Chapter 10 “Operation and maintenance“.
26. Hazards caused by assembly errors.	Hazards associated with machine instability caused by vibrations. Hazards on contact with operating fluids, risk of pollution due to dispersion of fluids into the environment.	Strictly observe all manual instructions. Chapter 2 “Safety“; Chapter 4 “Installation“ and Chapter 7 “Start-up“.
27. Risk of falling or projection of objects or fluids.	Contact of body parts with metallic materials such as the fan blades or moving parts of the compressor.	Disconnect the machine from the electricity supply during interventions on the hydraulic circuit. Strictly observe all manual instructions. Chapter 2 “Safety“; Chapter 4 “Installation“ and Chapter 10 “Operation and maintenance“.
28. Loss of machine stability / machine overturning.	Crushing of body parts.	Strictly observe all manual instructions. Chapter 4 “Installation“ and the indications on the unit.
29. Loss of stability/overturning of the machine due to installation on unstable ground and/or vibrations caused by the connection pipes.	Crushing of body parts due to overturning of the machine. Contact of body parts with water due to loss of hydraulic circuit connections because of excessive vibrations.	Strictly observe all manual instructions. Chapter 4 “Installation“ and Chapter 7 “Start-up“.

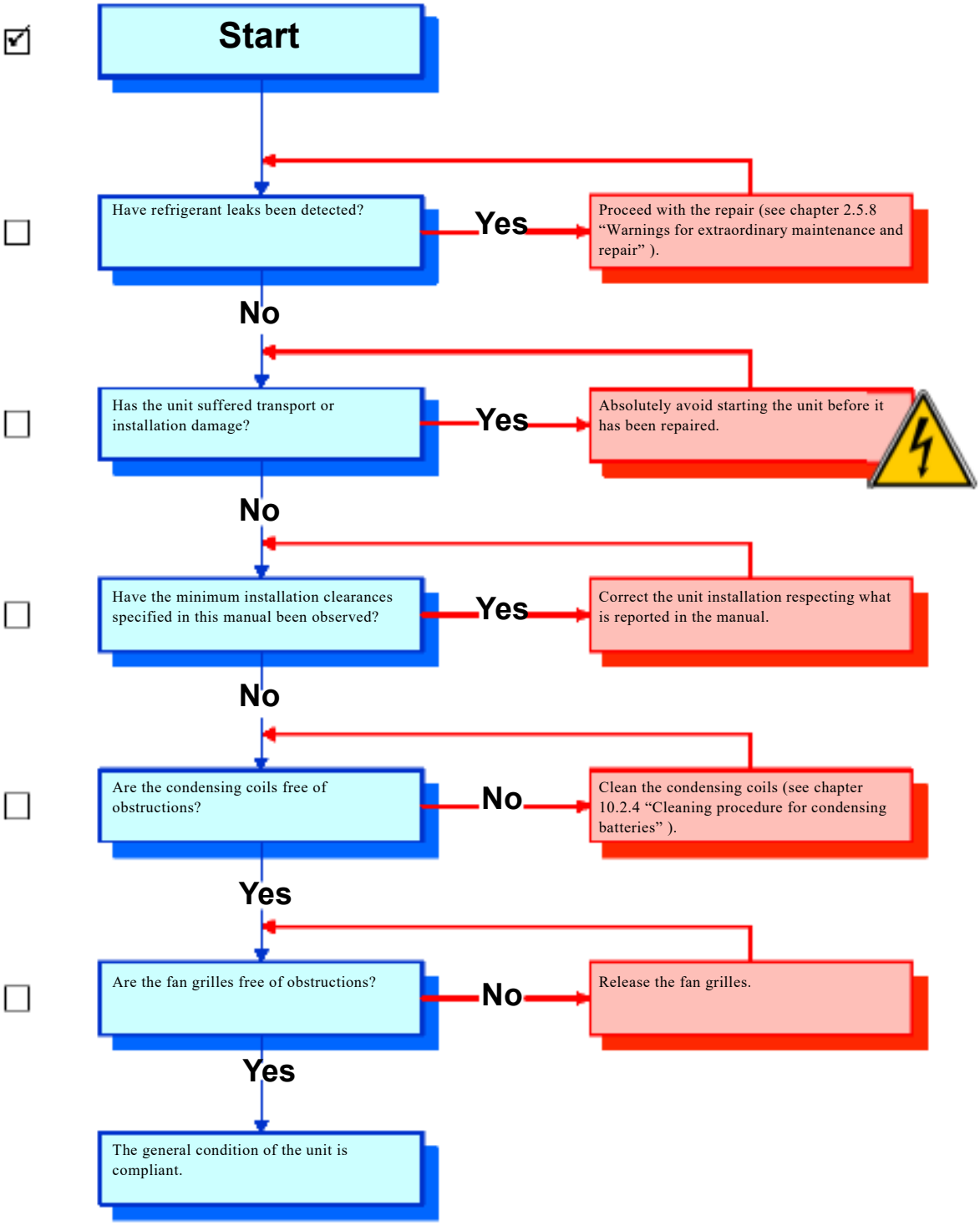
Description of risk:	Effect:	User instructions:
30. Hazards generated by the absence or incorrect position of safety measures/tools: all guards.	Hazard caused by contact with machine components and processed or used materials due to sudden ejections.	Strictly observe all manual instructions. Chapter 2 “Safety“; Chapter 4 “Installation“; Chapter 7 “Start-up“ and Chapter 10 “Operation and maintenance“.
31. Hazards generated by the absence or incorrect position of safety measures/tools: graphic safety signs.	Hazard associated with the lack of or inadequate graphic instruction and warning symbols related to dangers that could not be eliminated in design.	The operator must respect all the graphic symbols on the machine, and replace them when worn or illegible. Strictly observe all manual instructions. Chapter 1 “General information“.
32. Hazards generated by the absence or incorrect position of safety measures/tools: manual.	Hazards associated with incorrect preparation of the manual due to absent and/or unclear information required to ensure operator safety and safe machine use.	Consult all sections of the manual.
33. Hazards generated by the absence or incorrect position of safety measures/tools: disconnection of power sources.	Contact with live parts, contact with high pressure fluids or gas.	Strictly observe all manual instructions. Chapter 2 “Safety“ and 6.2 “Electrical connections” .
34. Hazards generated by the absence or incorrect position of safety measures/tools: instruments and accessories for adjustments and/or maintenance in safe conditions.	Hazard of cutting, ejection of high pressure fluids or gases, scalding, or vibrations caused by incorrect maintenance.	Strictly observe all manual instructions. Chapter 2 “Safety“; Chapter 4 “Installation“; Chapter 10 “Operation and maintenance“.

APPENDIX

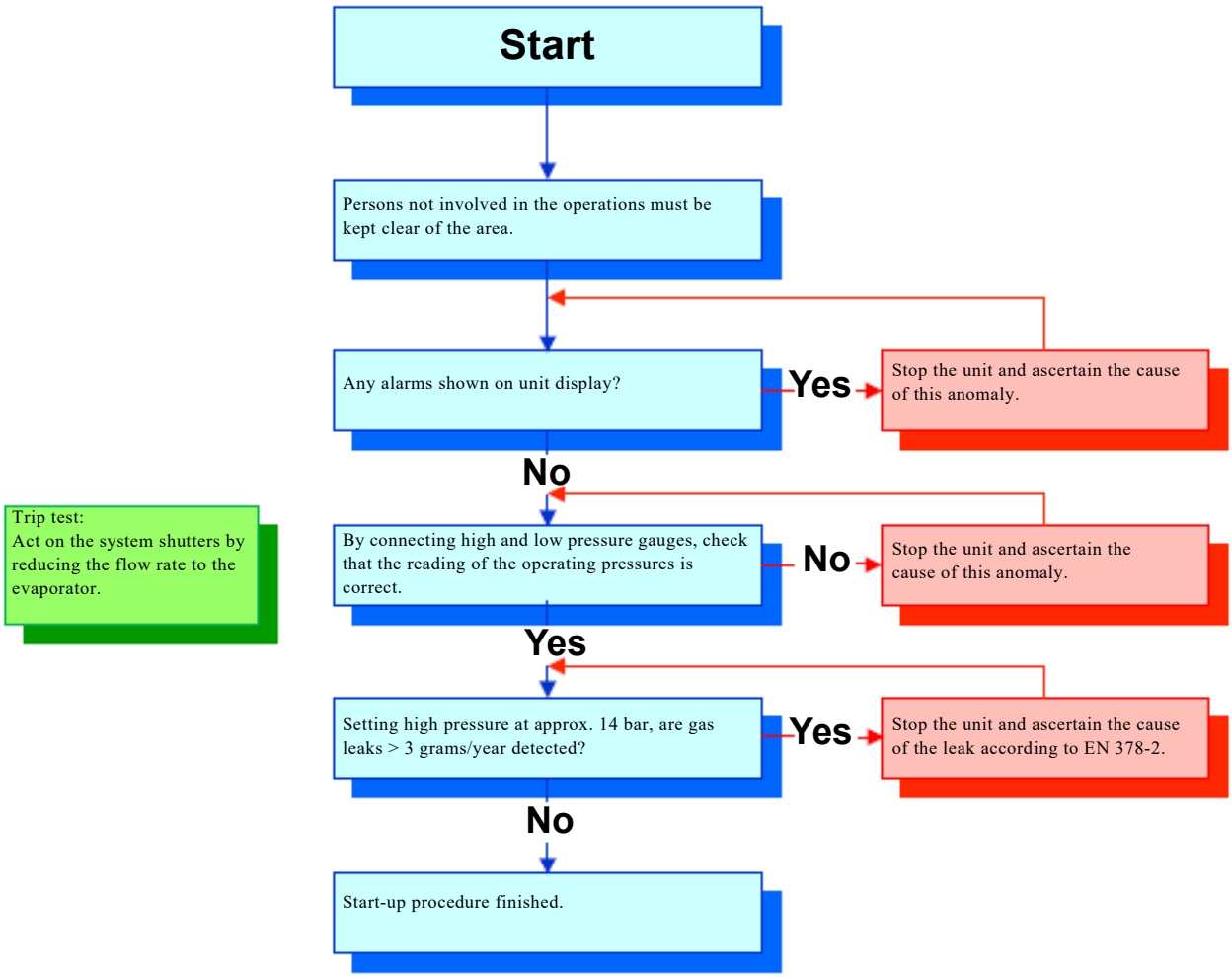
GENERAL CONDITIONS CHECKLIST

CAUTION

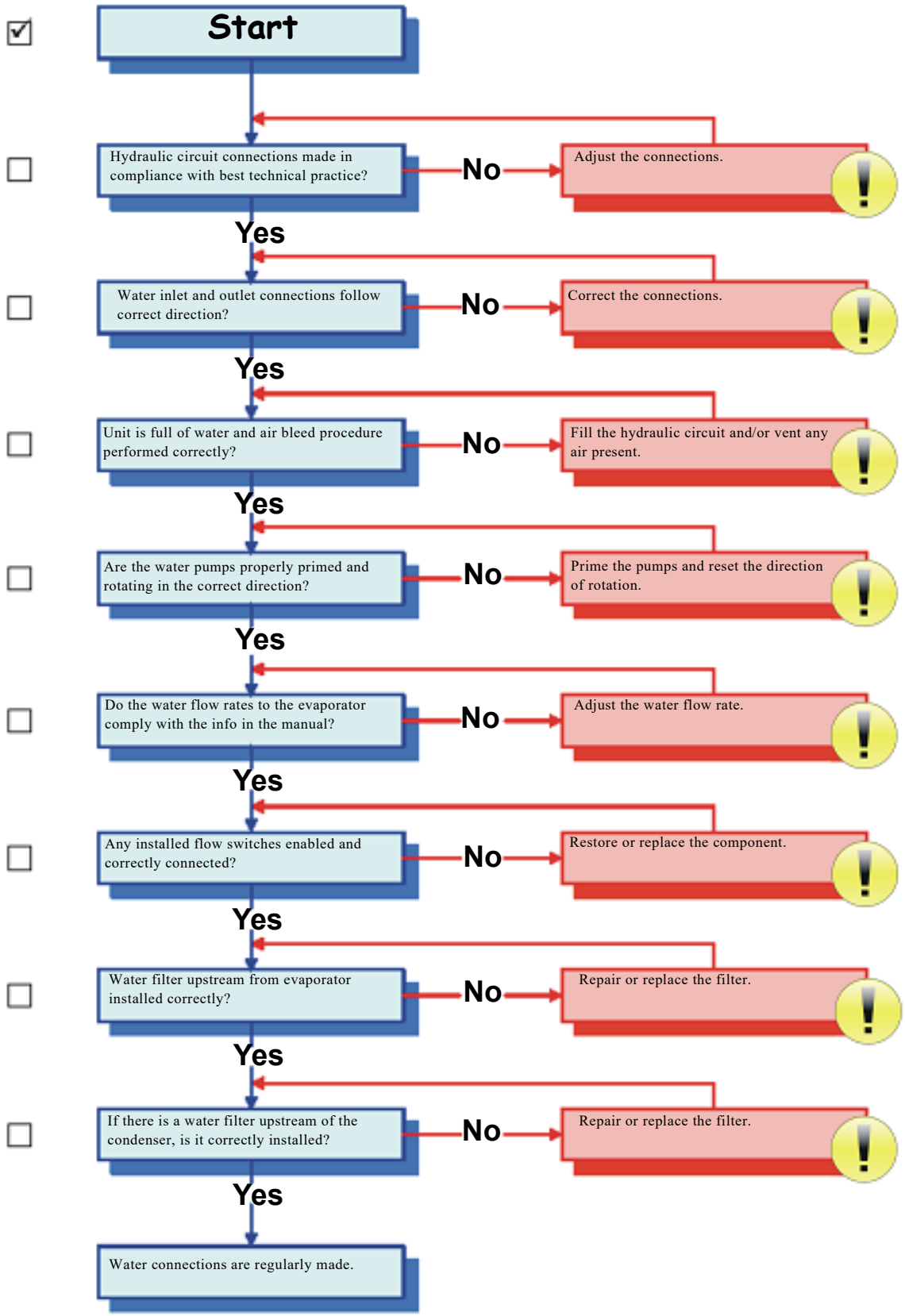
⚠ DO NOT SUPPLY THE UNIT



FIRST START CHECKLIST

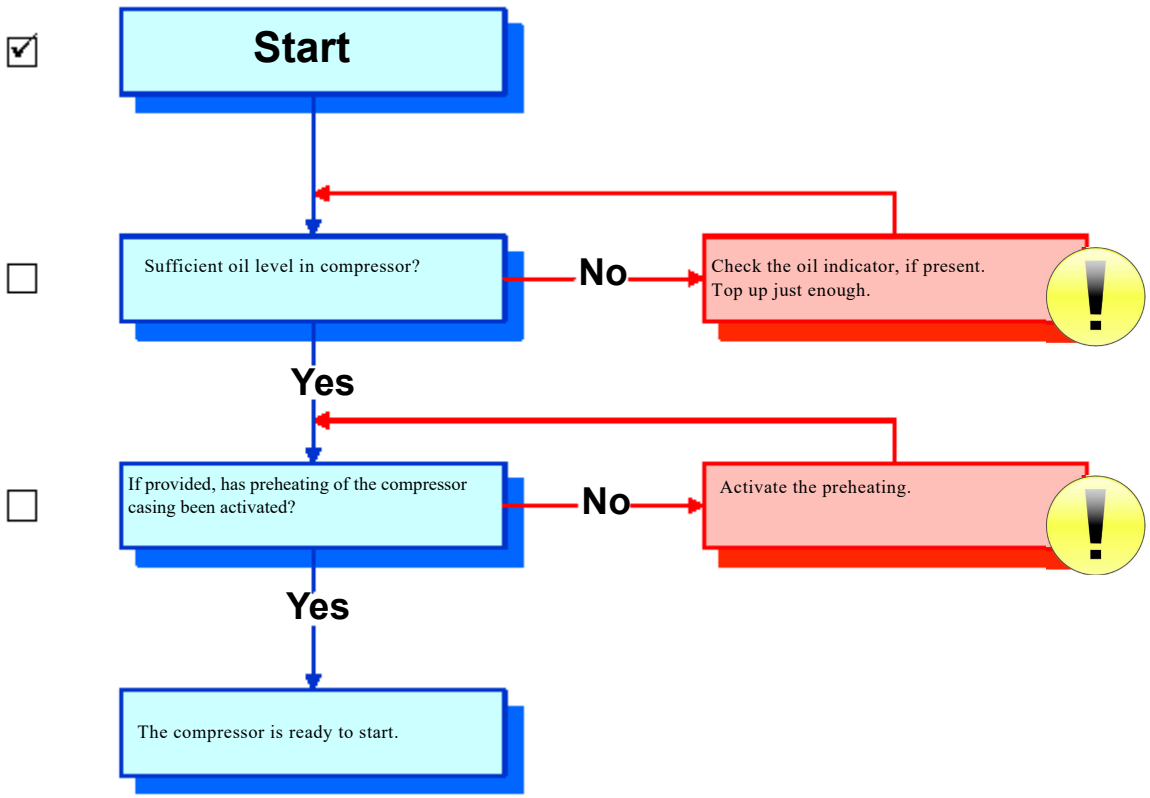


HYDRAULIC CIRCUIT CHECK LIST

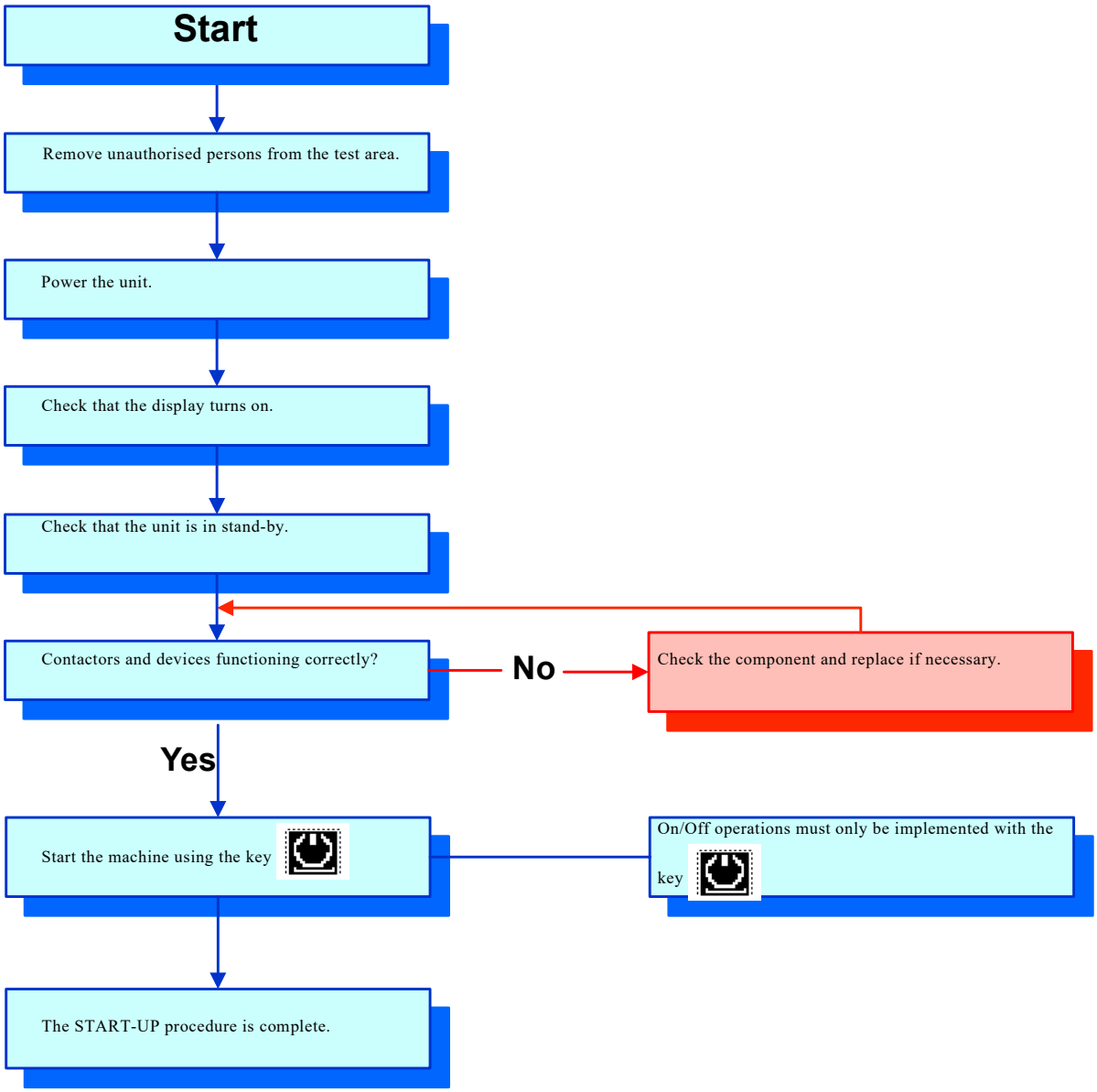


CONTROLLER CHECK

OIL CHECKLIST



UNIT OPERATING CHECKLIST



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CG-SVXO70B-GB October 2025
Supersedes CG-SVX070A-GB (March 2025)