

Precision Water Chillers

NPC 015 - 230 60 Hz UL



SERVICE MANUAL



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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:

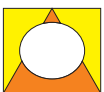
	Process water inlet
	Process water outlet
	Indications for lifting the unit
	Water drainage point from the machine
	Electric shock risk
	Risk of burns from contact with high-temperature surfaces
	Direction of the refrigerant fluid and water circuit
	Direction of pump rotation (if installed)
	Water filling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

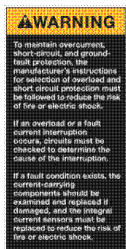
WARNING SYMBOL	DESCRIPTION
	To maintain overcurrent, short-circuit, and ground-fault protection, the manufacturer's instructions for selection of overload and short circuit protection must be followed to reduce the risk of fire or electric shock. In an overload or a fault current interruption occurs, 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

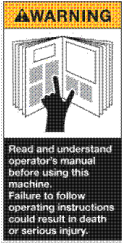
WARNING SYMBOL	DESCRIPTION
	Hazardous voltage. All doors must be closed before energizing the panel.
	Read and understand operator's manual before using this machine. Failure to follow operating instructions could result in death or serious injury.
	Moving parts can crush and cut. Do not operate with 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 <u>XX</u> <u>1</u>	refrigerant with 1 refrigeration circuit power indicative of the refrigeration compressor in hp
C	C - CHILLER
P	P = PRECISION
N	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.

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) to 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.

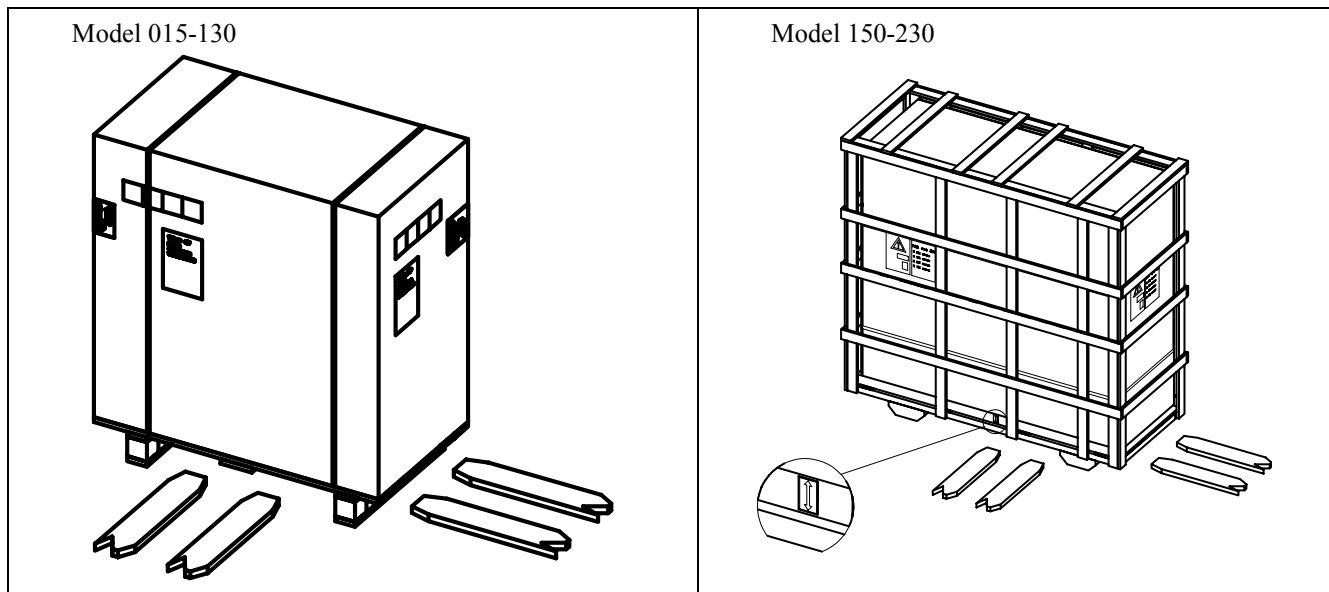
When a load is on a hoist stay clear of the danger area beneath and around it.

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	015	020	030	040	060	090	120	130	150	180	210	230
Weight (kg)	127	132	200	220	331	386	405	416	553	650	740	757
Weight (lb)	280	291	440	485	729	850	892	917	1219	1433	1631	1668

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/m ³ 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.	

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.
For TAEevo 015÷031 models	
MAX. COOLING PRESSURE	This is the design pressure of the refrigeration circuit.
MAX. COOLING TEMPERATURE	This is the design temperature of the refrigeration circuit.
For TAEevo 051 models and upper models	
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			015	020	030	040	060	090
Tank capacity	water volume	(litres) (galUS)	60 16	60 16	115 30	115 30	140 37	255 67
PUMP P3	water flow rate	(m³/h)	0.3/4.8	0.5/4.8	0.7/6	1.0/6	1.8/9.6	2.3/9.6
		(gpm)	1.1/21.1	1.1/21.1	1.8/26.4	2.6/26.4	4.4/42.3	5.7/42.3
	pump head	(bar)	3.2/1.4	3.2/1.4	3.1/1.5	3.0/1.4	2.9/1.3	2.9/1.5
		(PSI)	43.8/20.6	43.8/20.6	44.9/22.6	44.5/21.3	44.2/19.0	43.8/22.6
	nominal power	(kW)	0.75	0.75	0.75	0.75	0.9	0.9
PUMP P5	water flow rate	(m³/h)	0.3/4.8	0.5/4.8	0.7/4.8	1.0/4.8	1.8/13	2.3/13
		(gpm)	1.1/21.1	1.1/21.1	1.8/21.1	2.6/21.1	4.4/57.2	5.7/57.2
	pump head	(bar)	5.4/2.9	5.4/2.9	5.4/3.1	5.3/3.2	5.2/2.8	5.1/3.1
		(PSI)	79.4/42.1	79.4/42.1	78.9/45.4	78.3/46.6	75.8/40.6	75.7/45.8
	nominal power	(kW)	1.5	1.5	1.5	1.5	3	3

Table 5 CHARACTERISTICS OF STANDARD UNITS

Model			015	020	030	040	060	090
AXIAL FANS	number of fans		1	1	1	1	1	2
	total air flow	(m ³ /h) (gpm)	4050 17831	3500 15410	6900 30380	6400 28178	9200 40506	16000 70445

Table 5 CHARACTERISTICS OF STANDARD UNITS

Model			120	130	150	180	210	230
Tank capacity	water volume	(litres) (galUS)	255 67	255 67	350 92	350 92	350 92	350 92
PUMP P3	water flow rate	(m ³ /h) (gpm)	3.0/18 7.0/79.3	3.7/18 8.4/79.3	3.9/18 8.8/79.3	4.4/18 8.8/79.3	4.9/27 11.0/118.9	5.5/27 11.4/118.9
	pump head	(bar) (PSI)	2.8/1.6 41.5/24.2	2.8/1.7 41.4/25.1	2.8/2.0 41.4/29.8	2.8/2.0 41.4/29.8	3.3/0.9 48.8/13.3	3.2/0.8 48.7/12.3
	nominal power	(kW)	1,85	1,85	1,85	1,85	2.2	2.2
PUMP P5	water flow rate	(m ³ /h) (gpm)	3.0/13 7.0/57.2	3.7/13 8.4/57.2	3.9/30 8.8/132.1	4.4/30 8.8/132.1	4.9/30 11.0/132.1	5.5/30 11.4/132.1
	pump head	(bar) (PSI)	5.1/3.1 75.6/45.8	5.0/3.2 75.4/47.1	5.2/1.8 76.5/27.1	5.1/1.8 76.5/27.1	5.1/1.9 67.2/27.3	5.1/1.8 76.1/26.1
	nominal power	(kW)	3	2.2	3	4	4	4
AXIAL FANS	number of fans		2	2	2	2	3	3
	total air flow	(m ³ /h) (gpm)	15000 66043	14200 62520	18200 80132	17600 77490	23700 104347	23700 104347

Table 6 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 015	axial	69,5	82,5
NPC 020	axial	68,9	81,9
NPC 030	axial	69,6	82,6
NPC 040	axial	70,7	83,7
NPC 060	axial	70,9	83,9
NPC 090	axial	72,0	85,0
NPC 120	axial	71,2	84,2
NPC 130	axial	72,1	85,1
NPC 150	axial	74,2	87,2
NPC 180	axial	74,1	87,1
NPC 210	axial	75,6	88,6
NPC 230	axial	75,3	88,3

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

** global

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

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 TAEvo have a single refrigerant circuit with one or two compressors connected in parallel (tandem).

The circuits consist of the following components:

- refrigerant fluid used R407C;
- piston hermetic compressor or scroll compressor;
- fan pressure switch with on/off regulation;
- pressure switches for high and low refrigerant pressure;
- high pressure transducer for fan electronical regulation and for unloading;
- liquid solenoid valve (with prismatic tank and plate-type evaporator);
- thermostatic throttle valve with external equalization (in models without prismatic tank present only from NPC 030);
- dryer filter;
- liquid flow sight glass (in models without prismatic tank present only from NPC 030);
- lamination capillary (only for NPC 015-020);
- refrigerant manometers (NPC 030);
- safety valve and double HP pressure switches;
- Schrader service valves;

Consult the enclosed drawings for additional information.

4.3 Compressors

All the machines are equipped with piston or SCROLL hermetic 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 NPC 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 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.

The protection rating of the fans is IP44 for NPC 015 TO 020.

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.

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 015-020	(mm) (in)	560 22	1266 49.8	810 31.9
NPC 030-040	(mm) (in)	660 26	1311 51.6	1400 55.1
NPC 050-130	(mm) (in)	760 29.9	1858 73.1	1447 57
NPC 150-230	(mm) (in)	870 34.3	2240 88.2	2065 81.3

4.10 Materials in contact with the liquid to be cooled

There can be two different groups.

Standard refrigerators: carbon steel, copper, aluminium, zinc, brass, stainless steel and plastics
in particular:

- evaporator with copper tubes, aluminium fins and shoulders in galvanised steel;
- tank in carbon steel;

Refrigerators with non-ferrous water circuit: stainless steel (AISI 304), copper, brass and plastics
in particular:

- evaporator with tubes and fins in copper and brass shoulders;
- tank in AISI 304 stainless steel;

alternatively

- external plate evaporator
- prismatic atmospheric 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.

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 7 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 8 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(*)
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

(****) 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

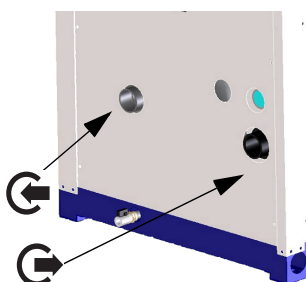
If the unit is furnished without hydraulic group, it is necessary to install a pump for the evaporation water circuit.
For maintenance purposes, we recommend installing a water drainage cock in the lower part of the circuit.

Evaporator water connection size

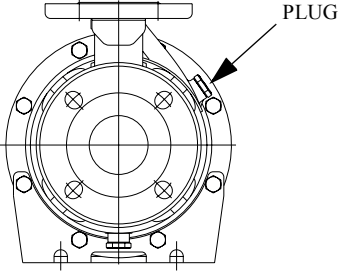
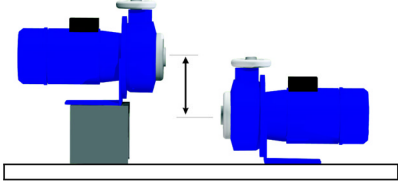
NPC unit model	015-020	030-040	060-130	150-230
Evaporator water IN/ OUT connections	Rp 3/4"	Rp 1"	Rp 1" 1/2	Rp 2"

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 can 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:

$$V = 2 \cdot V_t \cdot (P_{tmin} - P_{tmax})$$

where:

V_t =	total volume of the circuit in litres
P_{tmin} =	specific weight at the minimum temperature obtainable by water over the year in °C (even with the plant stopped)
P_{tmax} =	specific weight at the maximum temperature obtainable by water over the year in °C (even with the plant stopped)

Example of calculation:

V_t=200 litres

percentage of ethylene glycol in volume =30%

t_{min} =5°C from the table **P_{tmin}**=(1.045+1.041)/2 = 1.043

t_{max} =40°C from the table **P_{tmax}**=1.0282

$$V=2 \cdot 200 \cdot (1.043 - 1.0282)=5.92 \text{ litres}$$

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

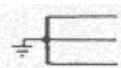
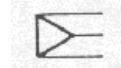
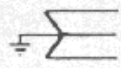
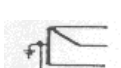
Table 9 SPECIFIC WEIGHTS

5.6 Electrical connections

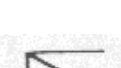
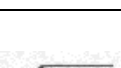
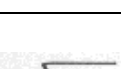
The machine must be connected to the main power supply in accordance with the laws and regulations in force in the country of installation, after verifying the wiring diagram annexed to the unit.

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 - 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 (see indication 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.

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 8.5 “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 for 5 seconds **if you want to start the unit.**

The led  flashes for 5 seconds and then it remains lit.

To **power-off** the machine, press the  key.



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. 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.
15. 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 Board.
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.

ELECTRONIC BOARD

7.1 Display

The display is divided in 3 zones.

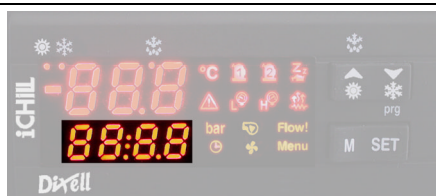


Top-left zone

It displays the temperature of temperature regulation probe.

NOTE

The displaying depends on the setting of parameter **CF36** (see chapter 7.9 “**Values displayed**”).

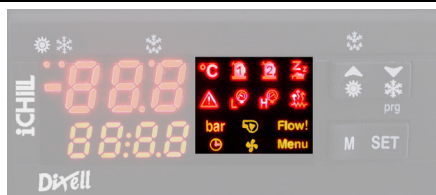


Bottom-left zone

It displays the operating setpoint, OFF with stand-by unit.

NOTE

The displaying depends on the setting of parameter **CF42** (see chapter 7.9 “**Values displayed**”).



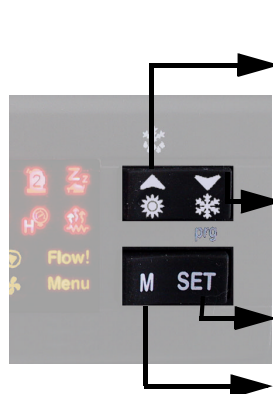
Right zone

Signalling icons.

7.1.1 Display icons

ICON	MEANING	ICON	MEANING
°C	Celsius degrees (If displayed)	L	Low pressure alarm
	Fahrenheit degrees (If not displayed)	Antifreeze	Antifreeze resistance
bar	Bar/Psi	Pump	Pump on
1	Compressor 1	Flow!	Flow meter alarm
2	Compressor 2	Clock	Time to defrost starting
Zz	Stand-by unit	Fans	Fans on
!	General alarm	Menu	Indication for Function Menu entering
H	High pressure alarm		

7.2 Function of buttons



BUTTON	FUNCTION
Up Arrow	It selects water temperature and ambient air temperatures in the top part of the display. During programming phase it scrolls the parameter's codes or increases their values.
Down Arrow	If pressed for 5 seconds, it allows to switch on or off the unit in chiller modality. It selects water temperature in the top part of the display. During programming phase it scrolls the parameter's codes or decreases their values.
SET	If pressed for 5 seconds, it allows to display or modify the set point. During programming phase it selects a parameter of confirms a value.
M	It allows to enter Function Menu.

7.2.1 Function of combined buttons

BUTTONS		FUNCTION
	+ 	To enter programming phase (pressed for 5 sec).
	+ 	To exit programming phase.
	+ 	If pressed for more than 5 seconds they allow to start a manual defrosting cycle (function not present).

7.3 Symbols and leds on the display

LED	LED STATUS	MEANING	LED	LED STATUS	MEANING
		Not enabled			Not enabled
	Steady	Unit on in chiller modality			Not enabled
	Flashing	Programming phase (if flashes together with  led)			Clock adjustment
		Not enabled			

7.4 Remote terminal

7.4.1 Function of buttons



BUTTON	FUNCTION
	It allows to enter Function Menu.
	If pressed for 5 sec., it allows to display or modify the set point. During programming phase it selects a parameter or confirms a value.
	It selects water temperature in the top part of the display. During programming phase it scrolls the parameter's codes or increases their values.
	It selects water temperature in the top part of the display. During programming phase it scrolls the parameter's codes or decreases their values.
	If pressed for 5 seconds it allows to switch on or off the unit.
	Not enabled

If there is no communication between the unit and the remote terminal, in the top part of the display it appears the message “noL” (no link).

NOTE

The displaying depends on the setting of parameter CF43-CF44 (see chapter 7.9 “Values displayed”).

7.5 Displaying during an alarm



During normal operation (no alarm), when an alarm occurs the alarm code and the appropriate icon flash in the bottom part of the display, alternated to the temperature / pressure.

7.5.1 Alarm icons

There are four icons for alarm signalling:

	General alarm
	High pressure alarm
	Low pressure alarm
	Flow meter alarm

7.6 How to silence the buzzer

Automatic silencing: it happens when the cause of the alarm has been eliminated.

Manual silencing: press and release one of the four buttons; the buzzer silences even if the alarm condition persists.

7.7 First start up

At the first start up of the unit in the bottom part of the display it could appear the message “rtC” alternated with the temperature. It indicates that it is necessary to regulate the clock.

If the probes used to control the unit are not connected or are damaged, the appropriate alarm will be displayed.

However, it is possible to regulate the clock or to programme the unit.

7.8 Programming by keyboard

The parameters of electronic control are divided in two groups and in two levels:

1. USER (Pr1);
2. SERVICE (Pr2).

USER level allows to access user parameters, SERVICE level allows to access the parameters of unit configuration (it is protected by a password).

The parameter's groups, indicated by some “Label”, are divided as follows:

LABEL	ACTION
ALL	It displays all parameters
ST	It displays Thermoregulation parameters
CF	It displays Configuration parameters
Sd	It displays only the parameters of the Dynamic Setpoint (NOT ENABLED FUNCTION)
ES	It displays only the parameters of the Energy Saving (NOT ENABLED FUNCTION)
CO	It displays Compressor parameters
FA	It displays Fan parameters
Ar	It displays only the parameters of the Antifreeze Resistance
dF	It displays only the parameters of the Defrosting (NOT ENABLED FUNCTION)
AL	It displays only the Alarm parameters
LS	It displays only the LASER parameters (NOT ENABLED FUNCTION)

7.8.1 Access to “Pr1” parameters (User level)

To enter the menu of “Pr1” parameters which can be access by the user:

1. Press for some seconds + buttons (and start flashing), in the top of the display appears “ALL”, the first group of parameters.
2. Select the various groups using and buttons.
3. After selecting a group, press button: if the selected group is part of the selected menu or any parameter of this group has been moved in this menu, in the bottom of the display it appears the “Label” and the code of the group's first parameter present in “Pr1”, its value appears in the top of the display.
It will not be possible to enter a parameter's group which is not part of this menu.
4. It is possible to scroll or modify the parameters contained in the group.

7.8.2 How to modify a parameter's value

1. Enter the programming procedure.
2. Select the desired parameter.
3. Press button to enable the value's adjustment.
4. Modify the value by means of and buttons.
5. Press to store the new value and to pass to the code of the following parameter.
6. To exit the procedure: Press + when a parameter is displayed, or wait (about 240 seconds) without pressing any button.

NOTE

The new value is stored also when the programming procedure is terminated for “time out”, without pressing  button.

ATTENTION

You can modify the parameter of the **CF** (configuration parameters) family only when the unit is in stand by.

7.9 Values displayed

The values visualized on the display change according to the configuration of parameters **CF36** for the top part and **CF42** for the bottom part. For remote terminal it changes according to the configuration of parameters **CF43** for the top part and **CF44** for the bottom part.

Parameter CF36/CF43 = 0

In the top part of the display it appears the probe **BEWOT**

Parameter CF36/CF43 = 1

In the top part of the display it appears the probe **BTWOT**

Parameter CF36/CF43 = 2

No value will appear in the top part of the display

Parameter CF36/CF43 = 3

In the top part of the display it appears the probe **BAT1**

Parameter CF36/CF43 = 4

In the top part of the display it appears the chiller set; off when unit in stand-by

Parameter CF36/CF43 = 5

In the top part of the display it appears “OnC” when the unit is operating; off when unit in stand-by

Parameter CF36/CF43 = 6

In the top part of the display it appears the LASER set (FUNCTION NOT ENABLED)

Parameter CF36/CF43 = 7

No value will appear in the top part of the display

Parameter CF36/CF43 = 8

In the top part of the display it appears the operating differential

Parameter CF42/CF44 = 0

In the bottom part of the display it appears the probe **BEWOT**

Parameter CF42/CF44 = 1

In the bottom part of the display it appears the probe **BTWOT**

Parameter CF42/CF44 = 2

In the bottom part of the display it appears the probe **PCP1**

Parameter CF42/CF44 = 3

In the bottom part of the display it appears the probe **BAT1**

Parameter CF42/CF44 = 4

In the bottom part of the display it appears the chiller set; off when unit in stand-by

Parameter CF42/CF44 = 5

In the bottom part of the display it appears “OnC” when the unit is operating

Parameter CF42/CF44 = 6

In the bottom part of the display it appears the LASER set (FUNCTION NOT ENABLED)

Parameter CF42/CF44 = 7

No value will appear in the bottom part of the display

Parameter CF42/CF44 = 8

In the bottom part of the display it appears the operating differential

If the probe **BTWOT** has been selected as default, every time you press  for 30 sec the top display visualizes the **BEWOT** probe, in the bottom part of the display it will appear the “Label” **Pb2** than the default value will return to be displayed.

If the probe **BEWOT** has been selected as default, every time you press  for 30 sec the top display visualizes the **BTWOT** probe, in the bottom part of the display it will appear the “Label” **Pb1** than the default value will return to be displayed.

7.10 Unit switching on / off

The pressure of  button for 5 seconds allows to switch on or off the unit.

The led of icon  flashes for 5 seconds then it remains lit.

7.11 How to put the unit in stand-by

Stand-by modality is obtained every time the unit is switched off.

It is indicated by the symbol  lit.

Also in stand-by modality the controller can:

1. Display the measured values
2. Manage the alarms by displaying and signalling.

7.12 Function menu (**M** button)

The access to Function Menu allows to:

1. Display and reset the alarms (see 7.12.3 “How to display the alarms “ALrM””).
Reset the alarms (see “How to reset an alarm “rSt””).
2. Display the alarm history (see 7.12.5 “How to display the alarm historic “ALoG””).
3. Upload the parameters from the unit to the key.
4. Display the operating hours of the controlled loads.
Reset the operating hours of the controlled loads.

7.12.1 Access to Function menu

Press and release **M** button (menu).

The icon “Menu” will appear.

7.12.2 Exit Function menu

Press and release **M** button or wait for time out (30 seconds).

The icon “Menu” disappears.

7.12.3 How to display the alarms “ALrM”

1. Press **M** to enter Function menu.
2. Press  or  to select “ALrM” function.
3. Press and release **SET** button.
4. Press  or  to scroll all alarms.
5. To exit press **M** or wait for time out (30 seconds).

7.12.4 How to reset an alarm “rSt”

1. Press **M** to enter Function menu.
2. Select “ALrM” function
3. Press **SET**, in the bottom of the display it appears the alarm code.
4. If the alarm can be reset in the top of the display it appears the Label “rSt”, if the alarm can not be reset it appears the Label “NO”.
5. Use  or  button to scroll all the alarms.
6. When the Label “rSt” is displayed, press **SET** to reset the alarm and go to the following one.
7. To exit press **M** button or wait for time out (30 seconds).

7.12.5 How to display the alarm historic “ALoG”

1. Press **M** button to enter Function menu.
2. Use  or  button to select the function “ALoG”.
3. Press **SET** until the Label with the alarm code will appear in the bottom of the display, and the Label “n°” with a progressive number will appear in the top of the display.
4. Using  or  button scroll all the alarms.
5. To exit “ALoG” function and to return to normal displaying, press **M** button or wait for time out (30 seconds).

The memory contains until 50 alarms, a further alarm will cancel from the memory the oldest one (the displaying is in increasing order, from the oldest one to the most recent one).

7.12.6 How to reset the alarm history “ArSt”

1. Enter Function menu.
2. Select “ALoG” function in the bottom of the display.
3. Press **SET** button.
4. Inside “ALoG” function, using  or  button, select the function “ArSt” in the bottom of the display and “PAS” in the top of the display.
5. Press **SET**: the password is required. In the bottom of the display it appears “PAS”, “0” flashes in the top of the display.
6. Insert the password for resetting.
7. If the password is correct the Label “ArSt” flashes for 5 seconds to confirm the resetting.

After resetting the unit returns to normal displaying.

7.12.7 Displaying the operating hours of loads “C1Hr - C2Hr - PFHr”

1. Press  button to enter Function menu.
2. Press  or  button until the Label of a single load appears in the bottom of the display: **C1Hr** (operating hours of compressor 1), **C2Hr** (operating hours of compressor 2), **PFHr** (operating hours of water pump and of outlet fan).
The operating hours will appear in the top of the display.
3. The icon  will be lit.

7.12.7.4 Reset of the load operating hours

1. Press  button to enter Function menu.
2. Press  or  button until the Label of a single load appears in the bottom of the display (**C1Hr**, **C2Hr** only 201÷351 units, **PFHr**) and the operating hours appear in the top of the display.
3. Press  button for 3 seconds: in the top of the display it will appear “0”. It indicates that the reset has happened.
4. To exit Function menu, press  button or wait for time out (15 seconds).
5. For the other loads repeat the operations from point 2. to point 4.

7.13 Other functions by keyboard

7.13.1 How to display the Set Point

Press and release  button.

In the bottom part of the display it appears **SetC** (chiller set).

7.13.2 How to modify the Set Point

1. Press  button for 5 seconds at least.
2. The set point will flash.
3. Use  or  button to modify the set point value.
4. To store the new set point value press  button or wait for time out to exit programming procedure.

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. It is not present in one compressor units.

The following messages will flash on the display:

AEUn= evaporator unloading function

ACUn= condensation unloading function

7.15 Probe key

In this chapter are indicated the probes **BEWOT**, **BTWOT**, **BCP1** and **BAT1**, for their positioning consult the refrigerant drawing.

Their description is indicated in the following table:

Name in the manual	Borne name	Description
-BEWOT	PB1	EVAPORATOR WATER OUTLET TEMPERATURE PROBE
-BTWOT	PB2	TANK WATER OUTLET TEMPERATURE PROBE
-BCP1	PB3	CONDENSING PRESSURE TRANSDUCER (only with electronic regulation)
-BAT1	PB4	AMBIENT AIR TEMPERATURE PROBE (Only with antifreeze protection function)

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") and 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 Board**". 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 Board**".

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

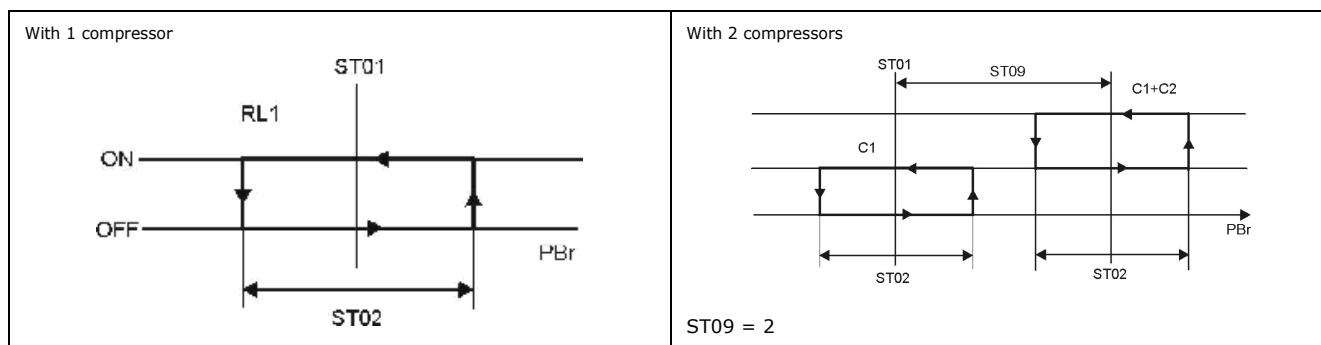
Only for TAEvo 351

Component	Refrigerant	TRIP				RESET			
		bar	PSI	°C	°F	bar	PSI	°C	°F
HP-Safety High pressure switch	R407C	26.7	387.3	62.7	144.9	22.7	329.2	51.9	125.4
HP-Type Approved High pressure switch		26.3	381.4	62.1	143.8	20.3	294.4	51.3	124.3

8.3 Compressor operation

The thermoregulation used is of proportional type. After fixing the temperature and differential values, the compressor will start when the value measured will exceed the sum of temperature + differential. It will stop when the value will be lower than the temperature - differential. The same logic will be applied also in two compressor units.

8.3.1 Compressor regulation graphic in Chiller mode



8.4 Fan speed regulation

The fan speed regulation can be carried out by means of a pressure switch (FP).

1. Fan pressure switch (FP)

In these units a pressure switch detects the refrigerant compressor outlet pressure and controls the fan operation powering them on or off.

The pressure switch FP is screwed to the refrigerant circuit piping with SCHRAEDER valves (with needle) which prevent leakage during replacement.

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

Axial fans

Pressure switch	Refrigerant	TRIP				RESET			
		bar	PSI	°C	°F	bar	PSI	°C	°F
Axial fans FP	R407C	18	261	46.4	115.5	14	203	37.0	98.6

8.5 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 MTA 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.

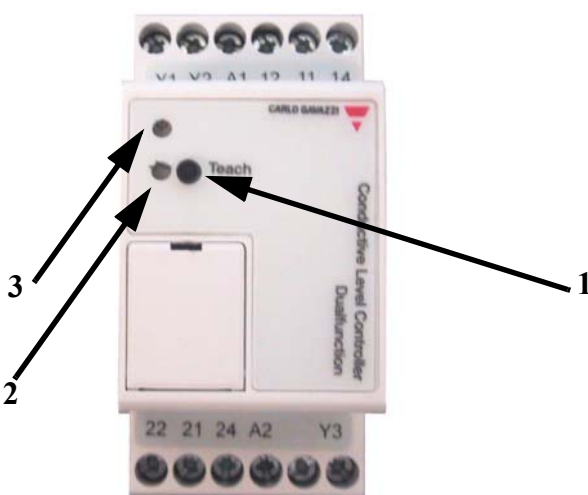
3. Amber LED (2) may illuminate or remain off.

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 MTA to operate at maximum sensitivity admissible on the instrument (220kOhm). Modifications to this setting may impair correct operation.

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The data inside this manual are not binding and they can be modified by the manufacturer without notice. All rights reserved.

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.

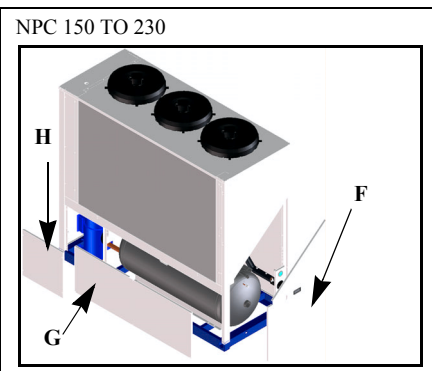
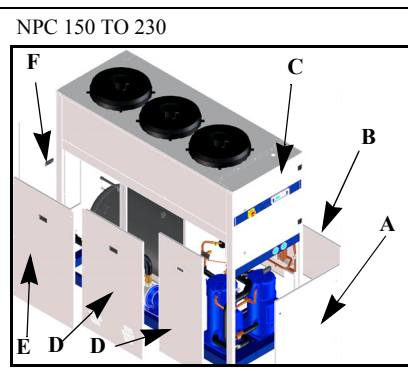
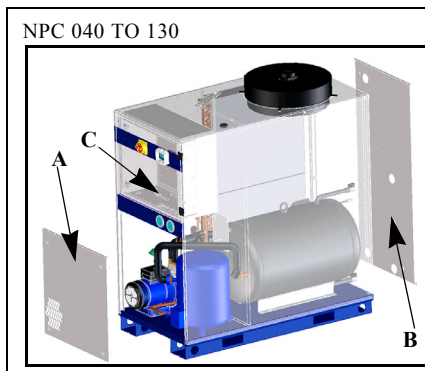
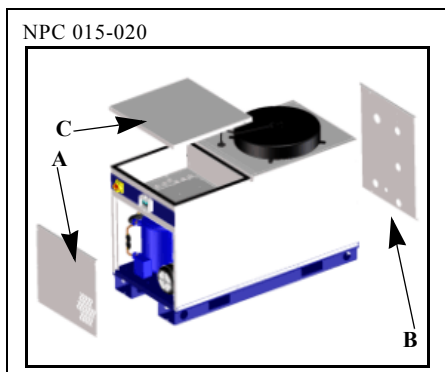
To access the components of the refrigerant circuit use an appropriate key furnished with the unit and operate on the closing bolts of the front panel (A).

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).

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To access the components of the refrigerant circuit operate on the closing bolts of the panel (A). Furthermore, it is possible to access the components of the refrigerant circuit removing the side panels (B-D). The access to the evaporator and to the components of the hydraulic circuit can be carried out removing the back panel (F) or the side panels (D), (E), (G) or (H).

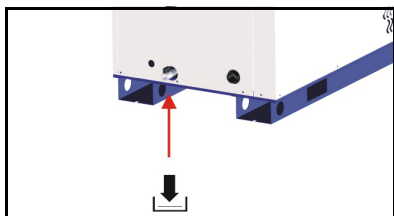


9.4 Emptying the process water circuit

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.

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: A08	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: A08. • main alarm relay tripped.	Clean the upstream filter, if installed. Follow the alarm reset procedure to star up the unit again (chapter Electronic Board).
	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 Board).
	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 Board).

PROBLEM	CAUSE	SYMPTOM	REMEDY
D High pressure switch tripped (HP) Alarm displayed: A01	D1 The fan doesn't work.	D1.1 - Refrigerant compressor stops; - the indication A01 appears on the display alternated to BTWOT value; - main alarm relay tripped; - the led of icon H  lights up.	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 Board). 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 Board).
	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 Board).
	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 Board).
	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 Board).
	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 Board).
E Low pressure switch tripped (LP) Alarm displayed: A02	E1 Lack of refrigerant (see also A5).	E1.1 - Refrigerant compressor stops; - the indication A02 appears on the display alternated to BTWOT value; - main alarm relay tripped. - the led of icon L  lights up.	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: A09 or A10	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 A09 or A10 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.

PROBLEM	CAUSE	SYMPTOM	REMEDY
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.
	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: P1, P2, P3, P4	H1 Probe BEWOT , BTWOT , BATI 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: A04	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: A08 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 A08 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 ACF1,ACF2,ACF3, ACF4,ACF5	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 EE	L1 The processor does not memorize the data in the right way	L1.1 • The machine does not work; • EE 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.

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.*

11.1 Parameter setting

To modify the following parameters, follow the procedure illustrated in Chapter 7 “Access to “Pr1” parameters (User level)“ and Chapter 7 “How to modify a parameter’s value“.

11.1.1 Thermoregulation parameters

Parameter	Level	Description	Min.	Max.	Udm	Resolution	Factory setting
ST01	U	Summer set point	ST05	ST06	°C °F °C °F	Dec Int	9°C with 1 compr. 48°F with 1compr. 8°C with 2 compr. 47°F with 2compr.
ST02	U	Summer differential	00.0 00.0	25.0 45.0	°C °F °C °F	Dec Int	4°C with 1 compr. 7°F with 1 compr. 2°C with 2 compr. 4°F with 2 compr.
ST05	U	Summer min. set	-40.0 -40.0	ST01	°C °F	Dec Int	5.0°C 41°F
Pr2		Password	0	999		-	-

11.1.2 Configuration parameters

Parameter	Level	Description	Min.	Max.	Udm	Resolution	Factory setting
CF34	U	Serial address	1	247			1
CF36	U	Default top displaying: 0 = BEWIT. 1 = BEWOT. 2 = none. 3 = BAT1. 4 = unit setpoint 5 = unit status (**) 6 = Laser set 7 = none 8 = operating differential	0	8			1
CF42	U	Default bottom displaying: 0 = BEWOT. 1 = BTWOT. 2 = BCP1 3 = BAT1. 4 = unit setpoint 5 = unit status (**) 6 = Laser set 7 = none 8 = operating differential	0	8			4
CF43	U	Default top displaying of remote terminal: 0 = BEWOT. 1 = BTWOT. 2 = BCP1 3 = BAT1. 4 = unit setpoint 5 = unit status (**) 6 = Laser set 7 = none 8 = operating differential	0	8			1

Parameter	Level	Description	Min.	Max.	Udm	Resolution	Factory setting
CF44	U	Default bottom displaying of remote terminal: 0 = BEWOT. 1 = BTWOT. 2 = none. 3 = BATI. 4 = unit setpoint 5 = unit status (**) 6 = Laser set 7 = none 8 = operating differential	0	6			4
Pr2		Password	0	999			-

11.1.3 Dynamic set point parameters (NBCP1OT ENABLED FUNCTION)

Parameter	Level	Description	Min.	Max.	Udm	Resolution	Factory setting
Pr2		Password	0	999			-

11.1.4 Energy Saving parameters (NOT ENABLED FUNCTION)

Parameter	Level	Description	Min.	Max.	Udm	Resolution	Factory setting
Pr2		Password	0	999			-

11.1.5 Compressor parameters

Parameter	Level	Description	Min.	Max.	Udm	Resolution	Factory setting
EVAPORATOR UNLOADING							
CONDENSER UNLOADING							
Pr2		Password	000	999			-

11.1.6 Fan parameters

Parameter	Level	Description	Min.	Max.	Udm	Resolution	Factory setting
HOT START							
Pr2		Password	000	999			-

11.1.7 Antifreeze support resistance parameters

Parameter	Level	Description	Min.	Max.	Udm	Resolution	Factory setting
Ar03	U	Antifreeze alarm set	Ar01	Ar02	°C °F	Dec Int	3°C 38°F
BOILER FUNCTION (NOT ENABLED)							
Pr2		Password	000	999			-

11.1.8 Defrost parameters (NOT ENABLED FUNCTION)

Parameter	Level	Description	Min.	Max.	Udm	Resolution	Factory setting
Pr2		Password	000	999			-

11.1.9 Alarm parameters

Parameter	Level	Description	Min.	Max.	Udm	Resolution	Factory setting
Pr2		Password	000	999			-

11.1.10 LASER parameters (NOT ENABLED FUNCTION)

Parameter	Level	Description	Min.	Max.	Udm	Resolution	Factory setting
Pr2		Password	000	999			-

ALARMS

12.1 Alarm codes and actions

See chapter 7.12.3 “How to display the alarms “ALrM”” and 7.12.4 “How to reset an alarm “rSt””.

CODE	MEANING	CAUSE	ACTION	RESET
P1	Alarm of BEWOT probe	Probe damaged or resistive value out of range	“open collector” outlet / alarm relay is activated The buzzer is activated The icon for general alarm flashes The alarm code is displayed	Automatic If the resistive value returns within the envisaged range.
P2	Alarm of BTWOT probe	Probe damaged or resistive value out of range	“open collector” outlet / alarm relay is activated The buzzer is activated The icon for general alarm flashes The alarm code is displayed	Automatic If the resistive value returns within the envisaged range.
P4	Alarm of BAT1 probe	Probe damaged or resistive value out of range	“open collector” outlet / alarm relay is activated The buzzer is activated The icon for general alarm flashes The alarm code is displayed	Automatic If the resistive value returns within the envisaged range.
A01	High pressure switch alarm	Digital input / high pressure switch enabled	“open collector” outlet / alarm relay is activated The buzzer is activated The icon for high pressure alarm flashes The alarm code is displayed	Manual The digital input is disabled and the resetting procedure is carried out
	Condensation fan thermal protection	Digital input enabled	“open collector” outlet / alarm relay is activated The buzzer is activated The icon for general alarm flashes The alarm code is displayed	Manual Digital input disabled and the resetting procedure is carried out
A02	Low pressure switch alarm	Digital input / low pressure switch enabled	“open collector” outlet / alarm relay is activated The buzzer is activated The icon for low pressure alarm flashes The alarm code is displayed	Automatic It becomes manual after the value set of “tripping per hour” Manual The digital input is disabled and the resetting procedure is carried out
A03	Ambient air low temperature alarm	Analogue input enabled	“open collector” outlet / alarm relay is activated The buzzer is activated The icon for general alarm flashes The alarm code is displayed	Automatic
A04	Unit outlet air low temperature alarm (not enabled)	Analogue input enabled	“open collector” outlet / alarm relay is activated The buzzer is activated The icon for general alarm flashes The alarm code is displayed	Automatic It becomes manual after nr. “tripping per hour”
A05	High temperature High pressure	Analogue input enabled if BAT1 > of “set value”	“open collector” outlet / alarm relay is activated The buzzer is activated The icon for high pressure alarm flashes The alarm code is displayed	Manual Disabled if BAT1 < than “set value” and the resetting procedure is carried out
A06	Low pressure / temperature alarm	Analogue input enabled if BAT1 < “set value”	“open collector” outlet / alarm relay is activated The buzzer is activated The icon for low pressure alarm flashes The alarm code is displayed	Automatic It becomes manual after “tripping per hour” Manual Disabled if BAT1 > than “set value” and the resetting procedure is carried out

CODE	MEANING	CAUSE	ACTION	RESET
A07	Antifreeze alarm	Digital input enabled if BTWOT < “set value” and activates for the “time set”	“open collector” outlet / alarm relay is activated The buzzer is activated The icon for general alarm flashes The alarm code is displayed	Automatic It becomes manual after “tripping per hour” Manual Disabling: - when the antifreeze regulation probe BTWOT > “set value” in chiller modality; and resetting procedure
A07	Antifreeze alarm	Digital input enabled	“open collector” outlet / alarm relay is activated The buzzer is activated The icon for general alarm flashes The alarm code is displayed	Automatic It becomes manual after “tripping per hour” Manual Disabling: digital input not enabled resetting procedure
A07	Antifreeze alarm motocondensing units (Not enabled)	Digital input enabled	“open collector” outlet / alarm relay is activated The buzzer is activated The icon for general alarm flashes The alarm code is displayed	Automatic It becomes manual after “tripping per hour” Manual Disabling: digital input not enabled resetting procedure
A08	Flow meter alarm and pump thermal alarm (air/water or water/water units)	Digital input enabled enabled for “time set”	“open collector” outlet / alarm relay is activated The buzzer is activated The icon for flow meter alarm flashes The alarm code is displayed	Automatic It becomes manual after “tripping per hour” Manual Disabling: Digital input disabled for “time set” and reset procedure
A09	Compressor 1 thermal alarm	Digital input enabled	“open collector” outlet / alarm relay is activated The buzzer is activated The icon for general alarm flashes The alarm code is displayed	Manual Digital input disabled and the resetting procedure is carried out
A10	Compressor 2 thermal alarm	Digital input enabled	“open collector” outlet / alarm relay is activated The buzzer is activated The icon for general alarm flashes The alarm code is displayed	Manual Digital input disabled and the resetting procedure is carried out
A09-A10	Compressor 1-2 thermal alarm	The alarm is visualized but not enabled during “compressor thermal delay time” after compressor start up	Relay alarm + buzzer activated	If ID is not activated Manual To reset the alarm enter the programming
A11	Condensation fan (Not enabled)	Digital input enabled	“open collector” outlet / alarm relay is activated The buzzer is activated The icon for general alarm flashes The alarm code is displayed	Manual Digital input disabled and the resetting procedure is carried out
A12	Error alarm during defrosting (not enabled)	Defrosting end (max. time)	Displayed code Only signalling	Automatic With following correct defrosting cycle Manual Reset procedure
A13	Compressor 1 maintenance alarm	Operating hours > “set threshold”	“open collector” outlet / alarm relay is activated The buzzer is activated The alarm code is displayed	Manual Operating hours reset
A14	Compressor 2 maintenance alarm	Operating hours > “set threshold”	“open collector” outlet / alarm relay is activated The buzzer is activated The alarm code is displayed	Manual Operating hours reset
A15	Water pump maintenance alarm	Operating hours > “set threshold”	“open collector” outlet / alarm relay is activated The buzzer is activated The alarm code is displayed	Manual Operating hours reset
A20	Low water temperature alarm at evaporator outlet	Only units operating if the temperature measured by PB2 is lower than AL23	“open collector” outlet / alarm relay activated The buzzer is activated The alarm code is displayed	Automatic

CODE	MEANING	CAUSE	ACTION	RESET
A21	High water temperature alarm at evaporator outlet	Only units operating if the temperature measured by PB2 is higher than AL24	“open collector” outlet / alarm relay are activated The buzzer is activated The alarm code is displayed	Automatic
rtC	Clock alarm	Clock to be regulated	“open collector” outlet / alarm relay is activated The buzzer is activated The icon for general alarm flashes The alarm code is displayed	Manual Clock regulation and resetting procedure
rtF	Clock alarm	Clock damaged Clock malfunction	“open collector” outlet / alarm relay is activated The buzzer is activated The icon for general alarm flashes The alarm code is displayed	Manual Resetting procedure If after resetting the alarm persists replace the clock
EE	Eeprom error alarm	Memory data lost	“open collector” outlet / alarm relay is activated The buzzer is activated The icon for general alarm flashes The alarm code is displayed	Manual Resetting procedure If after resetting the alarm persists the device remains blocked
ACF2	Configuration alarm	Unit configured as heat pump with commutation valve not configured	“open collector” outlet / alarm relay is activated The buzzer is activated The icon for general alarm flashes The alarm code is displayed	Automatic With correct re-programming
ACF3	Configuration alarm	Two digital inputs with the same configuration	“open collector” outlet / alarm relay is activated The buzzer is activated The icon for general alarm flashes The alarm code is displayed	Automatic With correct re-programming
ACF4	Configuration alarm	CF28 = 1 and the digital input not configured or CF28 = 2 probe BAT1 different from 3	“open collector” outlet / alarm relay is activated The buzzer is activated The icon for general alarm flashes The alarm code is displayed	Automatic With correct re-programming
FErr	Operating alarm	with two digital inputs enabled at the same time	The buzzer is activated The icon for general alarm flashes	Manual Disabling of digital inputs + reset procedure
AFr	Net frequency alarm	Net frequency out of range	“open collector” outlet / alarm relay is activated The buzzer is activated The icon for general alarm flashes The alarm code is displayed	Automatic Net frequency into operating range
ALOC	General alarm	ID configured as unit blocked generic alarm “time set” AL21	Relay alarm + buzzer activated	ID configured as unit blocked generic alarm “fixed time” Automatic: It becomes manual after “tripping per hour set” (reset procedure in function menu). It is memorized in the alarm historic only with manual rearm

12.2 Outlet blocking

Alarm code	Alarm Description	Comp. 1	Comp. 2	Antifreeze Resistances	Pump
P1	BEWOT probe	Yes	Yes	Yes	
P2	BTWOT probe	Yes	Yes	Yes	
P3	BCP1 probe	Yes	Yes	Yes	
P4	BAT1 probe	Yes	Yes	Yes	
A01	High pressure switch	Yes	Yes		
	Fan thermal protection	Yes	Yes		
A02	Low pressure switch	Yes	Yes		
A03	Ambient air low temperature				
A04	Air low temperature at unit outlet	Yes	Yes	Yes	
A05	High temperature High pressure	Yes	Yes		
A06	Low pressure Low temperature	Yes	Yes		
A07	Analogue input antifreeze	Yes	Yes		
A07	Digital input antifreeze	Yes	Yes		
A07	Motorcondensing antifreeze	Yes	Yes		
A08	Flow meter/pump thermal protection	Yes	Yes	Boiler Res. Yes	Yes
A09	Compressor 1 thermal protection	Yes			
A10	Compressor 2 thermal protection		Yes		
A09-A10	Compressor 1-2 thermal protection	Yes	Yes		
A13	Compressor 1 maintenance				
A14	Compressor 2 maintenance				
A15	Water pump maintenance				
A20	Low water temperature BTWOT				
A21	High water temperature BTWOT				
rtC	Clock alarm				
rtF	Clock alarm				
EE	Eeprom error	Yes	Yes	Yes	Yes
ACF2	Configuration alarm	Yes	Yes	Yes	Yes
ACF3	Configuration alarm	Yes	Yes	Yes	Yes
ACF4	Configuration alarm	Yes	Yes	Yes	Yes
ACF6	Configuration alarm	Yes	Yes	Yes	Yes
FErr	Operating error (motorcond.)	Yes	Yes		Yes
Afr	Net frequency alarm	Yes	Yes	Yes	Yes
ALOC	Generic alarm	Yes	Yes	Yes	Yes

NOTE

The electronic control board is furnished with a "history" loop, see chapter 7.12.5 "How to display the alarm historic "ALoG"".