Installation, Operation, and Maintenance

Trane Aries N (models iASN 075-150)

Air-cooled Liquid Chillers with
Inverter Reciprocating Compressors
170 – 320 kW
R290

⚠ WARNING

R290

This unit uses R290 flammable refrigerant (propane). Only experienced, responsible personnel are allowed to use the unit; incorrect use may lead to serious harm to people and damage to property.

July 2024

CG-SVX065A-GB

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CHAPTER 1

GENERAL INFORMATION

1.1 Terminology

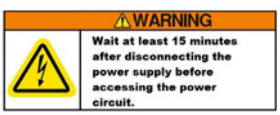
The machines described in this manual are called “CHILLERS”.
This manual is written for those responsible for the installation, use and maintenance of the unit.
These units have been designed to cool a liquid flow.
In most applications, the liquid to be cooled is water and the term “WATER” will be used even if the liquid to be cooled is different from water (for example mixtures of water and ethylene or propylene glycol).
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.

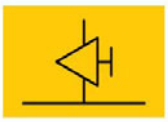
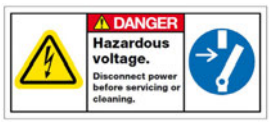
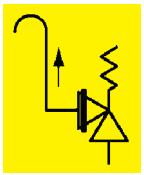
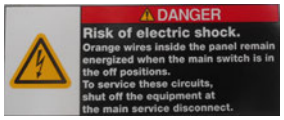
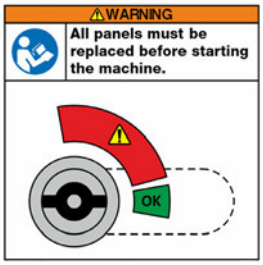
CAUTION

This manual provides the user, installer and maintenance technician with all the technical information required for installation, operation and carrying out routine maintenance operations to ensure long life.
Use only original spare parts for repairs and replacements. 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 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		Machine water outlet
	Water inlet to the desuperheater (only if present)		Water outlet from the desuperheater (only if present)
	Indication of the axis of reference for lifting operations		Unit drain point
	Electrocution risk		Cooling air flow
	Direction of flow of refrigerant fluid		Rotation direction of pump and fans
	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.		Risk of injury due to sharp edges

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	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.		Air bleed valve
	Moving parts can cause damage. Do not operate with guards removed. Follow lockout procedure before servicing.		Risk of burns from contact with high-temperature surfaces
	Hazardous voltage. Disconnect power before servicing or cleaning.		Safety valve discharge
	Attention: the unit contains R290 flammable refrigerant (propane)		Danger: inflammable material
	Electric shock risk. The orange wires in the panel remain live when the main switch is in the off position. To repair these circuits, switch off the appliance from the mains disconnecting switch.		Before starting the machine, make sure that all the panels have been correctly installed. Check that the key locks on the panels are in the OK position.
	Unit with nitrogen pre-charge (see 11.2.4 “Coolant charging procedure”)		

1.3 How to interpret the model

MODEL	DESCRIPTION
ASN ◊ ◊ ◊ / ◊ ◊ ◊	Machine version (HE, SHE) Nominal power of compressor expressed in HP Model Aries N with R290

MODEL	DESCRIPTION
iASN ◊ ◊ ◊ / ◊ ◊ ◊	Machine version (HE, SHE) Nominal power of compressor expressed in HP Model Aries N with R290 Version with inverter compressor

1.4 How to interpret the codes

/HE	Low noise operation value: standard. Fan rotation speed approx. 900 rpm. Fully cased compressor compartment.
/SHE	Low noise operation value: medium. Fan rotation speed approx. 700 rpm. Acoustically insulated and fully cased compressor compartment.

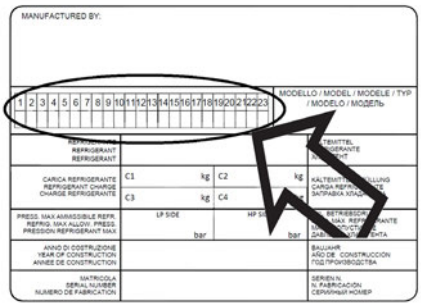
1.5 Data plate

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

MODEL and CODE	Identifies the size of the machine (see Chapter 1 “General Information”) and the type of construction which distinguishes it.
OPERATING MANUAL	Code number of this manual.
SERIAL NUMBER	Unit serial number or manufacturing number.
YEAR OF CONSTRUCTION	Year of unit's final testing.
VOLTAGES/PHASES/ FREQUENCY	Power supply specifications.
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	Amount of refrigerant fluid in the system.
MAX. REFRIG. MAX. HP SIDE (PS)	This is the design pressure of the HP side refrigeration circuit.
MAX. REFRIG. MAX. 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).
MAX. PRESSURE ALLOWED (PS)	Max. design pressure of the circuit.
PERMITTED TEMPERATURE (TS)	Min. and max. design temperature of the 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	Air minimum and maximum temperature values.
WEIGHT	Weight of the unit without packaging.

1.6 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 in the upper row is associated with an alphanumeric value in the lower row (0, 1, 2, A, B, etc.) and each character is associated with a specific feature of the unit.

	POS.	VALUE	DESCRIPTION
VERSION	1-2-3	HE	HE
		SHE	SHE
COMPRESSOR CONTROL	4	B	INVERTER+ON/OFF
VOLTAGE	5	0	400/3/50
REFRIGERANT	6	B	R290
SYSTEM COOLANT LOAD	7	0	LOAD COMPLETE
		1	PRESSURISATION IN NITROGEN
EVAPORATOR	8	A	PLATE EVAPORATOR
UNIT AMBIENT TEMPERATURE	9	0	STANDARD
		1	-20°C
HYDRAULIC UNIT	10	0	NONE
		1	P2
		2	P2+P2
		3	STORAGE+P2
		4	STORAGE+P2+P2
		6	P3
		7	P3+P3
		8	STORAGE+P3
		9	STORAGE+P3+P3
HEAT RECOVERY	11	0	NO
		4	DESUPERHEATER 20%
FAN CONTROL	12	4	EC BRUSHLESS FANS
EVAP. ANTIFREEZE PROTECTION	13	0	NO
		1	YES
COMPRESSOR START-UP	14	0	DIRECT
		4	DIRECT+PART WINDING
ENERGY METER	15	0	NO
		1	YES
COMPRESSOR TAPS	16	1	YES
CONDENSING COILS TYPE	17	B	MICRO-CHANNEL COIL
CONDENSING COILS PROTECTION	18	0	NONE
		1	FILTERS
PREPAINTED CONDENSING COILS	19	0	NO
		1	YES
MACHINE ENCLOSURE PANELS	20	1	YES
PRODUCT TYPE	21	0	STANDARD
		X	SPECIAL

1.7 Performance

The performance of the unit depends mainly on the flow rate and temperature of chilled water and ambient temperature.
Performance values are defined at the time of the contract, refer to the offer data if necessary.

1.8 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.

Model	ASN 075		ASN 100		ASN 110		ASN 150	
Version	HE	SHE	HE	SHE	HE	SHE	HE	SHE
Lp dB(A) *	78.3	71.6	78.6	73.2	80.7	74.2	82.0	75.5
Lw dB(A) **	91.3	84.6	91.6	86.2	93.7	87.2	95.0	88.5

Model	iASN 075		iASN 100		iASN 110		iASN 150	
Version	HE	SHE	HE	SHE	HE	SHE	HE	SHE
Lp dB(A) *	80.2	72.9	82.1	74.6	82.2	74.9	83.6	78.3
Lw dB(A) **	93.2	85.9	95.1	87.6	95.2	87.9	96.6	89.3

* at distance of 1 m
** global

Test conditions
Noise levels refer to operation of the unit at full load in nominal conditions. Values with tolerance of +/- 2 dB.
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.
Sound power level: in accordance with 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.

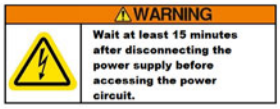
CAUTION

⚠ 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 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.



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 units cannot be used directly for domestic hygiene or food applications. 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 Instructions for the user

The machines must be installed in safe places, free of areas with potentially explosive atmospheres. They must be connected to electrical systems designed according to current standards, in areas compliant with the standards imposed by the Fire Brigade and in environments compliant with local building standards.
Within the potentially explosive areas generated by the machine, also taking into account the national regulations of the country of use, it is necessary to:

- Do not install equipment that is unsuitable for use in these potentially explosive zones (the minimum requirements of the equipment are: 3G IIB T4);
- Avoid naked flames, sparks and hot works;
- Avoid the presence of sources of ignition due to processes that may generate remote triggers (ionising and non-ionising radiation);
- Avoid the direct and indirect effects of lightning;
- Avoid electrostatic charges;
- Avoid interference with potentially hazardous elements such as drains, openings in the earth, basements, power lines, stores of flammable substances, railways, motorways etc.

As the refrigerant gas used is heavier than air, even a small gas leak, which in itself is not dangerous, can cause a build-up of gas if it infiltrates into underground areas, forming pockets.
A suitable “safety” distance should be assured also for chilling systems installed outdoors, in order to minimise the risk that flammable concentrations enter premises occupied by humans (e.g. through windows, ventilation openings, where people meet outdoors, etc.). However, external wind speeds tend to be quite high (compared to indoor environments) even when the air seems “still”, so also the amount of flammable mixture should be adjusted to consider the additional dispersion caused by the surrounding air.

WARNING

⚠ The safety zone/area around the machine must be at least 3 meters. Potentially explosive atmospheres may build up inside this area, and it is therefore necessary to avoid sources of ignition, as defined in standard EN378-2.

For installation precautions refer to paragraph 4.2 “Installation precautions”.

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:

- trained and familiar with the equipment and the installation (including the refrigerant used)
- 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**).

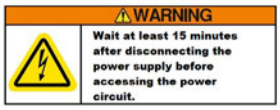
2.4 Essential safety rules for the inverter

Before carrying out any maintenance:

- Disconnect the inverter and the external control circuits from the electricity supply by turning the main switch to 0 and waiting 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 circuit

The liquids in the circuit must be compatible with the materials that make up the hydraulic circuit of the machine.
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 Characteristics of the recommended glycol

Product identification: **MONOPROPYLEN GLYCOL PROPANE**-1,2-DIOL
Below are the characteristics of propylene glycol:

Appearance:	Liquid
Colour:	Colourless
Odour:	Odourless
Melting point/range: (1013 hPa)	-68°C
Boiling point/range: (1013 hPa)	185°C
Autoflammability:	371°C
Flash point:	101°C
Lower explosion threshold:	2,6 Vol-%
Upper explosion threshold:	12,6 Vol-%
Vapour pressure: (20°C)	0,1 hPa
Density: (20°C)	Data not available
Bulk density: (20°C)	1,036 kg/m^3
Solubility in water: (20°C)	Soluble
Soluble in:	Polar solvents
PH value:	Neutral
Viscosity: (20°C)	46 mPa.s

2.5.3 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 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 per unit => Total Points: 990≤1000
- 4 units with 200 kg of R410 per unit + 2 units with 33 kg of R290 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.

2.5.4 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.

2.5.5 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.
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.

NOTES

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.
The way of handling the machines of this range will vary depending on the model.

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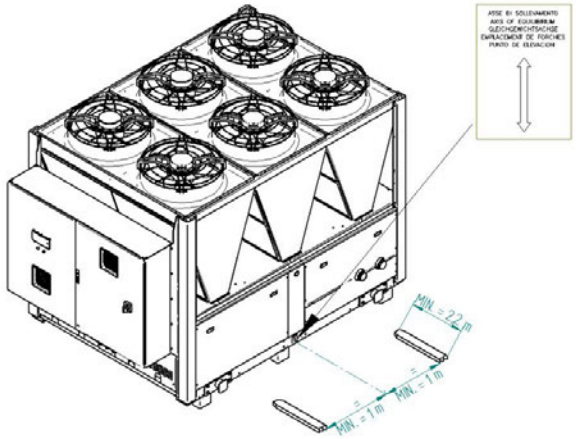
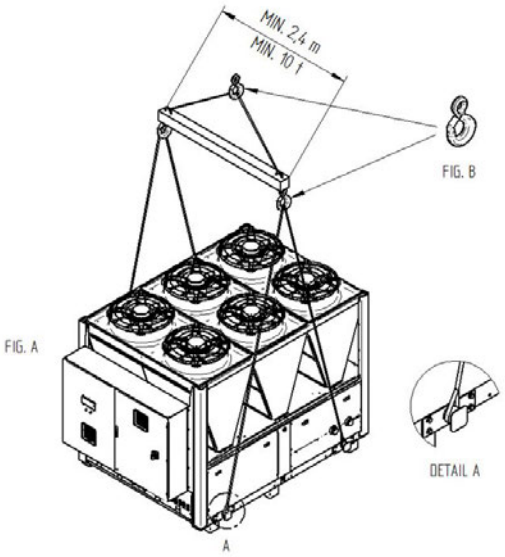
Use a forklift or lifting cables to handle the machines.
Lifting with a forklift is only permitted from the side part of the machine (see picture). It is NOT permitted from the front (control panel side) or rear.
The forklift must have a min. capacity of 5000kg.



Handling with lifting cables is possible with the aid of 1 linear lifting beam and the following material:

- no. 4 belts with a minimum capacity of 5t;
- no. 4 shackles with a minimum capacity of 5t;
- no. 1 linear type balancing lifting with minimum length of 2.4m and minimum capacity of 10t;
- no. 1 crane with capacity adequate to the handling type.

The slings must be connected to the base (see fig. A) and to the balancing lifting (if the balancing lifting has hooks be sure they have anti-unhitching system, see fig. B).

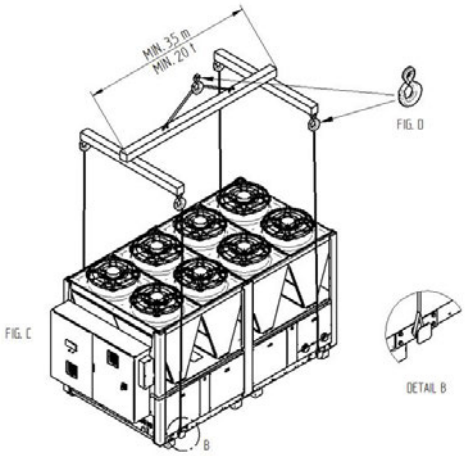


ASN / iASN 150

Handling is permitted ONLY with lifting cables, using an "H" type lifting beam and the following material:

- no. 4 belts with a minimum capacity of 5t;
- no. 4 shackles with a minimum capacity of 5t;
- no. 1 "H" type lifting beam with minimum length of 3.5m between the 2 arms, with minimum capacity of 20t;
- no. 1 crane with capacity adequate to the handling type.

The slings must be connected to the base (see fig. C) and to the lifting beam (if the lifting beam has hooks be sure they have anti-unhitching system, see fig. D).



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.

2.5.6 Storage of the unit

A3 chiller units and heat pumps with refrigerant must be stored outdoors.
In the event of storage inside the building, it must meet the following requirements (non-exhaustive list):

- Well ventilated and free of combustible materials or waste
- Free of ignition sources
- Absence of direct sunlight and out of the reach of heat sources
- The storage area must be provided with safety signs
- Adequate fire safety measures must have been taken

It is also recommended to use a detection sensor for flammable gases every 36-40 m2. Always refer to national regulations.
Whether the equipment is stored indoors or outdoors, it must comply with applicable regulations, local legislation and building regulations.
The unit may be equipped with pressure relief valves that could release refrigerant if the unit is exposed to high temperatures.
The storage temperature must not exceed 50°C.

2.5.7 Unpacking

WARNING

⚠ Before opening the packaging of the unit, use a special gas detector to check that there are no gas leaks in the environment. Check that there are no sources of ignition in the proximity of the unit.
No smoking near the unit.

The packaging must be removed only when the unit has reached its place of installation and will no longer need to be moved.
Remove the machine's packaging with care, ensuring it does not get damaged.
Use appropriate personal protective equipment (e.g. work gloves, protective helmet, safety goggles).
Since the packaging is composed of different materials (wood, polyethylene (PE), polystyrene, cardboard etc.), we recommend storing them separately and handing them to a specialised waste disposal and recycling company in order to protect the environment.

2.5.8 Precautions during exercise

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 local prescriptions in force in the installation site.
The unit and its auxiliary equipment must be connected to earth and protected against short circuits and overloads.
When the main power switch is closed the voltage in the electrical circuit assumes potentially 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 and trained on the specific risks caused by 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.

2.5.9 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 worn 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.
The accuracy of pressure and temperature gauges must be regularly checked. If values exceeding the permitted tolerances are detected, the gauges must be replaced.
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 each unit, establish a time interval for cleaning operations (see ch. 11.2.5 “Cleaning the condenser”).

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 guards and panels of the machine must be reinstalled after maintenance or repair (see ch. 11.2.1 “Accessing the internal machine compartments”).
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 out the disconnect switch on the “OFF” position by fitting 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 performing any operation to allow the capacitors installed inside the inverter to discharge.
- 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 joints of the refrigeration system such as vents, folders, and more generally all critical points (decoupled joints) in order to prevent any phenomena of refrigerant gas leakage.

CAUTION

⚠ The R290 refrigerant used in the chiller is odour-free.

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.

2.5.10 Warnings for extraordinary maintenance and repair

The following list of procedures is intended as a reminder and a check-list for the appointed technician.
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.



2.5.11 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 R290
- copper parts
- aluminium parts
- carbon steel parts
- stainless steel parts
- PVC parts
- CFC-free synthetic insulating material
- polystyrene parts
- polyester 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

R290 refrigerant is classified as group 1 “dangerous” on the basis of the criteria of the pressurised equipment directive 2014/68 / EU.

- Type of refrigerant: R290
- Global warming potential GWP: 3

In accordance with Standard ISO-817, R290 (E), it is classified in safety group A3: HIGH 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 R290.
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

	R290
Name:	Propane.
HAZARDS	
Main hazards:	Highly flammable gas.
Specific hazards:	Contains pressurised gas; may explode when heated.
FIRST AID MEASURES	
General information:	In high concentrations, it can cause asphyxiation. Symptoms may include loss of mobility and/or consciousness. The victim may not be aware that they are suffering from asphyxia. In low concentration, it can have a narcotic effect. Symptoms may include dizziness, headaches, nausea and loss of coordination.
Inhalation:	Move the victim to a non-contaminated area using the self-contained breathing apparatus. Keep the patient relaxed and warm. Call a doctor. Proceed with the artificial respiration in case of respiratory failure.
Contact with the eyes/face:	Wash the eyes immediately with water, continuing for at least 15 minutes.
Contact with the skin:	In case of contact with liquid, wash with water for at least 15 minutes.
FIRE-FIGHTING MEASURES	
General fire risks:	Exposure to naked flame may cause the container to rupture or explode.
Means of extinction:	Water spray. Dry powder.
Inappropriate extinguishing media:	Do not use water jets to extinguish the fire. Carbon dioxide.
Specific methods:	Use appropriate fire-fighting methods for the fire in the area. Exposure to naked flame and heat may cause the container to rupture. Keep exposed containers cool by showering with water from a safe position. Do not pour water contaminated by the fire into drains. Stop the leakage of product if possible. If possible, use water mist to abate fumes. Do not attempt to extinguish a burning gas leak unless absolutely necessary. The gas may re-ignite spontaneously and cause an explosion. Extinguish all flames in the vicinity. If it is possible to do so safely, move the recipients to a location at a safe distance from the fire.
MEASURES IN THE EVENT OF ACCIDENTAL LEAKAGE	
Individual precautions:	Try to stop the leakage. Evacuate the area. Consider the risk of explosive atmosphere. If it has not been proven that the air is breathable, use self-contained breathing apparatus to enter the area involved. Remove the sources of ignition. Ensure adequate ventilation. Prevent it from running into drains, cellars, excavation areas or places where the accumulation may be dangerous. Follow the local emergency plan. Stay upwind.
Environmental precautions:	Try to stop the leakage.

HANDLING AND STORAGE

Handling Technical measures/precautions:	Use only in well ventilated spaces.
Recommendations for safe use:	The product must be handled according to the good safety and industrial hygiene practices. The pressurised gas should be handled exclusively by experienced and suitably trained personnel. Install any safety relief valves necessary in the gas circuit. Before use, make sure that the entire gas distribution system has been (or is regularly) checked for leaks. Do no smoke while handling the product. Only use specific equipment, suitable for the product, pressure and temperature of use. In case of doubts, contact the gas supplier. Assess the risk of a potentially explosive atmosphere and the need for explosion-proof equipment. Bleed all the air from the system before inserting the gas. Take precautions against the risk of electrostatic discharges. Keep away from sources of ignition (including electrostatic charges). Assess the need for using only reduced-sparking tools. Do not inhale the gas. Avoid releasing the product in the atmosphere.
Storage:	Observe the local regulations and legal requirements concerning the storage of the containers. The containers should not be stored in conditions that may lead to corrosion. Fit all caps and/or plugs correctly. Containers in storage must be kept in an upright position and secured so that they cannot fall over. The stored containers should be checked regularly to assess their general state and identify any leaks. Keep the container at a temperature below 50°C, in a well-ventilated area. Store de containers in areas in which there is no risk of fire, away from heat and ignition sources. Keep away from combustible substances. Do not store with oxidising gases or other oxidants in general. All electrical equipment in the storage area must be certified for use in explosive atmospheres.

CONTROL OF INDIVIDUAL EXPOSURE/PROTECTION

Control parameters:	OEL (Occupational exposure limits): Data not available. DNEL (Derived no-effect level): Data not available. PNEC (Predicted no-effect concentration): Data not available.
Respiratory protection:	Filter masks may only be used if all surrounding environmental conditions (e.g. type and concentration of contaminant/s) and the envisaged duration of use are known. Recommended: AX filter (brown). See the instructions provided by the supplier for selecting suitable personal protective equipment. Filter masks do not protect against oxygen-deficient atmospheres. EN 14387 - Respiratory protective devices - Gas filters and combined filters. EN 136 - Respiratory protective devices. Full face masks.
Eye/face protection:	Wear safety eyewear with side shields. Wear safety googles when filling containers and disconnecting the hose.
Protection of the hands:	Wear safety work gloves when handling gas containers.

PHYSICAL AND CHEMICAL PROPERTIES

Colour:	Colourless
Odour:	Often odourless. Sweetish. Less noticeable at low concentrations.
Boiling point:	-42.1°C
Relative density (water =1):	0.58
Relative density (air=1):	1.5
Solubility in water:	75 mg/l
Upper flammability limit	9.5% (V)
Lower flammability limit	1.7% (V)
Auto-ignition temperature:	470°C

STABILITY AND REACTIVITY	
Stability:	Stable under normal conditions.
Possibility of dangerous reactions:	May react violently with oxidants. May form explosive mixtures with air.
Materials to avoid:	Air, oxidising agents. Refer to the ISO 11114 standard for further information regarding the material compatibility.
Hazardous decomposition products:	Should not product hazardous decomposition products in normal storage and usage conditions.

TOXICOLOGICAL INFORMATION	
Acute toxicity:	This product has no known toxicological effect.
Local effects:	In high concentrations, it can cause asphyxiation. Symptoms may include loss of mobility and/or consciousness. The victim may not be aware that they are suffering from asphyxia. In low concentration, it can have a narcotic effect. Symptoms may include dizziness, headaches, nausea and loss of coordination.
Long term toxicity:	No carcinogenic, teratogenic or mutagenic effects observed in laboratory animals.

ECOLOGICAL INFORMATION	
Global warming potential GWP (EN378-1:2021):	3
Ozone depletion potential ODP (R11=1):	0
Disposal:	Do not discharge gas in areas where there is a risk of the gas forming an explosive atmosphere with air. The gas should be disposed of in a suitable torch with an anti-backfire device. Do not drain the product in places where accumulation may be harmful. Make sure that the emissions limits specified by local regulations or indicated in authorisation documentation are not exceeded.

CHAPTER 3

DESCRIPTION

3.1 Casing

The casing is made of galvanised panels with a polyester powder coating.

3.2 Operating principle

All the units described in this manual use the same operating principle.
The refrigerant circuit consists of two separate, independent circuits which cool the water with a plate evaporator in which a heat exchange process takes place between the refrigerant and the heat transfer fluid. Suitable compressors are used to compress refrigerant in order to change it from a gas to a liquid. At this stage, the refrigerant gas releases energy in the form of heat. The liquid refrigerant enters the evaporator, where it expands and returns to its initial gaseous state. As it returns to a gaseous state, it absorbs energy in the form of heat. In compliance with the first principle of thermodynamics, the heat is released by the process fluid that flows over the evaporator surface at a higher temperature than that of the refrigerant fluid.
An electronic control unit regulates:

- the evaporator water inlet temperature, to keep it within the pre-set limits
- the evaporator water outlet temperature and the water flow, to avoid the risk of freezing in zero flow conditions.

3.3 Components

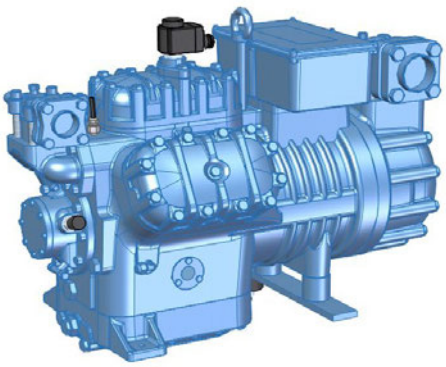
Information on the components of standard machines is given below.
Non-standard components may sometimes be used to meet particular needs.
In this case, refer to the project quote data.
All standard units can be equipped with the following components:

- high pressure switches (see chapter “10.2 High pressure switches (HP)”);
- high/low pressure transducers
- relief valves on the high and low pressure line;
- refrigerant shut-off taps
- dehydrating filters
- sight glass
- electronic expansion valve;
- flow switch (see ch. 10.5 “Flow switch”).

All the connections between the various components are welded with silver alloy, and the cold sections of the copper pipes are clad with insulating material to prevent the formation of condensate.

3.3.1 Compressors

The units are equipped with 2 semi-hermetic piston compressors, with a chiller circuit for each compressor. The compressors used include a compressor with direct start-up or part winding, and a compressor with variable speed inverter technology.
Each compressor is equipped with a casing heater, oil differential pressure switch, temperature probe on the gas delivery line, delivery and suction tap, non-return valve on the delivery line, mesh filter on the compressor inlet and anti-vibration supports.
The 2-pole electric motor is cooled by the suctioned gas and is protected against overheating on the windings by a module that controls their temperature.



WARNING

⚠ At the first start-up after a stop of several days, make sure the casing heater of each compressor has been activated for at least 12 hours before pressing the start button.

3.3.2 Condensing coils

Micro-channel coils

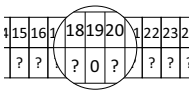
Heat exchangers consisting of an aluminium coil and copper connections. In particular, each section of the heat exchanger is formed of an aluminium micro-channel of varying height, bent several times to create a coil and then connected to the two manifolds (input and output). The advantages of these heat exchangers are basically linked to their lighter weight and a notable reduction in the freon load of the machine.

Pre-painted coils (optional)

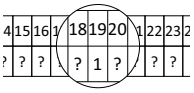
Upon request, Aries units can be fitted with coils with pre-painted fins (shoulders and manifolds) for use in marine areas where the ambient may be overly aggressive for the standard aluminium fins. The fins are treated with polyurethane paint that helps prevent corrosion. The shoulders are made of aluminium.

The presence or otherwise of the painted coils depend on the alphanumeric string-code. For further information see paragraph 1.6 “How to interpret the alphanumeric string”:

position 19 value 0 WITHOUT pre-painted coils



position 19 value 1 WITH pre-painted coils

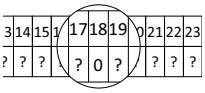


Air filters in the condensers (optional)

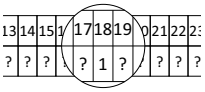
Upon request, the machines can be fitted with air filters made of galvanised sheet metal and aluminium. They are installed to prevent accidental contact with the sharp fin edges, and to protect the front surface of the condensing coils.

The presence or otherwise of the filters depends on the alphanumeric string-code. For further information see paragraph 1.6 “How to interpret the alphanumeric string”:

position 18 value 0 WITHOUT filters



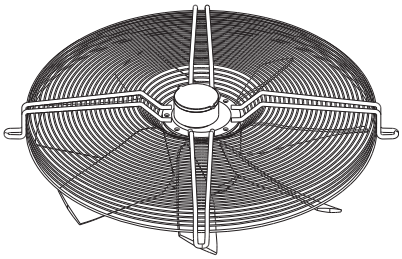
position 18 value 1 WITH filters



CAUTION

⚠ In the event that filters are not provided, the user must create a buffer zone that prevents unauthorised personnel from approaching the machine.

3.3.3 Motor fans



The motor fans are of the axial type, and have safety grilles. They are commanded by a pressure transducer that stops them when the condensation pressure falls below a certain value.

Compared with the HE version, the SHE versions have a lower number of fan rotations (low speed connection).

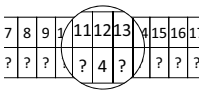
The protection level is IP54, with insulation class F. The blast tube has an aerodynamic shape.

High-efficiency fans that work quietly, with an integrated inverter motor and EC technology (permanent magnets with electronic switchover).

Adjustment is managed by the electronic control.

The type of fan adjustment depends on the alphanumeric string-code. For further information see paragraph 1.6 “How to interpret the alphanumeric string”:

position 12 value 4, EC BRUSHLESS FANS



DANGER

⚠ **In the event of maintenance work on the EC fans, the fact that condensers are used means it is necessary to wait at least 5 minutes after disconnecting the power supply to the unit before opening the box containing the electrical contacts.**

CAUTION

⚠ To avoid condensation, the drive must be continuously energised due to the application of heat, with interruptions such that cooling to the point of condensation does not occur.

3.3.4 Evaporator

Plate type:

The plates are made of braze-welded stainless steel and convey the cooling fluid and the process fluid to be cooled. The heat exchangers are highly efficient and compact, so they require minimal space inside the unit. The housing is covered with an anti-condensate insulating layer that's 9mm thick. The evaporator is protected from the risk of freezing due to low evaporation temperatures by means of the anti-freeze function of the electronic control, which adjusts the water outlet temperature. In addition, each evaporator is equipped with a flow switch to protect it from an insufficient water flow rate. All the evaporators can handle anti-freeze solutions and, in general, all other liquids that are compatible with the hydraulic circuit construction materials. All evaporators respect the “EC” normative about the pressure vessels.

CAUTION

⚠ The flow rate of fluid passing through the heat exchangers must not exceed the values given in the table in Chapter 4 “Installation”.

NOTES

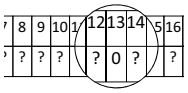
The evaporator is fitted with a tap on its lower part, for releasing the water inside when draining the system (see ch. 11.2.3 “Draining the water circuit”).

Electric evaporator heater (optional)

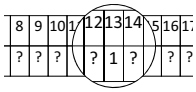
Upon request, the evaporators can be protected from the risk of freezing by means of an electric heater (optional) commanded via the control panel.

The presence or otherwise of the electric heater depends on the alphanumeric string-code. For further information see paragraph 1.6 “How to interpret the alphanumeric string”:

position 13 value 0 WITHOUT resistors



position 13 value 1 WITH resistors



3.4 Desuperheater

The desuperheaters for the recovery of about 20% of the heat to be disposed of at the condenser are placed in series, on the compressor supply and take advantage of the desuperheating heat from the compressor discharge temperature to the condensation start temperature (about 20% of the total heat disposed of at the condenser). There are two desuperheaters, one for each circuit.

3.5 Energy meter

The units equipped with Energy Meter provide the user with information in real time regarding the instantaneous energy consumption of the unit by making the following data available to the user:

- Current:
  instantaneous value: I1, I2, I3, In
  average max. value: I1, I2, I3, In
- Voltages and frequency:
  instantaneous value: V1, V2, V3, U12, U23, U31, F
- Power:
  instantaneous value: 3P, ΣP, 3Q, ΣQ, 3S, ΣS
  average max. value: ΣP, ΣQ, ΣS
- Power factors:
  instantaneous value: 3PF, ΣPF
- Active energy:
  +/- kWh

This data is visible on the display.

3.6 Hydraulic circuit

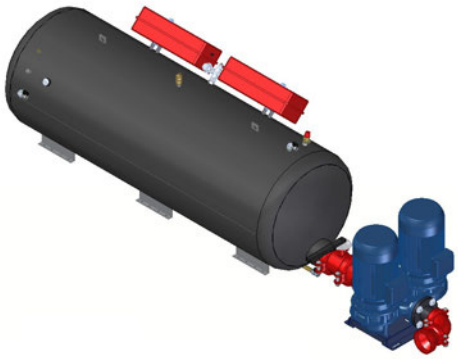
The hydraulic circuit is composed of the following components:

- plate evaporator;
- flow switch;
- air vent on plate evaporator;
- automatic vent on the tank
- tank drainage tap
- drainage cock on the lower side of the evaporator;
- victaulic type water connections (consult the attached drawings);
- counter connection points (with quickcoup joints supplied)

3.6.1 Hydraulic unit (optional)

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

- pump P2
- pump P3
- double pump P2+P2
- double pump P3+P3
- tank + pump P2
- tank + pump P3
- tank +double pump P2+P2
- tank +double pump P3+P3



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. Two taps (inlet/outlet) allow the pump to be isolated during maintenance.

Pump P3:
With a working head of approx. 30 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. Two taps (inlet/outlet) allow the pump to be isolated during maintenance.

Pumps P2+P2 (unit in standby):
Each with a working head of approx. 20 m.c.a. The two pumps are linked by rigid connections, and connected to the evaporator and the water inlets/outlets. The electronic control automatically commands the operation of one pump or the other, and manages the thermal protection alarm.
One inlet tap allows the pump to be isolated during maintenance.

Pumps P3+P3 (unit in standby):
Each with a working head of approx. 30 m.c.a. The two pumps are linked by rigid connections, and connected to the evaporator and the water inlets/outlets. The electronic control automatically commands the operation of one pump or the other, and manages the thermal protection alarm.
One inlet tap allows the pump to be isolated during maintenance.

Tank and pump unit:
A horizontal, cylindrical tank made of carbon steel with an aluminium-plated, anti-condensate insulating layer. For the description of the pump, see above (first or second option). The tank and pump are installed on the machine base and are

linked with rigid 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
- a level sensor

NOTES

Units with a pump are always fitted with a water pressure gauge.

WARNING

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

CHAPTER 4

INSTALLATION

CAUTION

⚠ Before installing or operating these machines, ensure that all personnel have read and understood the chapter on " Safety" this manual. The unit must be installed in accordance with current national legislation in the country of use.

4.1 Overall dimensions

See enclosures.

4.2 Installation precautions

WARNING

⚠ Before opening the packaging of the unit, use a special gas detector to check that there are no gas leaks in the environment. Check that there are no sources of ignition in the proximity of the unit.
No smoking near the unit.

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).**

DANGER

⚠ **This unit is equipped with a safety device that can detect the gas leakage. After installation, this unit must never be turned off, except during maintenance.**

4.3 Instructions for the user

The machines must be installed in safe places, free of areas with potentially explosive atmospheres. They must be connected to electrical systems designed according to current standards, in areas compliant with the standards imposed by the Fire Brigade and in environments compliant with local building standards.
Within the potentially explosive areas generated by the machine, also taking into account the national regulations of the country of use, it is necessary to:

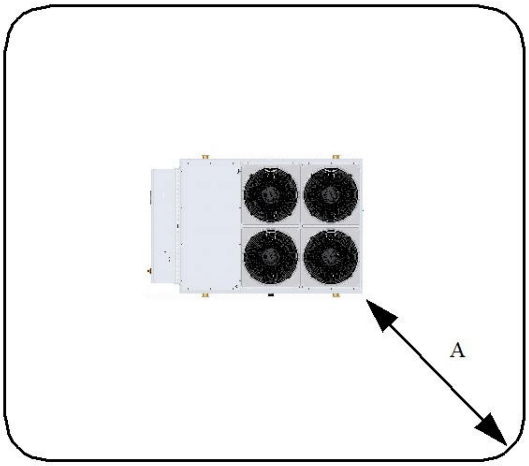
- Do not install equipment that is unsuitable for use in these potentially explosive zones (the minimum requirements of the equipment are: 3G IIB T4);
- Avoid naked flames, sparks and hot works;
- Avoid the presence of sources of ignition due to processes that may generate remote triggers (ionising and non-ionising radiation);
- Avoid the direct and indirect effects of lightning;
- Avoid electrostatic charges;
- Avoid interference with potentially hazardous elements such as drains, openings in the earth, basements, power lines, stores of flammable substances, railways, motorways etc.

As the refrigerant gas used is heavier than air, even a small gas leak, which in itself is not dangerous, can cause a build-up of gas if it infiltrates into underground areas, forming pockets.
A suitable "safety" distance should be assured also for chilling systems installed outdoors, in order to minimise the risk that flammable concentrations enter premises occupied by humans (e.g. through windows, ventilation openings, where people meet outdoors, etc.). However, external wind speeds tend to be quite high (compared to indoor environments) even when the

air seems “still”, so also the amount of flammable mixture should be adjusted to consider the additional dispersion caused by the surrounding air.

WARNING

⚠ The safety zone/area around the machine must be at least 3 meters. Potentially explosive atmospheres may build up inside this area, and it is therefore necessary to avoid sources of ignition, as defined in standard EN378-2.



A = 3 meters

CAUTION

⚠ The flammability and classification of the danger zone for the place of installation must be assessed by the final customer, who shall refer to the local regulations in force and consequently adopt the most restrictive result.

CAUTION

⚠ Cordon off access to the area to prevent accidents.

The electricity supply line to the machine must be protected with the aid of devices that should be chosen and installed by the user on the basis of the data in the wiring diagram and in ch. 6.2 “Electrical connections”. If the unit is connected to a closed hydraulic circuit with an automatic supply system, and the supply system pressure exceeds the maximum unit operating pressure, a pressure limiter device must be installed (e.g. a safety valve that intervenes at a pressure level lower than the maximum machine operating pressure) near the inlet connection point. All the piping of the cooled water must be painted or clearly marked in compliance with the local safety in force in the installation place. Manual on-off valves should be provided for the unit so that the hydraulic circuit can be by-passed to carry out maintenance. 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. If raised platforms are required to provide access to the unit they must not interfere with normal operation or obstruct access for lifting or dismantling components. Platforms and stairs should be of grid or plate construction with safety rails on all open sides.

4.4 Location

1. Max. height above sea level 2000 m.
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 (refrigerant side) must be facing towards the outside of the unit, in a safe area and away from any possible ignition sources. 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, sized and built to withstand the operating weight, especially in the contact points highlighted on the overall dimensions drawing. **In the event of installations which fail to comply with the above requirements, the manufacturer's warranty cover will immediately become null and void and the unit could malfunction or even lock out.**
11. The units are shipped from the factory with plastic or wooden supports placed underneath the base, which should be removed during installation (see ch. 11.2.1 "Accessing the internal machine compartments"). 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. Install a water tank if necessary. This will help reduce the extent of the temperature swings of the chilled water (DT). The total minimum volume of hydraulic inertia will depend on the model selected according to the table below, in standard operating conditions:

Model	**iASN / ASN 075**	**iASN / ASN 100**	**iASN / ASN 110**	**iASN / ASN 150**
Minimum volume [m^3]	0.50	0.50	0.50	0.80

14. Install appropriate windbreak barriers near the condensing batteries if the machine needs to operate with an outdoor air temperature below 0°C and there is a risk that the condensing batteries might be struck by winds at a speed higher than 2 m/s. Make sure these barriers do not prevent the natural ventilation of the compressor compartment.

CHAPTER 5

HYDRAULIC CONNECTIONS

5.1 Liquids to be cooled

The liquids to be cooled must be compatible with the materials used.
These can be water or mixtures of water and ethylene or propylene glycol, for example.
The addition of anti-corrosive chemical additives and operating in a pH range between 7 and 8 is recommended.
Even in the case of glycol mixtures, the use of appropriate chemical additives (consult the glycol supplier) is very important to protect the unit materials from possible corrosion caused by the chemical degradation to which glycol is subject. The use of chemical additives is necessary when the unit is part of an hydraulic circuit opened in at least one side to the atmosphere. In this case, in fact, the continuous supply of oxygen facilitates possible corrosive reactions inside the unit. The liquids to be cooled must not be flammable.

DANGER

⚠ **If the liquids to be cooled contains dangerous substances (e.g. glycol) it is very important to collect any liquid which leaks because it could cause damages to the ambient.**

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.

5.1.1 Evaporator water limit features

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

Contents		Concentration mg/l or ppm	Material	
			AISI 316L	Copper
Aluminium	Al	**<0.2**	+	+
		>0.2	+	o
Manganese	Mn	**<0.1**	+	+
		>0.1	+	o

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
o	When multiple factors are “o” 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.

5.2 Hydraulic connections

The unit is equipped with “Victaulic” connections (see drawing below).

1. Connect the unit to the water pipes as shown in the diagram below.
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. If the machine is supplied without the pump, ensure that the pump installed by the user is connected as follows:
   - with intake connected directly to the machine outlet connector if the utility circuit is closed.
   - with delivery connected directly to the machine inlet connector if the utility circuit is open to the atmosphere.
4. If the machine is supplied with the hydraulic unit, the utility circuit must be closed.
5. Install a water filter at evaporator inlet (with 0.4 mm mesh).

DANGER

⚠ **Failure to observe this prescription can result in 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.

DANGER

⚠ **In the event of evaporator failure, any loss of refrigerant may leak into the hydraulic circuit of the unit. To prevent the refrigerant from leaking into the building, pay attention to the design of the hydraulic circuit. In particular, safety valves and automatic air vents must be installed outside the building; if this is not possible, they must be conveyed outside.**

WARNING

⚠ In case of breakage of the evaporator, it is necessary to replace all the automatic vent valves present in the hydraulic circuit.

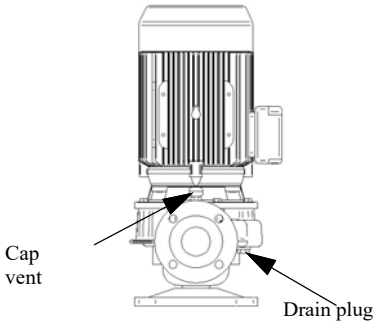
WARNING

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

CAUTION

⚠ If the mechanical seal is lost during the start-up of an electric pump, quickly open and close the delivery baffle valve several times while the pump is operating; the aim is to create sudden pressure variations inside the pump to help the mechanical seal to settle down. You are advised to do this at least 2 or 3 times, switching the pump off and then back on again between one attempt and the next.

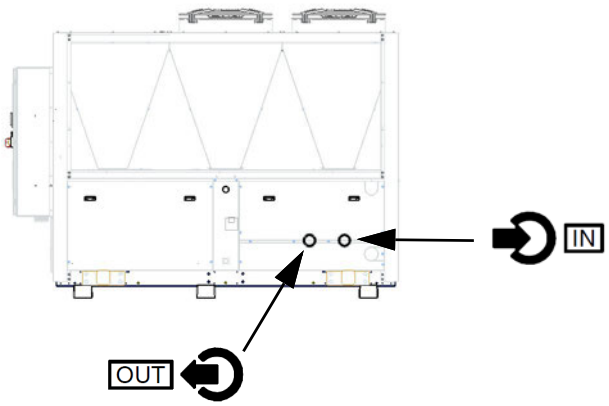
Lowara pump



When charging the liquid circuit, make sure there are no air bubbles or impurities. Vent the liquid circuit in order to prime the pump.
The procedure is as follows:

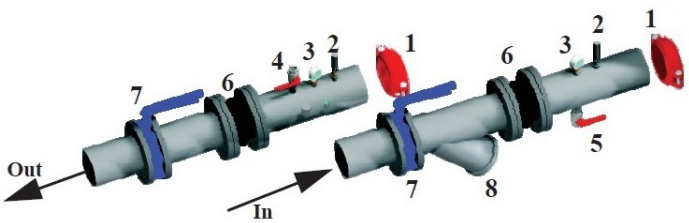
- unscrew the breather cap on the pump at the top
- proceed with filling the hydraulic circuit until the water comes out of the cap
- close the cap

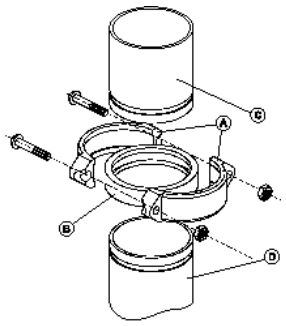
Repeat the operation, if the pump shows abnormal noise, in order to eliminate the residual air present in the impeller.



Typical water side connection

1. "Victaulic" Attacks
2. Thermometer
3. Pressure gauge
4. Vent
5. Discharge
6. Anti-vibration joint
7. Shut-off valve
8. Filter with removable filter cage



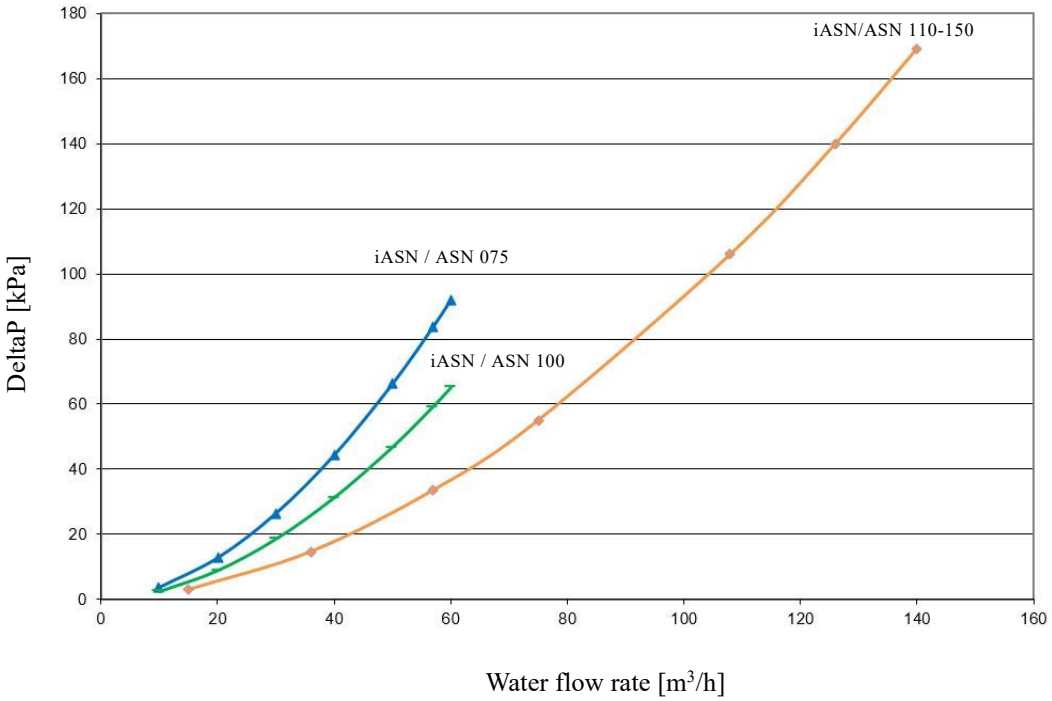


"VICTAULIC" TYPE ATTACK
- A clamping jaws
- B sealing gasket
- C welding ankle boot
- D evaporator ankle boot

The hydraulic circuit must be sized in such a way as to comply with the pressure limit value specified on the data plate and ensure the flow rate shown in the following table is not exceeded:

	PLATE EVAPORATOR Maximum flow rate [m^3/h]
iASN / ASN 075	60
iASN / ASN 100	60
iASN / ASN 110	140
iASN / ASN 150	140

Evaporator pressure drops
Plate type:



5.3 Anti-freeze protection

Even if the minimum ambient operating temperature is higher than 0°C, the machine may be installed in a place where the temperature falls below 0°C in periods of non-use during the winter. In these cases (and if the unit circuit is not drained), ice formation must be avoided by adding an anti-freeze solution (ethylene or propylene glycol) in the following percentages:

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

Depending on the cooled water outlet temperature, antifreeze (ethylene or propylene glycol) must be added in the following percentages to prevent the formation of ice:

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

NOTES

With intake temperature control, the reference for the glycol percentage is equal to the setpoint less 6°C.
E.g. Setpoint 11.0°C (reference for glycol 5°C) recommended percentage 20%.

NOTES

- The minimum recommended antifreeze % takes the coolant's operating conditions into consideration and is not strictly dependant on the freezing point of the chilled water leaving the unit.
- The water flow rate must comply with the value stated in the performance technical data or the selection software.

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 according to the formula:

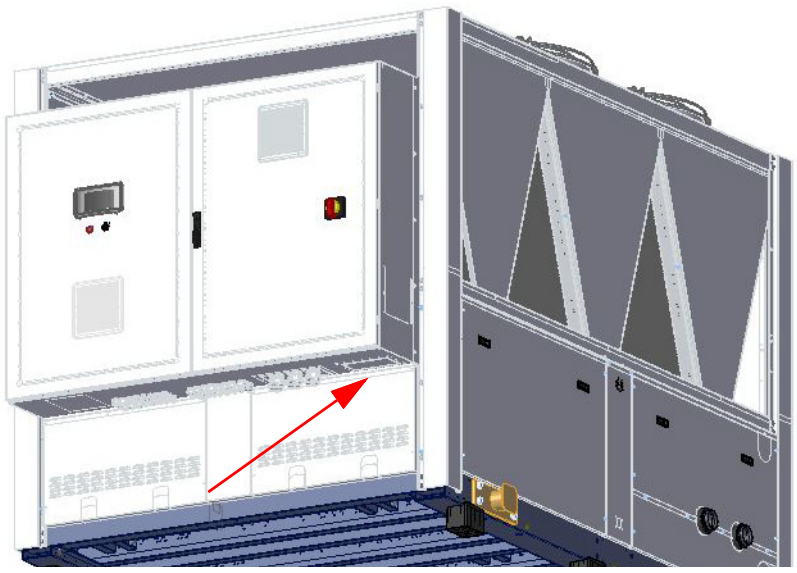
$$\frac{MaxPhaseVoltageDifferenceFromVavg}{Vavg} \bullet 100$$

Vavg= average phase voltage

Example: supply with nominal voltage 400V/3Ph/50Hz
L1-L2 = 410; L2-L3 = 400V; L1-L3 = 398V
Vavg= (410+ 400 + 398) / 3 = 403V

$$\frac{(410 - 403)}{403} \times 100 = 1{,}73$$

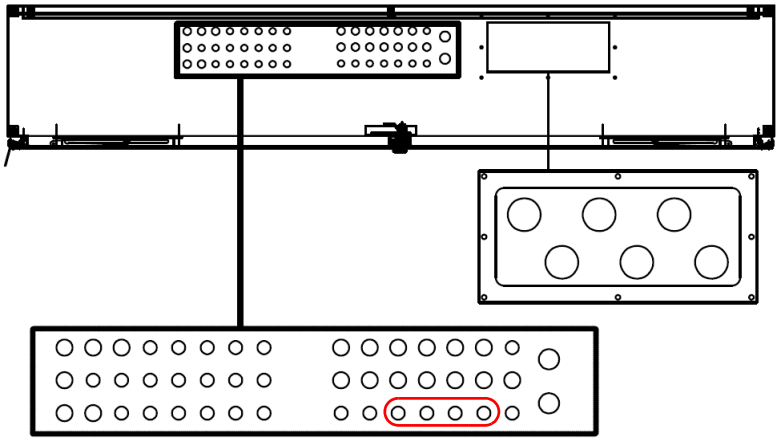
The unit must be connected to a three-phase supply TN(S)
Use the specific plate for feeding the electrical cables inside the machine; drill the plate and equip with suitable cable glands for the power cable entry.



Do not modify the casing for any reason; use only the holes provided, equipping them with cable glands to connect the foreseen optionals.

ELECTRIC PANEL BOX DRILLING

The contoured holes are available to the customer to manage the options.



For the electricity supply:

1. ! connect the machine (terminal PE on the control panel) to the earthing system of the building
2. ! ensure the automatic cut-off of the power supply in the event of an isolation fault (protection against indirect contact as per the indications of Standard IEC 60364), by fitting a **type A or B differential current device**; drill holes in the plate and use suitable cable glands to feed in the power cable
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 power cable source to protect it from current surges (short-circuits).
5. use wires rated to carry the maximum current required at the maximum ambient operating temperature, according to the chosen installation type (IEC 60364-5-523)
6. Install protection devices 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.

CAUTION

⚠ In the event of failure of one cooling circuit, it must be cut off electrically in order to operate the machine with the other circuit only.

CAUTION

⚠ Inside the control panel, on the earth bar, there is a terminal that must be used to connect the conductive parts outside the machine (extraneous conducting parts) located at less than 2.5m, if these have an earth connection that is separate from the electricity supply to the machine and if they could produce further potential (metal pipes, railings, stairs, handrails, etc.).

The terminal is identified by the symbol IEC 60417-5021

6.3 Phase Monitor

The electronic controller, with the aid of a Phase Monitor (see unit electrical diagram), enables to control unit electric power feeding.
Tripping of the Phase Monitor stops the unit and the appropriate alarm is displayed.
Voltage surges or an incorrect phase sequence on the unit's power feeding line can result in faults of electrical devices (motors, control devices, etc.) and can cause damage over the long term, especially to compressors.
Some measure of instability on the power feeding line can be considered to be normal.
If the frequency of unit shut-downs caused by Phase Monitor tripping should increase, contact your electricity company in order to solve the problem.

CAUTION

⚠ It is strictly prohibited to tamper with the Phase Monitor.

6.4 Protection rating

The protection level of the entire unit is **IP54** with insulation class F to ensure it is compatible with outdoor operation in all climates.

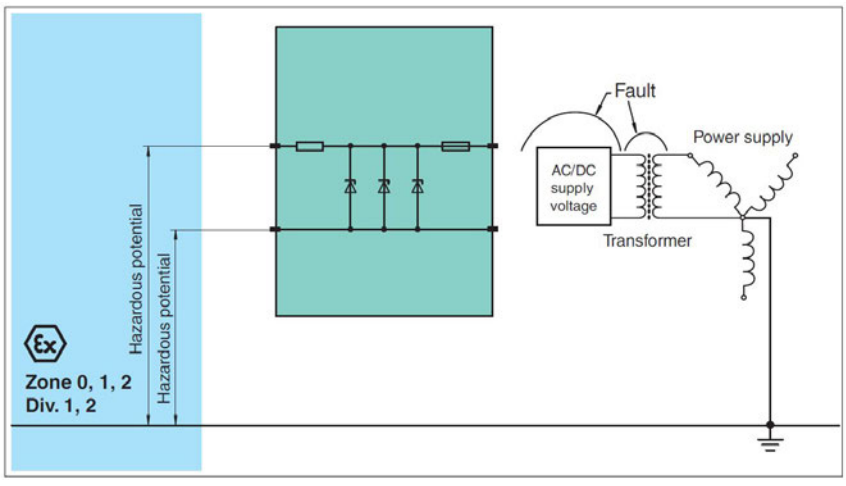
6.5 Ground connection for intrinsic barriers

CAUTION

⚠ Inside the electrical panel there are intrinsic Zener barriers that need periodic verification, see chapter 11.2.6 “Control and maintenance schedule” for more details.

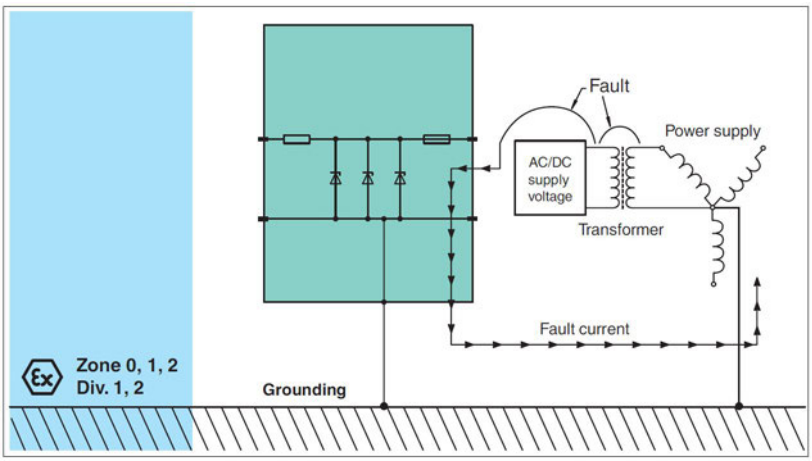
For the correct operation of the intrinsic barriers connected to the Kriwan protection device of the compressor, a dedicated earth connection must be guaranteed.
Comply with the earthing requirements according to IEC/EN 60079–14.
Maintaining these requirements prevents the occurrence of a potential hazard in the event of circuit failure.
On the side of the intrinsic barriers there is a terminal to which a copper conductor must be connected for connection to the ground circuit with a minimum section of 4 mm^2.
The ground circuit of this connection must ensure a resistance to ground ≤ 1 Ohm.
The ground connection system of the Zener barriers must have its own independent ground conductor, through which the current of the machine’s power supply system must not circulate.
In the event of a fault, if the Zener barrier is not grounded, a dangerous spark may occur.

Groundless Zener Barrier



In the event of a fault, if the Zener barrier is grounded, the Zener diodes conduct.
The current is diverted to the ground. The fuse opens.

Grounded Zener Barrier



Periodically check that the ground connection of the Zener barriers is intact and in good condition and guarantees a maximum resistance ≤ 1 Ohm.

The check must be carried out both on the internal connections to the electrical panel and on the external connections; the connections must be in good condition, not corroded and not damaged.

A six-monthly verification of the connections is recommended; the maintenance of the connection characteristics may depend on the installation environment of the machine, and the final customer must define the maximum verification time (see ch. 11.2.6 “Control and maintenance schedule”).

CAUTION

⚠ The ground circuit of this connection must ensure a resistance to ground ≤ 1 Ohm.

CAUTION

⚠ Periodically check that the ground connection of the Zener barriers is intact and in good condition and guarantees a maximum resistance ≤ 1 Ohm.

CHAPTER 7

MACHINE OPERATION

7.1 Precautions during operation

Operation must be carried out by competent personnel under a qualified supervisor.
Never remove or tamper with the safety devices, guards or insulation materials fitted to the unit or auxiliary equipment.
When the mains switch is ON, lethal voltages are present in the electrical circuit so extreme caution must be exercised if work needs to be carried out on the electrical system.

CAUTION

⚠ Do not exceed the liquid flow to be cooled specified in Chapter 4 “Installation”.

7.2 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 involved have read and understood chapter “ Safety” of this manual.

WARNING

⚠ At the first start-up, check the correct operation of all electrical connections.

WARNING

⚠ At the first start-up after a stop of several days, make sure the casing heater of each compressor has been activated for at least 12 hours before pressing the start button.

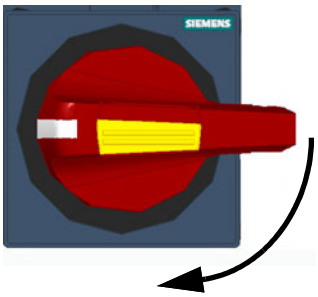
CAUTION

⚠ After pressing the main switch, the control display will remain off until the gas leak detector (fixed inside the compressor compartment) has completed the warm-up phase. The waiting time will be about 300 sec.

DANGER

⚠ **Open the compressor suction and delivery taps before starting the unit.**

1. Check the unit shut-off valves are open.
2. If the hydraulic circuit is of the closed type, check that an expansion tank has been installed with an adequate capacity.
3. Check that the ambient temperature is within the limits indicated on the machine data plate.
4. Check the main switch is in the OFF position (“O”).
5. Check that the power supply voltage is correct.
6. Power the machine by means of the line protection device.



7. Turn the unit main switch to the ON position ("I"). The presence of mains voltage is guaranteed by the activation of the display.

8. Models without pump: make sure water is flowing through the evaporator.

9. Check that the outlet cocks of the compressors are open.

10. Wait for the gas leak detector warm-up time (around 300 seconds). At the end of the warm-up time, if no refrigerant leaks are detected, the red indicator light on the electrical panel goes out; the unit can be started.

11. Press and hold the display button to activate the unit. The pump, if installed, starts immediately. After the set delay the compressors can start.

12. The compressors, pump and fans have only one correct rotation direction.
Check the rotation direction of all components at first start-up and after every maintenance operation. If all the components are rotating in the wrong direction, invert two phases on the main terminals of the control panel. If one component or more is not correctly connected, invert two phases on the terminals of the corresponding contactor(s) (see attached wiring diagram).

13. **If with the first start-up**, there is a high ambient temperature and the temperature of the water in the hydraulic circuit is much higher than the working value **(e.g. 25-30°C)** this means that the machine starts up overloaded with the consequence of possible protection device tripping. To reduce the overload, partially and **progressively** (but not completely!) **close a unit outlet valve to reduce the flow rate of water passing through.** The valve can be opened fully when the water temperature in the hydraulic circuit reaches the working value.

CHAPTER 8

ELECTRONIC CONTROL

The electronic control manages the operation of the unit, displays the value of the probes and the status of the compressor. It deals with the notification of alarms and allows to change the operating parameters.

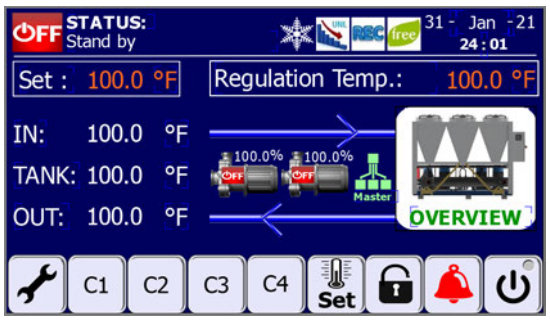
8.1 User Interface

8.1.1 PGDX Touch Terminal

The user interface is the pGDX Touch terminal

The terminal consists of a touch display and a vertical coloured LED notification bar. The colour of the led is linked to the status of the unit:

Coloured LED	Unit Status
Off	Unit OFF
Green	Unit ON
Red (flashing)	Unit in alarm

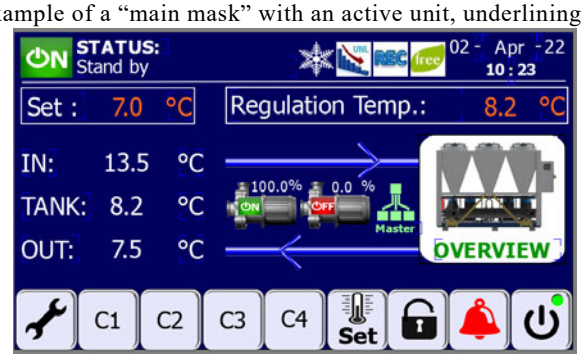


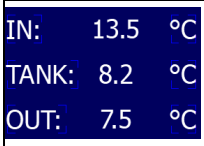
The terminal, shown in the figure above, has 6 keys and their meaning is described below:

	Access to the user menu for viewing/editing
	Return to Main Mask
	Allows to switch to the display of the quantities of the selected circuit
	Allows adjustment of the adjustment setpoint (see “8.1.1.4 Setpoint”). The unit can be either on or off without affecting the procedure. Use the  keys to set the value. Press  to confirm.
	Access to the main menu to view/edit parameters
	List of active alarms display. For the list of alarms see chapter 8.11 “Alarms”. Prolonged pressure: Manual reset alarms reset

	Prolonged pressure for 3” allows the unit to be switched on/off. When the unit is running the  icon is displayed; when it is shut-down the icon is  . The icon appears with the same meaning in all display masks.
	Allows to view the OVERVIEW SCREEN

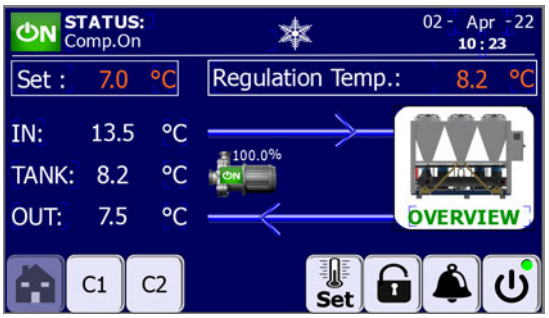
The following screen shows an example of a “main mask” with an active unit, underlining the fields and icons used:



	Unit Status
	Unit on in Chiller
	Leak Detector Calibration Expiring
	Unloading (active)
	Date and time (current)
	Adjustment setpoint
	Adjustment probe
	“Inlet / Tank /Outlet Evap.” probes
	Evaporator pumps status (% of work if inverter pump)
	Active modularity (Master, Slave1, Slave2,..)
	TOUCH key “OVERVIEW” The unit operation total display screen is reached

8.1.1.1 Main Mask

The following screen can be reached with key 



It allows to view the status of the unit and the adjustment quantities of the machine.

8.1.1.2 User menu

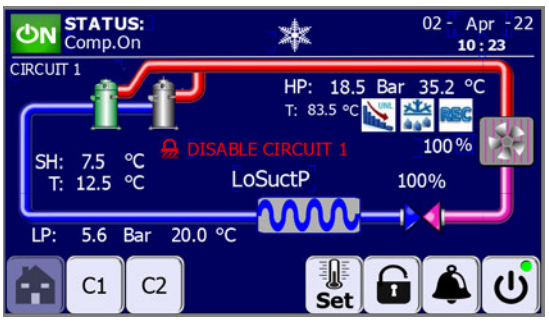
The following screen can be reached with key  :

It allows to:

- view the serial number
- set the desired language
  English, Italian, German, French, Spanish, Russian
- set the desired unit of measurement
- set date and time

8.1.1.3 Synoptic

The following screen can be reached with key  , 



It allows you to view the operating status of the circuit circuits.

The following screen can be reached with key 

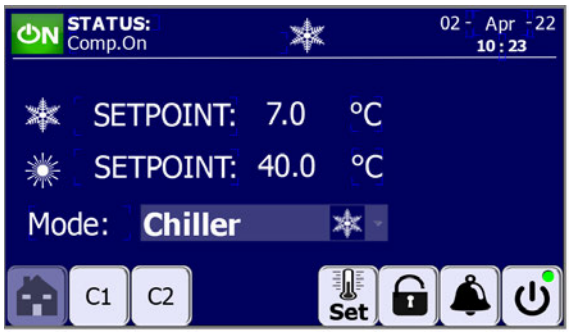
:

Allows to view the operating status of the unit.

8.1.1.4 Setpoint

The following screen can be reached with key 

:



Allows to set the setpoint.

8.1.1.5 Parameters menu

The following screen can be reached with key 
:

Allows access to the parameters menu (see paragraph 8.1.3 “Menu”).

8.1.1.6 Alarms interface pGDX

The ALARM key can be pressed in two different contexts: no alarm present or at least one alarm present .

If there is no alarm present, the following mask is displayed, which can be reached with key / :

If there is at least one alarm present, the alarm mask is displayed in the order from the lowest to the highest alarm code.
This mask gives the opportunity to enter the “alarm history”:

press key

then press key

then press key

then press key

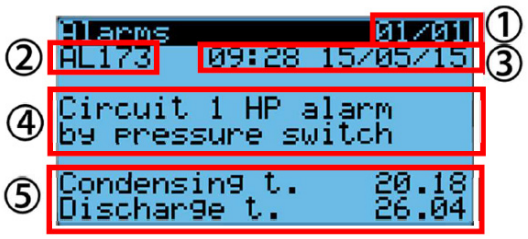
8.1.2 Alarms interface pGN1

8.1.2.1 Alarm and LED mask

The ALARM key can be pressed in two different contexts: no alarm present or at least one alarm present.
If there is no alarm present, the following screen is displayed:

This mask gives the possibility to easily enter the alarm history via the Enter key.
If there is at least one alarm present, the alarm mask is displayed in the order from the lowest to the highest alarm code.

Each alarm contains useful accessory information to understand the triggering cause of the alarm. Below is the information available in the mask:



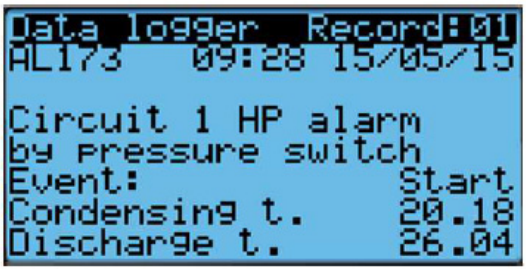
1. Total number of alarm/alarms
2. Unique alarm code
3. Alarm date and time
4. Extended alarm description
5. Alarm related probes value

In each alarm mask it is possible to view the alarm history by pressing the Enter key.
As for the red LED under the ALARM key, this can be:

- Off: no active alarm;
- Flashing: there is at least one active alarm and the display is displaying a mask that does not belong to the alarm loop;
- ON: There is at least one active alarm and a mask of the alarm loop is being displayed.

8.1.2.2 Alarm history

From the main menu, entering the Alarm History menu gives access the following alarm history display screen.



The alarm history allows to store the operating status of the softwear when alarms are triggered. Each storage constitutes an event that can be viewed among all the events available in memory.
The same information saved in the alarm mask will also be saved in the alarm history. The maximum number of memorable events is 64, reached the maximum limit, the last alarm will overwrite the oldest alarm.
The alarm history can be deleted in the Setting-initialisation menu through the specific command.

8.1.2.3 Reset alarms

Alarms can be reset manually, automatically or automatically with retries:

- Manual reset: once the cause of the alarm has ceased, it is necessary to first reset the buzzer (if present) using the ALARM key and then press the ALARM key a second time for the actual reset. At this point, the specific action of the alarm is also reset and the device can restart.
- Automatic reset: when the automatic alarm condition ends, the buzzer (if present) is silenced and the alarm is reset.
- Automatic reset with retries: The number of interventions in an hour is checked: if the number of interventions in an hour is less than the maximum number set, the alarm is automatically reset; once the limit is exceeded, it becomes manual.

8.1.3 Menu

Regardless of the mask you are in, by pressing the programming key you have access to the password entry mask that allows access to the main menu shown below.

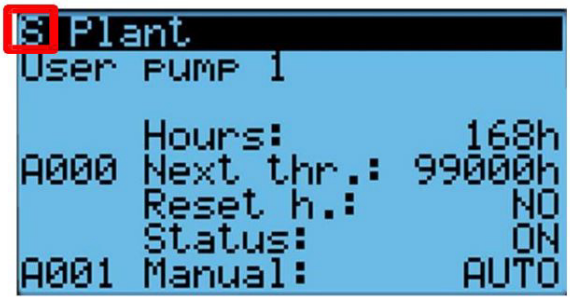
- A. Plant
  - a. Pumps
  - b. Setpoint
  - c. Adjustment
  - d. Scheduler
  - e. Alarm set
  - f. Antifreeze
  - g. Probes
  - h. Modularity
  - i. Freecooling
- B. EEV
- C. Compressors
- D. Heat recovery
- E. Fans/Defrost
- F. Alarms log
- G. Settings
  - a. Date/Time
  - b. UOM
  - c. Language
  - d. Info
  - e. Serial ports
  - f. Pwd change
  - g. Initialisation
- H. Logout

8.1.3.1 Password management

The program provides 3 different password levels:

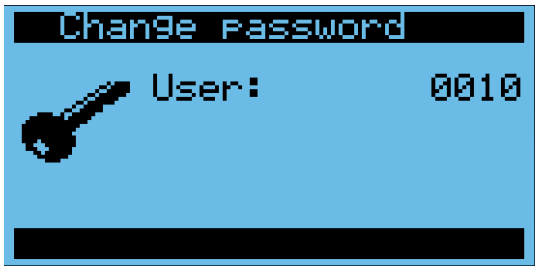
1. Advanced user (maintainer): read-only access to all parameters. Default password: 0010.
2. Service: read access to all parameters with the possibility of modifying some (for details on the editable parameters, see parameters table).
3. Manufacturer: read and write access to all parameters.

The parameter screens display the access needed to change the parameters on the screen (M for Manufacturer, S for Service). Here's an example:



Once the password is entered, access is maintained for 5 minutes from the last press of a key and then it will be necessary to re-enter the password to access the parameters of the advanced functions. In the Log-Out menu you can force the entering of the password without waiting for 5 minutes.

The User password can be changed at will by the user (who already has access to the user password) within the range 0000 – 0999 through the use of the appropriate mask in the Settings/Pwd Change menu.



8.1.3.4 Mask loops and their organization

Within each menu, the masks are organized in loops: with the use of the up and down keys, all the masks of the menu are scrolled. The masks are organized so that those with the highest frequency of use are accessible with the down key (scrolling down), while those with the lowest use (e.g. configuration) can be reached with the up key (scrolling up).

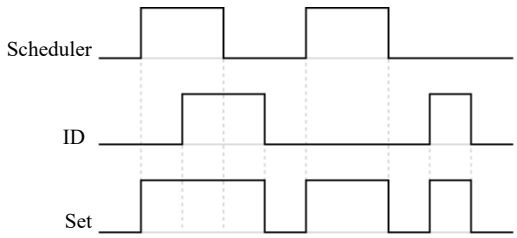
8.2 Adjustment

8.2.1 Temperature adjustment

The software provides for the regulation of the water inlet or outlet temperature to the evaporator or, if present, on the temperature probe at the outlet of the storage tank.

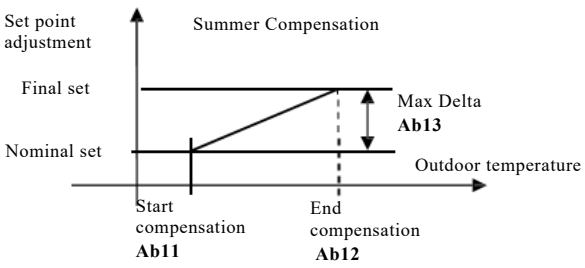
8.2.1.1 Second setpoint

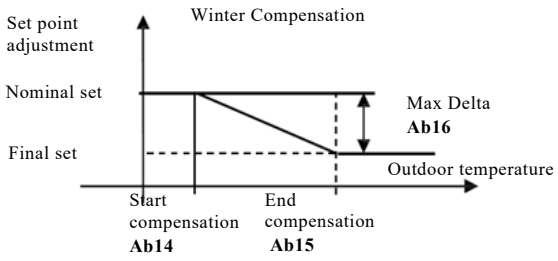
A second setpoint can be set in chiller (Ab04) and in heat pump (Ab05). The 2nd setpoint is activated through the appropriate digital input “ID2 - BUILT-IN DRIVER CPCO” or by enabling the scheduling function (Ab06) and the relative daily time slot.



8.2.1.2 Setpoint compensation from environment

Set point compensation is possible based on outdoor temperature. The function can only be enabled if the external temperature probe is present, via the **Ab09** parameter. It allows to obtain, in summer operation, a positive compensation starting from the compensation start threshold (par. **Ab11**) up to the end of compensation threshold (par. **AB12**) of the maximum value specified by the parameter **AB13**. During winter operation the compensation is negative, starting from parameter **Ab14** end parameter **Ab15**, maximum variation **Ab16**.

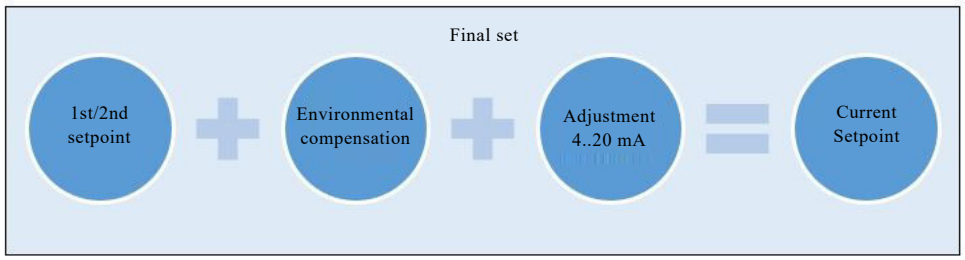




The function is enabled regardless of the active setpoint at that time.

8.2.2 Adjustable setpoint

It is possible to adjust the setpoint by means of a 0..10V/ 4..20mA signal (**AB10**) connected to the U7 channel of the expansion.
The function can be enabled with the Ab09 parameter: if activated, a differential is added ranging from a minimum of 0 when the signal measures 0V/4mA to a maximum of Ab17 when the transducer measures 10V/20mA.



8.2.3 Remote adjustment

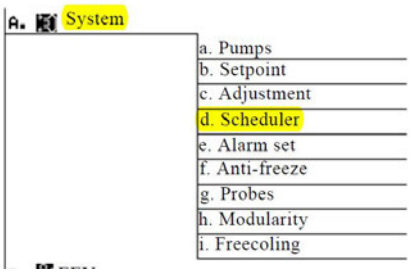
Remote adjustment can be enabled using the **Ab09** parameter.
If activated, the cooling capacity request from the normal adjustment is ignored in favor of a percentage obtained by a 0..10V/ 4..20mA signal (**Ab10**) connected to the U7 input of the expansion.

8.2.4 Request from BMS

It is possible to manage the regulation from BMS, by-passing the internal temperature regulation and directly controlling the power request by assigning a value 0-1000 to the specific **BMS_PwrReq serial variable**. Enabling is done via the **Ge01** parameter.
Adjustment via BMS takes precedence over all adjustments.

8.2.5 Scheduler on-off

The scheduler is used to manage the scheduling of the ignition calendar.

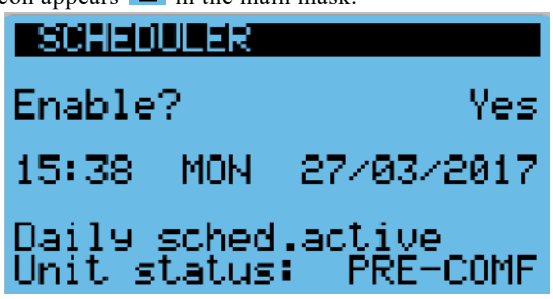


Allows the following activities:

- daily schedule where you can set a maximum of 4 events per day
- daily holiday planning
- scheduling for special days

In the main screen of the Plant - > Scheduler loop it is possible to see the current status of the unit (off, ON), the operating status of the scheduler (NOT RUNNING or IN PROGRESS) and the status of the configuration error indicator.

With scheduler enabled, the clock icon appears in the main mask.

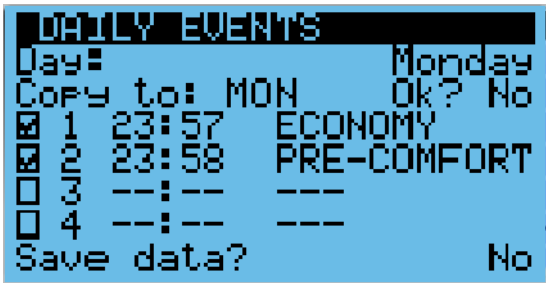


Daily events

Up to four events per day can be set with weekly repetition. Each event requires to be enabled and correctly filled in with the information related to the start time and the desired device mode (OFF, ON).
The scheduler also offers the ability to copy a day's configuration to other days of the week, in order to avoid manually entering the same configuration twice on different days.

NOTES

When the data is saved, a consistency check is performed: if the user has enabled the event without setting a correct time, the incorrect event and all subsequent ones are disabled.



Holiday periods

Up to three holiday periods can be set by specifying the start and end dates. For each period, it is necessary to set the operating mode of the device.

NOTES

When the user is filling in the holiday period parameters, a consistency check is performed: if the start and end dates are inconsistent OR if two periods are overlapping, the incorrect event(s) and all subsequent ones are disabled and an error message is displayed.

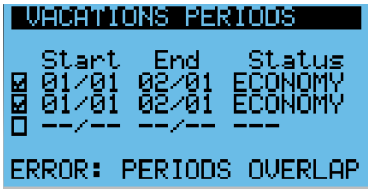


Figure 1 Overlapping periods

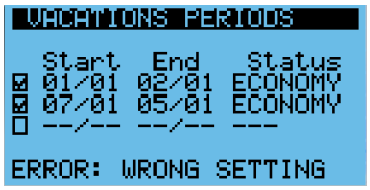


Figure 2 Incorrect event

Special Days

Up to six special days can be set with priority over the normal daily setup. For each special day it is necessary to set the date and operating mode of the device.

NOTES

When the user is filling in the parameters of a special day, a consistency check is performed: if two periods overlap, an error message is displayed.

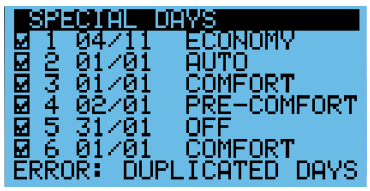


Figure 3 Duplicate Days

Special cases

- Each start time of the 4 events must be higher than the previous one. If an event is set to 23:59, all of the following events are forced disabled.
- It is not allowed to set a holiday period over a period of years. This means that the days and months must refer to the current year.
- If a holiday period is set, all daily events related to that day are overwritten.

If a special day is set, all daily events and days included in holiday periods related to that day are overwritten.

8.2.6 Antifreeze management with unit off

When the unit is switched off, the software provides for the antifreeze management of the unit with a configuration parameter (**Af00**) that prevents water from freezing by means of a pump and/or antifreeze heater.

8.2.7 Glycol tip

In the screens where the parameters Ab00 (Minimum setpoint chiller), Ac03 (regulation probe at full speed) and Ae07 (evaporator outlet low temperature alarm) are modified, a message appears if there are the conditions for which it is necessary to glycolate the process water.
The following are taken into account:
a) Ae07 increased by 2°C
b) Ab00 or Ab00 minus 6°C if the full throttle probe is in input.
If the smaller of these two values (a) and (b) is less than 6°C, then the message appears below all three parameters mentioned.
The aforementioned differentials and the set are fixed and defined within the code.

8.3 Pumps

The software can manage up to two pumps on the evaporator branch.
The thermoregulation is enabled only after the flow alarm delay from the start of the pump, to prevent the ignition of compressors when there is still no certainty of the presence of flow.

8.3.1 Evaporator pumps

When the machine is switched on, a pump on the evaporator branch is switched on immediately. The pump will be switched off after a delay from the moment the machine is switched off, if the compressors are already switched off, or from the moment the compressors are switched off. When the pump is switched on after a delay from the closing of the flow switch, the adjustment is enabled and then the compressors are switched on.
If only one pump is present, it is stopped in the event of a pump overload or flow alarm.
In the case of two pumps, it is possible to set two types of rotation in time or for start-ups to alternate the operation of the two pumps.
For each pump, in addition to the overload alarm that intervenes if the corresponding digital input is opened with the pump on, a maintenance warning is provided if the working hours threshold is exceeded.

8.3.1.1 Inverter Pumps

The pumps managed on the evaporator branch can be of the inverter type.
In chiller operation with compressors switched off, the pump is operated at the minimum value Aa19.

In machines that provide for heat pump operation, during this mode of operation, the inverter pump operates at a fixed percentage at all times, even when all compressors are switched off. It is possible to set from the display the parameter that represents the fixed value at which the pump must work.

8.4 Compressors

8.4.1 Rotation for alarm

In the event of a compressor alarm, the next available compressor will be switched on instead if the request is high enough to justify the call.
In the case of units with two circuits present and active prevent in a circuit, the thermoregulation will compensate the limited circuit by increasing the demand on the circuit not in prevent.

8.4.2 Check safety timelines

The software guarantees the safety timing of the compressor, such as:

- Minimum ignition time
- Minimum shutdown time, after shutdown by adjustment
- Minimum shutdown time, after alarm shutdown
- Minimum time for consecutive ignitions.

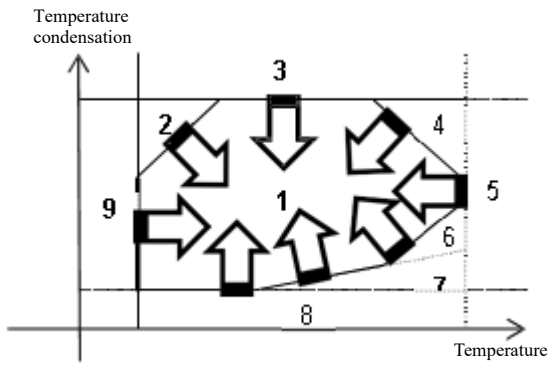
These timescales can be found in the Compressor menu, which can be modified by accessing the Service level.

8.4.3 Compressor guards

Control of the operating limits (hereinafter referred to as envelope) of the compressors is provided. This control is not disabled to prevent the compressor from working outside the safety limits dictated by the manufacturer. All the compressors inserted therefore contain the envelope data.

8.4.4 Compressor alarm

The suction and discharge pressures determine a working point and, depending on the area, the control operates corrective actions to keep or bring the compressor within operating limits.



Area	Description
1	Zone within operational limits
2	Prevention for high compression ratio
3	Prevention of high condensing pressure
4	Prevention of high motor current
5	Prevention for high evaporation pressure
6	Prevention for low compression ratio
7	Prevention for low differential pressure
8	Prevention of low condensing pressure
9	Prevention of low evaporation pressure

To allow the compressor to work inside the envelope, specific prevention actions are carried out that act on the power of the circuit, on the set point of the source fans and on the opening of the ExV.

8.4.5 Compressor alarm management

Shutting down the compressor

In the event of an abnormal condition that cannot be overcome by the possible preventive actions performed, which requires the circuit to be switched off to avoid damage to it or to other components of the machine, the control algorithm switches off the circuit compressors and closes the thermostatic valve.

8.5 Compressor/Circuit Configurations for ASN and iASN

The range includes 2 possible configurations, both with Frascold piston compressors for R290:

- ASN provides 2 circuits both with a compressor with a partialisation.
- iASN has a circuit with a compressor driven by an inverter while the other circuit has an On/Off compressor.

The range has one circuit with a compressor driven by an inverter while the other circuit has an On/Off type compressor (both with Frascold piston compressors for R290).

8.5.1 Alarm Readings and Inverter Alerts

Once an alarm or warning of the inverter is triggered, it will be notified on the alarm page of the machine display as “General Inverter Alarm”.

8.6 Unloading

Unloading consists of the possibility of reducing the power of a circuit, when it is higher, or of blocking it at a minimum before it reaches that value if certain conditions apply, such as water temperature or pressures.

The following types of **unloading** are managed:

- Unloading high temperature water inlet
- Unloading for high pressure
- Unloading for low pressure

8.6.1 High temperature unloading

It depends on the temperature of the water inlet probe -BEWIT and partialises all the circuits of the machine with more than one compressor on.

8.6.2 High pressure unloading

It depends on the condensation pressure of each circuit and partialises its circuit if it has more than one compressor on.

High pressure unloading occurs to “prevent by envelope”.

8.6.3 Low pressure unloading

It depends on the evaporation pressure of each circuit and partialises its circuit if it has more than one compressor on.

Low pressure unloading occurs to “prevent by envelope”.

8.7 EVD EVO device

The EVD Evo internal driver for controlling the electronic expansion valve allows you to safely manage the compressor and the circuit and reads all the fundamental probes for the regulation of the suction overheating, for the management of the work area and the exhaust temperature.

8.7.1 EVD EVO logic for ExV control

The driver is responsible for:

- Valve actuation;

- Adjustment of suction overheating;
- Alarm and control low overheating (Low SH);
- Minimum evaporation temperature (LOP) control and alarm;
- Maximum evaporation temperature (MOP) control and alarm;
- Control of the cooling capacity sent by the control, which positions the valve correctly in the transients according to the state of regulation of the circuit.

8.8 Fans

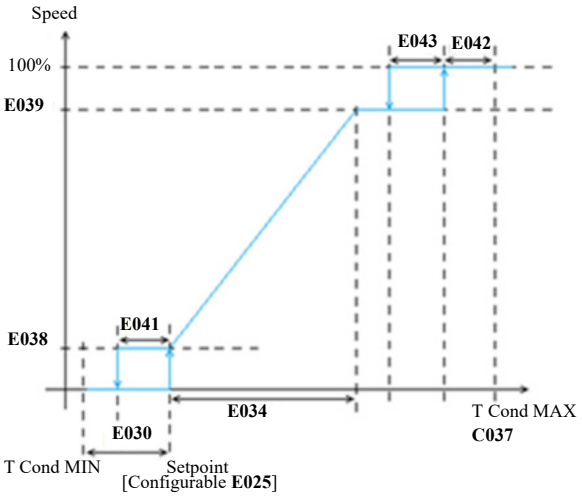
The control of the fans is intended to maintain the condensing temperature within the working range of the compressor.

8.8.1 ADJUSTED fans (0..10V/Modbus)

The fans are controlled by means of a 0..10V/Modbus modulating signal corresponding to the 0..100% range of the fan rotation speed.

8.8.1.1 Control in chiller mode

Below is the adjustment diagram:



NOTES

The parameter **C037** is considered only if it is lower than the value given by the envelope.

8.8.1.2 Low-noise function

Function active only with unit switched on in chiller.

Reduces the rotation speed of the modulating fans by raising the set point (to the value defined by par. **E054**) during the night time slot (beginning **E052**– hh:mm, end **E053** – hh:mm). Enabling parameter **E051**.

8.8.1.3 Fan anti-lock function

For installations intended for winter operation, the software manages the modulation of the fans in order to avoid freezing.

8.8.1.4 Floating HP

Allows EC fans to be adjusted in order to condense each circuit at the optimum temperature in terms of energy savings.

8.9 Leak detector

The leak detector must be calibrated during installation and recalibrated every year (365 days from parameter to parameter map, not to display).

Once calibrated on the machine, it is necessary to confirm the calibration from the display (from the service menu) in order to reset any warning and the day counter to bring it back to 365.

The counter also takes into account the time in which the machine is switched off or disconnected.

When the calibration is confirmed on the display, the date of the last calibration of the sensor will also be displayed and saved.

60 days before the expiration date, the icon appears on the Home pages on the display to alert the user. Only the icon appears and does not perform anyother action.

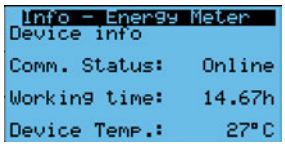
The warning flashes the status LED of the displays and appears in the alarm list (then triggers the general alarm of the machine) but does not perform any action, the machine continues to work normally. It is not possible to bypass the warning, it will always be activated and visible until calibration.

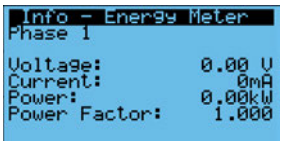
8.10 Energy Meter (optional)

The units equipped with Energy Meter provide the user with information in real time regarding the instantaneous energy consumption of the unit by making the following data available to the user:

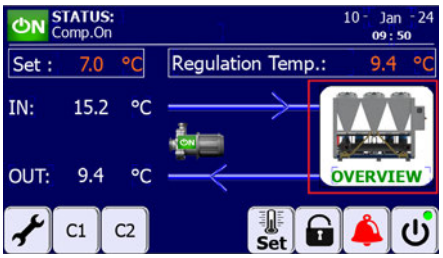
- **Current:**
  instantaneous value: I1, I2, I3, In
  average max. value: I1, I2, I3, In
- **Voltages and frequency:**
  instantaneous value: V1, V2, V3, U12, U23, U31, F
- **Power:**
  instantaneous value: 3P, ΣP, 3Q, ΣQ, 3S, ΣS
  average max. value: ΣP, ΣQ, ΣS
- **Power factors:**
  instantaneous value: 3PF, ΣPF
- **Active energy:**
  +/- kWh

This data is visible on the display.
From the "**Info**" user menu it is possible to display the masks, freely accessible, relating to the energy meter.
Voltage, current, power and power factor are made available for each power supply phase. The status of the communication, the hours of use and the temperature of the energy meter device are also available.

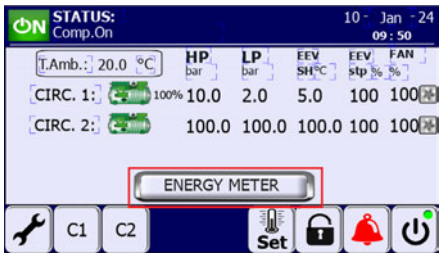


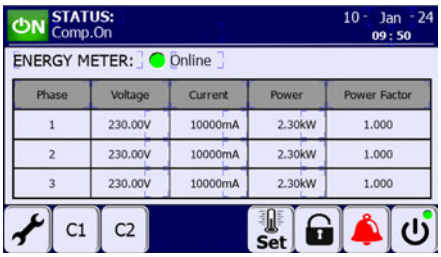


The following screen can be reached with the button  . It allows to view the status of the unit and the adjustment quantities of the machine.



If enabled, in the Overview screen by touching the "**ENERGY METER**" button it is possible to access the information of the energy meter installed in the electrical panel.

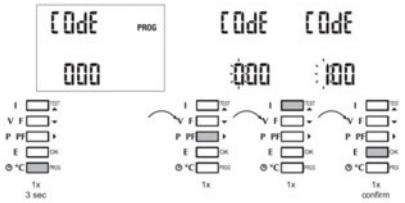




8.10.1 Energy Meter Setup Procedure

Once the energy meter is powered on, act on its display: hold down the "PROG" key then use the central ">" key (the central key allows to scroll through the characters in order to select the desired one to change it) to start entering the access password

100 with the "^" key (or even the "TEST" key) to change the numbers. Once the correct password has been entered, confirm with the "OK" button.



Scroll through the screens with the "^" key until you reach the one related to the modbus parameters, such as the following images:

Once a screen is reached, to change the content, press the central ">" key and change the value with the "^" key. Once the correct value has been reached, confirm with the "OK" key and then you can resume scrolling through the screens with the "^" key. Set:
Adr: 006
Bds: 192
Stop: 2

8.11 Alarms

The following table shows all the possible alarms of the machine.

Code	Description	Reset type
AL001	Alarm phase monitor	Parameter Ae03= 0=Auto reset / 1 user reset
AL002	Mem.retain writings	User reset
AL003	Mem.retain writings	User reset
AL004	Utility input water temp. probe error	Auto reset
AL005	Utility output water temp. probe error	Auto reset
AL006	Source input water temp probe error	Auto reset
AL007	External temp. probe error	Auto reset
AL008	Thermal pump 1 overload	User reset
AL009	Thermal pump 2 overload	User reset
AL010	Thermal source pump 1	User reset
AL011	Thermal source pump 2	User reset
AL012	No flow pump 1	User reset
AL013	No flow pump 2	User reset
AL014	No flow source pump 1	User reset
AL015	No flow source pump 2	User reset
AL016	Pump unit	User reset
AL017	Source pump unit	User reset
AL018	Pump 1 maintenance request	Auto reset
AL019	Pump 2 maintenance request	Auto reset
AL020	Source pump 1 maintenance request	Auto reset
AL021	Source pump 2 maintenance request	Auto reset
AL022	High outlet water temperature	Auto reset
AL024	Offline slave card	Auto reset
AL025	Slave card mem.retain write number	User reset
AL026	Slave board mem.retain writings	User reset
AL027	Tank outlet temp. probe error	Auto reset
AL028	Common row fans thermal	Auto reset
AL029	Evaporator outlet high temperature	Auto reset to counter - n°3(1h)

Code	Description	Reset type
AL030	Low evaporator outlet temperature	Auto reset to counter - n°3(1h)
AL031	High evaporation inlet temperature.	Auto reset to counter - n°3(1h)
AL032	Low evaporation inlet temperature.	Auto reset to counter - n°3(1h)
AL033	Tank outlet high temperature	Auto reset to counter - n°3(1h)
AL034	Low tank outlet temperature	Auto reset to counter - n°3(1h)
AL035	c.pCOe not connected	Auto reset to counter - n°5(1h)
AL036	c.pCOe misconfiguration	User reset
AL039	Thermal pump 1 pump recovery 1	User reset
AL040	Thermal pump 2 pump recovery 2	User reset
AL041	Request for recovery pump maintenance. 1	Auto reset
AL042	Request for recovery pump maintenance. 2	Auto reset
AL043	Trsd setpoint regol.guasto/disconnesso	Auto reset
AL050	Master disconnected	Auto reset
AL051	Slave 1 disconnected or in alarm	Auto reset
AL052	Slave 2 disconnected or in alarm	Auto reset
AL053	Slave 3 disconnected or in alarm	Auto reset
AL054	Slave 4 disconnected or in alarm	Auto reset
AL055	Slave 5 disconnected or in alarm	Auto reset
AL056	Slave 6 disconnected or in alarm	Auto reset
AL057	Slave 7 disconnected or in alarm	Auto reset
AL058	Slave 8 disconnected or in alarm	Auto reset
AL059	Slave 9 disconnected or in alarm	Auto reset
AL060	Temp. probe error BMWT	Auto reset
AL100	Circuit 1 discharge press. probe error	User reset
AL101	Aspiration pres. probe error circuit 1	User reset
AL102	Circuit 1 discharge temp. probe error	User reset
AL103	Aspiration temp. probe error circuit 1	User reset
AL104	Circuit 1 liquid temperature probe alarm	User reset
AL105	Circuit 1 high compression ratio	Auto reset to counter - n°5(1h)
AL106	Exhaust high pressure circuit 1	Auto reset to counter - n°2(1h)
AL107	Motor high current circuit 1	Auto reset to counter - n°5(1h)
AL108	Intake high pressure circuit 1	Auto reset to counter - n°5(1h)
AL109	Circuit 1 low compression ratio	Auto reset to counter - n°5(1h)
AL110	Circuit 1 low differential pressure	Auto reset to counter - n°5(1h)
AL111	Circuit 1 low discharge pressure	Auto reset to counter - n°5(1h)
AL112	Intake low pressure circuit 1	Auto reset to counter - n°2(1h)
AL113	Circuit 1 high temperature discharge	Auto reset to counter - n°5(1h)
AL114	Circuit 1 EVD Low SuperHeat	User reset
AL115	Circuit 1 EVD LOP	Auto reset to counter - n°5(1h)
AL116	Circuit 1 EVD MOP	Auto reset to counter - n°5(1h)
AL117	Circuit 1 EVD high condensing temp.	Auto reset to counter - n°5(1h)
AL118	Circuit 1 EVD low suction temp.	Auto reset to counter - n°5(1h)
AL119	Circuit 1 EVD motor error	User reset
AL120	Circuit 1 EVD emergency shutdown	Auto reset to counter - n°5(1h)
AL121	Circuit 1 EVD tax.out limits	User reset
AL122	Circuit 1 EVD tax.out range	User reset
AL123	Offline EVD Circuit 1	Auto reset to counter - n°5(1h)
AL124	Low battery EVD circuit 1	Auto reset to counter - n°5(1h)
AL125	Circuit 1 EVD EEPROM	User reset
AL126	Circuit 1 EVD incomplete closure	User reset
AL127	Circuit 1 EVD FW not compatible	User reset
AL128	Circuit 1 EVD configuration error	User reset
AL162	Fan 1 thermal circuit 1	User reset
AL163	Fan 2 thermal circuit 1	User reset
AL164	Fan 3 thermal circuit 1	User reset

Code	Description	Reset type
AL165	Circuit 1 temp. evaporation frost alarm	User reset
AL166	Maintenance request compressor 1 circ.1	Auto reset
AL167	Maintenance request compressor 2 circ.1	Auto reset
AL168	Maintenance request compressor 3 circ.1	Auto reset
AL169	Condensation temp. probe error circ.1	User reset
AL170	Maintenance request vent. 1 circ.1	Auto reset
AL171	Maintenance request vent. 2 circ.1	Auto reset
AL172	Maintenance request vent. 3 circ.1	Auto reset
AL173	Circuit 1 HP alarm from pressure switch	Auto reset to counter - n°1(1h)
AL174	Circuit 1 LP alarm from pressure switch	Auto reset to counter - n°1(1h)
AL175	Thermal compressor 1 Circuit 1	User reset
AL176	Thermal compressor 2 Circuit 1	User reset
AL177	Thermal compressor 3 Circuit 1	User reset
AL200	Circuit 2 discharge press. probe error	User reset
AL201	Aspiration pres. probe error circuit 2	User reset
AL202	Circuit 2 discharge temp. probe error	User reset
AL203	Aspiration temp. probe error circuit 2	User reset
AL204	Circuit 2 liquid temp. probe error	User reset
AL205	Circuit 2 high compression ratio	Auto reset to counter - n°5(1h)
AL206	Exhaust high pressure circuit 2	Auto reset to counter - n°2(1h)
AL207	Motor high current circuit 2	Auto reset to counter - n°5(1h)
AL208	Intake high pressure circuit 2	Auto reset to counter - n°5(1h)
AL209	Circuit 2 low compression ratio	Auto reset to counter - n°5(1h)
AL210	Circuit 2 low differential pressure	Auto reset to counter - n°5(1h)
AL211	Circuit 2 low discharge pressure	Auto reset to counter - n°5(1h)
AL212	Intake low pressure circuit 2	Auto reset to counter - n°2(1h)
AL213	Circuit 2 high temperature discharge	Auto reset to counter - n°5(1h)
AL214	Circuit 2 EVD Low SuperHeat	User reset
AL215	Circuit 2 EVD LOP	Auto reset to counter - n°5(1h)
AL216	Circuit 2 EVD MOP	Auto reset to counter - n°5(1h)
AL217	Circuit 2 EVD high condensing temp.	Auto reset to counter - n°5(1h)
AL218	Circuit 2 EVD low suction temp.	Auto reset to counter - n°5(1h)
AL219	Circuit 2 EVD motor error	User reset
AL220	Circuit 2 EVD emergency shutdown	Auto reset to counter - n°5(1h)
AL221	Circuit 2 EVD tax.out limits	User reset
AL222	Circuit 2 EVD tax.out range	User reset
AL223	Offline EVD Circuit 2	Auto reset to counter - n°5(1h)
AL224	Low battery EVD circuit 2	Auto reset to counter - n°5(1h)
AL225	Circuit 2 EVD EEPROM	User reset
AL226	Circuit 2 EVD incomplete closure	User reset
AL262	Fan 1 thermal circuit 2	User reset
AL263	Fan 2 thermal circuit 2	User reset
AL264	Fan 3 thermal circuit 2	User reset
AL265	Circuit 2 temp. evaporation frost alarm	User reset
AL266	Maintenance request compressor 1 circ.2	Auto reset
AL267	Maintenance request compressor 2 circ.2	Auto reset
AL268	Maintenance request compressor 3 circ.2	Auto reset
AL269	Condensation temp. probe error circ.2	User reset
AL270	Request maintenance vent.source 1 circ.2	Auto reset
AL271	Request maintenance vent.source 2 circ.2	Auto reset
AL272	Request maintenance vent.source 3 circ.2	Auto reset
AL273	Circuit 2 HP alarm from pressure switch	Auto reset to counter - n°1(1h)
AL274	Circuit 2 LP alarm from pressure switch	Auto reset to counter - n°1(1h)
AL275	Thermal compressor 1 Circuit 2	User reset
AL276	Thermal compressor 2 Circuit 2	User reset

Code	Description	Reset type
AL277	Thermal compressor 3 Circuit 2	User reset
AL455	Thermal fan warning	Auto reset
AL456	Offline module FC 1	Auto reset
AL457	Offline module FC 2	Auto reset
AL458	Offline module FC 3	Auto reset
AL459	Offline module FC 4	Auto reset
AL460	Offline module FC 5	Auto reset
AL461	Offline module FC 6	Auto reset
AL462	Al.probe module FC 1	Auto reset
AL463	Al.probe module FC 2	Auto reset
AL464	Al.probe module FC 3	Auto reset
AL465	Al.probe module FC 4	Auto reset
AL466	Al.probe module FC 5	Auto reset
AL467	Al.probe module FC 6	Auto reset
AL468	Al.gener.module FC 1	Auto reset
AL469	Al.gener.module FC 2	Auto reset
AL470	Al.gener.module FC 3	Auto reset
AL471	Al.gener.module FC 4	Auto reset
AL472	Al.gener.module FC 5	Auto reset
AL473	Al.gener.module FC 6	User reset
AL595	Circuit 1 Warning Partwinding	Auto reset
AL596	Circuit 2 Warning Partwinding	Auto reset
AL597	Circuit 1 Alarm Partwinding	User reset
AL598	Circuit 2 Alarm Partwinding	User reset
AL600	Output transducer inverter pump	Auto reset
AL601	Input transducer inverter pump	Auto reset
AL603	Danfoss Circuit 1 Inverter Alarm	Auto reset to counter - n°2(1h)
AL604	Danfoss Circuit 2 Inverter Alarm	Auto reset to counter - n°2(1h)
AL605	Danfoss Circuit 1 Inverter Warning	Auto Reset
AL606	Danfoss Circuit 2 Inverter Warning	Auto reset
AL607	Danfoss Circuit 1 Offline Inverter	Auto reset
AL608	Danfoss Circuit 2 Offline Inverter	Auto reset
AL609	Water in the electrical panel	User reset
AL610	High temperature in the electrical panel	Auto reset to counter - n°3(1h)
AL612	The Energy Meter is offline	Auto reset
AL613	Leak detector not calibrated	Auto reset

8.12 Part-Winding

The electronic control allows the reduction of the starting current during the start-up phase.

8.13 Variables under supervision

The parameters for configuring the Modbus supervision are accessible to the BMS mask in the **Ge** submenu. (settings/serial ports) of the reserved menu.
The following tables show all the variables accessible by supervision.

Contents	Size	Name	Description	Data type	Min	Max	UoM	Management
Coils								
0	1	BmsOnOff	Unit OnOff by BMS ((0=Off; 1=On)	Bool			NoUnits	ReadWrite
7	1	BmsOnOff_En	Enable the BMS Unit OnOff	Bool			NoUnits	ReadWrite

Contents	Size	Name	Description	Data type	Min	Max	UoM	Management
16	1	SrcFan3Circ 1_On	Source fan 3 circuit 1	Bool			NoUnits	ReadWrite
17	1	SrcFan3Circ 2_On	Source fan 3 circuit 1	Bool			NoUnits	ReadWrite
18	1	Al_InverterD anfoss_Circ1 .Active	General Alarm Inverter Danfoss Circuit 1 - Alarm status	Bool			NoUnits	ReadWrite
19	1	Al_InverterD anfoss_Circ1 _Offline.Acti ve	Inverter Danfoss Offline Circuit 1 - Alarm status	Bool			NoUnits	ReadWrite
20	1	Al_InverterD anfoss_Circ2 .Active	General Alarm Inverter Danfoss Circuit 2 - Alarm status	Bool			NoUnits	ReadWrite
21	1	Al_InverterD anfoss_Circ2 _Offline.Acti ve	Inverter Danfoss Offline Circuit 2 - Alarm status	Bool			NoUnits	ReadWrite
22	1	Al_W_Invert erDanfoss_Ci rc1.Active	General Warning Inverter Danfoss Circuit 1 - Alarm status	Bool			NoUnits	ReadWrite
23	1	Al_W_Invert erDanfoss_Ci rc2.Active	General Warning Inverter Danfoss Circuit 2 - Alarm status	Bool			NoUnits	ReadWrite
27	1	Inverter1_Is Running		Bool			NoUnits	ReadWrite
28	1	Inverter2_Is Running		Bool			NoUnits	ReadWrite
31	1	InverterDanf oss_AlarmW ordOut_Circ 1[0]		Bool			NoUnits	ReadWrite
32	1	InverterDanf oss_AlarmW ordOut_Circ 1[1]		Bool			NoUnits	ReadWrite
33	1	InverterDanf oss_AlarmW ordOut_Circ 1[2]		Bool			NoUnits	ReadWrite
34	1	InverterDanf oss_AlarmW ordOut_Circ 1[3]		Bool			NoUnits	ReadWrite
35	1	InverterDanf oss_AlarmW ordOut_Circ 1[4]		Bool			NoUnits	ReadWrite
36	1	InverterDanf oss_AlarmW ordOut_Circ 1[5]		Bool			NoUnits	ReadWrite

Contents	Size	Name	Description	Data type	Min	Max	UoM	Management
37	1	InverterDanfoss_AlarmWordOut_Circ1[6]		Bool			NoUnits	ReadWrite
38	1	InverterDanfoss_AlarmWordOut_Circ1[7]		Bool			NoUnits	ReadWrite
39	1	InverterDanfoss_AlarmWordOut_Circ1[8]		Bool			NoUnits	ReadWrite
40	1	InverterDanfoss_AlarmWordOut_Circ1[9]		Bool			NoUnits	ReadWrite
41	1	InverterDanfoss_AlarmWordOut_Circ1[10]		Bool			NoUnits	ReadWrite
42	1	InverterDanfoss_AlarmWordOut_Circ1[11]		Bool			NoUnits	ReadWrite
43	1	InverterDanfoss_AlarmWordOut_Circ1[12]		Bool			NoUnits	ReadWrite
44	1	InverterDanfoss_AlarmWordOut_Circ1[13]		Bool			NoUnits	ReadWrite
45	1	InverterDanfoss_AlarmWordOut_Circ1[14]		Bool			NoUnits	ReadWrite
46	1	InverterDanfoss_AlarmWordOut_Circ1[15]		Bool			NoUnits	ReadWrite
47	1	InverterDanfoss_AlarmWordOut_Circ1[16]		Bool			NoUnits	ReadWrite
48	1	InverterDanfoss_AlarmWordOut_Circ1[17]		Bool			NoUnits	ReadWrite
49	1	InverterDanfoss_AlarmWordOut_Circ1[18]		Bool			NoUnits	ReadWrite
50	1	InverterDanfoss_AlarmWordOut_Circ1[19]		Bool			NoUnits	ReadWrite

Contents	Size	Name	Description	Data type	Min	Max	UoM	Management
51	1	InverterDanfoss_AlarmWordOut_Circ1[20]		Bool			NoUnits	ReadWrite
52	1	InverterDanfoss_AlarmWordOut_Circ1[21]		Bool			NoUnits	ReadWrite
53	1	InverterDanfoss_AlarmWordOut_Circ1[22]		Bool			NoUnits	ReadWrite
54	1	InverterDanfoss_AlarmWordOut_Circ1[23]		Bool			NoUnits	ReadWrite
55	1	InverterDanfoss_AlarmWordOut_Circ1[24]		Bool			NoUnits	ReadWrite
56	1	InverterDanfoss_AlarmWordOut_Circ1[25]		Bool			NoUnits	ReadWrite
57	1	InverterDanfoss_AlarmWordOut_Circ1[26]		Bool			NoUnits	ReadWrite
58	1	InverterDanfoss_AlarmWordOut_Circ1[27]		Bool			NoUnits	ReadWrite
59	1	InverterDanfoss_AlarmWordOut_Circ1[28]		Bool			NoUnits	ReadWrite
60	1	InverterDanfoss_AlarmWordOut_Circ1[29]		Bool			NoUnits	ReadWrite
61	1	InverterDanfoss_AlarmWordOut_Circ1[30]		Bool			NoUnits	ReadWrite
62	1	InverterDanfoss_AlarmWordOut_Circ1[31]		Bool			NoUnits	ReadWrite
63	1	InverterDanfoss_AlarmWordOut_Circ2[0]		Bool			NoUnits	ReadWrite
64	1	InverterDanfoss_AlarmWordOut_Circ2[1]		Bool			NoUnits	ReadWrite

Contents	Size	Name	Description	Data type	Min	Max	UoM	Management
65	1	InverterDanfoss_AlarmWordOut_Circ2[2]		Bool			NoUnits	ReadWrite
66	1	InverterDanfoss_AlarmWordOut_Circ2[3]		Bool			NoUnits	ReadWrite
67	1	InverterDanfoss_AlarmWordOut_Circ2[4]		Bool			NoUnits	ReadWrite
68	1	InverterDanfoss_AlarmWordOut_Circ2[5]		Bool			NoUnits	ReadWrite
69	1	InverterDanfoss_AlarmWordOut_Circ2[6]		Bool			NoUnits	ReadWrite
70	1	InverterDanfoss_AlarmWordOut_Circ2[7]		Bool			NoUnits	ReadWrite
71	1	InverterDanfoss_AlarmWordOut_Circ2[8]		Bool			NoUnits	ReadWrite
72	1	InverterDanfoss_AlarmWordOut_Circ2[9]		Bool			NoUnits	ReadWrite
73	1	InverterDanfoss_AlarmWordOut_Circ2[10]		Bool			NoUnits	ReadWrite
74	1	InverterDanfoss_AlarmWordOut_Circ2[11]		Bool			NoUnits	ReadWrite
75	1	InverterDanfoss_AlarmWordOut_Circ2[12]		Bool			NoUnits	ReadWrite
76	1	InverterDanfoss_AlarmWordOut_Circ2[13]		Bool			NoUnits	ReadWrite
77	1	InverterDanfoss_AlarmWordOut_Circ2[14]		Bool			NoUnits	ReadWrite
78	1	InverterDanfoss_AlarmWordOut_Circ2[15]		Bool			NoUnits	ReadWrite

Contents	Size	Name	Description	Data type	Min	Max	UoM	Management
79	1	InverterDanfoss_AlarmWordOut_Circ2[16]		Bool			NoUnits	ReadWrite
80	1	InverterDanfoss_AlarmWordOut_Circ2[17]		Bool			NoUnits	ReadWrite
81	1	InverterDanfoss_AlarmWordOut_Circ2[18]		Bool			NoUnits	ReadWrite
82	1	InverterDanfoss_AlarmWordOut_Circ2[19]		Bool			NoUnits	ReadWrite
83	1	InverterDanfoss_AlarmWordOut_Circ2[20]		Bool			NoUnits	ReadWrite
84	1	InverterDanfoss_AlarmWordOut_Circ2[21]		Bool			NoUnits	ReadWrite
85	1	InverterDanfoss_AlarmWordOut_Circ2[22]		Bool			NoUnits	ReadWrite
86	1	InverterDanfoss_AlarmWordOut_Circ2[23]		Bool			NoUnits	ReadWrite
87	1	InverterDanfoss_AlarmWordOut_Circ2[24]		Bool			NoUnits	ReadWrite
88	1	InverterDanfoss_AlarmWordOut_Circ2[25]		Bool			NoUnits	ReadWrite
89	1	InverterDanfoss_AlarmWordOut_Circ2[26]		Bool			NoUnits	ReadWrite
90	1	InverterDanfoss_AlarmWordOut_Circ2[27]		Bool			NoUnits	ReadWrite
91	1	InverterDanfoss_AlarmWordOut_Circ2[28]		Bool			NoUnits	ReadWrite
92	1	InverterDanfoss_AlarmWordOut_Circ2[29]		Bool			NoUnits	ReadWrite

Contents	Size	Name	Description	Data type	Min	Max	UoM	Management
93	1	InverterDanfoss_AlarmWordOut_Circ2[30]		Bool			NoUnits	ReadWrite
94	1	InverterDanfoss_AlarmWordOut_Circ2[31]		Bool			NoUnits	ReadWrite
95	1	InverterDanfoss_LimitedCurrent_Circ1		Bool			NoUnits	ReadWrite
96	1	InverterDanfoss_LimitedCurrent_Circ2		Bool			NoUnits	ReadWrite
97	1	InverterDanfoss_WarningWordOut_Circ1[0]		Bool			NoUnits	ReadWrite
98	1	InverterDanfoss_WarningWordOut_Circ1[1]		Bool			NoUnits	ReadWrite
99	1	InverterDanfoss_WarningWordOut_Circ1[2]		Bool			NoUnits	ReadWrite
100	1	InverterDanfoss_WarningWordOut_Circ1[3]		Bool			NoUnits	ReadWrite
101	1	InverterDanfoss_WarningWordOut_Circ1[4]		Bool			NoUnits	ReadWrite
102	1	InverterDanfoss_WarningWordOut_Circ1[5]		Bool			NoUnits	ReadWrite
103	1	InverterDanfoss_WarningWordOut_Circ1[6]		Bool			NoUnits	ReadWrite
104	1	InverterDanfoss_WarningWordOut_Circ1[7]		Bool			NoUnits	ReadWrite
105	1	InverterDanfoss_WarningWordOut_Circ1[8]		Bool			NoUnits	ReadWrite
106	1	InverterDanfoss_WarningWordOut_Circ1[9]		Bool			NoUnits	ReadWrite

Contents	Size	Name	Description	Data type	Min	Max	UoM	Management
107	1	InverterDanfoss_WarningWordOut_Circ1[10]		Bool			NoUnits	ReadWrite
108	1	InverterDanfoss_WarningWordOut_Circ1[11]		Bool			NoUnits	ReadWrite
109	1	InverterDanfoss_WarningWordOut_Circ1[12]		Bool			NoUnits	ReadWrite
110	1	InverterDanfoss_WarningWordOut_Circ1[13]		Bool			NoUnits	ReadWrite
111	1	InverterDanfoss_WarningWordOut_Circ1[14]		Bool			NoUnits	ReadWrite
112	1	InverterDanfoss_WarningWordOut_Circ1[15]		Bool			NoUnits	ReadWrite
113	1	InverterDanfoss_WarningWordOut_Circ1[16]		Bool			NoUnits	ReadWrite
114	1	InverterDanfoss_WarningWordOut_Circ1[17]		Bool			NoUnits	ReadWrite
115	1	InverterDanfoss_WarningWordOut_Circ1[18]		Bool			NoUnits	ReadWrite
116	1	InverterDanfoss_WarningWordOut_Circ1[19]		Bool			NoUnits	ReadWrite
117	1	InverterDanfoss_WarningWordOut_Circ1[20]		Bool			NoUnits	ReadWrite
118	1	InverterDanfoss_WarningWordOut_Circ1[21]		Bool			NoUnits	ReadWrite
119	1	InverterDanfoss_WarningWordOut_Circ1[22]		Bool			NoUnits	ReadWrite
120	1	InverterDanfoss_WarningWordOut_Circ1[23]		Bool			NoUnits	ReadWrite

Contents	Size	Name	Description	Data type	Min	Max	UoM	Management
121	1	InverterDanfoss_WarningWordOut_Circ1[24]		Bool			NoUnits	ReadWrite
122	1	InverterDanfoss_WarningWordOut_Circ1[25]		Bool			NoUnits	ReadWrite
123	1	InverterDanfoss_WarningWordOut_Circ1[26]		Bool			NoUnits	ReadWrite
124	1	InverterDanfoss_WarningWordOut_Circ1[27]		Bool			NoUnits	ReadWrite
125	1	InverterDanfoss_WarningWordOut_Circ1[28]		Bool			NoUnits	ReadWrite
126	1	InverterDanfoss_WarningWordOut_Circ1[29]		Bool			NoUnits	ReadWrite
127	1	InverterDanfoss_WarningWordOut_Circ1[30]		Bool			NoUnits	ReadWrite
128	1	InverterDanfoss_WarningWordOut_Circ1[31]		Bool			NoUnits	ReadWrite
129	1	InverterDanfoss_WarningWordOut_Circ2[0]		Bool			NoUnits	ReadWrite
130	1	InverterDanfoss_WarningWordOut_Circ2[1]		Bool			NoUnits	ReadWrite
131	1	InverterDanfoss_WarningWordOut_Circ2[2]		Bool			NoUnits	ReadWrite
132	1	InverterDanfoss_WarningWordOut_Circ2[3]		Bool			NoUnits	ReadWrite
133	1	InverterDanfoss_WarningWordOut_Circ2[4]		Bool			NoUnits	ReadWrite
134	1	InverterDanfoss_WarningWordOut_Circ2[5]		Bool			NoUnits	ReadWrite

Contents	Size	Name	Description	Data type	Min	Max	UoM	Management
135	1	InverterDanfoss_WarningWordOut_Circ2[6]		Bool			NoUnits	ReadWrite
136	1	InverterDanfoss_WarningWordOut_Circ2[7]		Bool			NoUnits	ReadWrite
137	1	InverterDanfoss_WarningWordOut_Circ2[8]		Bool			NoUnits	ReadWrite
138	1	InverterDanfoss_WarningWordOut_Circ2[9]		Bool			NoUnits	ReadWrite
139	1	InverterDanfoss_WarningWordOut_Circ2[10]		Bool			NoUnits	ReadWrite
140	1	InverterDanfoss_WarningWordOut_Circ2[11]		Bool			NoUnits	ReadWrite
141	1	InverterDanfoss_WarningWordOut_Circ2[12]		Bool			NoUnits	ReadWrite
142	1	InverterDanfoss_WarningWordOut_Circ2[13]		Bool			NoUnits	ReadWrite
143	1	InverterDanfoss_WarningWordOut_Circ2[14]		Bool			NoUnits	ReadWrite
144	1	InverterDanfoss_WarningWordOut_Circ2[15]		Bool			NoUnits	ReadWrite
145	1	InverterDanfoss_WarningWordOut_Circ2[16]		Bool			NoUnits	ReadWrite
146	1	InverterDanfoss_WarningWordOut_Circ2[17]		Bool			NoUnits	ReadWrite
147	1	InverterDanfoss_WarningWordOut_Circ2[18]		Bool			NoUnits	ReadWrite
148	1	InverterDanfoss_WarningWordOut_Circ2[19]		Bool			NoUnits	ReadWrite

Contents	Size	Name	Description	Data type	Min	Max	UoM	Management
149	1	InverterDanfoss_WarningWordOut_Circ2[20]		Bool			NoUnits	ReadWrite
150	1	InverterDanfoss_WarningWordOut_Circ2[21]		Bool			NoUnits	ReadWrite
151	1	InverterDanfoss_WarningWordOut_Circ2[22]		Bool			NoUnits	ReadWrite
152	1	InverterDanfoss_WarningWordOut_Circ2[23]		Bool			NoUnits	ReadWrite
153	1	InverterDanfoss_WarningWordOut_Circ2[24]		Bool			NoUnits	ReadWrite
154	1	InverterDanfoss_WarningWordOut_Circ2[25]		Bool			NoUnits	ReadWrite
155	1	InverterDanfoss_WarningWordOut_Circ2[26]		Bool			NoUnits	ReadWrite
156	1	InverterDanfoss_WarningWordOut_Circ2[27]		Bool			NoUnits	ReadWrite
157	1	InverterDanfoss_WarningWordOut_Circ2[28]		Bool			NoUnits	ReadWrite
158	1	InverterDanfoss_WarningWordOut_Circ2[29]		Bool			NoUnits	ReadWrite
159	1	InverterDanfoss_WarningWordOut_Circ2[30]		Bool			NoUnits	ReadWrite
160	1	InverterDanfoss_WarningWordOut_Circ2[31]		Bool			NoUnits	ReadWrite
165	1	UnloadingWater_Inverter		Bool			NoUnits	ReadWrite
166	1	UnloadingCirc1_Inverter	Collection of unloading conditions for circuit 1 for inverter configurations	Bool			NoUnits	ReadWrite

Contents	Size	Name	Description	Data type	Min	Max	UoM	Management
167	1	UnloadingCirc2_Inverter	Collection of unloading conditions for circuit 2 for inverter configurations	Bool			NoUnits	ReadWrite
Discrete Input								
0	1	GlbAlrm		Bool			NoUnits	ReadWrite
1	1	UserPmp1_On	User pump 1 status	Bool			NoUnits	ReadWrite
2	1	UserPmp2_On	User pump 2 status	Bool			NoUnits	ReadWrite
17	1	SrcFan1Circ1_On	Source fan 1 circuit 1 status	Bool			NoUnits	ReadWrite
18	1	SrcFan2Circ1_On	Source fan 2 circuit 1	Bool			NoUnits	ReadWrite
19	1	SrcFan1Circ2_On	Source fan 1 circuit 2 status	Bool			NoUnits	ReadWrite
20	1	SrcFan2Circ2_On	Source fan 2 circuit 1	Bool			NoUnits	ReadWrite
21	1	AFreezeHeat	Antifreeze heater	Bool			NoUnits	ReadWrite
26	1	HRPmp1_On	HR pump 1 status	Bool			NoUnits	ReadWrite
27	1	HRPmp2_On	HR pump 2 status	Bool			NoUnits	ReadWrite
50	1	UnitOnOffDin	Unit OnOff by DIn (0=Off; 1=On)	Bool			NoUnits	ReadWrite
51	1	Active2ndSetPDin		Bool			NoUnits	ReadWrite
53	1	RemAlrmDin		Bool			NoUnits	ReadWrite
101	1	Al_RemAlrm.Active	Unit - Remote alarm - Alarm status	Bool			NoUnits	ReadWrite
105	1	Al_W_OutTempUserPrb.Active	Unit - User outlet water temperature probe - Alarm status	Bool			NoUnits	ReadWrite
106	1	Al_W_InTempSrcPrb.Active	Unit - Source inlet water temperature probe - Alarm status	Bool			NoUnits	ReadWrite
107	1	Al_ExtTempPrb.Active	Unit - External temperature probe - Alarm status	Bool			NoUnits	ReadWrite
108	1	Al_OvldUserPmp1.Active	Unit - User pump 1 overload - Alarm status	Bool			NoUnits	ReadWrite
109	1	Al_OvldUserPmp2.Active	Unit - User pump 2 overload - Alarm status	Bool			NoUnits	ReadWrite
112	1	Al_FlwSwUserPmp1.Active	Unit - Flow switch alarm, no flow present with user pump 1 active - Alarm status	Bool			NoUnits	ReadWrite

Contents	Size	Name	Description	Data type	Min	Max	UoM	Management
113	1	Al_FlwSwUserPmp2.Active	Unit - Flow switch alarm, no flow present with user pump 2 active - Alarm status	Bool			NoUnits	ReadWrite
114	1	Al_FlwSwSrcPmp1.Active	Unit - Flow switch alarm, no flow present with source pump 1 active - Alarm status	Bool			NoUnits	ReadWrite
115	1	Al_FlwSwSrcPmp2.Active	Unit - Flow switch alarm, no flow present with source pump 2 active - Alarm status	Bool			NoUnits	ReadWrite
116	1	Al_UserPmpGroup.Active	Unit - User pump group alarm - Alarm status	Bool			NoUnits	ReadWrite
118	1	Al_HrsUserPmp1.Active	Unit - User 1 pump maintenance - Alarm status	Bool			NoUnits	ReadWrite
119	1	Al_HrsUserPmp2.Active	Unit - User 2 pump maintenance - Alarm status	Bool			NoUnits	ReadWrite
122	1	Al_HiW_Temp.Active	Unit - High chilled water temperature - Alarm status	Bool			NoUnits	ReadWrite
200	1	Al_DscgPrbP_Circ1.Active	Circuit 1 - Alarm discharge probe pressure - Alarm status	Bool			NoUnits	ReadWrite
201	1	Al_SuctPrbP_Circ1.Active	Circuit 1 - Alarm suction probe pressure - Alarm status	Bool			NoUnits	ReadWrite
202	1	Al_DscgPrbTempCirc1.Active	Circuit 1 - Alarm discharge probe temperature - Alarm status	Bool			NoUnits	ReadWrite
203	1	Al_SuctPrbTempCirc1.Active	Circuit 1 - Alarm suction probe temperatu - Alarm status	Bool			NoUnits	ReadWrite
204	1	Al_LiqdPrbT_Circ1.Active	Circuit 1 - Alarm liquid probe temperature - Alarm status	Bool			NoUnits	ReadWrite
205	1	Al_HiRatioP_Circ1.Active	Circuit 1 Envelope - High compression ratio - Alarm status	Bool			NoUnits	ReadWrite

Contents	Size	Name	Description	Data type	Min	Max	UoM	Management
206	1	Al_DscgHiP_Circ1.Active	Circuit 1 Envelope - High discharge pressure - Alarm status	Bool			NoUnits	ReadWrite
207	1	Al_HiCurrCirc1.Active	Circuit 1 Envelope - High motor current - Alarm status	Bool			NoUnits	ReadWrite
208	1	Al_SuctHiP_Circ1.Active	Circuit 1 Envelope - High suction pressure - Alarm status	Bool			NoUnits	ReadWrite
209	1	Al_LowRatioP_Circ1.Active	Circuit 1 Envelope - Low compression ratio - Alarm status	Bool			NoUnits	ReadWrite
210	1	Al_LowDeltaP_Circ1.Active	Circuit 1 Envelope - Low differential pressure - Alarm status	Bool			NoUnits	ReadWrite
211	1	Al_DscgLowP_Circ1.Active	Circuit 1 Envelope - Low discharge pressure - Alarm status	Bool			NoUnits	ReadWrite
212	1	Al_SuctLowP_Circ1.Active	Circuit 1 Envelope - Low suction pressure - Alarm status	Bool			NoUnits	ReadWrite
213	1	Al_DscgHiTempCirc1.Active	Circuit 1 Envelope - High discharge temperature - Alarm status	Bool			NoUnits	ReadWrite
214	1	Al_LowSH_EVD_Circ1.Active	Circuit 1 EVD - Low SH - Alarm status	Bool			NoUnits	ReadWrite
215	1	Al_LOP_EVD_Circ1.Active	Circuit 1 EVD - LOP - Alarm status	Bool			NoUnits	ReadWrite
216	1	Al_MOP_EVD_Circ1.Active	Circuit 1 EVD - MOP - Alarm status	Bool			NoUnits	ReadWrite
217	1	Al_HiTempCond_EVD_Circ1.Active	Circuit 1 EVD - High condensing temperature - Alarm status	Bool			NoUnits	ReadWrite
218	1	Al_LowSuct_EVD_Circ1.Active	Circuit 1 EVD - Low suction temperature - Alarm status	Bool			NoUnits	ReadWrite
219	1	Al_EEV_EVD_Circ1.Active	Circuit 1 EVD - Motor error - Alarm status	Bool			NoUnits	ReadWrite

Contents	Size	Name	Description	Data type	Min	Max	UoM	Management
220	1	Al_EmergCl_EVD_Circ1.Active	Circuit 1 EVD - Emergency closing - Alarm status	Bool			NoUnits	ReadWrite
221	1	Al_PinOutOfBound_EVD_Circ1.Active	Circuit 1 EVD - Setting out of bound - Alarm status	Bool			NoUnits	ReadWrite
222	1	Al_RangeErr_EVD_Circ1.Active	Circuit 1 EVD - Settings range error - Alarm status	Bool			NoUnits	ReadWrite
223	1	Al_OfflineEVD_Circ1.Active	Circuit 1 EVD - Offline - Alarm status	Bool			NoUnits	ReadWrite
224	1	Al_BattEVD_Circ1.Active	Circuit 1 EVD - Low battery - Alarm status	Bool			NoUnits	ReadWrite
225	1	Al_EPROM_EVD_Circ1.Active	Circuit 1 EVD - EEPROM - Alarm status	Bool			NoUnits	ReadWrite
226	1	Al_IncompClEVD_Circ1.Active	Circuit 1 EVD - Incomplete valve closing - Alarm status	Bool			NoUnits	ReadWrite
262	1	Al_OvldScrFan1Circ1.Active	Circuit 1 - Source fan 1 overload - Alarm status	Bool			NoUnits	ReadWrite
263	1	Al_OvldScrFan2Circ1.Active	Circuit 1 - Source fan 2 overload - Alarm status	Bool			NoUnits	ReadWrite
265	1	Al_FreezeCirc1.Active	Circuit 1 - Alarm freeze evaporation temperature - Alarm status	Bool			NoUnits	ReadWrite
266	1	Al_HrsComp1Circ1.Active	Circuit 1 - Compressor 1 maintenance - Alarm status	Bool			NoUnits	ReadWrite
269	1	Al_CondPrbTempCirc1.Active	Circuit 1 - Alarm condensing temperature probe - Alarm status	Bool			NoUnits	ReadWrite
270	1	Al_HrsSrcFan1Circ1.Active	Circuit 1 - Source fan 1 maintenance - Alarm status	Bool			NoUnits	ReadWrite
271	1	Al_HrsSrcFan2Circ1.Active	Circuit 1 - Source fan 2 maintenance - Alarm status	Bool			NoUnits	ReadWrite
273	1	Al_HP_PstatCirc1.Active	Circuit 1 - High pressure alarm by pressure switch - Alarm status	Bool			NoUnits	ReadWrite

Contents	Size	Name	Description	Data type	Min	Max	UoM	Management
274	1	Al_LP_PstatCirc1.Active	Circuit 1 - Low pressure alarm by pressure switch - Alarm status	Bool			NoUnits	ReadWrite
275	1	Al_OvldComp1Circ1.Active	Circuit 1 - Overload compressor 1 - Alarm status	Bool			NoUnits	ReadWrite
278	1	Al_PmpDwnEndMaxT_Circ1.Active	Circuit 1 - Pump-Down end for max time - Alarm status	Bool			NoUnits	ReadWrite
300	1	Al_DscgPrbP_Circ2.Active	Circuit 2 - Alarm discharge probe pressure - Alarm status	Bool			NoUnits	ReadWrite
301	1	Al_SuctPrbP_Circ2.Active	Circuit 2 - Alarm suction probe pressure - Alarm status	Bool			NoUnits	ReadWrite
302	1	Al_DscgPrbTempCirc2.Active	Circuit 2 - Alarm discharge probe temperature - Alarm status	Bool			NoUnits	ReadWrite
303	1	Al_SuctPrbTempCirc2.Active	Circuit 2 - Alarm suction probe temperature - Alarm status	Bool			NoUnits	ReadWrite
304	1	Al_LiqdPrbT_Circ2.Active	Circuit 2 - Alarm liquid probe temperature - Alarm status	Bool			NoUnits	ReadWrite
305	1	Al_HiRatioP_Circ2.Active	Circuit 2 Envelope - High compression ratio - Alarm status	Bool			NoUnits	ReadWrite
306	1	Al_DscgHiP_Circ2.Active	Circuit 2 Envelope - High discharge pressure - Alarm status	Bool			NoUnits	ReadWrite
307	1	Al_HiCurrCirc2.Active	Circuit 2 Envelope - High motor current - Alarm status	Bool			NoUnits	ReadWrite
308	1	Al_SuctHiP_Circ2.Active	Circuit 2 Envelope - High suction pressure - Alarm status	Bool			NoUnits	ReadWrite
309	1	Al_LowRatioP_Circ2.Active	Circuit 2 Envelope - Low compression ratio - Alarm status	Bool			NoUnits	ReadWrite
310	1	Al_LowDeltaP_Circ2.Active	Circuit 2 Envelope - Low differential pressure - Alarm status	Bool			NoUnits	ReadWrite

Contents	Size	Name	Description	Data type	Min	Max	UoM	Management
311	1	Al_DscgLowP_Circ2.Active	Circuit 2 Envelope - Low discharge pressure - Alarm status	Bool			NoUnits	ReadWrite
312	1	Al_SuctLowP_Circ2.Active	Circuit 2 Envelope - Low suction pressure - Alarm status	Bool			NoUnits	ReadWrite
313	1	Al_DscgHiTempCirc2.Active	Circuit 2 Envelope - High discharge temperature - Alarm status	Bool			NoUnits	ReadWrite
314	1	Al_LowSH_EVD_Circ2.Active	Circuit 2 EVD - Low SH - Alarm status	Bool			NoUnits	ReadWrite
315	1	Al_LOP_EVD_Circ2.Active	Circuit 2 EVD - LOP - Alarm status	Bool			NoUnits	ReadWrite
316	1	Al_MOP_EVD_Circ2.Active	Circuit 2 EVD - MOP - Alarm status	Bool			NoUnits	ReadWrite
317	1	Al_HiTempCond_EVD_Circ2.Active	Circuit 2 EVD - High condensing temperature - Alarm status	Bool			NoUnits	ReadWrite
318	1	Al_LowSuct_EVD_Circ2.Active	Circuit 2 EVD - Low suction temperature - Alarm status	Bool			NoUnits	ReadWrite
319	1	Al_EEV_EVD_Circ2.Active	Circuit 2 EVD - Motor error - Alarm status	Bool			NoUnits	ReadWrite
320	1	Al_EmergCl_EVD_Circ2.Active	Circuit 2 EVD - Emergency closing - Alarm status	Bool			NoUnits	ReadWrite
321	1	Al_PinOutOfBound_EVD_Circ2.Active	Circuit 2 EVD - Setting out of bound - Alarm status	Bool			NoUnits	ReadWrite
322	1	Al_RangeErr_EVD_Circ2.Active	Circuit 2 EVD - Settings range error - Alarm status	Bool			NoUnits	ReadWrite
323	1	Al_OfflineEVD_Circ2.Active	Circuit 2 EVD - Offline - Alarm status	Bool			NoUnits	ReadWrite
324	1	Al_BattEVD_Circ2.Active	Circuit 2 EVD - Low battery - Alarm status	Bool			NoUnits	ReadWrite
325	1	Al_EPROM_EVD_Circ2.Active	Circuit 2 EVD - EEPROM - Alarm status	Bool			NoUnits	ReadWrite
326	1	Al_IncompClEVD_Circ2.Active	Circuit 2 EVD - Incomplete valve closing - Alarm status	Bool			NoUnits	ReadWrite

Contents	Size	Name	Description	Data type	Min	Max	UoM	Management
362	1	Al_OvldScrFan1Circ2.Active	Circuit 2 - Source fan 1 overload - Alarm status	Bool			NoUnits	ReadWrite
363	1	Al_OvldScrFan2Circ2.Active	Circuit 2 - Source fan 2 overload - Alarm status	Bool			NoUnits	ReadWrite
365	1	Al_FreezeCirc2.Active	Circuit 2 - Alarm freeze evaporation temperature - Alarm status	Bool			NoUnits	ReadWrite
366	1	Al_HrsComp1Circ2.Active	Circuit 2 - Compressor 1 maintenance - Alarm status	Bool			NoUnits	ReadWrite
369	1	Al_CondPrbTempCirc2.Active	Circuit 2 - Alarm condensing temperature probe - Alarm status	Bool			NoUnits	ReadWrite
370	1	Al_HrsSrcFan1Circ2.Active	Circuit 2 - Source fan 1 maintenance - Alarm status	Bool			NoUnits	ReadWrite
371	1	Al_HrsSrcFan2Circ2.Active	Circuit 2 - Source fan 2 maintenance - Alarm status	Bool			NoUnits	ReadWrite
373	1	Al_HP_PstatCirc2.Active	Circuit 2 - High pressure alarm by pressure switch - Alarm status	Bool			NoUnits	ReadWrite
374	1	Al_LP_PstatCirc2.Active	Circuit 2 - Low pressure alarm by pressure switch - Alarm status	Bool			NoUnits	ReadWrite
375	1	Al_OvldComp1Circ2.Active	Circuit 2 - Overload compressor 1 - Alarm status	Bool			NoUnits	ReadWrite
376	1	Al_OvldComp2Circ2.Active	Circuit 2 - Overload compressor 2 - Alarm status	Bool			NoUnits	ReadWrite
377	1	Al_OvldComp3Circ2.Active	Circuit 2 - Overload compressor 3 - Alarm status	Bool			NoUnits	ReadWrite
378	1	Al_PmpDwnEndMaxT_Circ2.Active	Circuit 2 - Pump-Down end for max time - Alarm status	Bool			NoUnits	ReadWrite
379	1	Al_UnexpRestart_InvCirc2.Active	Circuit 2 Inverter - Unexpected restart (98) - Alarm status	Bool			NoUnits	ReadWrite
554	1	CRL_W_OvldSrcFan.Active	Warning overload source fans - Alarm status	Bool			NoUnits	ReadWrite

Contents	Size	Name	Description	Data type	Min	Max	UoM	Management
573	1	CRL_Al_OvldFansComRowCrc2_3.Active	Unit - Overload fans common row circuit 2 and 3 - Alarm status	Bool			NoUnits	ReadWrite
695	1	Al_W_Frascold_C1.Active	Alarm status	Bool			NoUnits	ReadWrite
696	1	Al_W_Frascold_C2.Active	Alarm status	Bool			NoUnits	ReadWrite
697	1	Al_A_Frascold_C1.Active	Alarm status	Bool			NoUnits	ReadWrite
698	1	Al_A_Frascold_C2.Active	Alarm status	Bool			NoUnits	ReadWrite
699	1	Al_LeakDetector.Active	Alarm status	Bool			NoUnits	ReadWrite
706	1	Al_W_EnergyMeterOffline.Active	Energy meter is offline	Bool			NoUnits	ReadWrite
707	1	Al_W_LeakDetectorExpired.Active	Leak detector calibration expired - Alarm status	Bool			NoUnits	ReadWrite
708	1	LeakDetectorIsExpiring	Leak detector is expiring in 60 days	Bool			NoUnits	ReadWrite
Holding Register								
0	1	CoolSetP	Q001 - Cooling mode setpoint	Real	LowLimMskSetP_CH	HiLimMskSetP_CH	DegreesCelsius	ReadWrite
1	1	HeatSetP	Q002 - Heating mode setpoint	Real	LowLimMskSetP_HP	HiLimMskSetP_HP	DegreesCelsius	ReadWrite
43	1	InverterDanfoss_Error_Circ1		Int			NoUnits	ReadWrite
44	1	InverterDanfoss_Error_Circ2		Int			NoUnits	ReadWrite
46	2	InverterPump_Aout.Val	Inverter Pump status	Real			NoUnits	ReadWrite
48	2	InverterStartNumber_Circ1		UDInt			NoUnits	ReadWrite
50	2	InverterStartNumber_Circ2		UDInt			NoUnits	ReadWrite
52	2	InverterOperatingHours_Circ1		UDInt			NoUnits	ReadWrite
54	2	InverterOperatingHours_Circ2		UDInt			NoUnits	ReadWrite
103	2	EnergyMeter_Current1	Energy meter measured current for phase 1 (mA)	UDint			Milliamperes	ReadWrite
105	2	EnergyMeter_Current2	Energy meter measured current for phase 2 (mA)	UDint			Milliamperes	ReadWrite

Contents	Size	Name	Description	Data type	Min	Max	UoM	Management
107	2	EnergyMeter_Current3	Energy meter measured current for phase 3 (mA)	UDint			Milliamperes	ReadWrite
109	1	EnergyMeter_DeviceTemp	Energy meter device temperature (°C)	Int			DegreesCelsius	ReadWrite
110	1	EnergyMeter_Power1_mask	Energy meter measured power for phase 1 (kW)	Real			Kilowatts	ReadWrite
111	1	EnergyMeter_Power2_mask	Energy meter measured power for phase 2 (kW)	Real			Kilowatts	ReadWrite
112	1	EnergyMeter_Power3_mask	Energy meter measured power for phase 3 (kW)	Real			Kilowatts	ReadWrite
113	1	EnergyMeter_PowerFactor1_mask	Energy meter measured power factor for phase 1	Real			NoUnits	ReadWrite
114	1	EnergyMeter_PowerFactor2_mask	Energy meter measured power factor for phase 2	Real			NoUnits	ReadWrite
115	1	EnergyMeter_PowerFactor3_mask	Energy meter measured power factor for phase 3	Real			NoUnits	ReadWrite
116	1	EnergyMeter_Time_mask	Energy meter working time (Hours)	Real			Hours	ReadWrite
117	1	EnergyMeter_Voltage1_mask	Energy meter measured voltage for phase 1 (V)	Real			Volts	ReadWrite
118	1	EnergyMeter_Voltage2_mask	Energy meter measured voltage for phase 2 (V)	Real			Volts	ReadWrite
119	1	EnergyMeter_Voltage3_mask	Energy meter measured voltage for phase 3 (V)	Real			Volts	ReadWrite
Input Register								
0	1	W_InTempUser	User water inlet probe	Real	-999.9	999.9	DegreesCelsius	ReadWrite
1	1	W_OutTempUser	User water outlet probe	Real	-999.9	999.9	DegreesCelsius	ReadWrite
2	1	W_OutTankTemp	Tank water outlet probe	Real	-999.9	999.9	DegreesCelsius	ReadWrite
3	1	ExtTemp	External air temperature	Real	-999.9	999.9	DegreesCelsius	ReadWrite
4	1	DscgP_Circ1	Discharge pressure probe circuit 1	Real	-999.9	999.9	Bars	ReadWrite
5	1	SuctP_Circ1	Suction pressure probe circuit 1	Real	-999.9	999.9	Bars	ReadWrite
6	1	DscgTempCirc1	Discharge temperature probe circuit 1	Real	-999.9	999.9	DegreesCelsius	ReadWrite
7	1	CondTempCirc1	Condensing temperature probe circuit 1	Real	-999.9	999.9	DegreesCelsius	ReadWrite

Contents	Size	Name	Description	Data type	Min	Max	UoM	Management
8	1	SuctTempCirc1	Suction temperature probe circuit 1	Real	-999.9	999.9	DegreesCelsius	ReadWrite
9	1	EvapTempCirc1	Evaporating temperature circuit 1	Real	-999.9	999.9	DegreesCelsius	ReadWrite
10	1	DscgP_Circ2	Discharge pressure probe circuit 2	Real	-999.9	999.9	Bars	ReadWrite
11	1	SuctP_Circ2	Suction pressure probe circuit 2	Real	-999.9	999.9	Bars	ReadWrite
12	1	DscgTempCirc2	Discharge temperature probe circuit 2	Real	-999.9	999.9	DegreesCelsius	ReadWrite
13	1	CondTempCirc2	Condensing temperature probe circuit 2	Real	-999.9	999.9	DegreesCelsius	ReadWrite
14	1	SuctTempCirc2	Suction temperature probe circuit 2	Real	-999.9	999.9	DegreesCelsius	ReadWrite
15	1	EvapTempCirc2	Evaporating temperature circuit 2	Real	-999.9	999.9	DegreesCelsius	ReadWrite
50	1	UnitStatus	Unit status	UInt	0	9	NoUnits	ReadWrite
51	1	RegSetP	Actual setpoint	Real			DegreesCelsius	Read
85	1	SrcFanStatusCirc1		UInt	0	10	NoUnits	ReadWrite
87	1	SrcFanStatusCirc2		UInt	0	10	NoUnits	ReadWrite
89	1	CRL_SrcFanStatusCirc3	Status source fan circuit 3	UInt	0	10	NoUnits	ReadWrite
93	1	SrcFan1Circ1_Aout.Val	Source fan 1 circuit 1	Real	-999.9	999.9	NoUnits	ReadWrite
94	1	SrcFan1Circ2_Aout.Val	Source fan 1 circuit 2 status	Real	-999.9	999.9	NoUnits	ReadWrite
95	1	InverterPumpOut	Inverter pump out (0-10V)	Real	0.0	100.0	Percent	ReadWrite
129	1	DayOfWeek	Day of the week	UInt	0	9	NoUnits	ReadWrite
130	1	Day	Actual day	UInt	0	99	Days	ReadWrite
131	1	Month	Actual month	UInt	0	99	Months	ReadWrite
132	1	Hour	Actual hour	UInt	0	99	Hours	ReadWrite
133	1	Minute	Actual minute	UInt	0	99	Minutes	ReadWrite
134	1	Second	Actual second	UInt	0	99	Seconds	ReadWrite
153	2	WorkingHours.UserPmp1Hrs	User pump 1 working hour	UDInt	0	999999	Hours	ReadWrite
155	2	WorkingHours.UserPmp2Hrs	User pump 2 working hour	UDInt	0	999999	Hours	ReadWrite
193	1	LeakDetectorCalibrationDay	Leak detector calibration day	UInt			NoUnits	ReadWrite
194	1	LeakDetectorCalibrationMonth	Leak detector calibration month	UInt			NoUnits	ReadWrite

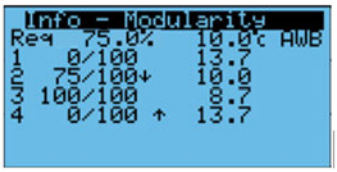
Contents	Size	Name	Description	Data type	Min	Max	UoM	Management
195	1	LeakDetectorCalibrationYear	Leak detector calibration year	UInt			NoUnits	ReadWrite

CHAPTER 9

MODULARITY

The connection takes place via Ethernet cable using the two ports on each card that allow a daisy-chain type scheme.
In each modular system, a board acts as a master and has the task of calculating the cooling demand and distributing it among the available units. The master controls the start of the system and also defines the adjustment setpoint common to all units.
In case of loss of connection, the unit remains in the state it was in (on or off) and continues to adjust with the last setpoint received from the master.
In slave units, the fixed setpoint must always be set while the type of adjustment (NZ or PID) is indifferent. Any other adjustments (double setpoint, plywood, etc. must be set in the master).

In the **Info** screen it is indicated with ↑ the unit that must satisfy an increase in cooling power (turn on a compressor) while with ↓ the unit that must decrease cooling power (turn off a compressor).
The increase in power is always satisfied by the **last** module that is switched on and when it reaches saturation it moves on to the next in the sequence. Conversely, the decrease in power always occurs in the **first** module to have a compressor on.



CHAPTER 10

FUNCTIONS AND COMPONENTS OF THE UNIT

10.1 Electronic thermostatic

The electronic thermostatics of each circuit is controlled by the electronic board that processes the information sent to it by the pressure and temperature transducers.
The electronic thermostatic valve regulates the flow of refrigerant fluid to the evaporator, based on the superheat value obtained by measuring the evaporation pressure and the suction temperature of the compressor. The adoption of the electronic lamination device instead of the traditional one allows to operate with significantly less condensation and allows to use partialisations up to 20% of the total power without incurring dangerous liquid returns or evaporator instability.

10.2 High pressure switches (HP)

They ensure an electromechanical protection beyond that offered by the respective transducers present in the unit.
They are installed at the delivery of the refrigeration compressor to prevent dangerous pressure values from being reached for the proper functioning of the unit and for the safety of people.
There is a manual reset pressure switch on the high pressure side of each circuit. Its intervention opens the compressor power supply circuit (see wiring diagram). When the pressure decreases and drops below the reset point, the pressure switch must be manually reset, after which the machine can be restarted by pressing the electronic control ALARM button.
For a correct operation of the machine, the intervention-reset values of the pressure switches are indicated in the following table and must not be modified:

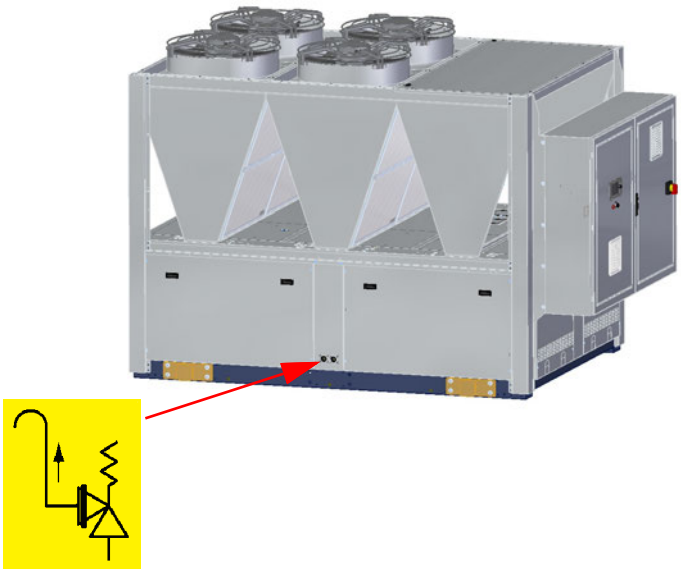
COMPONENT	REFRIGERANT	INTERVENTION		RESTORE	
		bar	°C	bar	°C
High pressure switch	R290	23.0	66.2	19.0	57.3

10.3 Safety valve

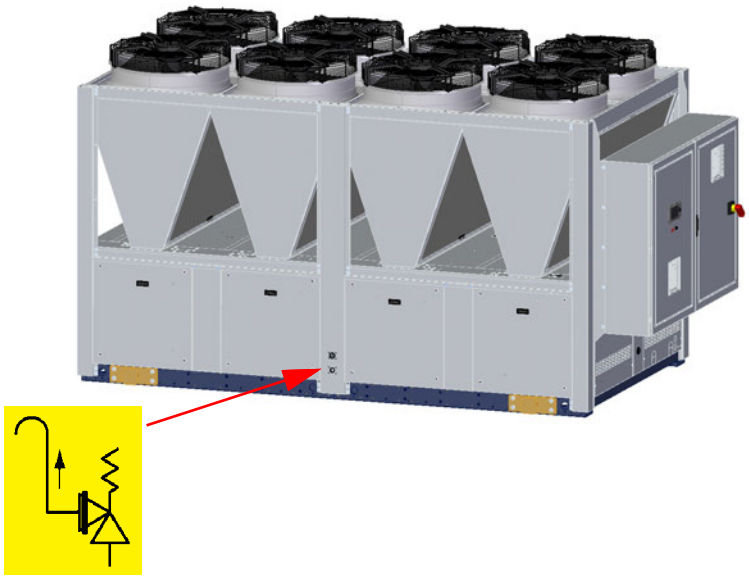
Its task is to protect the system from pressures so high as to cause serious damage to the machine and surrounding things in the event of failure to intervene with other protections.
When the pressure of the refrigerant fluid exceeds the intervention value of the valve (see table below), the latter opens the circuit and lets the gas discharge into the atmosphere until the pressure has reached values lower than those set.
Under these 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 images below show the drains of the safety valves, whose positions are indicated by the relative adhesive (see 1.2 “Symbols”).

ASN / iASN 075÷110



ASN / iASN 150



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.

DANGER

Zone 2 that is generated by the emission of a safety valve can have a horizontal extension of up to 23 metres and up to 25 metres of vertical extension.
The assessment of the risk areas is carried out by the installer.
Do not convey the exhaust in the proximity of ignition sources as defined by EN378-2.
If more restrictive, always refer to the local regulations in force.

WARNING

Do not remove or tamper with the safety valve.

COMPONENT	REFRIGERANT	INTERVENTION	
		bar	°C
HP Safety Valve	R290	26	72.2
LP Safety Valve		20	59.6

WARNING

The intervention of the safety valve is a symptom of an abnormal operation of the machine.
Identify the cause of the anomaly as soon as possible and restore normal conditions.

10.4 Pressure and temperature transducers

There are two types of transducers on the machine:

- pressure, fed directly by the control
- temperature

10.4.1 Pressure transducers

A low-pressure transducer and a high-pressure transducer are installed in each refrigerant circuit.
By detecting the suction and delivery pressures of the compressors, they adjust the operation of the unit based on the setpoint values set.
Through the detection of the parameters it is possible to control, for each circuit, the following functions:

- high pressure alarm;
- low pressure alarm;
- unloading for high;
- fan control;
- measurement of high and low pressure values.

Therefore, if the pressure in a circuit rises or falls with respect to the preset limit values, an alarm signal blocks: the machine, the switching on or off of the fans, the more or less delayed switching off of one or more compressors.

Probe-Transducer	Description	Function
-BHP1	High Pressure Transducer 1	P
-BHP2	High Pressure Transducer 2	P
-BLP1	Low pressure transducer 1	P
-BLP2	Low pressure transducer 2	P
-BEWIT	Evaporator inlet water temperature	T
-BEWOT	Evaporator outlet water temperature	T
-BTWOT	Tank outlet water temperature	T
-BAT1	Ambient temperature 1	T

10.5 Flow switch

The machine is equipped with a flow switch, of the vane type, which detects the correct circulation of water inside the evaporator. Otherwise an alarm system locks the machine after the set delay. When the water flow is restored, the machine can be restarted by resetting the alarm. This situation should be isolated and limited in time.

10.6 Level sensor

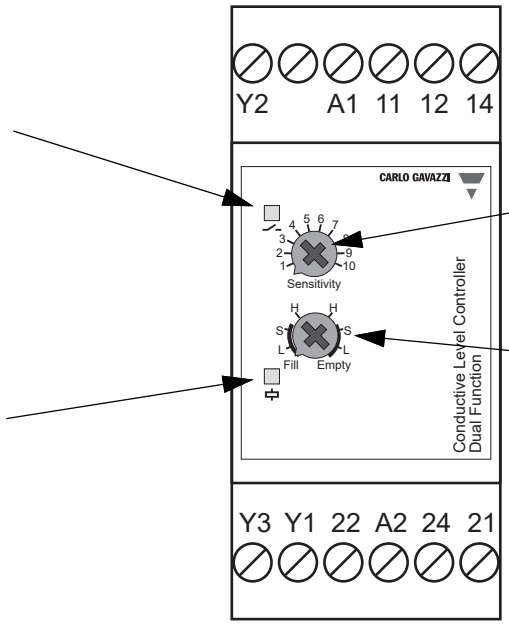
The sensor is installed inside the evaporator or tank and has the task of detecting any lack of water. If this anomaly is detected, the sensor sends an alarm signal to the control unit causing the chiller to stop immediately.

CAUTION

⚠ Implement all possible precautions in order to avoid accidental contact with live elements.
The voltage present in the electrical panel can reach lethal values for humans.

The Orange LED lights up in the presence of water (in normal operation), turns off in the absence of water.

Power up the system, the green LED lights up steady.



A Sensitivity adjustment

B Sensitivity adjustment range

Adjusting potentiometer **B** changes the sensitivity field of regulator **A**

B	A
L	250 Ω ÷ 5 KΩ
S	5KΩ ÷ 100KΩ
H	50KΩ ÷ 500KΩ

WARNING

⚠ The level sensor has been calibrated to operate with a sensitivity of 100kOhm.
The calibration of the level sensor is the responsibility of the manufacturer, therefore it must not be modified.

WARNING

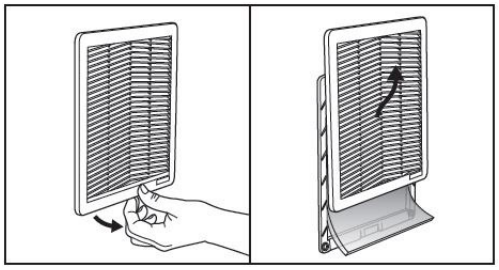
⚠ An anti-tamper label is placed above the adjustment potentiometers (A and B).
Its total or partial damage entails the forfeiture of the guarantee.

10.7 Forced ventilation of the electrical panel

The machines are equipped with a thermostat ventilation system for the electrical panel.
The circulation fan is activated when the temperature of the electrical panel exceeds about 40°C.
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.



NOTES

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.**

10.8 Function -20

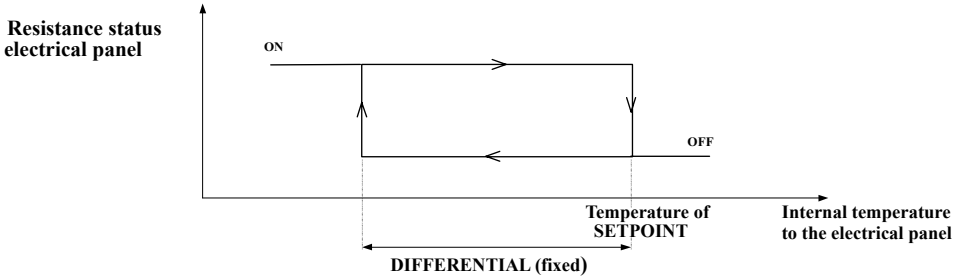
It imposes the electronic regulation of the fans and the resistors on the electrical panel. As an option, antifreeze resistors can be installed to protect the pump and tank against frost hazards when the ambient temperature is below 0°C. The antifreeze resistors option protects the components of the hydraulic circuit for ambient temperatures up to -10°C. For ambient temperatures below -20°Cit is necessary to glycol the circuit.

10.9 Anti-freeze control

The antifreeze control action depends on the temperature measured at the outlet of the evaporator. When the temperature drops below the antifreeze threshold value previously set, the control signals an alarm that blocks the machine. It remains active until the temperature returns to a value above the + differential setpoint.

10.10 Electrical panel resistance

In the electrical panel of units designed to work up to -20°C, an electrical resistance is installed, which is intended to heat the electrical components inside the panel itself, to safeguard them from problems related to temperature lowering.
The resistance is controlled by a thermostat inside the electrical panel and is activated when the temperature of the environment inside the electrical panel drops below the setpoint value minus the differential.



The setpoint is 5°C.
The differential, with a value of 10°C, is fixed.

10.11 Coolant leak detector

DANGER

This unit is equipped with a safety device that can detect the gas leakage. After installation, this unit must never be turned off, except during maintenance.

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. Upon exceeding 25% of the LFL (Lower Flammable Limit), the detector closes an alarm contact and, by means of a specific remote control, disconnects the control circuit of the electrical panel and the power circuit present in the compressor box; the electrical circuit of the Leak Detector always remains energised.
To restore the system, after the refrigerant gas loss falls below 25% of the LFL, use the “ALARM/reset” button on the left door of the electrical panel to restart the machine.
The restoration operation must be carried out only after careful verification of “non-leakage” by authorised operators, that are 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.
By default, the device is calibrated to 25% of the “LFL”.
Operators must be aware of regulations established by the industrial sector and/or the country of installation to test and calibrate the device.
The sensitive element of the device must be reset annually (see chapter 11.2.6 “Control and maintenance schedule”).
For the method and methods of testing, calibrating and replacing the device, refer to the authorised service centre.

WARNING

Refer to your service centre for testing and calibration of the sensitive element.
Replacement is only provided in case of damaged sensor.

WARNING

On first start-up, it is mandatory to recalibrate the sensor and reset the sensor operation counter.

CHAPTER 11

OPERATION AND MAINTENANCE

11.1 Operation

WARNING

⚠ Never switch off the water circuit pump before stopping the machine.

The machine is designed to work autonomously, and switches off when the pre-set temperature is reached.

DANGER

⚠ **Never exceed the water flow values specified in the table in Chapter 5 "Hydraulic connections".**

11.2 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 incompliance 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 this machine, make sure all personnel involved have read and understood the chapter " Safety" of this manual.

WARNING

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

DANGER

⚠ **This unit is equipped with a safety device that can detect the gas leakage. After installation, this unit must never be turned off, except during maintenance.**

11.2.1 Accessing the internal machine compartments

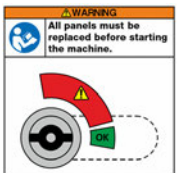
See the attached drawings

DANGER

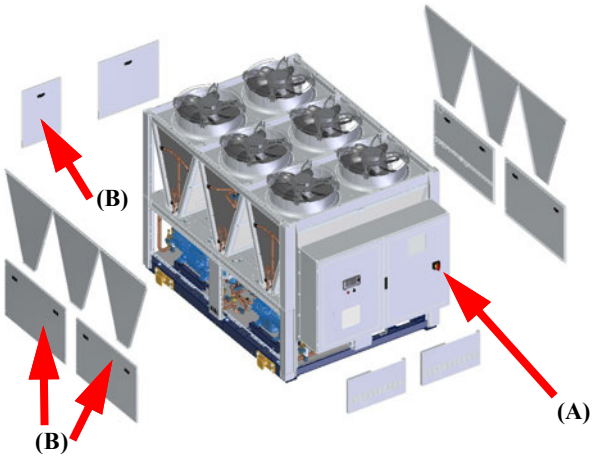
⚠ **The control panel must only be opened when the machine is switched off.**

DANGER

⚠ **Before starting the machine, make sure that all the panels have been correctly installed.**
Failure to comply with this indication does not guarantee the correct operation of the Leak Detector safety device.
Check that the key locks on the panels (B) are in the OK position.

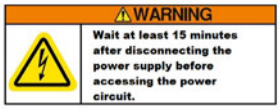


To gain access to the components of the electrical board, turn the main switch/circuit breaker **(A)** to the open "O" position and open the closing bolts with the provided key.
To remove the side panels, use a screwdriver to loosen the screws fixing it to the top and bottom.



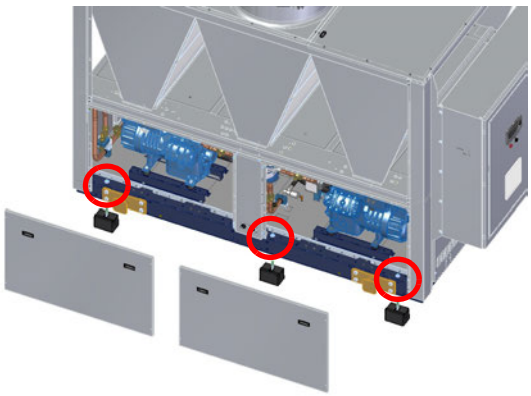
WARNING

⚠ 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.



To remove the supports, it is necessary to remove the panels:

- by acting on the key locks **(B)**
- by unscrewing the highlighted nuts (all other panels)



CAUTION

⚠ Given the presence of sharp corners and edges in the rear compartment, service personnel must protect themselves from accidental contact when working inside the compartment.
Caution must also be used in relation to the floor of the compartment, as it may be wet and slippery.

11.2.2 Filling the water circuit

The procedure for filling the units (according to the hydraulic circuit fitted on the machine) is explained below:

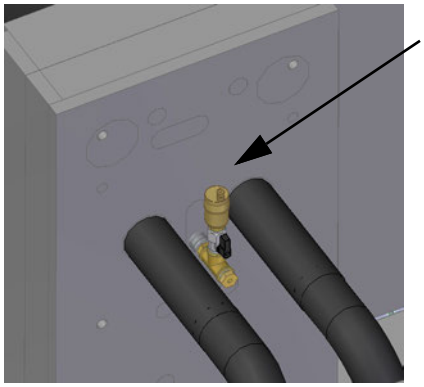


Plate evaporator:
Connect the water pipes to the machine.
Make sure there is a filling point on the water inlet pipe.
Make sure there are vents on the highest points of the hydraulic circuit, where air may collect.
Fill the system until water seeps out of the vents on the circuit and out of the evaporator's vent (**A**). The water pressure gauge on the hydraulic circuit must show a value that's compatible with the expansion tank (fitted by the installer).
Start up the pumps without activating the compressors, to fully bleed the system, and continue filling if necessary.

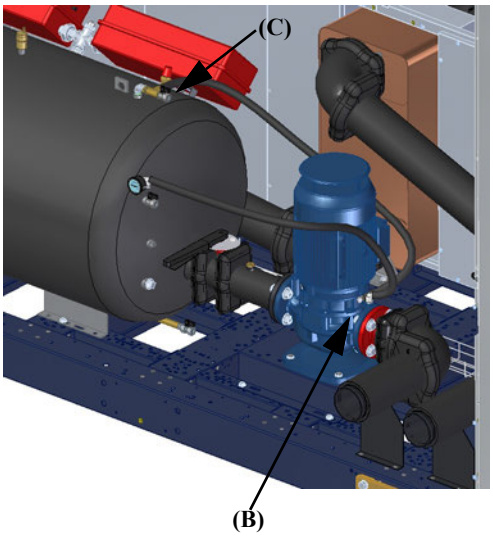


Plate evaporator + pumps:
Connect the water pipes to the machine.
Make sure there is a filling point on the water inlet pipe.
Make sure there are vents on the highest points of the hydraulic circuit, where air may collect.
Fill the system until water seeps out of the vents on the hydraulic circuit, from the vent of the plate evaporator **(A)** (accessed via the compressor compartment), the pump vent cap **(C)** and the vent on the pump outlet pipe **(B)**. The water pressure gauge on the hydraulic circuit must show a value that's compatible with the expansion tank (fitted by the installer).
Start up the pumps without activating the compressors, to fully bleed the system, and continue filling if necessary.

Accumulation + plate evaporator:
Connect the water pipes to the machine.
Make sure there is a filling point on the water inlet pipe.
Make sure there are vents on the highest points of the hydraulic circuit, where air may collect.
Fill the system until water seeps out of the vents on the hydraulic circuit, the accumulation tank vent **(C)**, from the vent of the plate evaporator **(A)** (accessed via the compressor compartment), the pump vent cap **(B)**. The water pressure gauge on the hydraulic circuit must show a value that's compatible with the components installed in the hydraulic circuit itself.
Start up the pumps without activating the compressors, to fully bleed the system, and continue filling if necessary.

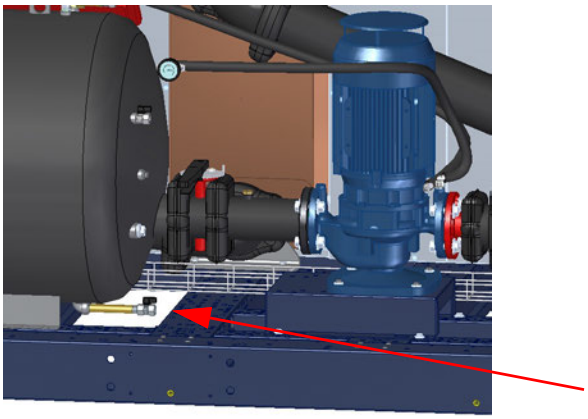
CAUTION

⚠ If the mechanical seal is lost during the start-up of an electric pump, quickly open and close the delivery baffle valve several times while the pump is operating; the aim is to create sudden pressure variations inside the pump to help the mechanical seal to settle down. You are advised to do this at least 2 or 3 times, switching the pump off and then back on again between one attempt and the next.

11.2.3 Draining the water circuit

If the machine is idle and not fitted with an anti-freeze heater, the water circuit must be drained if the ambient temperature reaches the freezing value of the water in the unit.

There is a tap on the lower part of the evaporator, to be used for draining it.



Only units equipped with a tank have a tap on the lower part, for draining the hydraulic circuit.

If it will be necessary to empty the water circuit it is possible to:

- discharge the water using the drainage cocks of the unit (see paragraph 5.2 “Hydraulic connections”)
- If the unit is not fitted with these taps, the water can be drained via the delivery pipe.

CAUTION

⚠ The water circuit drainage operation is indispensable when the machine must remain OFF for a long time in a place where temperatures which could reach the freezing values of the water inside the evaporator and condenser (risk of breakage).

11.2.4 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.

NOTES

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.

11.2.5 ⚠ Cleaning the condenser

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. Use high pressure water or air, up to 120 bar (cold) to rinse the battery.

NOTES

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. Use soap or NEUTRAL detergent. The reason is that chemicals at extreme pH can affect the natural protective layer of aluminum oxide.
6. 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.

11.2.6 Control and maintenance schedule

OPERATION	1 Day	1 Month	6 months	1 Year
Check there are no alarm signals.	◊			
Check the water outlet temperature is within the correct range.	◊			
Check the user water inlet temperature is OK for the machine configuration.		◊		
Check that the difference between the pump output pressure (if installed) and intake pressure (measured by a pressure gauge with the pump stopped) is within the limits envisaged and, in particular, is not lower than the value corresponding to the maximum flow.		◊		
Check the liquid sight glass 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.			◊	
Make a visual inspection of the refrigerant circuit to check the condition of the pipes and to make sure there are no traces of oil (which may indicate a refrigerant leakage).			◊	
Check the condition and firmness of the pipe connections.			◊	
Check the condition and security of wiring and electrical connections.			◊	
Check the ambient air temperature is OK for the machine configuration. Check that the environment is well ventilated.		◊		
Check the fan motors are automatically activated by the electronic control unit. Check they are not noisy. Check that the grilles of the unit are free from dirt and any other obstructions.			◊	
Clean the condenser fins with soap or neutral detergent (see ch. 11.2.5 “Cleaning the condenser”).				◊
Clean the water filter. In any case, you are advised to clean the filter one week after the initial machine start-up.		◊		
Calibration or replacement of the sensitive element of the refrigerant leak detector.				◊
Check the correct operation of the high pressure switch that is triggered on the STO digital input of the compressor.				◊
Check that the ground connection of the Zener barriers is intact and in good condition and guarantees a maximum resistance ≤ 1 Ohm **(*)** (see ch. 6.5 “Ground connection for intrinsic barriers”).			◊	

NOTES

(*) The maintenance of the connection characteristics may depend on the installation environment of the machine; the final customer must define the maximum verification time.

CAUTION

⚠ The above maintenance schedule is based on average operating conditions.
In some cases it may be necessary to increase maintenance frequency.

CHAPTER 12

TROUBLESHOOTING

PROBLEM	MANIFESTATION	CAUSE/REMEDY
A Unit fails to start	• Unit is powered and yet fails to start.	**Presence of shut-down alarms** Check for the presence of alarms that prevent the unit from starting. **Unit programmed to run by time band** The unit is set to start only within the programmed time bands. Activate start mode outside the time bands in the User stage. **Supervision active** Check that supervision is not enabled on the unit. Enter the supervision stage and disable supervision function.
B Water outlet temperature higher than set-point.	• Unit is operational but water temperature is higher than the set-point value. • Temperature higher than the value envisaged. • High water outlet temperature alarm trip. • Low evaporation pressure. • Presence of a large number of air bubbles in the liquid sight glass. • Excessively noisy operation of compressors.	**Water flow rate too high** Increase the pressure drop in the water circuit (e.g.: partially closing a tap on the pump delivery line). **Thermal load too high** Reduce the thermal load to within preset limits. **Ambient temperature too high** Increase air recirculation. **Condenser fins fouled** Clean the condenser fins. **Front surface of the condenser blocked** Remove the obstruction from the front surface of the condenser. **Incorrect direction of fan rotation** Invert the position of 2 of the 3 power supply phases. **Circuit has insufficient refrigerant charge** Call in a qualified refrigeration engineer to check for leaks and eliminate them. Fill the plant. **Incorrect compressors rotation** Invert the position of two phase wires of the compressors power supply (see chap.7.2 “Start-up”).
C Insufficient pressure head (water pressure) at the outlet of the pump (if present).	• Rise of water outlet temperature. • With pump installed: pressure difference (read on the unit pressure gauge) with pump running and pump stopped is too low. • Increase in the pressure drop due to the presence of ice. • High temperature difference between water inlet and outlet.	**Water flow rate too high** Reduce water flow within design limits, for example by partially closing a pump outlet cock. **Presence of ice in the evaporator** Stop the unit, leave the pump running, edit the set-point value and add glycol to the water. **Evaporator blocked** Supply a high flow rate of water in counter-current conditions. Install a filter upline from the unit.
D The unit is blocked and water does not flow.	• No water flow. • Flow switch alarm trip. • Low pressure alarm trip. • Suction pressure too low.	**Set-point value too low** Increase the SET-POINT value or add glycol (antifreeze) in adequate percentage (see heading “5.3 Anti-freeze protection”). **! The formation of ice can severely damage the unit.**
E High pressure	• High pressure switch trip. • Refrigerant compressor stops. • The icon 🔔 lights up. • Intervention of general alarm relay. • Fans stopped or reverse rotation direction. • Water outlet temperature too high.	**Fans stopped or incorrect rotation** Repair or replace the fan. Invert the position of two phase wires of the fan power supply. **Warm air recirculation** Change the position of the unit or the position of any adjacent obstructions to avoid recirculation. **Coil fouled** Clean the condenser fins. **Thermal load too high** Reduce the thermal load to within preset limits.
F Low pressure.	• Refrigerant compressor stops. • The icon 🔔 lights up. • Intervention of general alarm relay.	**Circuit has insufficient refrigerant charge** Call in a qualified refrigeration engineer to check for leaks and eliminate them. Fill the plant.

PROBLEM	MANIFESTATION	CAUSE/REMEDY
G Compressor internal protection trip	• The icon lights up. • Intervention of general alarm relay. • Refrigerant compressor stops.	**Thermal load too high** Check that user water temperature and ambient air temperature are within rated limits. Restore the load within the preset limits. Wait a few minutes before turning on again. **Circuit has insufficient refrigerant charge** Call in a qualified refrigeration engineer to check for leaks and eliminate them. Fill the plant.
H Display off.	• Despite the presence of voltage on the board terminals the display remains blank.	**Control board fuse has blown** Change the fuse. Provide cleaner power supply to the unit.
I Pressure transducer faulty or disconnected	• Intervention of general alarm relay.	**Transducer disconnected or short-circuited** 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.
J Fans overload	• Fans stopped. • Intervention of general alarm relay. • Refrigerant compressor stops. • The icon lights up. • One of the fans is running noisily.	Check the status of fans, electrical connections, and power supply.
K Pump overload	• The pump doesn't work. • Intervention of general alarm relay. • Refrigerant compressor and pump stop. • The icon lights up. • Pressure difference (read on the unit pressure gauge) with pump running and pump stopped is lower than the available pressure head.	Reset thermal cut-out. Increase the pressure drop in the hydraulic circuit, for example by partially closing the pump supply cock. Check for the presence of electrical power.
L Flow switch alarm trip	• The icon lights up. • Intervention of general alarm relay. • Refrigerant compressor and pump stop.	Check condition of pump. The water circuit is obstructed outside the machine.
M The desuperheater is enabled but the water is cold.	• Cold desuperheater water.	Check operating mode (chiller only).

CHAPTER 13

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 11 “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 11 “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 11 “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” and Chapter 4 “Installation”.
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” and Chapter 11 “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 11 “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 11 “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”.
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”.

Description of risk:	Effect:	User instructions:
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 11 “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.
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.

Description of risk:	Effect:	User instructions:
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 11 “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 11 “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”; Chapter 4 “Installation” 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 7.2 “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 7.2 “Start-up”.
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 7.2 “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 11 “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 packaging.
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 7.2 “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”; 7.2 “Start-up” and Chapter 11 “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 11 “Operation and maintenance”.

CHAPTER 14

APPENDIX

14.1 Default parameters

CAUTION

⚠ Incorrect programming of the electronic controller can cause severe damage to the unit.
The parameters can be edited exclusively by properly qualified personnel.

The default parameters are the factory values of the unit main operation parameters.
The table contains a list of the following:

- the reference to the display masks
- parameter code
- the parameter that appears in the mask
- the short description
- parameter default value
- unit of measurement
- window level

Window	Code	Parameter	Description	Default	UoM	Level
Setpoint						
Set	Q001	Cooling	Chiller setpoint	7.0	°C	U
	-	Actual	Current setpoint	--	--	U
Set	Q002	Heat-Pump	Heat-Pump setpoint	40.0	°C	U
	-	Actual	Current setpoint	--	--	U
Set	Q003	Mode	Heat-Pump setpoint (FALSE=CHILLER, TRUE=HEAT-PUMP)	CHILLER	--	U
	-	Actual	Current setpoint	Chiller	--	U
Set	Q004	Heat recovery	Heat recovery setpoint	40.0	°C	U
	-	Actual	Current heat recovery setpoint (0=DI, 1=BRWIT, 2=BRWOT, 3=BRWIT + DI, 4=BRWOT + DI)	DI	--	U
Set - FC	Q005	Mode	Freecooling disabling	NO	--	U
Plant						
Setpoint						
2° setpoint	Ab04	Chiller	Second Chiller setpoint	10,0	°C	U
	Ab05	Heat	Second Heat setpoint	35,0	°C	U
2° setpoint	Ab06	Scheduler	Second Chiller setpoint (Enabled by Scheduler FALSE= Disabled, TRUE= Enabled)	FALSE	--	U

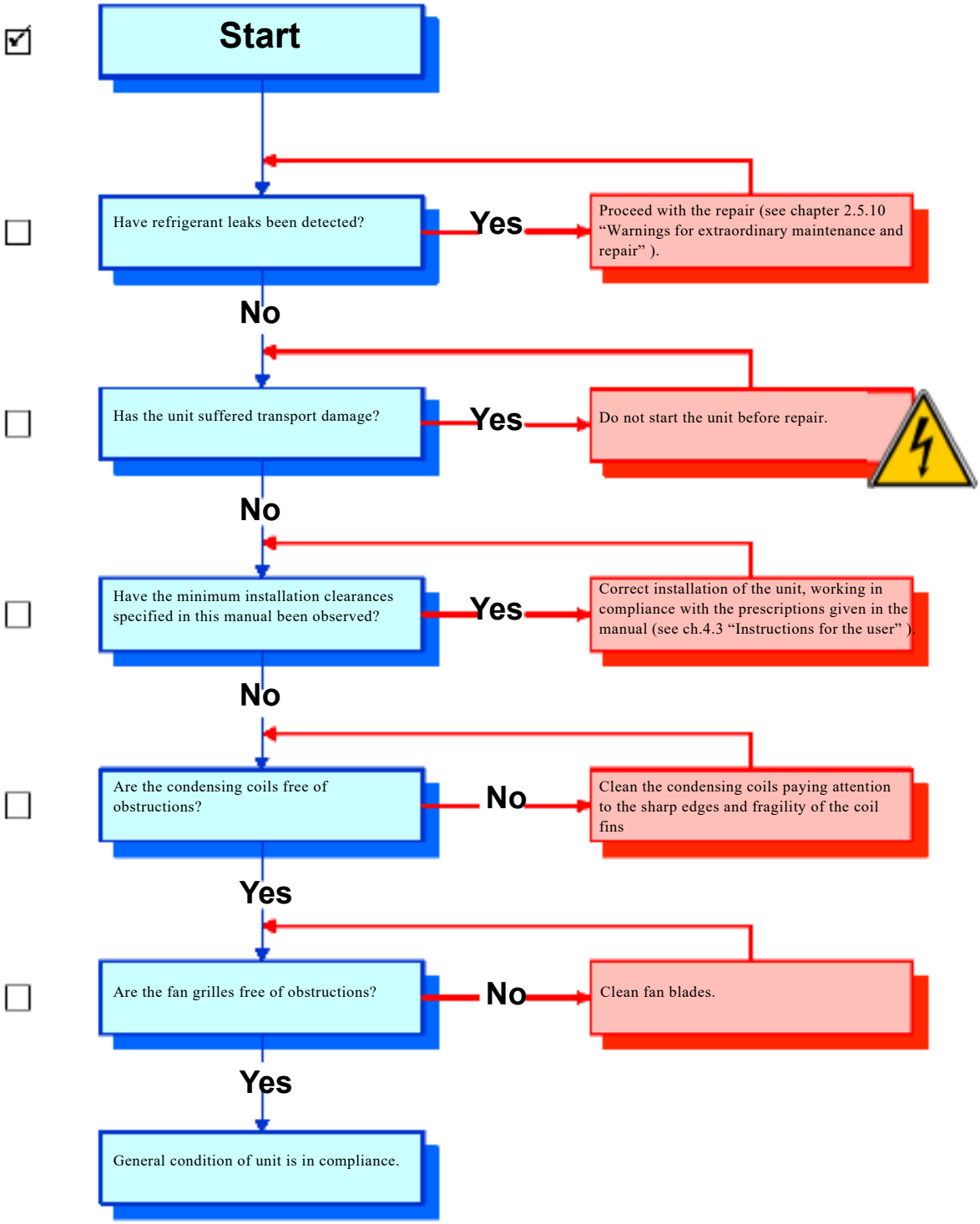
Window	Code	Parameter	Description	Default	UoM	Level
2° setpoint Scheduler	Ab07	Start time	Scheduling function 2° setpoint: Start time	20:00	--	U
	Ab08	End time	Scheduling function 2° setpoint: End time	06:00	--	U
Functions selection	Ab09	/	Multifunction input configuration (0= None, 1= Set.adjustable, 2= Remote reg., 3= Power limit, 4= Setpoint compensation)	None	--	U
	Ab10	/	Multifunction signal type (0=0-10V, 1=4-20mA, 2=NTC)	0-10V	--	U
Chiller set compensa.	Ab11	Start	Start	20,0	°C	U
	Ab12	End	End	30,0	°C	U
	Ab13	Max diff.	Max differential	5,0	°C	U
Heatpump set compensa.	Ab14	Start	Start	5,0	°C	U
	Ab15	End	End	-5,0	°C	U
	Ab16	Max diff.	Max differential	5,0	°C	U
Chiller set adjust.	Ab17	Max diff.	Chiller - Max differential	5,0	°C	U
Heatpump set adjust.	Ab18	Max diff.	Heatpump - Max differential	5,0	°C	U
Regulation						
Scheduler						
/	/	Enable	Enable scheduler “Unit On/Off” (FALSE= Disabled , TRUE= Enabled)	No	--	U
Alarm set						
Antifreeze						
Probes						
Modularity						
EEV						
Compressor						
Fans (Fans/Defrost)						
Alarm logs						
--	-	Press ENTER to DATA LOGGER	Allows access to the alarm history	--	--	U
Alarm export	-	Memory type	It allows you to save the alarm log file in the internal memory or on a USB	--	--	U
	-	File name	Name of the log file to save	--	--	U
	-	Confirm	Allows you to save the log file	--	--	U

Window	Code	Parameter	Description	Default	UoM	Level
Settings						
Date/Time						
Change date / time	Ga00	Format	Date format shown on the display (0=DD/MM/YY, 1=MM/DD/YY, 2=YY/MM/DD)	0=DD/MM/YY	--	U
	Ga01	Date	Current date	--	--	U
	Ga02	Hour	Current time	--	--	U
	--	Day	Current day of the week	--	--	U
UoM						
Language						
Language	--	Language	Language change: (0=EN, 1=IT, 2=DE, 3=FR, 4=ES, 5=RU)	ENGLISH	--	U
Info						
Info	--	Info	Info - EVDEVO / System / Serial line / Blackout	--	--	U
Serial ports						
Pwd change						
Change password	--	User	User password	0010	--	U
Initialization						
Logout						
Logout	--	Press ENTER to Log Out	Press ENTER to Log Out - password	Enter key	--	U

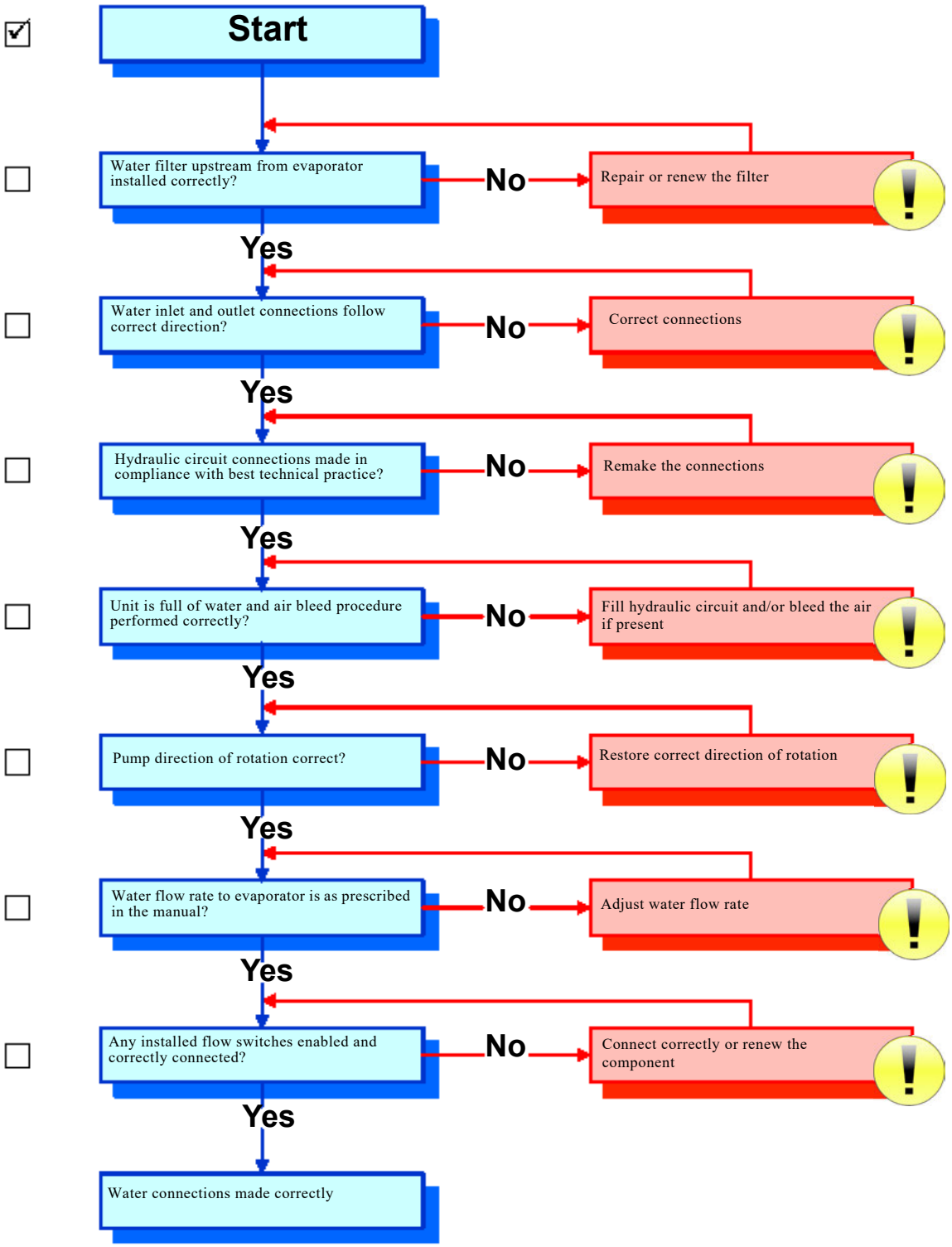
GENERAL CONDITIONS CHECKLIST

CAUTION

⚠ DO NOT SUPPLY THE UNIT

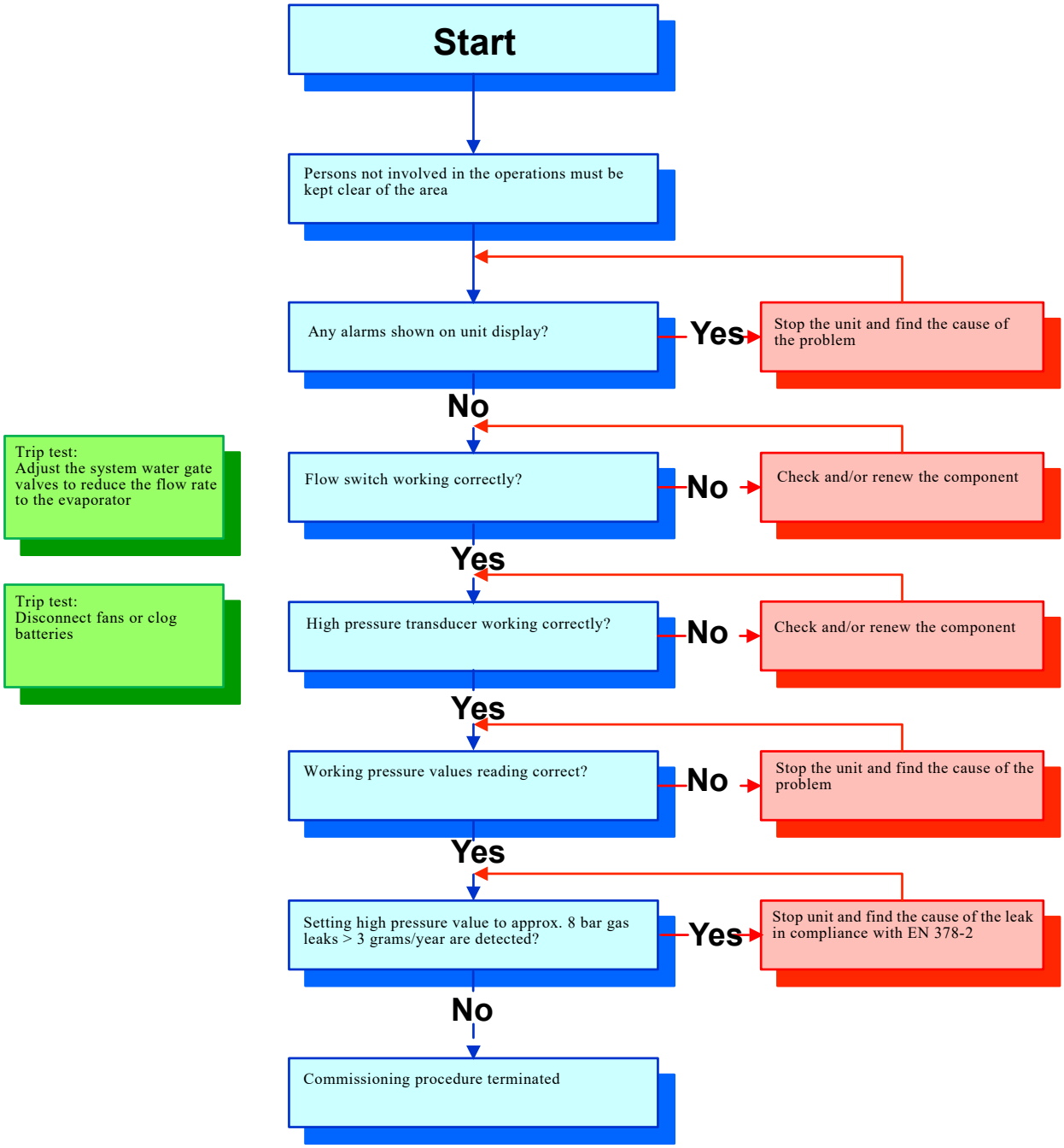


HYDRAULIC CIRCUIT CHECK LIST

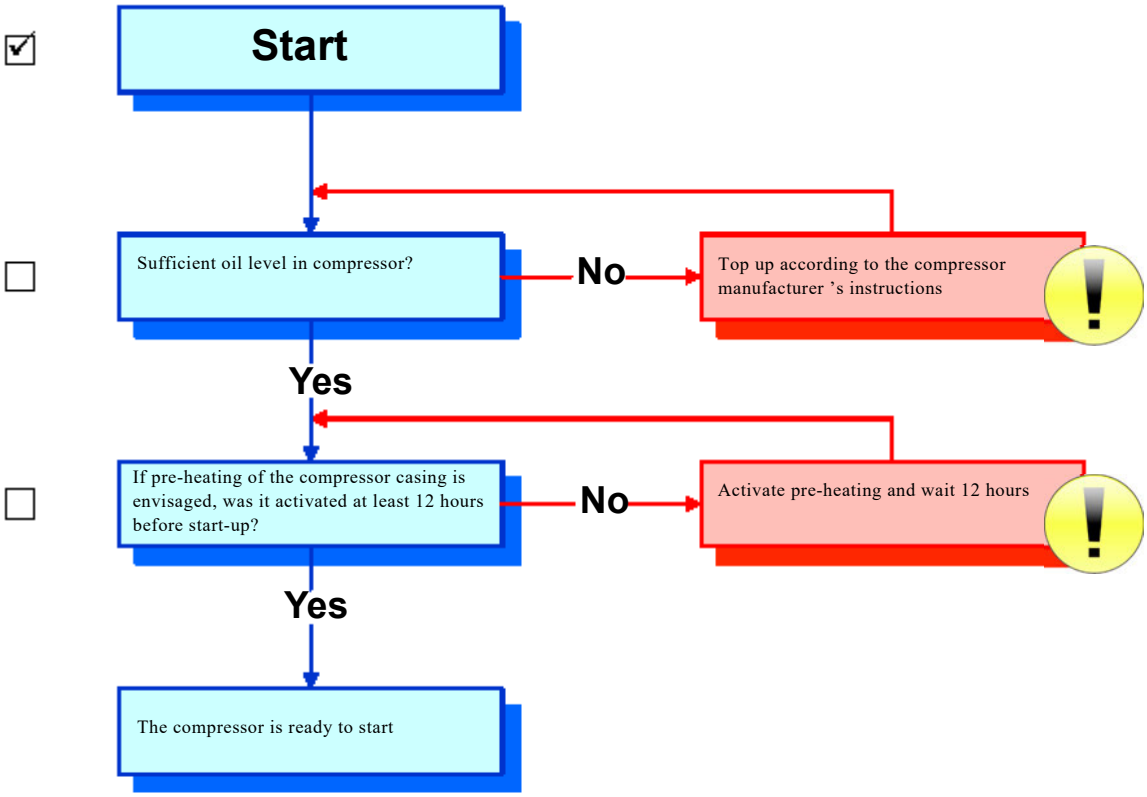


CONTROLLER CHECK

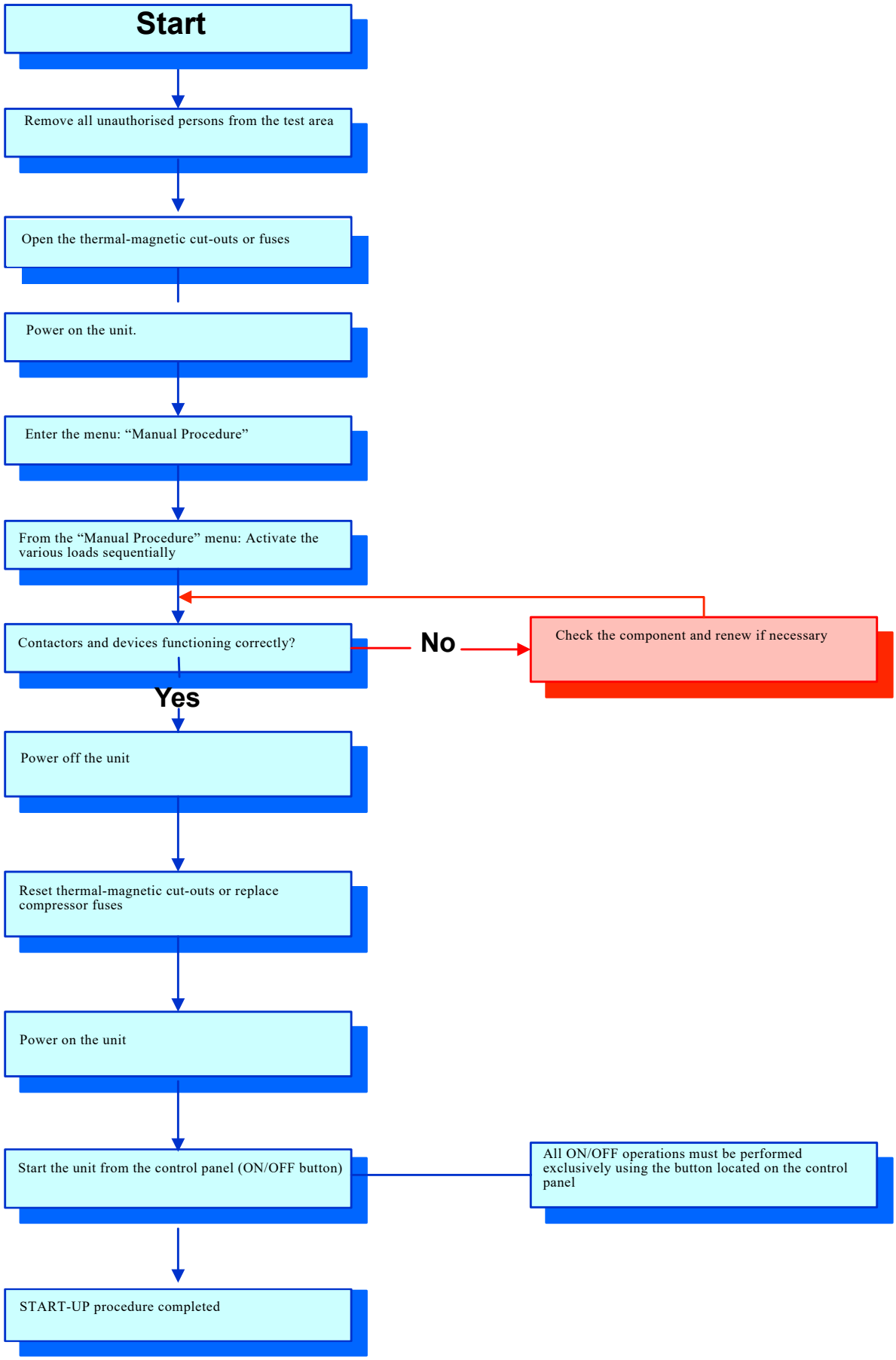
FIRST START CHECKLIST



OIL CHECKLIST



UNIT OPERATING CHECKLIST



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