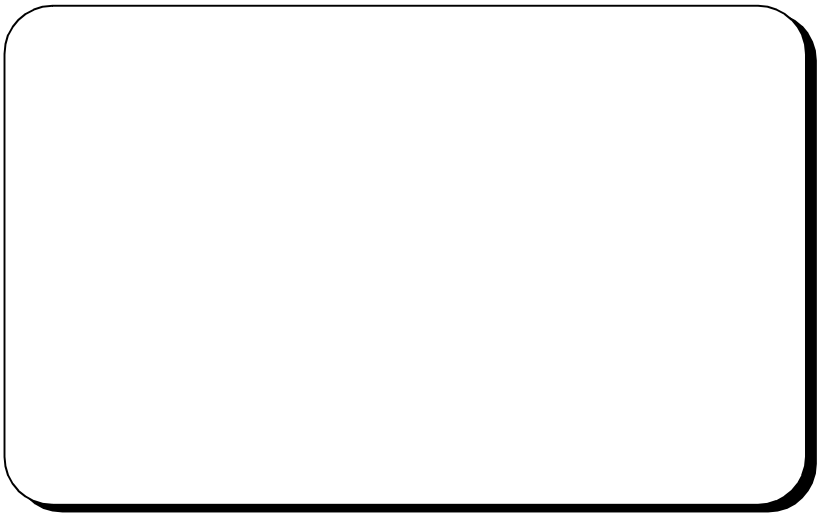
PURIFICATION SOLUTIONS

Precision Water Chillers

NPC 280 - 400 60 Hz UL

SERVICE MANUAL



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CHAPTER 1

GENERAL INFORMATION

The machines described in this manual are called “WATER REFRIGERATORS”.
This manual is written for those responsible for the installation, use and maintenance of the unit.
The components used are of high quality and all the projecting process, from the production to the unit checking, has been manufactured in conformity with ISO 9001 norms.
In most applications, the liquid of the user circuit is water and the term “WATER” will be used even if the liquid of the user circuit is different from water (e.g. a mixture of water and glycol).
Here below the term “PRESSURE” will be used to indicate the gauge pressure.
The electrical panel has been designed following UL508A standard rule (Industrial Control Panels), homologated with UL file number E249753 and marked. .

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:

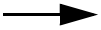
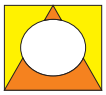
	Process water inlet
	Process water outlet
	Indications for lifting the unit
	Water drainage point from the machine
	Electric shock risk
	Risk of burns from contact with high-temperature surfaces
	Direction of the refrigerant fluid and water circuit
	Direction of pump rotation (if installed)
	Water filling point
	Air vent
	Hole for inserting bars for lifting the machine

Table 1 SYMBOLS

The following warning symbols are shown on the stickers on the unit. If requested, the same stickers are available also in French. Their meaning is the following:

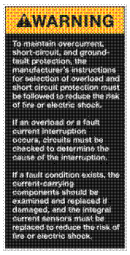
WARNING SYMBOL	DESCRIPTION
	To maintain overcurrent, short-circuit, and ground-fault protection, the manufacturer’s instructions for selection of overload and short circuit protection must be followed to reduce the risk of fire or electric shock. In an overload or a fault current interruption occurs, circuits must be checked to determine the cause of the interruption. If a fault condition exists, the current-carrying components should be examined and replaced if damaged, and the integral current sensors must be replaced to reduce the risk of fire or electric shock.

Table 2 WARNING SYMBOLS

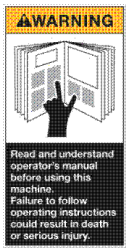
WARNING SYMBOL	DESCRIPTION
	Hazardous voltage. All doors must be closed before energizing the panel.
	Read and understand operator's manual before using this machine. Failure to follow operating instructions could result in death or serious injury.
	Moving parts can crush and cut. Do not operate with guard removed. Follow lockout procedure before servicing.
	Hazardous voltage. Disconnect power before servicing or cleaning.

Table 2 WARNING SYMBOLS

1.1 How to interpret the model

MODEL	DESCRIPTION
NPC XX 2	refrigerant with 2 refrigeration circuits
	power indicative of the refrigeration compressor in hp
	C = CHILLER
	P = PRECISION
	N = nano-purification solutions

ATTENTION

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.
If spare parts are required, this must be original.
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 MACHINE NUMBER shown on the machine data plate and on the first page of this manual.

CHAPTER 2

SAFETY

This machinery was designed to be safe in the use for which it was planned provided that it is installed, started up and maintained in accordance with the instructions contained in this manual.
The manual must therefore be studied by all those who want to install, use or maintain the unit.
The machine contains electrical components which operate at the line voltage, and also moving parts.
It must therefore be isolated from the electricity supply network before being opened. Maintenance operations involving work inside the machine must be performed by skilled and adequately qualified personnel equipped with suitable protection means (active and passive, e.g. work gloves) ton ensure work in maximum safety.
Do not allow extraneous persons (such as children) where the machine is installed.

2.1 General

When handling or maintaining the unit and all auxiliary equipment, the personnel must operate with care observing all instructions concerning health and safety at installation site.

ATTENTION

Most accidents which occur during the operation and maintenance of the machinery are a result of failure to observe basic safety rules or precautions.

An accident can often be avoided by recognising a situation that is potentially hazardous.
The user should make sure that all personnel concerned with operation and maintenance of the unit and all auxiliary equipment have read and understood all warnings, cautions, prohibitions and notes written in this manual as well as on the unit.
Improper operation or maintenance of the unit and auxiliary equipment could be dangerous and result in an accident causing injury or death.
We cannot anticipate every possible circumstance which might represent a potential hazard.
The warnings in this manual are therefore not all-inclusive.
If the user employs an operating procedure, an item of equipment or a method of working which is not specifically recommended, he must ensure that the unit and auxiliary equipment will not be damaged or made unsafe and that there is no risk to persons or property.
Any improper use of the machine will relieve the manufacturer from any liability for possible personal injury or property damage.
Arbitrary modifications made to the unit will automatically invalidate all forms of guarantee provided by the manufacturer.

2.2 Liquids of the user circuit

The liquids of the user circuit must be compatible with the materials used.
These can be water or mixtures of water and glycol, for example.
Additives and glycol suppliers must guarantee compatibility with the materials. For further information refer to 4.10 “Materials in contact with the liquid to be cooled” .

ATTENTION

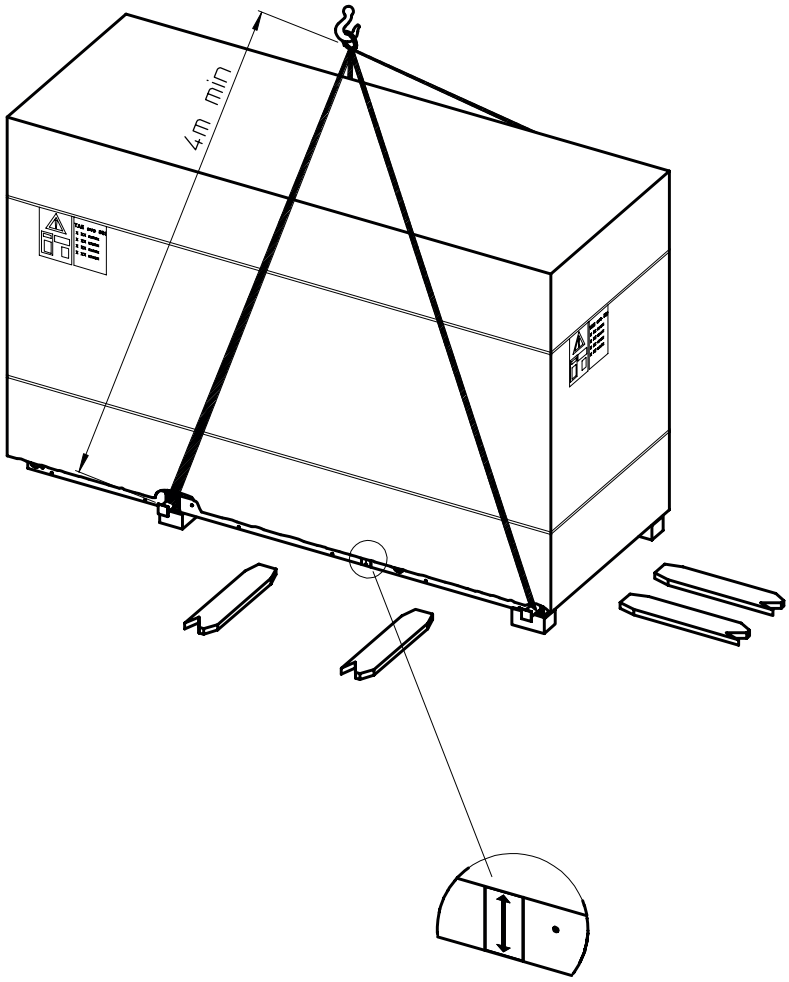
If the liquids of the user circuit contains dangerous substances (e.g. ethylene glycol) is very important to collect any liquid which leaks because it could cause damages to the ambient. Furthermore, when the refrigerator is no longer used, dangerous liquids must be disposed of by firms specialised and authorised for treating them.

2.3 Lifting and carriage precautions

Avoid injury by using a hoist to lift heavy loads.
Check all chains, hooks, shackles and slings are in good condition and are of the correct capacity.
They must be tested and approved according to local safety regulations.
Cables, chains or ropes must never be applied directly to lifting eyes.
Always use an appropriate shackle or hook properly positioned.
Arrange lifting cables so that there are no sharp bends.
Use a spreader bar to avoid side loads on hooks, eyes and shackles.
When a load is on a hoist stay clear of the danger area beneath and around it.
Keep lifting acceleration and speed within safe limits and never leave a load hanging on a hoist for longer than is necessary. The weight values shown in the following table were obtained with the unit empty, pump P3 and axial fans.
The manufacturer does not supply bars, belts and lifting hooks with the unit.

MODEL	280	330	400
Weight (kg)	1245	1285	1345
Weight (lb)	2744	2832	2965

Table 3 WEIGHTS



NOTE
Weight values are guideline, with the water circuit empty. The values may vary in relation to the configuration of the unit (pump type, supply type, and ventilation type).

2.4 Installation precautions

The connections to be made are for the process water circuit. Use the electrical diagram accompanying this manual to for the connection to the power grid.

2.5 Precautions during operation

Operation must be carried out by competent personnel under a qualified supervisor.

All the water piping must be painted or clearly marked in accordance with local safety regulations in the place of installation.

ATTENTION
Never remove or tamper with the safety devices, guards or insulation materials fitted to the unit or auxiliary equipment.

All electrical connections must comply with local codes.

The unit and auxiliary equipment must be earthen and protected by fuses against short-circuits and overloading.

When mains power is switched on, lethal voltages are present in the electrical circuits and extreme caution must be exercised whenever it is necessary to carry out any work on the electrical system.

Do not open any electrical panels or cabinets or touch any electrical components or associated equipment while voltage is applied unless it is necessary for measurements, tests or adjustments. Such work should be carried out only by a qualified electrician equipped with the proper tools and wearing appropriate body protection against electrical hazards.

2.6 Maintenance and repair precautions

ATTENTION
When disposing of parts and waste material of any kind make sure that there is no pollution of any drain or natural water-course and that no burning of waste takes place which could cause pollution of the air. Protect the environment by using only approved methods of disposal.

Keep a written record of all maintenance and repair work carried out on the unit and auxiliary equipment. The frequency and the nature of the work required over a period can reveal adverse operating conditions which should be corrected.

ATTENTION

Use only refrigerant gas specified on the specification plate of the unit.

Make sure that all instructions concerning operation and maintenance are strictly followed and that the complete unit, with all accessories and safety devices, is kept in good working order. The accuracy of pressure and temperature gauges must be regularly checked. They must be renewed when acceptable tolerances are exceeded.

ATTENTION

Do not weld or carry out any operation which produces heat near a system which contains oil or flammable liquids. The systems which may contain oil or flammable liquids must be completely drained and cleaned (with steam, for example), before carrying out these operations.

The adjacent components must always be screened with non-flammable material and if the operation is to be carried out near any part of the lubrication system, or close to a component which may contain oil, the system must first be thoroughly purged, preferably by steam cleaning.
Never use a light source with an open flame to inspect any part of the machine.
For every unit establish a suitable time schedule for cleaning operations.

ATTENTION

If replacement parts are needed use only original spares.

Avoid to damage the safety valves and other pressure relief devices.
All guards must be reinstated after carrying out repair or maintenance work.

ATTENTION

Check the direction of rotation of electric motors (the pump if installed) when starting up the unit initially and after any work on the electrical connections or switch gear.

Do not use flammable liquid to clean any component during operation. If chlorinated hydrocarbon non-flammable fluids are used for cleaning, safety precautions must be taken against any toxic vapours which may be released.

ATTENTION

Before removing any panels or dismantling any part of the unit, carry out the following operations:
- Isolate the unit from the main electrical power supply by disconnecting the cable from the electrical power source.
- Lock the isolator in the "OFF" position with a lock.
- Attach a warning label to the main isolator switch conveying: "WORK IN PROGRESS - DON NOT APPLY VOLTAGE".
- Do not switch on electrical power or attempt to start the unit if a warning label is attached.

Coloured tracers can be used in service-maintenance operations.
Inspect all refrigerant circuit joints including connectors, flanges, and more generally all critical points (open joints) in order to prevent possible leakage of refrigerant gas.

2.7 Refrigerant gases

R407C is used as refrigerant in these units. Never attempt to mix refrigerant gases. The manufacturer's instructions and local safety regulations should always be observed when handling and storing high pressure gas cylinders.

2.7.1 Refrigerant safety schedule

	R407C
Denomination:	23% Difluoromethane (R32); 25% Pentafluoroethane (R125); 52% R134a
INDICATION OF THE DANGERS	
Major dangers:	Asphyxia.
Specific dangers:	Rapid evaporation can cause freezing.
FIRST AID MEASURES	
General information:	Do not give anything to unconscious persons.
Inhalation:	Take the person outdoors. Use oxygen or artificial respiration if necessary. Do not administer adrenaline or similar substances.
Contact with the eyes:	Thoroughly wash with plenty of water for at least 15 minutes and call a doctor.
Contact with the skin:	Wash immediately with plenty of water. Remove contaminated clothing immediately.
FIRE-FIGHTING MEASURES	
Means of extinction:	Any means.

Specific dangers:	Pressure increase.
Specific methods:	Cool the containers with water sprays.
MEASURES IN THE EVENT OF ACCIDENTAL LEAKAGE	
Individual precautions:	Evacuate personnel to safe areas. Provide adequate ventilation. Use means of personal protection.
Environmental precautions:	Evaporates.
Cleaning methods:	Evaporates.
HANDLING AND STORAGE	
Handling technical measures/ precautions:	Ensure sufficient air change and/or extraction in the work areas.
recommendations for safe use:	Do not inhale vapours or aerosols.
Storage	Close properly and store in a cool, dry well-ventilated place. Store in its original containers. Incompatible products: explosives, flammable materials, organic peroxide.
CONTROL OF EXPOSURE/INDIVIDUAL PROTECTION	
Control parameters:	AEL (8-h e 12-h TWA) = 1000 ml/m3 for each of the three components.
Respiratory protection:	For rescue and maintenance work in tanks, use autonomous breathing apparatus. The vapours are heavier than air and can cause suffocation, reducing the oxygen available for breathing.
Protection of the eyes:	Safety goggles.
Protection of the hands:	Rubber gloves.
Hygiene measures:	Do not smoke.
PHYSICAL AND CHEMICAL PROPERTIES	
Colour:	Colourless.
Odour:	Similar to ether.
Boiling point:	-43.9°C at atm. press.
Flammability point:	Non flammable.
Relative density:	1.138 kg/l at 25°C.
Solubility in water:	Negligible.
STABILITY AND REACTIVITY	
Stability:	No reactivity if used with the relative instructions.
Materials to avoid:	Alkaline metal, earthy alkaline metals, granulated metals salts, Al, Zn, Be, etc. in powder.
Hazardous decomposition products:	Halogen acids, traces of carbonyl halides.
TOXICOLOGICAL INFORMATION	
Acute toxicity:	(R32) LC50/inhalation/4 hours/lab. rats >760 ml/l (R125) LC50/inhalation/4 hours/lab. rats >3480 mg/l (R134a) ALC/inhalation/4 hours/lab. rats = 567 ml/l.
Local effects:	Concentrations substantially above the TLV can cause narcotic effects. Inhalation of products in decomposition can lead to respiratory difficulty (pulmonary oedema).
Long-term toxicity:	Has not shown any cancerogenic, teratogenic or mutagenic effects in experiments on animals.
ECOLOGICAL INFORMATION	
Global warming potential HGWP (R11=1):	R125: 0.84 - R134a: 0.28
Ozone depletion potential ODP (R11=1):	0
CONSIDERATIONS ON DISPOSAL	
Usable with reconditioning.	

CHAPTER 3

TECHNICAL DATA

The main technical data are given on the machine data plate:

MODEL and CODE	They identify the size of the unit and the type of construction.
MANUAL	This is the code number of the manual.
SERIAL NUMBER	This is the construction number of the unit.
MANUFACTURING YEAR	This is the year of the final test of the unit.
VOLTAGE/PHASE/FREQUENCY	Electric alimentation characteristics.
SHORT CIRCUIT CURRENT	Short circuit current.
HIGHER MOTOR FLA	Max. absorbed current.
MAX. CONSUMPTION (I max)	This is electrical current consumed by the unit during the limit working conditions.
INSTALLED POWER (P max)	It is the power absorbed by the unit during the limit working conditions.
PROTECTION	As defined by the EN 60529 European standard / NEMA 250 international standard.
WIRING DIAGRAM	Number of wiring diagram.
REFRIGERANT	This is the refrigerant fluid in the unit.
REFRIGERANT QUANTITY	This is the quantity of refrigerant fluid contained in the unit.
MAX. COOLING PRESSURE HP SIDE	This is the design pressure of the refrigeration circuit of the high pressure side
MAX. COOLING PRESSURE LP SIDE	This is the design pressure of the refrigeration circuit of the low pressure side
USER CIRCUIT FLUID	Fluid used by the unit (normally water).
MAX. UTILIZATION PRESSURE	Max. designed pressure of the utilization circuit.
MAX. TEMPERATURE	Design temperature of the user circuit; this should not be confused with the maximum working temperature which is established when the offer is made.
CONDENSER COOLING FLUID	Fluid the machine uses to cool the condenser.
MAX. WORKING PRESSURE	Maximum design pressure of the condenser cooling circuit.
MAX. TEMPERATURE	Maximum designed temperature of the cooling circuit of the condenser.
SOUND PRESSURE LEVEL	Sound pressure level in a free field in hemispherical irradiation conditions (open field) at a distance of 1 m from the machine, condenser side, and at 1.6 m from the ground.
AMBIENT TEMPERATURE	Min. and max. cooling air temperature value.
WEIGHT	This is the approximate weight of the unit before packing.

Table 4 DATA PLATE AND MEANING OF ABBREVIATIONS

ATTENTION

The performance of the unit mainly depends on the flow and temperature of the water in the user circuit and on the temperature of the thermal exchanger fluid of the condenser. These data are defined during the offer stage.

3.1 Other data relative to the standard machines

3.1.1 Dimensions

See enclosures.

3.1.2 Characteristics of pumps and of the fans

Model			280	330	400
Tank capacity	**water volume**	**(litres) (galUS)**	**500 132**	**500 132**	**500 132**
PUMP P3	**water flow rate**	**(m^3/h) (gpm)**	7.7/48 17.6/211.3	8.2/48 17.6/211.3	10.4/48 17.6/211.3
	pump head	**(bar) (PSI)**	3.8/1.5 57.0/21.8	3.8/1.5 57.0/21.8	3.7/1.5 57.0/21.8
	nominal power	**(kW)**	4	4	4
	nominal power (460/3/60 Hz)	**(kW)**	4	4	4
PUMP P5	**water flow rate**	**(m^3/h) (gpm)**	7.7/48 17.6/211.3	8.2/48 17.6/211.3	10.4/48 17.6/211.3
	pump head	**(bar) (PSI)**	5.5/3.0 80.5/44.5	5.5/3.0 80.5/44.5	5.4/3.0 80.5/44.5
	nominal power	**(kW)**	7.5	7.5	7.5
	nominal power (460/3/60 Hz)	**(kW)**	7.5	7.5	7.5
CENTRIFUGAL FANS (NOT present with 460/3/60 Hz supply)	**number of fans**		2	2	2
	available head	**(Pa) (PSI)**	450 0.06	440 0.06	420 0.06
	total air flow	**(m^3/h) (gpm)**	40000 176114	40000 176114	40000 176114
AXIAL FANS	**number of fans**		2	2	2
	total air flow (50/60Hz)	**(m^3/h) (gpm)**	45400 199860	43800 192845	42000 184920

Table 5 CHARACTERISTICS OF STANDARD UNITS

NOTE
The values in the table may vary in relation to the model and configuration of the unit. In this case reference should be made to the data in the offer.

NOTE
The head is the head available to the user. It is possible for the pump installed to be different from the standard. There are two numbers for the flow rate and pressure: the first number refers to the nominal conditions while the second to the maximum conditions.

3.1.3 Sound Level Measurements

	Fan	Lp dB(A) *	Lw dB(A) **
NPC 280	axial	79,0	92
	centrifugal ***	80,0	92,9
NPC 330	axial	79,0	92
	centrifugal ***	80,0	92,9
NPC 400	axial	79,0	92
	centrifugal ***	80,0	92,9

* at distance of 1 metre (3,2 FT)

** global

*** (NOT present with 460/3/60 Hz supply)

Test conditions

Noise levels refer to operation of the unit at full load in nominal conditions.

Sound pressure level in hemispherical irradiation conditions at a distance of 1 m (3,2 FT) from the condenser side of the unit and height of 1.6 m (5,2 FT) from the ground. Values tolerance ± 2 dB.

Sound power level: in compliance with ISO 3744

CHAPTER 4

DESCRIPTION

4.1 Components

The data relating to the materials refer to standard machines. In case of particular units special materials are used, so it is necessary to refer to the data on the offer.

The machines essentially consist of the following components:

- Refrigerant compressor
- Condenser
- Evaporator
- Tank
- Pump
- Frame/outer panelling
- Electronic controller

4.2 Cooling circuit

Models TAEevo have two refrigerant circuits with two compressors connected in parallel (tandem).

Each circuit consists of the following components:

- refrigerant fluid used R407C;
- Scroll hermetic compressor;
- pressure switches for high and low refrigerant pressure;
- high pressure transducer for fan electronical regulation and for unloading (NOT present with 460/3/60 supply, centrifugal fans);
- liquid solenoid valve (with prismatic tank and plate-type evaporator);
- thermostatic throttle valve with external equalization;
- dryer filter;
- liquid flow sight glass;
- refrigerant manometers;
- check valve;
- Schrader service valves;

Consult the enclosed drawings for additional information.

4.3 Compressors

All the machines are equipped with SCROLL compressors, which are distinguished for their high energy efficiency, low vibrations and consequent silence in normal operation.

They are cooled by the aspirated gas, protected against overheating of the windings by an internal module that monitors their temperature and, upstream, by magnetothermic circuit breakers. These components are housed in a closed, but easily accessible, compartment.

4.4 Condenser

Condensation occurs through fin-pack coils consisting of copper tubes and collectors, aluminium fins and shoulders in galvanised sheet.

4.5 Evaporator

The evaporator is a finned pack type; the water flows in contact with the finned surface and at a speed that guarantees low pressure drops, while the refrigerant fluid flows inside the tubes.

In the TAEevo models, the exchanger is protected against the formation of ice, caused by low evaporation temperatures, through an anti-freeze function in the electronic controller. A probe monitors the temperature of the evaporator outlet water. If it is necessary to achieve a negative ambient/water temperatures, a mixture of water and glycol must be used.

To drain the circuit, see Chapter 9.4 “Emptying the process water circuit” .

4.6 Tank

The storage tank is cylindrical.

The tank can be protected against freezing by means of an electric heater managed by the electronic controller. A level sensor in the tank serves to signal low water level conditions. The standard supply includes anti-condensation cladding, a drain valve and an air bleed valve. An internal bypass between the water delivery and return connections, makes it possible to read the anti-freeze probe if the unit's process water inlet and outlet connections are inadvertently closed. In this case the unit stops due to tripping of the antifreeze alarm and the shut-off valves must be reopened.

The bypass serves exclusively to allow an antifreeze alarm to trip (if present) and to allow the pump to run with a reduced water flow rate without damage. It is advisable to avoid repeated antifreeze alarm trip cycles in the foregoing conditions.

4.7 Pump

Centrifugal pumps are installed and it is possible to choose between 2 different types, which provide two different pressures based on requirements (a 3 or 5-barg pump). It is also possible to have units without pump.

The unit can be equipped with a tandem pump, managed by the controller.

The pump seals are made of ceramics/treated carbon/EPDM.

ATTENTION

Bleed the circuit by unscrewing the bleed cap on the pump whenever the water circuit is filled .See 5.4 “Collegamenti idraulici” .

NOTE
The pump must never run dry.

4.8 Fans

Axial fans

The fans of axial type consist of a die-cast aluminium fan with sickle profile.

The protection rating of the fans is IP54.

All fans have “F” insulation class to assure the external working with all types of climates. The assembly is completed with a superior (support to the fan) safety protection grill.

Centrifugal fans (NOT present in models with 460/3/60 supply)

These are double drive fans with the fanwheel coupled directly to the motor shaft and they feature ON/OFF control. The delivery port is located on the top of the unit.

4.9 Casing

The base, uprights and panels are made of galvanized carbon steel and held together by screws and/or rivets. All panels undergo a phosphor degreasing process followed by epoxy polyester powder coating.

The frame is designed to allow easy access to all machine components.

Model		width	depth	height
NPC 280-400	(mm) (in)	1255 49.4	3290 19.5	2140 84.3

4.10 Materials in contact with the liquid to be cooled

The chosen materials are:

- evaporator with copper tubes, aluminium fins and galvanized sheet metal shoulders
- carbon steel tank;

The pump mechanical seals are made of ceramics, graphite and/or EPDM.

4.11 Minimum distances from walls in the installation ambient

See enclosures.

4.12 Electrical circuit

For the electrical connections, see Chapter 5 **“Installation“**, Installation, and consult the enclosed drawings.

4.13 Negative ambient temperatures (not present in models for 460/3/60 power supply)

In the presence of sub-zero ambient temperatures (-20) the unit is equipped with a system that assures perfect operation, also in the presence of harsh temperatures.

The additional elements fitted are:

- electronic fans speed control;
- crankcase heaters
- electrical cabinet heaters

The pump and tank can be equipped with electrical heaters to prevent icing up (instead of using glycol solutions).

CHAPTER 5

INSTALLATION

ATTENTION

Before carrying out the installation or operating on this machine, ensure that all the personnel has read and understood the Chapter 2 **"Safety"** *in this manual.*

5.1 Inspection

Immediately after uncrating, inspect the unit.

5.2 Positioning

1. The unit may be installed both outdoors and indoors.
2. If installed indoors, the room must be well ventilated and with a sufficient height which allows the air to be expelled by fans. In some cases it may be necessary to install fans or extractors to limit the temperature of the room.
3. The minimum and maximum working ambient temperature are specified on the unit data plate. In extreme temperature conditions, the protection devices may trip.
4. The machine must be positioned on any flat surface capable of supporting its weight.
5. Leave at least one metre around the unit to permit access during service operations.
6. Do not obstruct or disturb the condenser's flow of thermal exchanging air.

5.3 Antifreeze protection

Even if the minimum working ambient temperature is above 0°C it is possible for the machine - during stoppages in the cold seasons - to find itself in an environment with a temperature below 0°C.
In these cases, if the machine is not emptied, antifreeze (ethylene glycol) must be added in the following percentages to prevent the formation of ice:

Ambient temperature up to [°C] (°F)	Ethylene Glycol [% in weight]
0 (32)	0
-5 (23)	15
-10 (14)	25
-15 (5)	30
-20 (-4)	40

Table 6 ADDING ETHYLENE GLYCOL BASED ON THE AMBIENT TEMPERATURE

Add the following anti-freeze (ethylene glycol) percentages in order to avoid freezing when operating at low water outlet temperature:

Water outlet temperature up to [°C] (°F)	Ethylene Glycol [% in weight]
5 (41)	0
0 (32)	19
-5 (23)	27
-10 (14)	34
-15 (5)	39
-20 (-4)	44

Table 7 ADDITION OF ETHYLENE GLYCOL ACCORDING TO THE WATER OUTLET TEMPERATURE

ATTENTION

Carry out the level sensor calibration when the unit is activated the first time. Repeat the operation each time the composition of the process liquid changes.

5.3.1 Operating limits

The operating limits are decided at the time of sale. Refer to the contract data.

		Minimum	Maximum
ambient air temperature Standard version	°C /°F	-5 /23	43 /109.4(*)
ambient air temperature (**)	°C /°F	-20/-4(***)	43/109.4(*)
evaporator inlet water temperature	°C /°F	-5 /23(****)	35 /95
evaporator outlet water temperature	°C /°F	-10 /14(****)	30 /86

(*) With outlet water to a temperature of 15 °C

(**) Not present in models with 460/3/60 supply.

(***) With unit equipped with condensing pressure control.

(****) For temperatures below +5°C (41°F) use antifreeze solutions.

5.4 Hydraulic connections

NOTE

All hydraulic connections must be carried out by the customer.

1. Connect the unit to the water pipelines respecting the water flow direction as indicated in the annexed overall dimension drawings.
2. Provide two cocks (one at the inlet and one at the outlet) for excluding the unit when maintaining without emptying the user water circuit.
3. Fill the tank with water using:
   - A remote discharge system. In this case it is necessary to leak manually the air from the tank by operating on the manual valve.
   - If there are frequent air infiltrations into the water circuit it is advisable to install an automatic bleed valve.
4. If the machine is supplied without a pump, make sure that the pump installed by the user has the suction directly connected to the tank outlet.

NOTE

The pump must never run dry.

ATTENTION

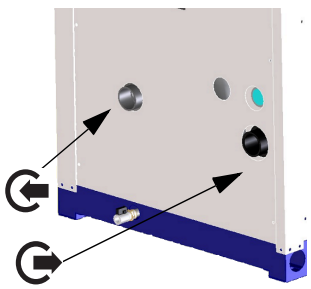
If the unit is furnished without hydraulic group, it is necessary to install a pump for the evaporation water circuit.
For maintenance purposes, we recommend installing a water drainage cock in the lower part of the circuit.

Evaporator water connection size

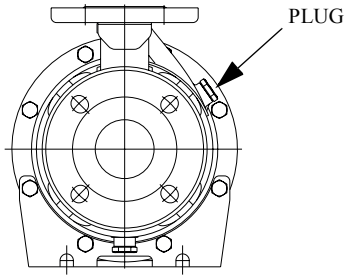
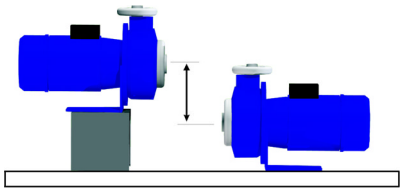
NPC unit model	280-400	Max. pressure [Bar] units with tank
Evaporator water IN/ OUT connections	2” 1/2 NPT	6

ATTENTION

For correct operation, we strongly recommend the installation of a water filter to be connected to the inlet pipe to avoid the entry of solid particles that could damage the pumps. The non-observance of this prescription can cause big damages to the evaporator.



	Process water inlet				Process water outlet		

	When filling the circuit with liquid check to ensure the absence of air bubbles and contaminants. If the pump runs noisily or emits anomalous noise it may be necessary to bleed the liquid circuit in order to prime the pump. The procedure is as follows: • unscrew the filler/breather plug at the top of the pump • fill the hydraulic circuit until water starts to overflow from the filled hole • refit the plug and tighten it Repeat the operation if the pump continues to run noisily, in such a way as to eliminate any air that had previously remained trapped in the impeller vanes.
	In the event of double pump, keep particular attention during priming the pump. It is necessary to verify first the pump positioned on the top.

5.5 Expansion tank

If the hydraulic circuit is of closed type, it is necessary to install an expansion tank.
The expansion tank must always be connected at pump inlet.
To calculate the minimum volume of the expansion tank required for a given installation, the formula below cab be used and is valid if the pressure is less than or equal to 0.5 bar when the pump is stopped and the maximum working pressure of the expansion tank is greater than or equal to 4 bar.
The volume of the expansion tank V in litres is given by the formula:
$V = 2 \cdot Vt \cdot (Ptmin - Ptmax)$
where:

Vt=	total volume of the circuit in litres
Ptmin=	specific weight at the minimum temperature obtainable by water over the year in °C (even with the plant stopped)
Ptmax=	specific weight at the maximum temperature obtainable by water over the year in °C (even with the plant stopped)

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

Table of specific weights P

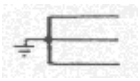
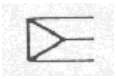
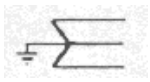
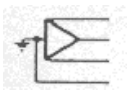
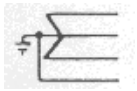
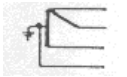
	% Glycol	0%	10%	20%	30%	40%
Temperature [°C]	-20(-4)	1,0036	1,0195	1,0353	1,0511	1,0669
	-10(14)	1,0024	1,0177	1,033	1,0483	1,0635
	0(32)	1,0008	1,0155	1,0303	1,045	1,0598
	10(50)	0,9988	1,013	1,0272	1,0414	1,0556
	20(68)	0,9964	1,0101	1,0237	1,0374	1,051
	30(86)	0,9936	1,0067	1,0199	1,033	1,0461
	40(104)	0,9905	1,003	1,0156	1,0282	1,0408

Table 8 SPECIFIC WEIGHTS

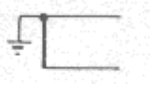
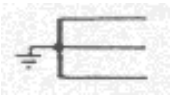
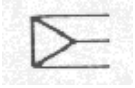
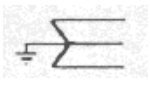
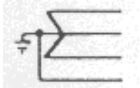
5.6 Electrical connections

The machine must be connected to the main power supply in accordance with the laws and regulations in force in the country of installation, after verifying the wiring diagram annexed to the unit.
Voltage, frequency and the number of phases must comply with the values indicated on the machine data plate.

Main distribution systems in United States:

System	Nominal Voltage	Utilization Voltage	
	120	115	110
	240/120	230/115	220/110
	600 480 240	575 460 230	550 440 220
	480	460	440
	480/277 208/120	460/266 200/115	440/254 190/110
	240/120	230/115	220/110
	240/120	230/115	220/110

Main distribution systems in Canada:

System	Nominal Voltage	Utilization Voltage	
	240 480 600	230 460 575	220 440 550
	240/120	230/115	220/110
	600 480 240	575 460 230	550 440 220
	600 480 240	575 460 230	550 440 220
	600/347 480/277 416*/240 208/120	575/332 460/266 400*/230 200/115	550/318 440/254 380*/220 190/110

For mains power input:

1. Connect the machine (terminal  in the electrical panel) to the earth system of the building;
2. Provide protection against direct contact of at least NEMA Type 1 upline from the power cable;
3. Fit a device protecting the power cable from overcurrent (short-circuit) (see indication in the electrical diagram) upline from the power cable. For this purpose, all protection devices must be homologated (“listed”).
4. Use conductors which can carry the maximum current required at the maximum ambient operating temperature, according to the type of installation chosen (seeindication in the electrical diagram). Use only UL marked copper cables, in conformity with NEC (NATIONAL ELECTRICAL CODE) and CEC (CANADIAN ELECTRICAL CODE).
5. After the connection to the circuit breaker/switch (as indicated in the wiring diagram), the unit’s power cable must exit the unit by the appropriate hole positioned on the back panel and identified by a label with the indication of the power supply.

CHAPTER 6

START UP

ATTENTION

Before starting up these units be sure that all personnel have read and understood the Chapter 2 **"Safety"**.

1. Check that the machine's on/off valves are open.
2. Check that the tank is completely full of water and properly vented .
3. Carry out the level sensor calibration as indicated in the 8.6 "Level sensor" paragraph
4. Check that the ambient temperature is within the limits indicated in the machine data plate.
5. It is possible to check that the pressure is about 0.5 bar on the manometer located on the back of the unit (only if the water circuit is of the closed type).

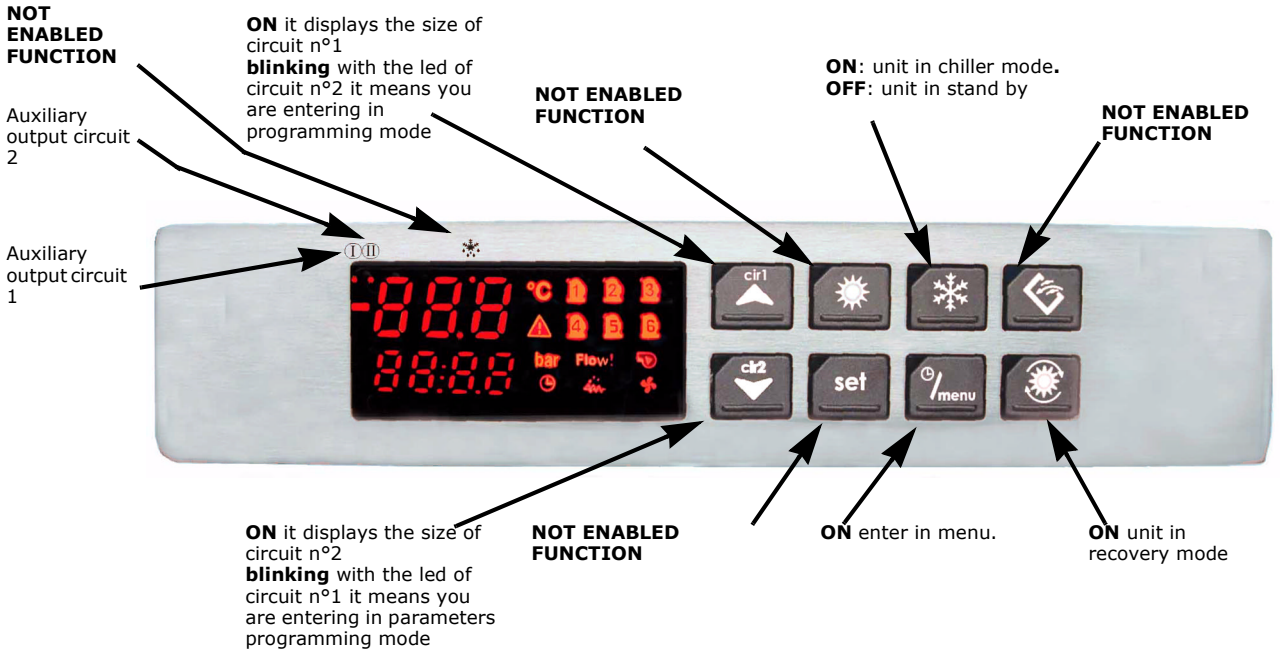
6. Check that the main switch is in the OFF position ("0").
7. Check that the power supply voltage is correct.
8. Power the machine by means of the supply line protection device.
9. Turn the machine main switch ON ("I").
10. Check that the water flows across the evaporator.
11. Press button if you want to start the unit.
    To power-off the unit, press button again.

12. In three-phase units, check that compressor works correctly (it must not be noisy or overheated) and check that the fans and the pump (if installed) rotation direction is correct.
    If necessary invert two phases of supply.
13. Check that the pressure difference between the value read on the manometer located on the machine control panel with the pump in motion and the value read with the pump stopped is higher than the available pressure with the pump's maximum flow capacity. If this difference is lower, it means that the water flow capacity is higher than the maximum value allowed. In order not to damage the pump, it is necessary to increase the pressure drop of the hydraulic circuit by, for example, partially closing a pump discharge cock.
14. Models with centrifugal fans:
    Check that the output of the centrifugal fans is correctly ducted and that the pressure drop of the ducting system is about equal to the available head. If the pressure drops are:
    - greater this means that there is a reduction in the flow of cooling air with a consequent drop in machine performance and the possibility of protection devices tripping even at relatively low ambient temperatures;
    - lower this means that the air flow may be too high for the fan and this could be dangerous for the centrifugal fan motor.
15. 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 refrigerator starts up overloaded with the consequence of possible tripping of the protection devices. To reduce this overload, a refrigerator outlet valve can be gradually (but not totally!) closed to reduce the flow of water passing through it. Open the valve as the water temperature in the hydraulic circuit reaches the working value.
16. The machine is now **ready for operating**.
    If the thermal load is lower than that produced by the unit, the water temperature drops until it reaches the set point (ST01 parameter) set following the instruction of chapter Electronic control.
    When SET-POINT value has been reached, the electronic control controlling the water inlet temperature stops the compressor. The water pump, on the other hand, is always in motion.

CHAPTER 7

ELECTRONIC CONTROL

7.1 User interface; Leds and buttons



7.2 Display

The display of the control is divided into three zones.

Top-left zone

The top-left zone shows the evaporator outlet water temperature

Bottom-left zone

The bottom-left zone shows no value.

Right zone

Signalling icons.

7.2.1 The icons of the display

ICON	ICON STATUS	MEANING
°C	ON	Celsius degrees (If viewed)
	OFF	Fahrenheit degree (If not viewed)
⚠	ON	General alarm
	BLINKING	Alarm without icon
bar	ON	Bar pressure
	OFF	PSI pressure

ICON	ICON STATUS	MEANING
	ON	Normal function; it displays the time in the bottom part of the displays. During the programming mode; it displays the time based parameters.
	BLINKING	In function menu indicates the defrost delay counting
1	ON	Compressor 1 active
	BLINKING	Compressor 1 delay counting
2	ON	Compressor 2 active.
	BLINKING	Compressor 2 delay counting
3	ON	Compressor 3 active.
	BLINKING	Compressor 3 delay counting
4	ON	Compressor 4 active
	BLINKING	Compressor 4 delay counting
5	ON	Compressor 5 active
	BLINKING	Compressor 5 delay counting
6	ON	Compressor 6 active
	BLINKING	Compressor 6 delay counting
	ON	Antifreeze resistance active
	OFF	Antifreeze resistance off
Flow!	ON	Flow alarm
	OFF	Normal operation (without flow alarm)
	ON	Pump on
	OFF	Pump off
	ON	Condensing fans on
	OFF	Condensing fans off

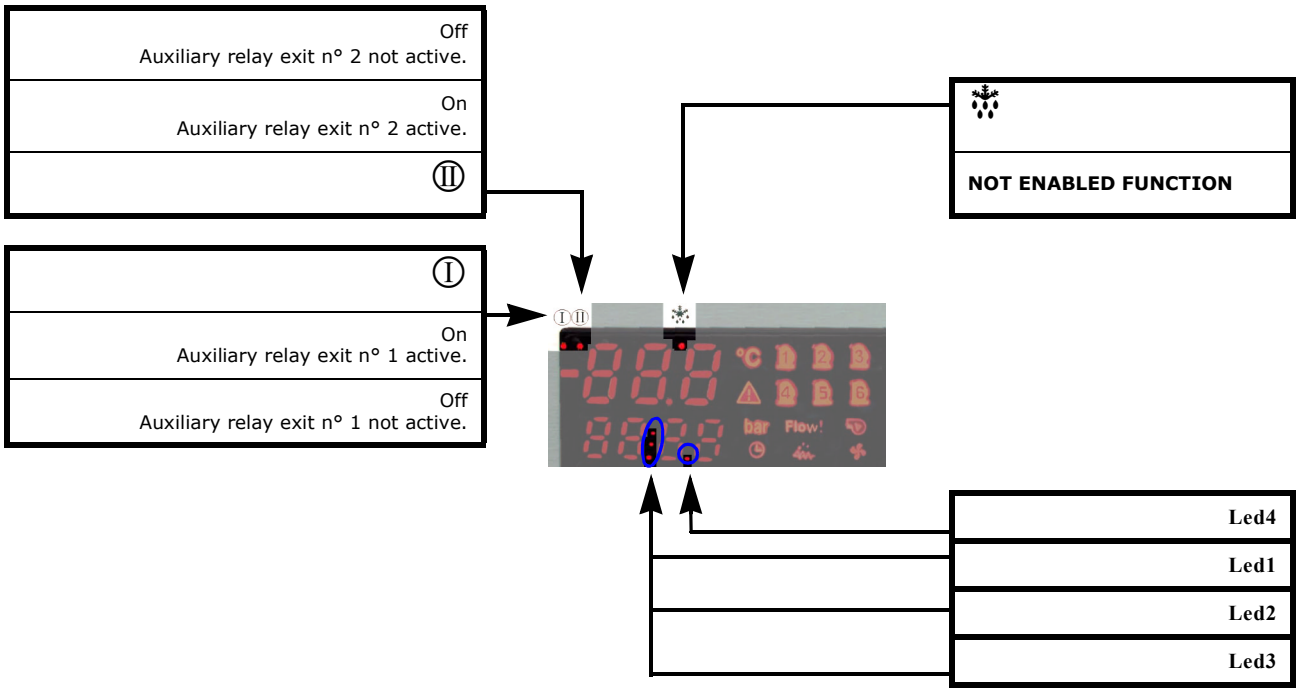
7.3 Function of the buttons

BUTTON	ACTION	FUNCTION
cir1	Press once	With **Cir1** on it shows on the display the values of the circuit n°1 probes. With **Cir2** on it shows on the display the values of the circuit n° 2.
	During the programming: press once	It scrolls the parameter codes or increases their value.
		NOT ENABLED FUNCTION
	Press once	Turn the chiller on or off, if the unit is on led is on. The led is blinking if there is a POWER ON delay or during the pump down.
		NOT ENABLED FUNCTION
		NOT ENABLED FUNCTION
menu	Press once	Enter the function menu
	Press for 3 sec.	Enter the time setting menu (control with the clock)
	During the prog.: press once	To exit from a group of parameter.
SET	Press once	Displays the set point in chiller mode (SetC label)
	Press for 3 sec.	Modify the chiller set
	During the prog.: press once	Select a parameter and confirm value
	Press when a probe label in bottom display appears	Modify the displaying from circuit 1 to circuit 2 and vice-versa.
cir2	Press once	With **Cir1** on it shows on the display the values of the circuit n°1 probes. With **Cir2** on it shows on the display the values of the circuit n° 2.
	During the prog.: press once	It views the codes of the parameters or decreases their values

7.3.1 Button function in combination

BUTTONS	ACTION	FUNCTION
cir2 + SET	Press for 3 seconds	Enter the programming.
	In Pr3 level: keep SET pressed, then press and release cir2.	Select the parameter level visibility Pr1 / Pr2 / Pr3
cir1 + SET	Press once	Exit the programming
SET + menu	In Pr3 level: keep SET pressed, then press and release menu.	Defines if the parameter can be changed or not in the other levels.

7.4 Symbols and leds of the display



- **Led n° 1 - 2 (Control with clock)**
  If the bottom display shows the time, the clock icon is on and the led n° 1 / 2 blink.
- **Led in Parameter programming:**
  Level "Pr1":

Led n°1 and Led n°2 blinking	the parameter is shown but not modifiable

7.5 Remote terminal

For the function of the buttons and of the led see 7.2 "***Display"***, 7.3 "***Function of the buttons"*** and 7.4 "***Symbols and leds of the display"***.
It is possible to connect 2 remote terminals. The remote terminal can be interfaced with a shiels cable for a maximum length of 150mt.
If there is no communication between the instrument and the remote, the top display shows "**noL**" (no link).
Failure to connect the remote terminal when the remote terminal parameter is enabled will cause the appearance of signal ATR1(2) on the controller display.

7.6 Visualization during an alarm

In the bottom of the display it will be viewed the alarm code, while above you will see the temperature/pressure blinking. The icon of the general alarm will start blinking.

7.6.1 Alarm icons

There are two icons for the alarm signalling:

⚠	Generic alarm
Flow!	Flow alarm

7.7 How to switch off the buzzer

Automatic switching off: when the alarm ends.

Manual switching off: press and release one of the six buttons; the buzzer will stop even if the alarm is not ended.

7.8 First start up

Starting up the unit for the first time, on the display could be viewed the message "rtC" and the temperature; it is necessary to set the clock. If the checking probes are not connected, or are damaged, on the display it will be viewed their specific alarm. However it is possible to continue with the setting of the clock or the programming.

7.9 Programming by keyboard

The USER level (**Pr1**) allows to enter only the user parameters, the MAINTENANCE (**Pr2**) / MANUFACTURER (**Pr3**) allows to enter the setting parameters of the machine. The parameter of the three levels are settled during the design phase.

ATTENTION

All levels are protected by a password.
The USER password is 23.

The parameters are so subdivided:

LABEL	ACTION
ALL	View all parameters
ST	View only the parameters of the Thermoregulation
dP	View only the parameters of the Display Visualization
CF	View only the parameters of the Configuration
SD	View only the parameters of the dynamic Set Point (**NOT ENABLED FUNCTION**)
ES	View only the energy saving and start up parameters (**NOT ENABLED FUNCTION**) View only the parameters of the second set-point
CO	View only the parameters of the Compressors
US	View only the auxiliary exit parameters (**NOT ENABLED FUNCTION**)
FA	View only the parameters of the Fans (**NOT ENABLED FUNCTION**)
Ar	View only the antifreeze resistance parameters
DF	View only the defrosting parameters (**NOT ENABLED FUNCTION**)
rC	View only the parameters of the recovery
AL	View only the parameters of the Alarms
Pr	Password

ATTENTION

The parameters of the "CF" configuration can be modify only when the unit is in Stand-by mode.

7.9.1 Access to the parameters

To enter the "Pr1" menu parameters (user level):

1. Press for 3 sec. the buttons SET+cir2 the top display shows the label "**PAS**" and the bottom display the label "**Pr1**". The programming can start when the leds cr1-cr2 of the buttons cir1 + cir2 switch on.

After entering the programming, press the button SET, the top display shows "**0**" blinking.

To move the password use the buttons cir1 or cir2.

If the password is wrong it must be wrote again. If the password is right press SET to view the parameters. The top display shows the first label "**ALL**".

To choose the labels press cir1 or cir2 and than SET. The bottom display shows the label and the code of its first parameter, the top display shows its value.

ATTENTION

Some parameters can be views but not modified. If the parameter can not be modify the Led n°1 and n°2 blink.

To exit the programming and enter the normal visualization press together the buttons SET + cir1.

7.9.2 How to change the value of a parameter

1. Enter the programming;
2. Press together SET + cir2 for 3 sec.
3. Choose the parameter.
4. To modify the value press SET.
5. Modify the value using cir1 or cir2.
6. Press SET to memorize the new value and go to the code of the next parameter.
7. To exit the programming press SET + cir2 or wait for 15 sec. without pressing any button.

NOTE

The new value is memorized even if you exit the programming because of the time out, without pressing SET.

7.10 Values shown on the display

As default, in normal condition, the display shows the circuit 1 information.

The displayed circuit is indicated from the corresponding LED Cir1 (circuit n° 1) on, near the button cir1, or Cir2 (circuit n° 2) on near the button cir2.

7.10.1 How to display the values inside a circuit

When the led Cir1 is on, press cir1 or cir2 to display the values checked by the circuit n° 1.

When the led Cir1 is on, press cir1 or cir2 to display the values checked by the circuit n° 2.

To each value corresponds a label with the temperature and pressure values showed by the displays (see the top/bottom display visualization table).

7.10.2 How to move the visualization of the values from circuit n° 1 to circuit n° 2

To move from a circuit to another one use cir1 or cir2 and select an identification label of a circuit, press SET.

7.11 Unit start up and stop

The unit can be started up and stopped from:

- Keyboard
- Digital input configured as remote ON/OFF

When the unit is turned off, the stand-by mode is activated.

The electronic control is in stand-by when the led near ❄ button is off.

Also in stand-by the electronic control allows to:

1. display the measured values
2. manage alarm situations by displaying and signalling.

7.11.1 Unit start up and stop from keyboard

Press and release ❄ button: it allows to start up or stop the unit. When the unit is running and the led near the corresponding button is on.

7.11.2 Unit start up and stop from digital input

From digital input configured as remote ON/OFF, that is able to commute the unit operation on/off.
The digital input overrides the keyboard command, you can use the keyboard to start up and turn off the unit only if the digital input is not active.
When you disconnect the digital input, the control goes back to the status before its activation.

7.12 Function menu, button "menu"

Enter the function menu

Press and release menu (menu).

Exit the function menu

Press and release menu or wait the time out.

Entering the function menu allows to:

1. Display and reset the present alarms
   ALrM function
2. Reset the compressor overload alarms
   COtr function
3. Display and clear the alarm historic
   ALOG function
4. Upload the parameters from the control to the key
   UPL function
5. Enable or disable the operation of one circuit from keyboard
   CrEn function
6. Enable or disable the operation of one compressor from keyboard
   COEn function
7. Display the temperature of compressor outlet
   COdt function **(when the compressor outlet temperature probe is present)**
8. Display and reset the hours of operation of controlled loads
   Hour function
9. Display and reset the starting number of each compressor
   COSn function
10. Display the operation percentage of the 4 proportional exits 0 ÷ 10 Volt
    Pout function
11. Display the temperature of the probes that check the auxiliary exits
    uS function (if enabled)

To scroll the list of the functions use cir1 or cir2 button.

7.12.1 How to view and reset the status of an alarm

ATTENTION

This procedure can reset all the alarms except for the compressor thermal alarm COtr.
Resetting a compressor thermal alarm is explained in the next paragraph.

1. Enter the functions menu
2. Pressing cir1 or cir2 select the **ALrM** function
3. Press SET.

   If any alarm is on, the pressure of SET is not enabled.
4. The bottom display shows the label with the alarm code, while the top display shows the label **rSt** (if the alarm can be reset) or the label **NO** (if the alarm can not be reset).
5. Scroll all alarms using cir1 or cir2.
6. Pressing SET on the label **rSt** the alarm can be reset. With the same procedure all resettable alarm can be reset. Pressing SET on a not resettable alarm (label **NO**) it does not happen anything; to view the next alarm press cir1 or cir2.
7. To exit the function **ALrM** and go back to the normal visualization, press menu or wait for the time-out.

7.12.2 How to reset a compressor thermal protection alarm

Inside the function **COtr** are displayed all compressor thermal protection alarms of manual reset enabled.
The labels **CO1r - CO2r - CO3r - CO4r - CO5r - CO6r** are present according to the digital input configured as compressor thermal protection alarm.

ATTENTION

The function **COtr** *is present in function menu only if the number of tripping per hour of the compressor thermal protection alarm, set by parameter* **AL20**, *is reached. When this number is reached the alarm resetting changes from automatic to manual.*

Manual reset alarm:

1. Enter the function menu
2. Pressing cir1 or cir2 select the **COtr** function on the bottom display
3. Press SET, the bottom display shows the label of the compressor thermal protection alarm
4. Pressing SET if the alarm in not resettable, it will appear the label **NO**. Anything will happen.
5. Pressing SET button near the label **rSt** it is requested the password for resetting, in the bottom display appears the label **ArSt** and in the top display **PAS**.
6. Press SET: in the bottom display appears **PAS** and in the top display **0** flashing.
   Insert the password for resetting using cir1 or cir2 buttons.
   If the password is correct the label **ArSt** flashes for 3 sec. to confirm the reset, if the password is wrong, the bottom display shows **PAS** and the top display **0** flashing. If the password is not inserted again within 5 sec. the label **CO1r** is automatically displayed again.
7. To exit the function **COtr** and return in normal displaying, press menu button or wait for time-out
8. Repeat the operations 2 - 5 with all compressor thermal protection alarms.

ATTENTION

The password for resetting the compressor thermal protection alarm corresponds to the value of parameter AL46 which is 4.

7.12.3 How to display the alarm history list

The function of displaying the alarms codes can be activated only if there are alarm events.

1. Enter the function menu
2. Select the function **ALOG**
3. Press SET.
   If any alarm is on, the pressure of SET is not enabled.
4. The bottom display shows the label with the alarm code, while the top display shows the label "**n**" and a progressive number from 00 to 99.
5. Scroll the alarms list using cir1 or cir2.
6. To exit **ALOG** function and return to the normal visualization press menu or wait for the time-out.

7.13 Other displaying

7.13.1 How to display the set point

1. Press and release SET button, the leds indicating the circuits light off and the operating set point is displayed
2. When unit in stand-by the bottom display will show **SetC** (chiller set).
   When unit operating it will show only the set point of the operating status.
   The top display will show the set value.

7.13.2 How to modify the set point

1. Press SET button for 3 sec. at least, the leds of circuits light off and the operating set point flashes.
2. To modify the value use cir1 or cir2 buttons.
3. To store the new set point, press SET or wait for time-out to exit the programming procedure.

7.13.3 Display read-out on unit stopped by remote control

From a digital input configured as a remote ON/OFF, when the input is active the OFF command is generated.
The top display shows "**OFF**" with the decimal places LED flashing.

7.14 Compressors unloading function

This procedure is necessary when sudden peaks in cooling demand occur, for instance if the machine is restarted after a long period of inactivity. Under these conditions the evaporator inlet water temperature might be so high as to require a cooling delivery in excess of system capacity. The consequent system overload would require the start-up of all the compressors at once, which would be forced to operate in near-limit conditions.
The overburdened compressors would thus be subject to dangerous overheating which would cause the activation of the thermal protections, or the pressure of the refrigerant gas could reach alarm levels which would cause the machine to shut down.
This function enables the machine to run (through the switch-off or capacity step operation of the compressors) even when the temperature of the water at the evaporator's inlet is high (summer start-up with hot water accumulation), preventing the possible triggering of high pressure alarms. (see alarm table)

7.15 Probe key

In this chapter are indicated the probes **BTWOT**, **BEWOT1**, **BEWOT2, BHP1, BHP2** and **BAT1**, for their positioning consult the refrigerant drawing.
Their description is indicated in the following table:

Name in the manual	Borne name	Description
-BTWOT	**PB2**	TANK WATER OUTLET TEMPERATURE PROBE
-BHP1	**PB3**	HIGH PRESSURE TRANSDUCER OF CIRCUIT 1
-BHP2	**PB4**	HIGH PRESSURE TRANSDUCER OF CIRCUIT 2
-BEWOT1	**PB7**	EVAPORATOR WATER OUTLET TEMPERATURE PROBE CIRCUIT 1
-BEWOT2	**PB8**	EVAPORATOR WATER OUTLET TEMPERATURE PROBE CIRCUIT 2
BAT1	**PB9**	AMBIENT TEMPERATURE PROBE (Only if antifreeze protection is present)

CHAPTER 8

OTHER COMPONENTS SETTING

8.1 Compressor integral protection (PI)

For each compressor, this protection consists of three or six thermistor probes, each inserted in the winding of a motor phase; they are connected in series and, depending on the model, the terminals can be external. This system ensures complete protection against most of the problems which can give rise to burning of the windings. When it trips, it is necessary to find and eliminate the cause; then you can start the machine again by pressing ON-OFF button.

8.2 Refrigerant high and low pressure switches

The units are fitted with the following pressure switches:

1. **low pressure switch (LP)**
   This monitors refrigerant compressor suction pressure and will trip to avoid that values dangerous for compressor normal operation are reached. It is of an “automatic reset” type. The alarm **A02** (see chapter "12.1 Alarm codes and actions"), produced by this pressure switch tripping, can have a delay time after the compressor starting to avoid simple intake pressure fluctuations or false alarms interfere with the unit normal operation. After the time set, the pressure switch tripping will be detected by the electronic board which will display the alarm signal **A02** (see chapter "12.1 Alarm codes and actions") band will stop the compressor/s while the pump (if it is installed) will continue to operate. After the alarm tripping, if the compressor intake pressure increases and exceeds the pressure switch tripping value it will restart. It will be possible to start up the unit again following the alarm reset procedure described in Chapter 7 “***Electronic control”***. If the cause of the pressure switch tripping has not removed this cycle will repeat continuously.
2. **high pressure switch (HP)**
   This monitors the refrigerant compressor discharge pressure and prevents it increases to levels dangerous for compressor working and for people safety. It is of an “automatic reset” type. Its tripping is detected by the electronic board which will open the compressor power supply circuit and will display the alarm signal **A01** (see chapter "12.1 Alarm codes and actions").
   When the compressor outlet pressure drops below the reset point it is reset.
   It will be possible to start up the unit again following the alarm reset procedure described in Chapter 7 “***Electronic control”***.
   If the cause of the pressure switch tripping has not removed this cycle will repeat continuously.

The pressure switches LP and HP are screwed to the refrigerant circuit piping with SCHRAEDER valves (with needle) which prevent leakage during replacement.

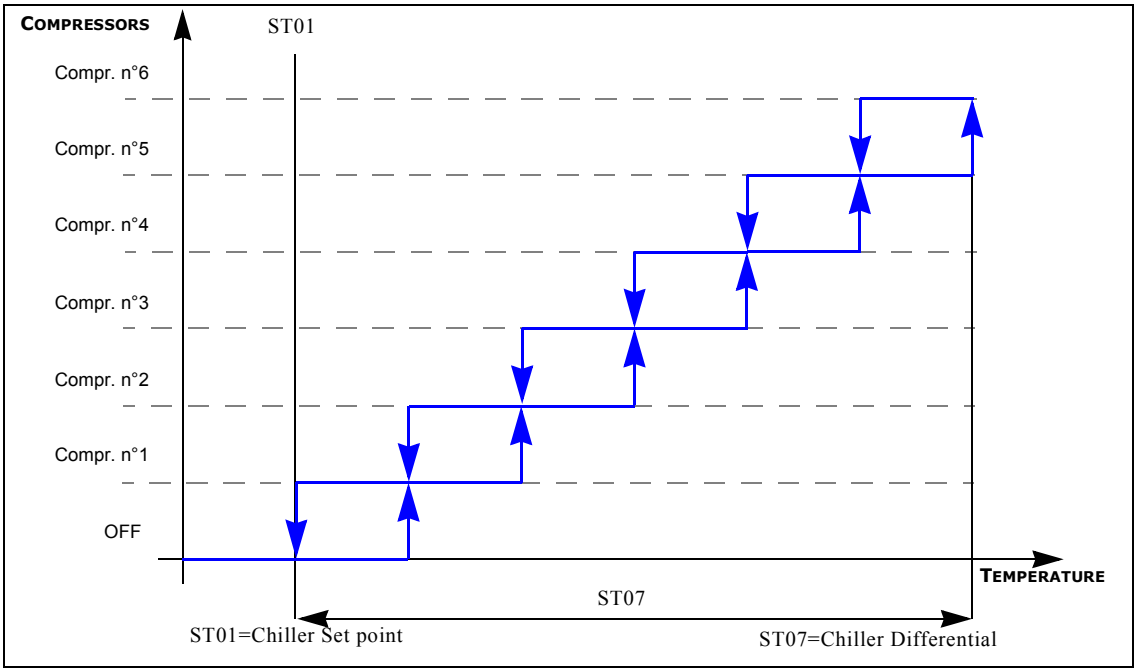
The TRIP and RESET values of the pressure switches depend upon the refrigerant gas used and are listed in the table below:

Pressure switch	Refrigerant	TRIP				RESET			
		bar	PSI	°C	°F	bar	PSI	°C	°F
HP	R407C	27.2	394.5	63.4	146.1	20.5	297.3	51.5	124.7
LP		1.7	24.6	-17.3	0.9	2.7	39.1	-8.8	16.2

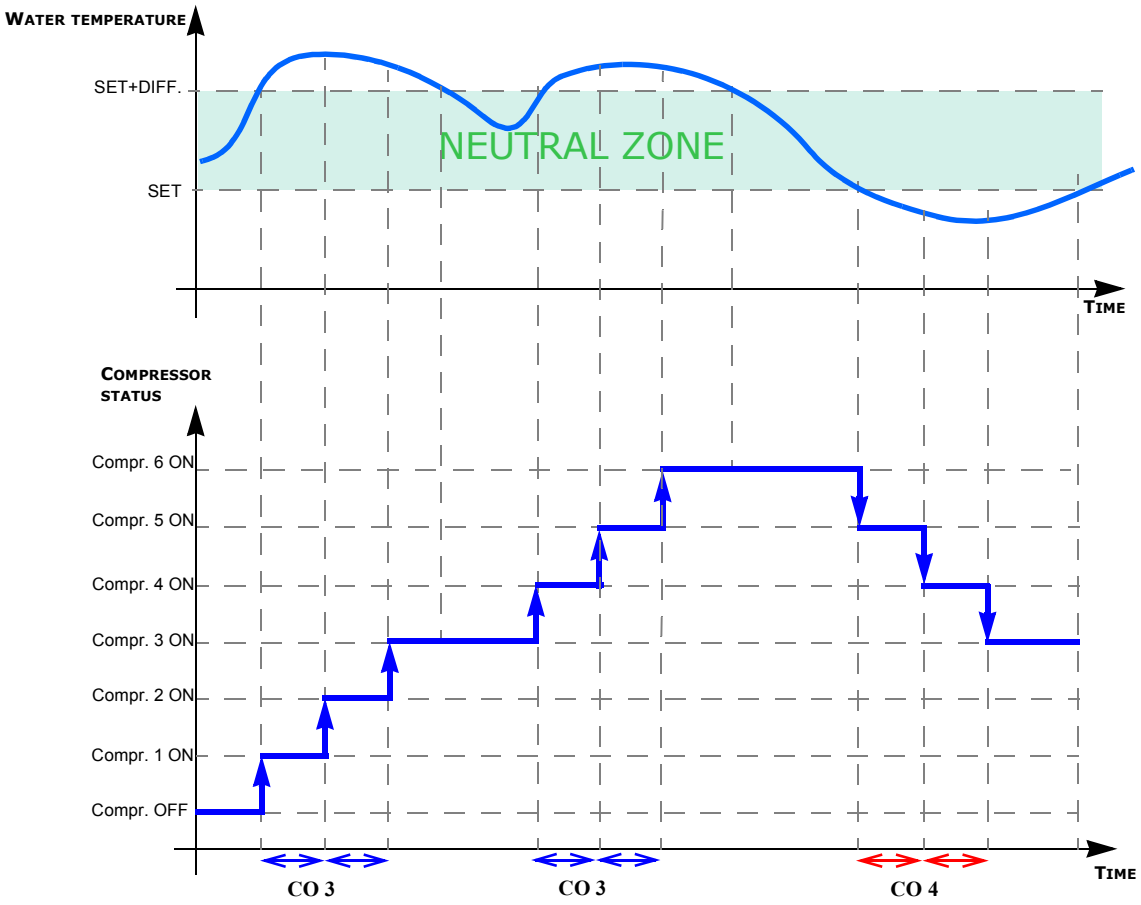
8.3 Compressor operation

The type of thermoregulation can be:

- Proportional
- Neutral Zone:



The Proportional regulation uses as reference the temperature and differential values. When the temperature increases the compressors will start pregressively. Whne the temperature value decreases under the differential the compressors will stop progressively.



CO 3 = Delay between starting 2 compressors. CO 4 =Delay between stopping 2 compressors.

NEUTRAL ZONE= Set point (ST01)-[Set point (ST01)+Diff. (ST07)]

The Neutral Zone regulation uses a further variable: the time. The starting of compressors depends on the temperature value during a certain time. If during a certain time the temperature measured increases, the compressors will start with a delayed sequence. In this way the number of compressors in operation is always optimal.

8.4 Pressure transducers

All models have a high pressure transducer in the refrigeration circuit.

Measuring the outlet pressures of the compressors, they control the unit operation, according to the pressure setpoint values adjusted by the electronic control.

With these measured values it is possible to control the following functions of each circuit separately:

- high pressure alarm;
- unloading for high pressure;
- high pressure values measurement.

For this reason, if the pressure of a circuit rises above the set limit, there may be an alarm signal that locks the machine and the more or less delayed powering-off of one or more compressors.

8.5 Fan regulation

The fans can be controlled in two different ways:

- with speed regulator (**speed control**)
- by steps (**step**)

The selection is fixed according to the unit configuration.

1. **Units configured with "STEP" fans**

   These units are furnished with a pressure transducer positioned on the refrigerant compressor outlet pipeline.

   According to the pressure detected by the transducer, the electronic control switches on or off the fans.

2. **Units configured with fan speed regulator (NOT present with 460/3/60 Hz supply)**

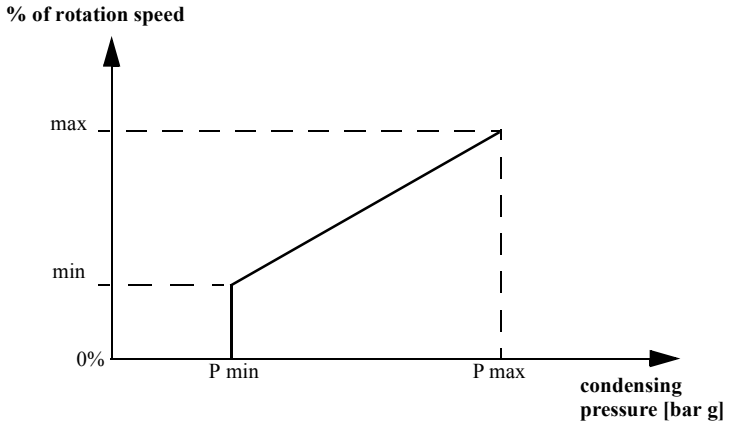
   The unit is furnished with a speed regulator of fan rotation, which operates to maintain the condensing pressure within a pre-fixed value.

   These units are furnished with a pressure transducer positioned on the refrigerant compressor outlet pipeline.

   For example, if the temperature of the air sent to the condenser decreases, the pressure transducer will measure a decreasing of the condensing pressure. This pressure decreasing is sent to the speed regulator which will reduce the fan speed and consequently, the condenser air flow will be reduced.

   Analogously, when the air temperature to the condenser and the condensing pressure increase, the regulator will increase continuously the fan speed to increase the air flow through the condenser.

   The following graphic shows the progress of the fan rotation speed according to the condensing pressure changings.



ATTENTION

The pressure and the fan rotation speed values are set by the electronic control and can not be modified by the user.

8.6 Level sensor

ATTENTION

- Take all the necessary precautionary measures to avoid accidental contact with powered elements.

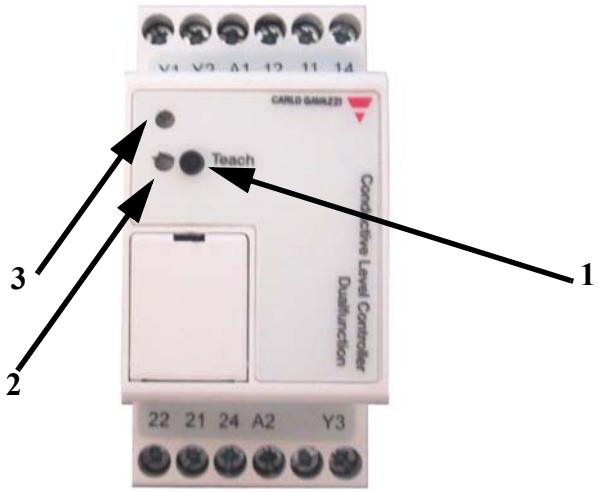
- The voltage values inside the electric panel can be lethal for humans.

- The manufacturer is responsible for level sensor calibration and therefore further modifications are not necessary. Key (1) is sealed to prevent tampering by the user.

The level sensor indicates the absence of process water inside the tank. An alarm, with relative blocking of the unit, appears on the control display.

Level sensor calibration **(to be performed only on instruction by the nano-purification solutions Service Centre)**:

1. Make sure the level probe is immersed in the liquid (at least 1 cm).
2. Power on the system; green LED (3) will illuminate steadily.
3. Amber LED (2) may illuminate or remain off.
4. Press black “Teach” pushbutton (1) and hold down for more than 2 seconds.
5. Green LED (3) will flash while amber LED (2) can:
   - illuminate, if it was previously off
   - remain illuminated, if it was previously lit.
6. This sequence of steps causes the device to self-calibrate in accordance with the electrical resistance of the liquid.



NOTE

If the electrical resistance of the liquid is outside the maximum range of the control device, green LED (3) will flash rapidly for 2 seconds while amber LED (2) remains off, thus signalling a teach-in error.

ATTENTION

The level sensor has been calibrated by nano-purification solutions to operate at maximum sensitivity admissible on the instrument (220kOhm). Modifications to this setting may impair correct operation.

CHAPTER 9

OPERATION AND MAINTENANCE

9.1 Operation

The machine operates in completely automatic mode.

There is not necessary to turn it off when there is no thermal load as it turns off automatically when the preset water outlet temperature has been reached.

9.2 Maintenance

ATTENTION

Before proceeding with the installation or the maintenance of these units be sure that all personnel concerned have read and understood the Chapter 2 **"Safety"**.

9.3 Unit access

ATTENTION

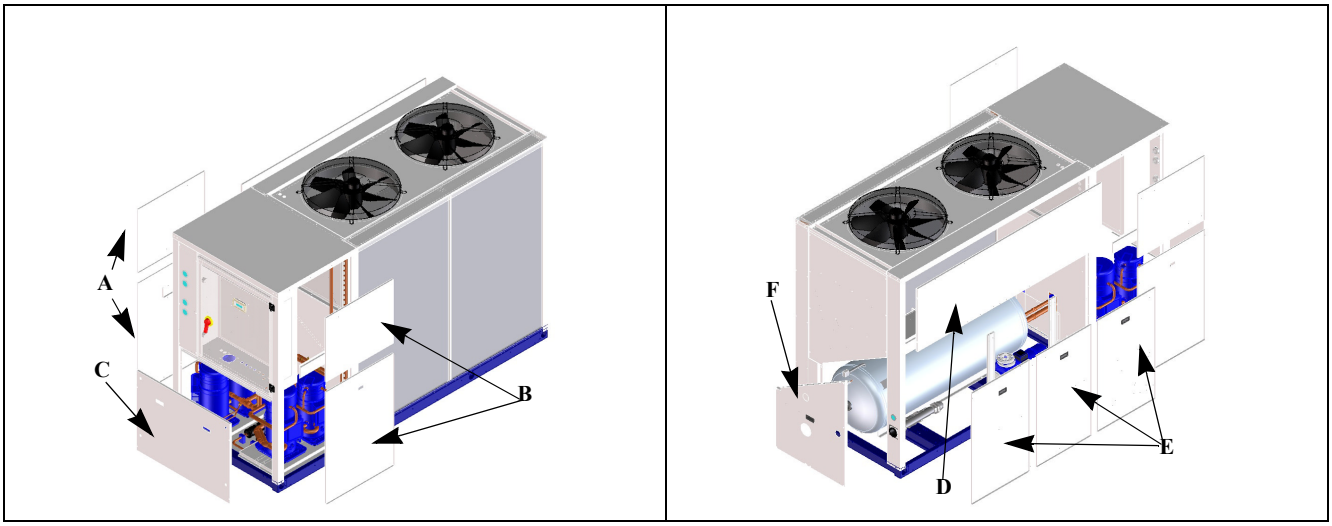
Everytime the panels must be removed the unit must be switched off and disconnected from power supply.

To access the components of the refrigerant circuit use an appropriate key furnished with the unit and operate on the closing bolts of the front panel (A).

The access to the evaporator and to the components of the hydraulic circuit can be carried out by unscrewing, by a screwdriver, the screws fixing the panel (B).

To access the components of the electrical circuit remove the front panel (C).

A further access to the evaporator and to the components of the hydraulic circuit can be carried out by removing the panel (F) or the side panels (D) and (E).

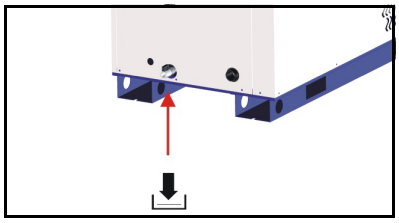


9.4 Emptying the process water circuit

Use the cock installed on the unit lower side if the storage tank need to be emptied for maintenance purposes (in models fitted with a hydraulic unit).

ATTENTION

The water circuit must be emptied when a unit that has no heating elements or anti-freeze liquid is to be left inactive for a certain period of time in an environment where the temperature may fall low enough to freeze the water in the evaporator (with the risk of breaking the evaporator).



9.5 Maintenance schedule

OPERATION	1 day	1 month	6 months	1 year
Check for any alarm signals.	x			
Check that the water outlet temperature is within the envisaged range.	x			
Check that the water inlet temperature is in accordance with the value used for selecting the unit.		x		
In units with hydraulic group, check that the pressure in the tank (with pump stopped, if present) is at least 0.5 bar with the circuit closed.		x		
In units with hydraulic group, check that the difference between the discharge and the suction pressure of the pump (measured on the manometer with the pump stopped) is within expected limits and, in particular, that it is not lower than the value corresponding to the maximum flow capacity.		x		
Clean the water filter. We recommend to clean the filter after a week from the unit starting.		x		
Check that the liquid indicator (if present) is full or with a small stream of bubbles when the compressor is running.			x	
Check that the unit current absorption is within the values on the data plate.			x	
Carry out visual inspection of refrigerant circuit, looking out for any deterioration of the piping or any traces of oil which might indicate a refrigerant leak.			x	
Check the condition and security of piping connections.			x	
Check the condition and security of electrical connections.			x	
Using a spanner, check that the connections between the compressor inlet and outlet pipelines have not slackened.			x	
Check that the ambient air temperature is within the unit capacities. Check that the environment is well ventilated.		x		
Check that fan is automatically switched on. Thoroughly clean the fins of the condenser with soft brush and/or jet of clean compressed air. Check that the grilles of the unit are free from dirt and any other obstructions.			x	
Clean condenser fins with a mild detergent.				x

ATTENTION

- This plan is based on an average working situation.
- In some installations it may be necessary to increase the frequency of maintenance.

CHAPTER 10

TROUBLE SHOOTING

PROBLEM	CAUSE	SYMPTOM	REMEDY
A Tank water outlet temperature **BTWOT** higher than the expected value.	**A1** Thermal load too high.	**A1.1** Temperature **BTWOT** greater than expected value.	Restore the thermal load to within the preset limits.
	A2 Ambient temperature too high.	**A2.1** See A1.1	In the event of installation in a closed place, if it is possible, increase the change air flow into the installation location, to restore the ambient temperature to within the preset limits.
	A3 Condenser fins are dirty.	**A3.1** See A1.1	Clean the condenser fins.
	A4 Front surface of the condenser obstructed.	**A4.1** See A1.1	Free the front surface of the condenser.
	A5 Lack of refrigerant in the plant.	**A5.1** • See **A1.1**; • evaporating pressure too low; • a lot of bubbles in the liquid indicator.	Get a refrigerator technician to check for leaks and eliminate them. Fill the plant.
	A6 Compressor protection trips.	**A6.1** • The head and the body of the compressor are very hot; • the compressor stops and try to start up again after few seconds.	Get a refrigerator technician to check for leaks and eliminate them. Fill the plant.
B Low pressure drop (water pressure) at pump outlet.	**B1** Water flow too high. Wrong working of the pump (high flow, low discharge head, high absorption).	**B1.1** • Possible increase in the outlet temperature **BTWOT** (see A1.1); • with pump installed on the machine: pressure difference, read on the machine pressure gauge, too low with pump stopped and pump running; • possible tripping of pump thermal protection.	Reduce water flow to within the preset limits, for example by closing partially a pump outlet cock. Reset the pump thermal protection and check the electrical absorption.
	B2 See point C.	**B2.1** See point C.	See point C.
	B3 Evaporator obstructed because of dirt transported by the utilization water.	**B3.1** High water temperature difference between input and outlet.	Depending on the type of dirt: • clean the evaporator by running a detergent solution which is not aggressive for steel, aluminium and copper; • run a high water flow against the stream. Install a filter upstream from the unit.
C Water differential pressure switch FLOW alarm trips. Alarm displayed: AEF	**C1** The filter upstream from the unit is obstructed, if installed.	**C1.1** • Water does not flow. Pressure difference between inlet and outlet lower than 25mbar. • Alarm displayed: AEF. • main alarm relay tripped.	Clean the upstream filter, if installed. Follow the alarm reset procedure to star up the unit again (chapter Electronic control).
	C2 The pump is defective or rotate in the wrong direction. (three-phases supply).	**C2.1** • See **C1.1**; • main alarm relay tripped.	Check the pump electrical supply and, if it is necessary, invert the two phases. Follow the alarm reset procedure to star up the unit again (chapter Electronic control).
	C3 Water inlet-outlet inverted (units without hydraulic kit).	**C3.1** • See **C1.1**; • main alarm relay tripped.	Invert the water inlet-outlet. Follow the alarm reset procedure to star up the unit again (chapter Electronic control).

PROBLEM	CAUSE	SYMPTOM	REMEDY
D High pressure switch tripped (HP) Alarm displayed: B_HP	**D1** The fan doesn't work.	**D1.1** • Refrigerant compressor stops; • the indication B_HP appears on the display alternated to **BTWOT** value; • main alarm relay tripped; •	Repair or replace the fan. Verify the eventual heat protection of the fan/s. Follow the alarm reset procedure to star up the unit again (chapter Electronic control). Check the fan speed regulation system.
	D2 Ambient air temperature too high.	**D2.1** • Air ambient temperature higher than maximum permitted value; • see **D1.1**	In the event of installation in a closed place, reduce the ambient temperature to within design limits, for example by increasing local ventilation. Follow the alarm reset procedure to star up the unit again (chapter Electronic control).
	D3 Recirculation of warm air due to incorrect installation location.	**D3.1** • Condenser thermal exchanging air temperature higher than the permitted value; • see **D1.1**	Change the position of the unit or the position of any adjacent obstructions to avoid recirculation. Follow the alarm reset procedure to star up the unit again (chapter Electronic control).
	D4 See **A3**	**D4.1** See **D1.1**	Clean the condenser fins. Follow the alarm reset procedure to star up the unit again (chapter Electronic control).
	D5 See **A4**	**D5.1** See **D1.1**	Clean the front surface of the condenser. Follow the alarm reset procedure to star up the unit again (chapter Electronic control).
	D6 Thermal load too high.	**D6.1** • Water outlet temperature too high; • refrigerant compressor stops; • main alarm relay tripped.	If possible, reduce the thermal load to within the design limits. Follow the alarm reset procedure to star up the unit again (chapter Electronic control).
E Low pressure switch tripped (LP) Alarm displayed: B_LP	**E1** Lack of refrigerant (see also **A5**).	**E1.1** • Refrigerant compressor stops; • the indication B_LP appears on the display alternated to **BTWOT** value; • main alarm relay tripped. •	Call a qualified refrigeration engineer to check for leaks and replenish refrigerant charge.
	E2 The filter upstream from the unit is dirty, if installed.	**E2.1** See **E1.1**.	Clean or replace the water inlet filter, if installed.
F Compressor protection trips Alarm displayed: C_10	**F1** Thermal load too high combined with a shortage of refrigerant (also see **A5**).	**F1.1** • The head and the body of the compressor are very hot; • the compressor stops and tries to restart after a short period (even a few seconds); • compressor thermal protection trips; • the indication C_10 appears on the display; • the led of general alarm icon ⚠ lights up.	Call a qualified refrigeration engineer to check for leaks and replenish refrigerant charge.
	F2 The rotation direction of scroll compressor is wrong (only three-phase units).	**F2.1** The refrigerant fluid is not compressed and the unit doesn't cool.	Invert two phases of the power supply.
G Digital display and all LEDs off although P1 main switch On ("I").	**G1** Auxiliary circuit fuse tripping.	**G1.1** Measuring with a tester the voltage at the transformer secondary winding connector, there will be not tension survey.	Check the causes of the fuse tripping. Replace the fuse.

PROBLEM	CAUSE	SYMPTOM	REMEDY
	G2 Abnormal power consumption by one or more of the control board components.	**G2.1** Despite presence of power at the connectors of the control board, the display and all LEDs remain unlit.	Try to turn the unit OFF and ON again. If this doesn't solve the problem, contact the nearest service centre
H Alarm displayed: AP_	**H1** Probe **BEWOT**, **BTWOT**, **BAT1** damaged.	**H1.1** • See problem; • main alarm relay tripped.	Check that the temperature probe is correctly connected to the control board terminals and that the cable is undamaged. If necessary replace the probe.
I Alarm displayed: Ht	**I1** Low water outlet temperature. The value fixed by the parameter is lower than the one measured by the probe.	**I1.1** • See problem; • the compressor stops and restarts; • main alarm relay tripped. • the led of general alarm icon ⚠ lights up.	Identify and remove the cause which provoked **BTWOT** temperature decreasing to a value lower than Ar03.
	I2 Too low water flow.	**I2.1** • See problem; • the compressor stops and restarts; • main alarm relay tripped.	Increase the water flow.
J Alarm displayed: AtE pump thermal protection.	**J1** The pump's thermal protection device has tripped because the water flow is too high.	**J1.1** • See problem; • main alarm relay tripped; • the refrigerant compressor and pump stop; • the indication AtE appears on the display alternated to **BTWOT** value; • the pressure difference read on the machine gauge with the pump stopped and pump running is lower than the available head with maximum pump flow.	Reset the thermal protection device. Increase the pressure drop in the hydraulic circuit, for example by partially closing the pump output valve.
	J2 The grille through which the pump cooling air passes is obstructed.	**J2.1** • See problem; • main alarm relay tripped; • the refrigerant compressor and pump stop.	Reset the thermal protection device. Free the grille.
	J3 The pump is defective.	**J3.1** • See problem; • main alarm relay tripped; • the refrigerant compressor and pump stop; • the current absorbed by the pump is greater than the nominal rating; • the pump may be noisy.	Reset the thermal protection device. Replace the pump.
K Alarm , ACF6, ACF7,ACF8,ACF9	**K1** Configuration error.	**K1.1** ACFx flashes on the display and unit blocked.	Turn off and turn on the unit. If this does not solve the problem, contact the nearest service centre.
L Alarm AEE	**L1** The processor does not memorize the data in the right way	**L1.1** • The machine does not work; • AEE flashes on the display; • the led of general alarm icon ⚠ lights up.	Turn off and turn on the unit. If this does not solve the problem, contact the nearest service centre.

CHAPTER 11

SETTING TABLES

The following tables show the list of all masks which contain adjustable parameters.
On **Factory setting** column are indicated the setting values set during the unit testing; they are referred only to the unit which has the same serial number you can find on the label of the first page of this manual.

DANGER

The wrong programming of the electronic control could cause big damages to the unit.
The parameters can be modified by specialized personnel only.

ATTENTION

The values of the probes can be displayed using a measurement system other than the manufacturer's factory setting. This operation does not automatically convert the parameter values, which retain the measurement unit set by the manufacturer. To change the measurement unit from one system to the next proceed with the utmost caution and ensure the operation is carried out by skilled personnel.

11.1 Parameter setting

To modify the following parameters, follow the procedure illustrated in chapters 7.9.1 “Access to the parameters” and 7.9.2 “How to change the value of a parameter” .

11.1.1 Thermoregulation parameters

Parameter	Description	Min.	Max.	Udm	Resolution	Factory setting
ST01	Chiller set point It allows to fix the operating set point during chiller operation	**ST02**	**ST03**	°C °F	dec int	 45°F
ST02	Chiller minimum Setpoint It fixes the min. setpoint limit during chiller operation	-30.0 -22	**ST01**	°C °F	Dec int	 41°F
ST07	Tripping band of regulation steps during chiller operation	0.1 0	25.0 45	°C °F	Dec int	 7.0°F
Pr1	Password	0	999			023
Pr2	Password	0	999			
Pr3	Password	0	999			

11.1.2 Displaying parameters

Parameter	Description	Min.	Max.	Udm	Resolution	Factory setting
Displaying						
Forced displaying of remote terminals						
Pr1	Password	0	999			023
Pr2	Password	0	999			
Pr3	Password	0	999			

11.1.3 Configuration parameters

Parameter	Description	Min.	Max.	Udm	Resolution	Factory setting
Unit						
Compressors						
Analogue inputs						
Probe Offset						
Digital inputs						
Relay outputs						
Condensing proportional outputs						
Module outputs						
Remote terminal						
CF74	Remote terminal n° 1 configuration: 0= absent 1= NTC probe installed 2= NTC probe not installed	0	2			0 2 **with remote terminal kit**
Operating logic						

Parameter	Description	Min.	Max.	Udm	Resolution	Factory setting
Chiller / Heat pump operation selection						
Automatic change over						
Unit of measurement selection						
Net frequency selection						
Serial address						
CF84	Serial address	1	247			1
CF86	Mappa parametri Eeprom.					0
Pr1	Password	0	999			023
Pr2	Password	0	999			
Pr3	Password	0	999			

11.1.4 Dynamic set point parameters (NOT ENABLED FUNCTION)

Parameter	Description	Min.	Max.	Udm	Resolution	Factory setting
Pr1	Password	0	999			023
Pr2	Password	0	999			
Pr3	Password	0	999			

11.1.5 Energy saving parameters (NOT ENABLED FUNCTION) - Double set point

Parameter	Description	Min.	Max.	Udm	Resolution	Factory setting
Pr1	Password	0	999			023
Pr2	Password	0	999			
Pr3	Password	0	999			

11.1.6 Compressor parameters

Parameter	Description	Min.	Max.	Udm	Resolution	Factory setting
Capacity controls (NOT ENABLED FUNCTION)						
Compressor start-up						
Compressor rotation - balancing - thermoregulation						
Evaporator water pump (NOT ENABLED FUNCTION)						
Condenser water pump (NOT ENABLED FUNCTION)						
Load maintenance						
Pump down (OPTION)						
Evaporator Unloading (NOT ENABLED FUNCTION)						
Condenser Unloading						
Compressor liquid injection function						
Resource management in neutral zone operation						
Pr1	Password	0	999			023
Pr2	Password	0	999			
Pr3	Password	0	999			

11.1.7 Auxiliary outlet parameters (NOT ENABLED FUNCTION)

Parameter	Description	Min.	Max.	Udm	Resolution	Factory setting
Auxiliary relay circuit n° 1 (NOT ENABLED FUNCTION)						
Auxiliary relay circuit n° 2 (NOT ENABLED FUNCTION)						
Pr1	Password	0	999			023
Pr2	Password	0	999			
Pr3	Password	0	999			

11.1.8 Condensation fan parameters

Parameter	Description	Min.	Max.	Udm	Resolution	Factory setting
Chiller operation						
Heat pump operation						
Hot start						
3-4 fan steps (chiller operation)						
3-4 fan steps (heat pump operation)						
Pr1	Password	0	999			023
Pr2	Password	0	999			
Pr3	Password	0	999			

11.1.9 Antifreeze resistance - supply - boiler parameters (NOT ENABLED FUNCTION)

Parameter	Description	Min.	Max.	Udm	Resolution	Factory setting
Boiler function (NOT ENABLED FUNCTION)						
Boiler function in chiller modality (NOT ENABLED FUNCTION)						
Boiler function in heat pump modality (NOT ENABLED FUNCTION)						
Tank resistance						
Antifreeze alarm						
Pump for antifreeze						
Pr1	Password	0	999			023
Pr2	Password	0	999			
Pr3	Password	0	999			

11.1.10 Defrosting parameters (NOT ENABLED FUNCTION)

Parameter	Description	Min.	Max.	Udm	Resolution	Factory setting
Forced defrosting						
Defrosting modality						
Δt defrosting management						
Defrosting start and stop from analogue input (NOT ENABLED FUNCTION)						
Pr1	Password	0	999			023
Pr2	Password	0	999			
Pr3	Password	0	999			

11.1.11 Heat recuperator parameters (NOT ENABLED FUNCTION)

Parameter	Description	Min.	Max.	Udm	Resolution	Factory setting
Pr1	Password	0	999			023
Pr2	Password	0	999			
Pr3	Password	0	999			

11.1.12 Alarm parameters

Parameter	Description	Min.	Max.	Udm	Resolution	Factory setting
Low pressure alarm						
High pressure alarm						
Oil alarm						
Flow meter alarm						
Compressor thermal protection alarm						
Pump-down alarm						

Parameter	Description	Min.	Max.	Udm	Resolution	Factory setting
Antifreeze alarm in chiller mode						
AL26	Antifreeze alarm set point in chiller mode: to set the temperature under which the antifreeze alarm is enabled, ambient air low temperature (air/air units), outlet air low temperature (air/air units) (from AL23 to AL24).	AL24	AL25	°C °F	Dec int	37.0°F
Antifreeze alarm in heat pump						
High temperature at compressor outlet						
Unit block general alarm						
Alarm relay						
Password for alarm history reset - compressor thermal protection alarm						
Pr1	Password	0	999			023
Pr2	Password	0	999			
Pr3	Password	0	999			

CHAPTER 12

ALARMS

12.1 Alarm codes and actions

See chapter *7.12 "How to view and reset the status of an alarm"*.

Code	Meaning	Cause	Reset	Restart	Icon	Action
AP01÷ AP10	Probe alarms **PB01÷PB09**	Probe configured and the converted value is outside the range	The probe is not configured or converted values are within the range	Auto.	⚠ Flashing	Alarm relay + buzzer enabled
AEFL	Evaporator side flow-switch alarm	active ID for the **AL15** (**) time from the start of the water pump, after the ID is active for the **AL17** (**) time.	Inactive ID for the **AL18** time (**)	Auto. - becomes manual after **AL16** (**) tripping per hour (reset procedure in functions menu)	Flow! Flashing	Alarm relay + buzzer enabled only if the flow switch alarm is active during a normal operation phase
AtSF	Outlet fan thermal protection alarm	**CF01**=0 (**) at each starting-up of the fan, active ID for the **AL15** (**) time from the start of the water pump, after the ID is active for the **AL17** (**) time.	Inactive ID for the **AL18** time (**)	Auto. - becomes manual after **AL16** (**) tripping per hour (reset procedure in functions menu)	Flow! Flashing	Alarm relay + buzzer enabled
AtE1	Evaporator 1 water pump thermal protection	ID configured as evaporator 1 water pump thermal protection	With ID not enabled	Manual (reset procedure in functions menu)	⚠ Flashing	Alarm relay + buzzer enabled.
AtE2	Support evaporator 2 water pump thermal protection	ID configured as support evaporator 2 water pump thermal protection				
AEE	Eeprom alarm	Failed Eprom data.	-------	Manual	⚠ Flashing	Alarm relay + buzzer enabled.
AFr	Net frequency alarm	Net frequency different from the one configured in **CF83 (**)** parameter	Control the power supply frequency disabled by **CF83**=2 (**) parameter or the frequency is within the set range	Auto.	⚠ Flashing	Alarm relay + buzzer enabled.
ALOC	Unit block general alarm	ID configured as a unit block general alarm active for the time set by parameter **AL43(*)**	ID configured as a unit block general alarm inactive for the time set by parameter **AL44(*)**	Auto. – becomes manual after **AL42(*)** tripping per hour (reset procedure in functions menu). Logged only with manual reset.	⚠ Flashing	Alarm relay + buzzer enabled.
ACF1	- Unit configured as heat pump and circuit inversion valve not configured. - Incorrect combination of the defrost parameter values (**dF22/dF23**) (**)	Incorrect programming	Correct programming	Auto.	⚠ Flashing	Alarm relay + buzzer enabled.

Code	Meaning	Cause	Reset	Restart	Icon	Action
ACF2	- Unit configured for the ON/OFF or proportional control of the condensation without the configuration of the related probe (one probe per circuit if separate condensation, at least one probe if single condensation). - If one of the following rules is not respected in the event of proportional regulation: **(FA09**+**FA11**+**FA12**<**FA10)**(**) **(FA12**<**FA13)**(**) **(FA07**<**FA15**<**FA08)**(**) - If one of the following rules is not respected when the proportional regulation with pump is enabled: **(FA18**+**FA21**+**FA20**<**FA19)**(**) **(FA21**<**FA22)**(**) **(FA16**<**FA23**<**FA17)**(**) - If one of the following rules is not respected in the event of ON-OFF regulation: **(FA09**<**FA10)**(**) - If one of the following rules is not respected when the ON-OFF regulation with pump is enabled: **(FA18**<**FA19)**(**) - If a condensation/ evaporation probe per circuit is not present when the pump and defrost are enabled. - When triac regulation is enabled (**CF68**, **CF69**=2) (**) and the continuous power supply has been selected (**CF83**=0)(**).	Incorrect programming	Correct programming	Auto.	⚠ Flashing	Alarm relay + buzzer enabled.
ACF3	Two digital/analogue inputs configured with the same function or without the necessary resources (eg. compressor 3 relay configured but not compressor 3)	Incorrect programming	Correct programming	Auto.	⚠ Flashing	Alarm relay + buzzer enabled
ACF4	**CF79**(*) and the non-configured input or **CF79**(*) NTC probe not configured as external air temperature	Incorrect programming	Correct programming	Auto.	⚠ Flashing	Alarm relay + buzzer enabled.
ACF5	If circuit 2 has been configured and the resources have been configured (relay: solenoid pump-down, heaters, inversion valve, condensing fan ON - OFF, recovery, auxiliary)	Incorrect programming	Correct programming	Auto.	⚠ Flashing	Alarm relay + buzzer enabled.

Code	Meaning	Cause	Reset	Restart	Icon	Action
ACF6	The total number of compressors in the 2 circuits (**CF04+CF05**) (**) is: >6 >4 and the starting of the compressors is indirect (**CO10** different than 0) (**) or the number of capacity control **CF06** (**) is different than 0. >2 and the intermittent valve is enabled with ON (**CO08**) (**) and OFF (**CO09**) (**) times different than 0 - If the pump-down function is configured in at least one circuit. The pump-down circuit solenoid relay is not configured. Neither the pump-down pressure-switch nor the circuit evaporation probe are configured and the pump-down is enabled in start-up or not even the low-pressure pressure-switch is configured.	Incorrect programming	Correct programming	Auto.	⚠ Flashing	Alarm relay + buzzer enabled.
ACF6	- The compressor has been configured with **CF04(*)** and **CF05(*)** parameters but the related relays have not been foreseen Main. Intermittent valve when enabled by the ON/OFF times different than 0; Neither the capacity control nor the by-pass gas when the by-pass time is different than 0; Star centre coil 2 / when starting is part winding or star delta; The capacity control for all foreseen capacity control; A relay has been configured related to a compressor that has not been foreseen; Intermittent valve when the ON or OFF times are at 0; Star centre coil 2 / when starting is direct; Capacity control not foreseen	Incorrect programming	Correct programming	Auto.	⚠ Flashing	Alarm relay + buzzer enabled

Code	Meaning	Cause	Reset	Restart	Icon	Action
ACF6	- The compressor has been configured with **CF04** (**) and **CF05** (**) parameters but the related relays have not been foreseen - Main. - Intermittent valve when enabled by the ON/OFF times (**CO08/CO09**) (**) different than 0; - Neither the capacity control nor the by-pass gas when the by-pass time is different than 0; - Star centre coil 2 / when starting is part winding or star delta; - The capacity control for all foreseen capacity control; - A relay has been configured related to a compressor that has not been foreseen; - Intermittent valve when the ON or OFF times are at 0; - Star centre coil 2 / when starting is direct; - Capacity control not foreseen	Incorrect programming	Correct programming	Auto.	⚠ Flashing	Alarm relay + buzzer enabled
ACF7	Evaporator pump: - defined (**CO16** different from 0) (**) but no relay is configured: - not defined (**CO16**=0) (**) but a relay is defined; Condenser pump: - defined (**CO21** different from 0) (**) but no relay is configured; - not defined (**CO21**=0) (**) but a relay is defined	Incorrect programming	Correct programming	Auto.	⚠ Flashing	Alarm relay + buzzer enabled
ACF8	Thermoregulation probe configuration: - a thermoregulation probe (in chiller **ST09**, in pump when enabled **ST10**) is not correctly configured (it does not exist or is not NTC)	Incorrect programming	Correct programming	Auto.	⚠ Flashing	Alarm relay + buzzer enabled
ACF9	- Recovery enabled **rC01(**)** parameter different than 0 but only some of the resources are configured in a circuit (condensation probes, recover ID, recovery relay are necessary) or no output has been defined	Incorrect programming	Correct programming	Auto.	⚠ Flashing	Alarm relay + buzzer enabled
ArtF	Clock alarm	Clock damaged	Clock replacement	Manual (reset procedure in functions menu)	⚠ Flashing	Alarm relay + buzzer enabled
ArtC	Clock alarm	Clock to be adjusted	Clock adjusted	Manual (reset procedure in functions menu)	⚠ Flashing	Alarm relay + buzzer enabled

Code	Meaning	Cause	Reset	Restart	Icon	Action
AEUn	Evaporator unloading signal	Functioning if the measured evaporator water input temperature is > than the set **CO40(**)** for the time set in the **CO42(**)** parameter	If the measured water temperature is < than the set **CO39(**)** differential **CO41(**)** unloading is activated after the **CO43(**)** parameter set time	Auto.		Alarm relay + buzzer NOT enabled
ALti	Evaporator air inlet low temperature	If **CF01**=0 (**) if the NTC probe is configured as evaporator input. Measures a temperature < than the set **AL26** (**) for **AL28** (**) seconds in chiller If **CF01**=0 (**) if the NTC probe is configured as evaporator input. and measures a temperature < than the set **AL33** (**) for **AL36** (**) seconds in heat pump In stand-by or OFF remote the reference probe is the evaporator input probe and the shortest time between **AL28** (**) and **AL36** (**) is taken as the by-pass time before the alarm.	If the configured probe is > then the set **AL26** (**)+ differential **AL27** (**) in chiller or if the configured probe is > than the set **AL33** (**)+ differential **AL34** (**) in heat pump In stand-by or OFF remote if the configured probe is > than the set **AL26** (**)+ differential **AL27** (**) or > than the set **AL33** (**)+differential **AL34** (**)	Auto.	⚠ Flashing	Alarm relay + buzzer enabled
AEP1	Evaporator 1 water pump maintenance request	Compressor operating time > than the set counter	Reset operating time (in functions menu - Hour function)	Manual	⚠ Flashing	Alarm relay + buzzer enabled
AEP2	Support evaporator 2 water pump maintenance request					
ACP1	Condenser 1 water pump maintenance request	Compressor operating time > than the set counter	Reset operating time (in functions menu - Hour function)	Manual	⚠ Flashing	Alarm relay + buzzer enabled
ACP2	Condenser 2 water pump maintenance request					
AELt	Evaporator water outlet low temperature	With unit operation selected (probe configured in evaporator outlet) if temperature detected by temperature control probe < AL48	If temperature detected by temperature control probe > AL48	Always automatic	⚠ Flashing	Alarm relay + buzzer activated
AEHt	Evaporator water outlet high temperature	With unit operation selected if temperature detected by temperature control probe > AL49	If temperature detected by temperature control probe < AL49	Always automatic	⚠ Flashing	Alarm relay + buzzer activated
b1HP	Circuit 1 digital input high pressure	With the unit ON, and the input of the high-pressure circuit pressure switch active	Input inactive	Manual (reset procedure in functions menu)	⚠ Flashing	Alarm relay + buzzer enabled
b2HP	Circuit 2 digital input high pressure					
b1LP	Circuit 1 digital input low pressure	- With the low-pressure circuit pressure switch active - If **AL08**=1 (**), even with the unit in stand-by or OFF remote, if the circuit low-pressure pressure switch input is active - In defrost is **AL06**=1 (**) if the compressor low-pressure pressure switch input is active The alarm is not signalled: 1. In defrost for the **AL07** (**) time in correspondence with the activation of the cycle inversion valve 2. On the start-up of the compressor for the **AL01** (**) time	Input disabling	Auto.- becomes manual after **AL02(**)** tripping per hour (reset procedure in functions menu)	⚠ Flashing	Alarm relay + buzzer enabled
b2LP	Circuit 2 digital input low pressure					

Code	Meaning	Cause	Reset	Restart	Icon	Action
b1AC	Circuit 1 chiller mode antifreeze alarm	Operating and in stand-by OFF remote If the antifreeze regulation probe **Pbr** measures a temp.< than the set **AL26** (**) for at least **AL28** (**) seconds With the digital input configured as antifreeze alarm and active.	Antifreeze regulation probe **Pbr** measures a temp. > than the set **A26(**)**+ differential **AL27(**)** With digital input disabled	Auto. – becomes manual after **AL29(**)** tripping per hour (reset procedure in functions menu)	⚠ Flashing	If **AL30**(**)=0 only the comp. are turned off the alarm label (**b1Ac b2Ac**) is signalled but the alarm relay and buzzer are not activated If **AL30**(**)=1 the comp. are turned off, The alarm label (**b1AC b2AC**) are signalled and the alarm relay and buzzer are activated. In addition to the above mentioned actions, if the alarm comes from the ID, the antifreeze heaters are also activated
b2AC	Circuit 2 chiller mode antifreeze alarm					
b1Ac	Circuit 1 chiller mode antifreeze alarm signal					
b2Ac	Circuit 2 chiller mode antifreeze alarm signal					

ATTENTION

Both labels are displayed with the evaporator input alarm or the evaporator common output active or with a single ID configured.

b1AH	Circuit 1 heat pump mode antifreeze alarm	Operating and in stand-by OFF remote If the antifreeze regulation probe **Pbr** measures a temp.< than the set **AL33** (**) for at least **AL36** (**) seconds With the ID configured as antifreeze alarm and active.	Antifreeze regulation probe **Pbr** measures a temp. > than the set **A33** (**)+ differential **AL34** (**) With ID inactive	Auto. – becomes manual after **AL37** (**) tripping per hour (reset procedure in functions menu)	⚠ Flashing	If **AL38**=0 (**) only the comp. are turned off the alarm label (**b1Ah-b2Ah**) is signalled but the alarm relay and buzzer are not activated If **AL38**=1 (**) the comp. are turned off, The alarm label (**b1AH-b2AH**) are signalled and the alarm relay and buzzer are activated. In addition to the above mentioned actions, if the alarm comes from the ID, the antifreeze heaters are also activated
b2AH	Circuit 2 heat pump mode antifreeze alarm					
b1Ah	Circuit 1 heat pump mode antifreeze alarm signal					
b2Ah	Circuit 2 heat pump mode antifreeze alarm signal					

Both labels are displayed with the evaporator input alarm or the evaporator common output active or with a single ID configured.

ATTENTION

Parameter **AL35** *(**) delays the antifreeze alarm (air/air unit low air temperature output) at the start of the unit in the heat pump mode.*
If in the stand-by / OFF remote mode, the unit indicates an antifreeze alarm and the time set in parameter **AL35** *(**) is different than 0, by selecting the heat pump mode with the button or with ID, the antifreeze situation is reset and the compressor can be turned on for the time set in parameter* **AL35** *(**) because the unit starts to heat the water or air. Once the delay time* **AL35** *(**) has passed, if the antifreeze regulation probe* **Pbr** *still measures a temperature < than the set* **AL33** *(**) for at least* **AL36** *(**) seconds, the unit is blocked and an antifreeze alarm is signalled.*

Code	Meaning	Cause	Reset	Restart	Icon	Action
b1hP	Circuit 1 analogue input high pressure (not enabled)	With unit in chiller or in heat pump operation if the condensation control probe measures a value > than the set **AL09**	If the condensation control probe measures a value < than the set **AL09** - the differential **AL10**	Manual (reset procedure in functions menu)	⚠ Flashing	Alarm relay + buzzer enabled
b2hP	Circuit 2 analogue input high pressure (not enabled)					
b1lP	Circuit 1 analogue input low pressure (not enabled)	The alarm is activated when the probe, which is configured as condensation control, measures a pressure < than the set **AL03**(**) in the following conditions: -- chiller mode or heat pump - stand-by or OFF-remote if **AL08**(**)=1 In defrost mode if **AL06**(**)=1 The alarm is not signalled: - in defrost for the **AL07**(**) time in correspondence with the inversion of the valve - on the start-up of the compr. for the time **AL01**(**).	If the condens. Control probe measures a pressure of the set > **AL03**(**)+differential **AL04**(**)	Auto. - becomes manual after **AL05**(**) tripping per hour (reset procedure in functions menu)	⚠ Flashing	Alarm relay + buzzer enabled
b2lP	Circuit 2 analogue input low pressure (not enabled)					

ATTENTION

If the low pressure transducers are configured the low pressure alarm adjustment is on them only.

b1tF	Circuit 1 condensation fan relay alarm	With configured ID active	With inactive ID	Manual (reset procedure in functions menu)	⚠ Flashing	Alarm relay + buzzer enabled
b2tF	Circuit 2 condensation fan relay alarm					
b1PH	Circuit 1 pump-down stop alarm	Pressure switch if **CO36**=1,2,3,4 (**) and with ID inactive and the pump-down stops for the **CO39** (**) time Transducer if **CO36**=1,2,3,4 (**) the set **CO37** (**) time is not reached and the pump-down stops for the **CO39** (**) time	From thermoregulation start-up and ID not active From thermoregulation start-up with evaporating pressure > than the set **CO37** (**) + **CO38** (**) differential	Auto. - becomes manual after **AL21** (**) tripping per hour (reset procedure in functions menu). Logged only with manual restart	⚠ Flashing	Alarm relay + buzzer enabled only when the alarm becomes manual reset
b2PH	Circuit 2 pump-down stop alarm					
b1PL	Circuit 1 pump-down start alarm	Pump-down pressure switch if **CO36(**)**=1,2,3,4 with thermoregulation start-up and ID inactive for the time **CO39(**)** Low pressure transducer if **CO36(**)**=1,2,3,4 with thermoregulation start-up, the set **CO37(**)** is not reached within the time **CO39(**)**	From thermoregulation start-up and ID not active From thermoregulation start-up with evaporating pressure > than the set **CO37(**)**+ differential **CO38(**)**	Auto. - becomes manual after **AL21(**)** tripping per hour if **AL23(**)**=1 (reset procedure in functions menu) If **AL23(**)**=0 it remains in automatic Logged only with manual restart	⚠ Flashing	Alarm relay + buzzer enabled only when the alarm becomes manual reset
b2PL	Circuit 2 pump-down start alarm					
b1dF	Circuit 1 defrost alarm signal	In defrost only, if **DF01**=1.3 defrost end temperature/ pressure or external contact and the defrost ends for **DF05** time	If stand-by or ON-OFF remote Next defrost cycle ends for temp./press.	Auto. if next defrost ends for temperature/ pressure, otherwise manual. (reset procedure in functions menu)	⚠ Flashing	Alarm relay + buzzer NOT enabled
b2dF	Circuit 2 defrost alarm signal					
b1CU	Circuit 1 unloading signal	Operating if the probe, which is configured as condensation press/temp. control, measures a value > than the set **CO44(**)**	If the condensation press./temp. measures < than the set **CO44(**)**- differential **CO44(**)** After unloading is activated and after parameter **CO47(**)**	Auto.	⚠ Flashing	Alarm relay + buzzer NOT enabled
b2CU	Circuit 2 unloading signal					

Code	Meaning	Cause	Reset	Restart	Icon	Action
b1CU	Circuit 1 condenser coil unloading signal	Operating is the probe, which is configured as condensation temp./press. control or evaporation pressure, measures a value < than the set **CO46(**)**	If the condensation temp/press or evaporation pressure measures > than **CO46(**)+CO47(**)** With unloading function set after the set **CO48(**)** parameter time	Auto.	⚠ Flashing	Alarm relay + buzzer NOT enabled
b2CU	Circuit 2 condenser coil unloading signal					
b1rC	Circuit 1 recovery disabled alarm	Operating if the probe, which is configured as condensation press/temp control, measures > than the set **rC06(**)**	If the condensation press/temp measures < than the set **rC06(**)**-differential **rC07(**)** With unloading function set after the set **rC08(**)** parameter time	Auto.	⚠ Flashing	Alarm relay + buzzer NOT enabled
b2rC	Circuit 2 recovery disabled alarm					
C1HP÷C6HP	Compressors 1÷6 high pressure alarm	With the unit ON and the compressor pressure switch input active	Input disabling	Manual (reset procedure in functions menu)	⚠ Flashing	Alarm relay + buzzer enabled
C1oP÷C6oP	Compressors 1÷6 pressure switch	The alarm is not signalled: after turning on the compressor for the time **AL11(**)** after the time **AL11(**)** it is not signalled with the unit running for the time **AL12(**)**	Input disabling	Auto - becomes manual after **AL13(**)** tripping per hour (reset procedure in functions menu)	⚠ Flashing	Alarm relay + buzzer enabled
C1tr÷C6tr	Compressor 1÷6 relay alarm	The alarm is not detected for **AL19**(**) after the starting of the compressor with ID active	If ID is not active	Manual If more than **AL20**(**) tripping per hour Of the compressor to reset the alarm, go to functions menu (see **COtr**(**) function in functions menu)	⚠ Flashing	Alarm relay + buzzer enabled

Compressor involved: If parameter **AL47**=0 (**) or 1 Off
Compressor not involved: If parameter **AL47**=0 (**) perform adjustment
If parameter **AL47**=1 (**) Off

ATTENTION

The **AL47** *(**) parameter determines the compressor relay alarm function.*

If the parameter **AL47**=0 (**) (single compressor blocked) with digital input configured as active compressor relay, only the compressor connected to the input is blocked and the related alarm is displayed.
If the parameter **AL47**=1 (**) (circuit blocked) with digital input configured as active compressor relay, all compressors within the circuit are blocked and the related alarm is displayed (the single signal is maintained).

C1dt÷C6dt	Compressor 1÷6 high delivery temperature alarm	The temp. measured by the probe that is configured as high delivery temperature is > than the set 70°C **AL39(**)** **ATTENTION** *With operating temperature up to 99.9°C the alarms are defined in tenths of degrees and in single degrees for operating temperatures greater than 100°C.*	The temp. measured by the probe that is configured as high delivery temperature is < than the set **AL39(**)**-differential **AL40(**)**	Auto. Manual If more than **AL41(**)** tripping per hour occurs, enter the functions menu to reset the alarm	⚠ Flashing	Alarm relay + buzzer enabled
C1Mn÷C6Mn	Compressor 1÷6 maintenance request	Compressor operating hours > than the set hour counter	Operation time Reset (hour function in the functions menu)	Manual	⚠ Flashing	Alarm relay + buzzer enabled

NOTE
(**) The values of parameters can not be modified or accessed by user. If it is necessary to modify them please contact the qualified personnel.