
Instruction Manual



AQUAFLAIR

BREC

Air-cooled water chillers

BREF

Air-cooled water chillers with free-cooling system

1602A - 1802A - 2202A - 2502A - 2802A - 3202A - 3602A - 4202A - 4802A

R134a (300-1050 kW)















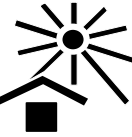
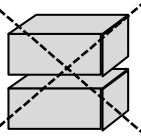
UNIFLAIR SpA policy is one of continuous technological innovation and the Company therefore reserves the right to amend any data herein without prior notice.

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SYMBOLS USED

SYMBOL	MEANING	SYMBOL	MEANING
	DANGER		MOVING COMPONENTS
	IMPORTANT WARNING		HOT SURFACES – DANGER OF BURNING
	HIGH VOLTAGE – ELECTRICAL RISK		SHARP EDGES
	FRAGILE: handle with care.		THIS SIDE UP shows the orientation of the unit.
	PROTECT AGAINST MOISTURE: the packaged unit must be stored in a dry place.		TEMPERATURE LIMITS: the unit must not be stored outside these limits.
	CENTRE OF GRAVITY: shows the centre of gravity of the packaged unit.		NO HOOKS: do not use hooks to lift the packed unit.
	KEEP AWAY FROM HEAT: the unit must be kept away from heat sources.		DO NOT STACK.

WARNING

GENERAL

This unit has been subjected to risk analysis under EC Directive 98/37/CEE (89/392/CEE). The technical solutions implemented during the design phase are described in the unit's technical file.

This equipment is manufactured to function safely for the purposes for which it was designed, as long as the installation, operation and maintenance are carried out according to the instructions in this manual and the labels attached to the unit.

In compliance with European Community Directive 94/9/CE these units are not to be used in potentially explosive environments.

This machine is subject to the European Community Directive 97/23/EEC regarding Pressure Equipment. Any intervention on the pressure circuit must be authorized by Uniflair, and the personnel must be approved by Uniflair. If any of the following components: compressors, liquid receivers, safety valves, refrigerant pressostats are to be replaced, Uniflair must be immediately informed of the serial number of the new devices and the devices replaced, otherwise Uniflair shall not guarantee the integrity of the equipment. Additionally, if any soldered joint needs to be repaired on site, Uniflair must be immediately informed which joint and the name of the engineer.



This unit contains refrigerant gas circuits, chilled water under pressure, live electrical components, hot surfaces, sharp edges (the fins on the coils) and rotating devices such as the fans.

All service and maintenance operations which require access to the inside of the unit while it is in operation must be performed by qualified and experienced personnel who are aware of the necessary precautions.



Before accessing the inside of the unit, disconnect it from the electrical power supply.



In any case, all safety legislation regarding the installation location must be followed.

In the event of fire, water and other conductive substances must not be used to extinguish the fire near live electrical components. This warning must be displayed on notices in the unit installation location.

If the refrigerants used come into contact with fire they decompose, forming acids and other irritants. The smell of these substances, even at concentrations below the danger levels, gives enough warning to allow evacuation of the area at risk.

Make sure that the mains supply to the unit is the same as that shown on the data plate.



Free cooling chillers must be loaded with anti-freeze.

If the unit is fitted with the *optional* heating cable, it must be turned off without cutting the electrical power supply.

Install a mechanical filter in the section of tubing near the intake of the unit to prevent the heat exchanger being blocked with pieces of welding or flakes of oxidised metal from the water mains.

LOW OUTDOOR AIR TEMPERATURE

Units without free-cooling: drain all the water from the system before the winter to avoid freezing.

In periods in which the temperature may fall below 0°C, empty the unit in order to prevent serious damage caused by the formation of ice.

This precaution is not necessary if the unit is charged with an appropriate anti-freeze mixture.

Air-cooled water chillers with the free-cooling system must be loaded with anti-freeze mixture.

SAFETY

The new range of AQUAFLAIR water chillers and heat pumps features state-of-the-art technology ensuring maximum reliability, safety, quiet operation and respect for the environment.

- 1) **RELIABILITY:** Trouble-free operation of Uniflair precision chillers is ensured by rigorous production process controls under ISO 9001-certified quality procedures:
 - quality control of components;
 - pressure testing of refrigerant and water circuits;
 - testing of current absorption and IEC safety testing;
 - calibration and testing of instruments and safety devices;
 - final testing of the unit under operating conditions.

- 2) **ACTIVE SAFETY:** UNIFLAIR safety and control systems have a supervision and prevention function with:
 - automatic blocking of components in dangerous conditions;
 - indication of function status; reading and continuous display of circulating fluid temperature;
 - management of compressor start-ups to reduce excessive switching on and off;
 - compressor start timing to reduce total unit start-up current;
 - indication of anomalous operating conditions and/or alarms.

- 3) **PASSIVE SAFETY:** The essential functions of UNIFLAIR chillers are protected against anomalous function conditions and potential damage by:
 - high and low pressure switches on the refrigerant circuit (HP with manual re-set);
 - safety valve on the high pressure refrigerant line;
 - anti-freeze protection to prevent freezing of the evaporator, pump and tank;
 - compressor motor electrical protection;
 - water circuit safety (with optional pump group);
 - compressor crankcase heater (standard on free-cooling and heat pump versions).

- 4) **PERSONAL SAFETY.** The design and cabling of all UNIFLAIR chillers conforms to IEC electro-technical norms. Electrical panels have auxiliary 24V circuits and are equipped with:
 - general switch and door lock switch;
 - automatic circuit-breaker switches;
 - double protection panel on fan compartment.

The fans are protected on both sides by an external metal grille which conforms to applicable safety norms.

DOCUMENTATION INCLUDED WITH THE UNIT

Each **AQUAFLAIR** chiller is delivered complete with the following documentation:

- BRE and microprocessor control instruction manuals
- Unit installation diagrams
- Diagrams of the refrigerant and hydraulic circuits of the unit
- Electrical diagrams
- List of spare parts
- CE declaration with list of European directives and norms to which the unit conforms
- Warranty Conditions

DATA PLATE

The chiller data plate is in the electrical panel and gives the following information:

- Model of the unit
- Serial number
- Voltage, number of phases and power supply frequency for primary and auxiliary circuits
- Current and power absorbed
- OA (Operating current), FLA (Full load current) and LRA (Locked rotor current)
- Safety device settings
- Refrigerant type and charge in kg for each circuit.

<i>MODEL</i>	<i>SERIAL No.</i>
<i>POWER SUPPLY VOLTAGE</i>	
<i>CURRENT</i>	
<i>OA FLA LRA KW TOTAL</i>	
<i>SAFETY DEVICE SETTINGS</i>	
<i>REFRIGERANT</i>	

<i>REFRIGERANT</i>	<i>TYPE</i>	<i>O.D.P.</i>	<i>G.W.P.</i>	<i>T.E.W.I.(*)</i>
R134	HFC	0	1300	1821

(*) for year, specific (each kW, each year), with assumed total refrigerant recovery factor at end of life ($\alpha=1$)

DIMENSIONS AND WEIGHTS

BREC - F		1602A	1802A	2202A	2502A	2802A	3202A	3602A	4202A	4802A
Height (**)	mm	2510	2510	2510	2510	2510	2510	2510	2510	2510
Depth	mm	4985	4985	6415	6415	6415	8890	8890	10320	10320
Width	mm	2250	2250	2250	2250	2250	2250	2250	2250	2250
Weights (BREC)										
Weight (basic version, without hydraulic kit) (*)	Kg	3961	4317	4583	4611	5095	6304	6604	7321	7360
Weight (basic version with 1 pump) (*)	Kg	4111	4467	4748	4776	5260	6654	6954	7621	7660
Weight (version with 2 pumps) (*)	Kg	4271	4627	4929	4957	5441	7035	7335	7928	7967
Weights (BREF)										
Weight (basic version, without hydraulic kit) (*)	Kg	4677	5121	5546	5574	5936	7402	7702	8843	8882
Weight (basic version with 1 pump) (*)	Kg	4827	5271	5711	5739	6101	7752	8052	9143	9182
Weight (version with 2 pumps) (*)	Kg	4989	5433	5896	5924	6286	8133	8433	9450	9489
Options										
Partial heat recovery	Kg	80	80	110	110	110	300	300	320	320
Ultra low noise version	Kg	200	200	200	200	200	505	505	550	550
Economizer	Kg	35	35	45	45	45	80	80	85	85

(*) with empty hydraulic circuit

(**) without vibration supports

INSTALLATION

TRANSPORT AND HANDLING

Move the unit as near to the installation site as possible before removing packaging. The unit must be lifted using equipment and procedures illustrated in the drawings in the documentation attached.

Check the drawings attached to the unit or the installation drawings included in the machine documentation.

Unit dimensions are given in the technical data tables and installation drawings included.

RECEIVING AND STORING THE UNIT

Each unit leaves the factory in perfect condition. Therefore please check the unit very carefully on delivery and notify the transport company immediately and in writing of any damage which may have been caused during transportation.

Respect the storage temperature : -15 → +50°C
Do not expose to the solar ray



Check that the load capacity of the floor is sufficient to support the weight of the unit.



The unit must be set on a solid, level surface. Once positioned, level the unit with the aid of a suitable spirit level using the adjustable feet and, where necessary, shims: the gradient should not exceed 0.5 degrees under any circumstances.

The unit must not be turned on its side or upside down.

POSITIONING THE UNIT – OPERATING SPACE

For lifting the unit it is necessary to consult the drawings attached to the documentation

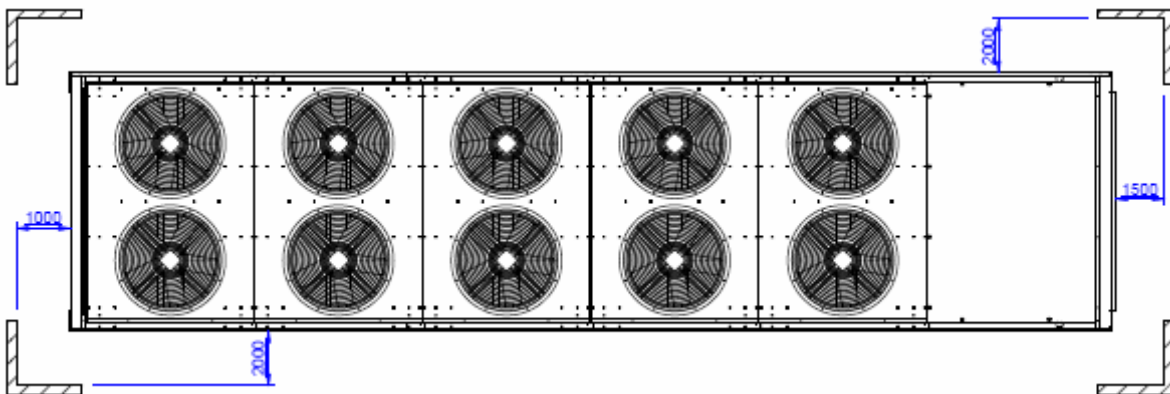


This unit has been built for outdoor installation and therefore with a free flow of air to the condensing coil. The air flow aspirated by the fans through the condensing coil must not be blocked in order not to affect the unit's efficiency and to avoid the safety devices intervening.

In any case, the safety standards in force on the installation site must be respected as well as the minimum distances indicated (see operating space paragraph), they must also be respected when any maintenance is carried out.

Avoid installation in particularly harsh environments (in this case please contact Uniflair S.p.A. for possible technical solutions.)

The rubber or spring anti-vibration supports (both optional) reduce the transmission of vibrations to the support slab.



Note: The dimensions are in mm.

Verify the placing of the unit on the roof/floor. The unit should be placed on anti-vibration supports (rubber or spring type depending on the type of application) in order to reduce the vibration levels. The unit must be placed perfectly horizontally.

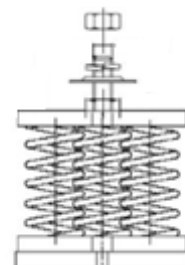


ANTI-VIBRATION SUPPORTS

To reduce vibrations, AQUAFLAIR^{B.R.E} units can be supplied with anti-vibration supports.

Uniflair has selected spring supports for its units. They are composed of C72 steel with epoxy painted springs, the bases are made of elastomer with a metal insert. These supports allow considerable yielding while being highly compact. As a result, they are particularly efficient in insulating low frequencies, typical of machines, such as refrigerators, running at low revs.

Moreover, their design enables them to be used in particularly difficult and/or aggressive environments, as the supports are highly resistant to oils, corrosion and high temperatures.

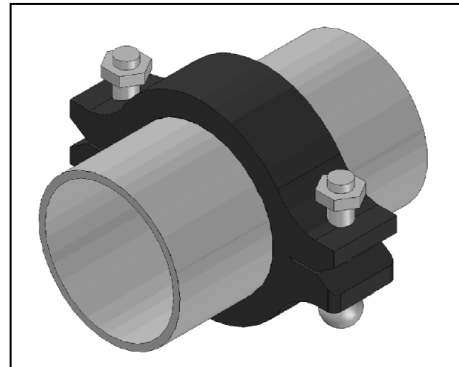


HYDRAULIC CONNECTIONS

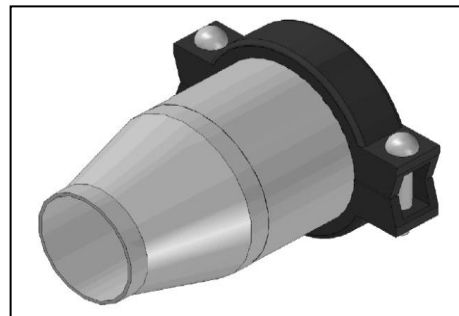
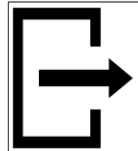
For a welded hydraulic connection use the “stub pipes” which are supplied, or connect the unit directly by using pipes channeled into the unit using a victaulic joint, ensuring that the joint gasket is adequately embedded.

- 1) CHECK that the section of chilled water pipes and the circulation pump fitted are adequate. An inadequate water flow significantly reduces the cooling capacity of the unit.
- 2) CHECK the water inlet/outlet directions. There are labels next to the inlet, outlet and heat recovery connections as shown in the diagram below.

INGRESSO - INLET
EINGANG - ENTREE
ENTRADA
 I_{ev} →



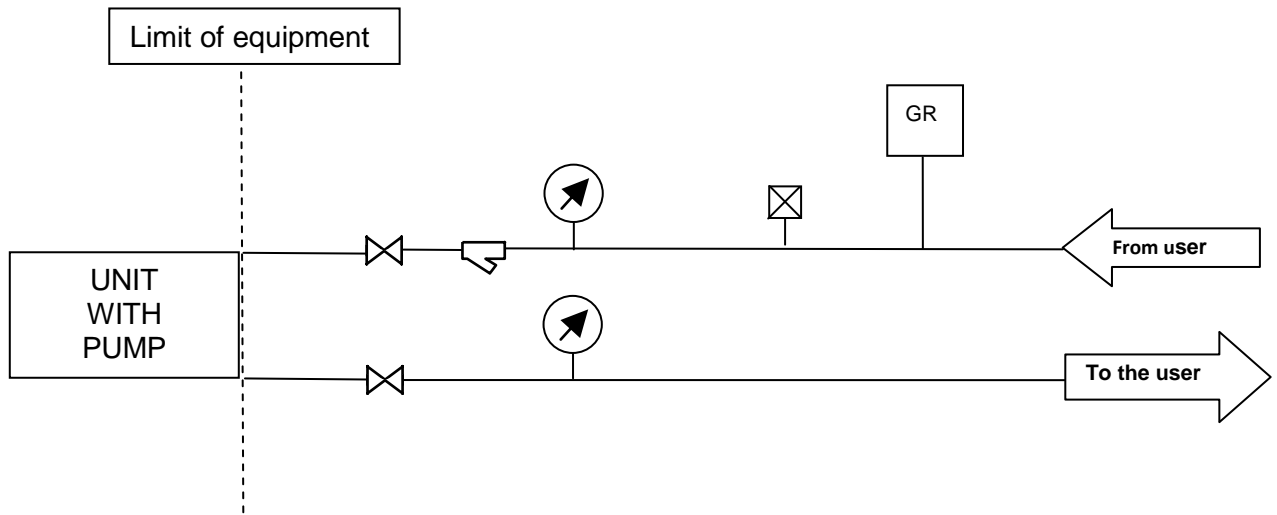
USCITA - OUTLET
AUSGANG - SORTIE
SALIDA
 U_{ev} ←



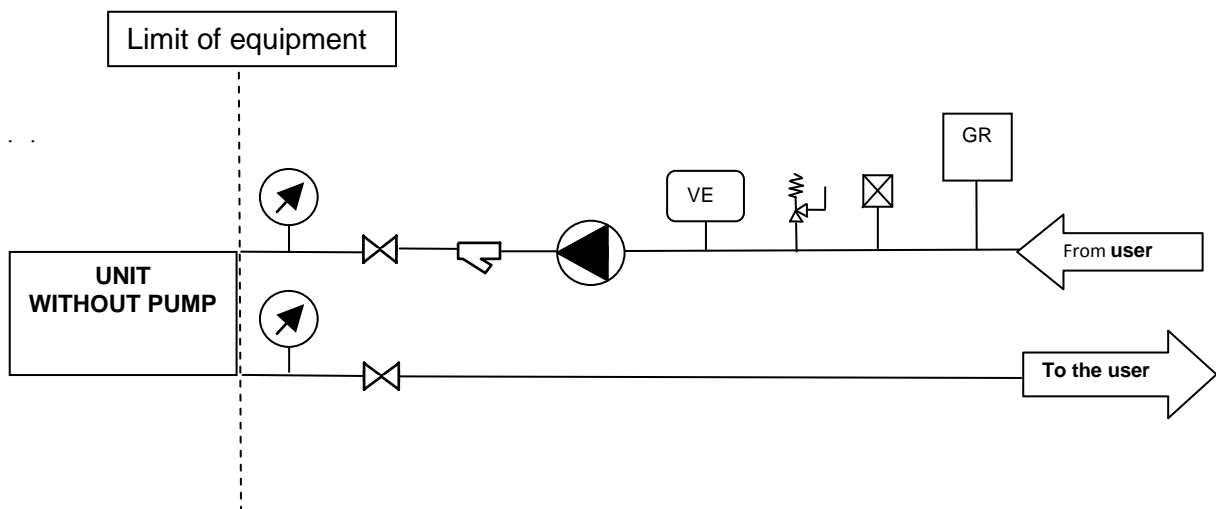
- 3) Connect the chiller using flexible tubes to stop the transmission of vibrations. Fit shut-off valves so that the unit can be isolated from the water circuit;
- 4) Insulate the chilled water pipes to stop the formation of condensation;
- 5) Fit temperature measuring points on the pipes near the inlet and outlet connections;
- 6) Install a metal filter in the section of pipe next to the unit intake to prevent pieces of welding or flakes of rust entering the heat exchanger;
- 7) Provide a discharge well so that the unit can be emptied when necessary.

BREC- BREF		1602A	1802A	2202A	2502A	2802A	3202A	3602A	4202A	4802A
Victaulic hydraulic connections		4"	4"	4"	4"	5"	5"	5"	6"	6"

EXAMPLE OF UNIT INSTALLATION WITH OR WITHOUT PUMP



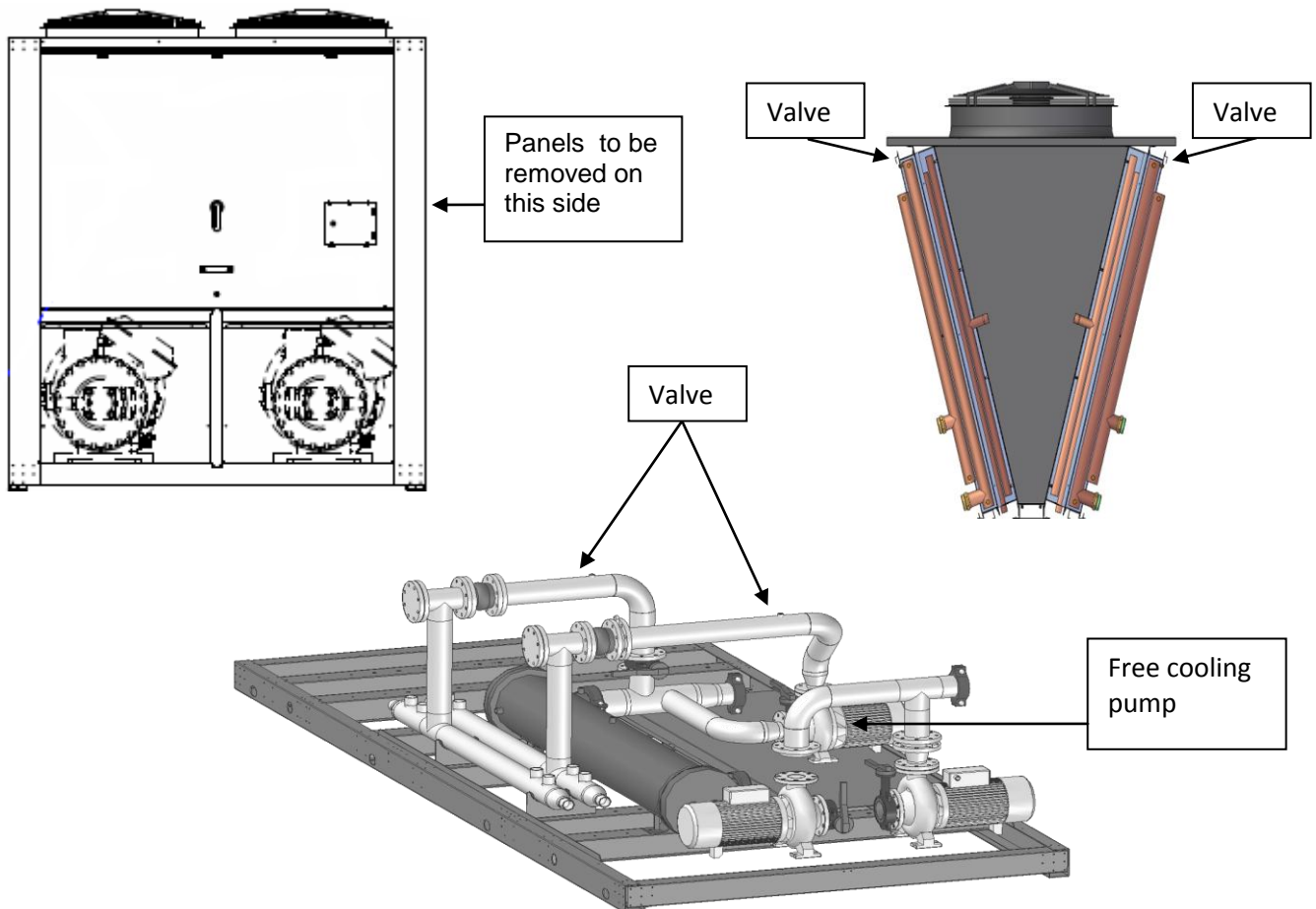
VE	EXPANSION VESSEL		SAFETY VALVE
GR	FILL IN		VALVE
	PUMP		MECHANICAL FILTER
	AUTOMATIC AIR VALVE		MANOMETER



Filling of the water circuit

Once the unit is connected to the installation of the user it is possible to proceed with filling it with water (or water + Glycol) allowing the air present in the pipes to escape by means of the installer's predisposed valves.

For models with free-cooling (BREF) remove the panels on the right side of the unit and allow the air to escape by means of the appropriate screw valves as indicated in the following designs. During the filling phase of the free-cooling circuit it is also necessary to allow the air to escape from the pipes above the pump to avoid cavitation and any consequent damage to the pump.



Glycol water mixtures can be cooled down to -15°C as long as the water in the circuit contains sufficient antifreeze to prevent freezing inside the evaporator

Minimum fluid temperature with unit operating	5,0 °C	3,0 °C	-5,0 °C	-10,0 °C	-18,0 °C	-28,0°C
Freezing temperature	0 °C	-4,4 °C	-9,6 °C	-16,1 °C	-24,5 °C	-35,5 °C
Percentage of ethylene glycol by weight	0%	10%	20%	30%	40%	50%

Important: if a possible stop during winter is predicted, it is necessary to completely empty the hydraulic circuit adding the necessary quantity of glycol to the remaining water in the unit.



ELECTRICAL CONNECTIONS

Before performing any work on electrical parts, make sure they are not connected to the power supply.

In order to prevent accidents and for the chiller to provide good, lasting, continuous service, it is essential that wiring is carried out correctly, in a professional manner and in accordance with the regulations in force.

GENERAL INSTRUCTIONS CONNECTION TO MAINS SUPPLY

To connect the power cables, remove the cover plate on the bottom of the unit.

Since the unit is placed outdoors, IP55 insulation protection must be maintained, therefore suitable cable clamps/sheath clamps and/or junction boxes must be used.

Cables must be connected by first removing the Plexiglas cover protecting the poles of the disconnecter and then fastening the wire terminals of the cables to the relevant holes provided for this purpose.

Once this has been done, make sure the cover is re-positioned.

It is vital the phases are connected correctly in the position indicated on the wiring diagram which is supplied with the unit as if they are connected in any other way, the unit will not work.

Particular attention must be given to the following:
Electrical connections must be carried out by qualified installers.
Power leads must be protected upstream against the effects of short-circuits and current overload.



DESCRIPTION OF PROCEDURE

- 1) OPEN the door of the master electrical panel which is located on the front of the unit above the compressor compartment;
- 2) MAKE SURE that the mains voltage matches the voltage given on the data plate of the unit (voltage, number and frequency of the phases);
- 3) INTRODUCE the feeding cable through the flange in the position indicated in the diagram.

Remove the flange which is placed low on the left of the unit, and make the necessary entry holes (this must be done in such a way as to fix the cable to the upright of the unit until it reaches the electrical panel).

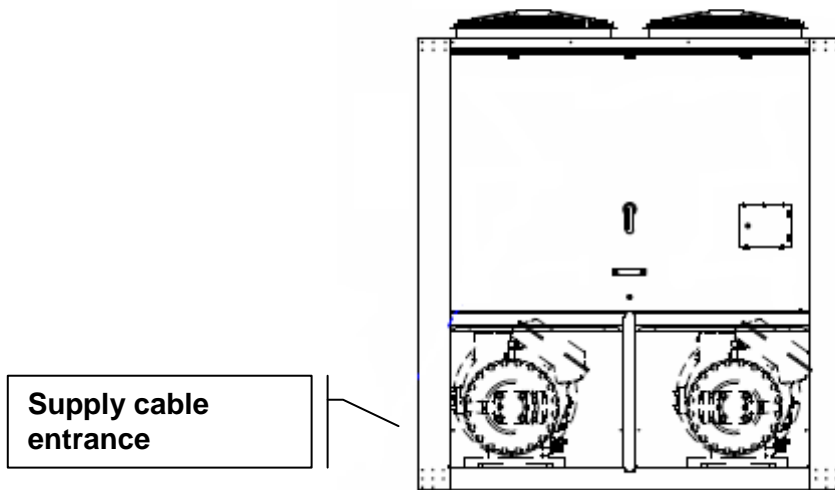
There is an extractable flange on the left of the base of the electrical panel and two holes on the right hand side to allow the power supply and signal cables to enter.

- a. for the power supply cables, which will be connected to the terminals on the IG general switch on the left hand side of the electrical panel, it is necessary to unscrew the flange and make two holes where needed.
- b. for the signal cables, which will be connected to the terminals on the microprocessor board on the right hand side of the electrical panel, only the plugs on the holes which have already been made need to be removed.

The power supply lead is not supplied by UNIFLAIR S.p.A and the installer must choose an appropriately sized cable.

The power lead's cross-section **must be chosen based on the length of the lead**, how it is to be laid, the chiller's maximum current demand, and in such a way that an excessive drop in voltage is avoided (the supply voltage must be within $\pm 10\%$ of the rated value).

The power supply connection must be supported by the entry flange provided for this purpose.



4) CONNECT the three power phases to the terminals of the IG master switch, making sure beforehand that none of the electrical parts are live.
Ensure the wires are properly fitted in the respective terminals and tighten the screws as far as they will go.

It is possible to switch the unit on and off or switch between cooling and heating mode using remote switches:

5) CONNECT the remote ON/OFF switch to terminals 20 and 50 on the terminal board of the electrical panel;

6) CONNECT the remote alarm warning (if there is no remote user terminal):

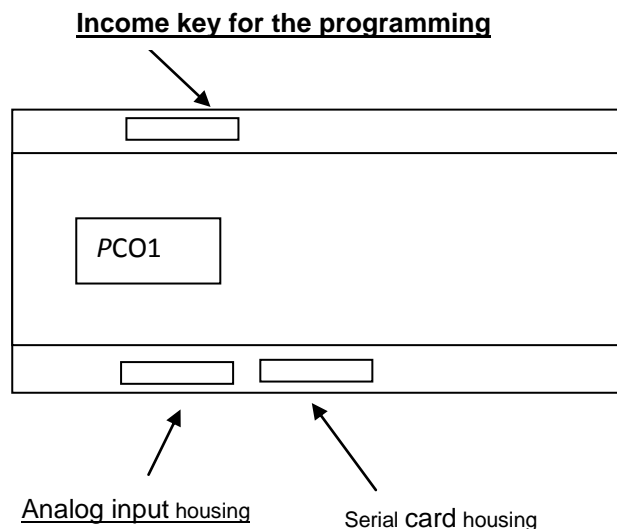
7) USE the switching contact (terminals 961, 960, 962) for signalling type-A alarms (971,970,972) for type-B alarms (see controller's manual).

8) Close the IG master switch followed by the IM9 switch and then make sure the two LEDs on the RSF phase sequence relay, which is located at the top of the panel, come on.
If this doesn't happen, check the power supply or swap over the two phases of the power lead.

FITTING THE OPTIONAL RS 485 BOARD

1. Disconnect the power supply to the board;
2. Insert the RS485 card on the SERIAL connector of the main board;
3. Respect the polarities shown when connecting the serial line;
4. The serial line must be closed by means of a 120Ω - $1/4W$ resistance, placed between the TX/RX+ and TX/RX- terminals of the board at the end line of the network.

The serial address is set via the user terminal using the relevant functions (see controller's manual)



STARTUP AND TESTING CHECK LIST

Before starting-up the unit, read the enclosed section on Commissioning the first start-up for screw compressors



Once installation is complete, follow the procedure illustrated:

Tighten all the electrical terminal connections

Verify the correct mains voltage

Verify the gas circuit pressures (manometer).

Verify the percentage of glycol present in the hydraulic circuit.

Close the IG master switch electrical panel, making sure beforehand that the power supply phases are properly connected

OIL HEATING :

after the unit has been connected to the power supply, (with the IG master switch in position ON, the IM9 closed and the unit switched off from the user terminal) wait 12 hours before starting the system in order to heat the oil of the compressors sufficiently. Do not switch off the power during weekly breaks in operation. When left idle for longer periods, the refrigerant may migrate into the compressor casing of its own accord. This may result in the oil foaming when the machine is switched on, which is liable to lead to damage because of insufficient purification.



When the power is supplied to the auxiliary circuit of the electrical panel (IM9) the control is activated as follows:

the yellow led lights up indicating that there is a power supply to the master board (see master board layout)

a short audible signal is heard

the display shows the start screen for 10 seconds before switching to unit stopped status

when the unit is powered but not running, 3 fields are active on the user terminal display: Time and current date (only in units featuring a clock card), return water temperature, external temperature (only units featuring free-cooling), and one of the following messages indicating how the unit has been switched off : ON/OFF button, supervisory system, time programme or manual override.

WATER IN TEMP. . . . °C
WATER OUT TEMP. . . . °C
UNIT OFF

Start the unit (read the section on commissioning screw compressors first) by pressing the on-off key on the user terminal.

Make sure none of the red alarm LEDs are lit : if an LED lights up, refer to the “Problem solving guide” section and instructions given in the microprocessor control manual. To switch off the unit, use the local terminal to allow the pumps to stop at least 10 seconds after the chiller, thus preventing the chiller from stopping in no-flow conditions

PROGRAMMING AND REGULATION

This system, which is able to be programmed according to the specific needs of its user, is particularly suitable for technological applications since it enables independent control of all of the on/off switches on the compressors.

The regulation program, which can be found in the FLASH EPROM memory (base card), is identified by an alphanumeric code, the logic of which is explained here below.

Control parameters (set points, alarms) and display of data and events (reading of set points and control values, operating events or/and alarms) **are all programmed** through the **User terminal** as shown below



PROGRAM VERSION

Press  to view the program version which has been installed in the Flash Eeprom memory.

You will need this information when several units are to be connected to a local LAN network, all of the units which are connected must have the same program version.

When using a service centre, it is important to inform the technicians which version of the regulation program is installed in the Flash Eeprom.



UPC1m board



SEMI-HERMETIC COMPACT SCREWS START-UP PROCEDURE

CHECKING THE ROTATION DIRECTION

Attention!

Danger of severe compressor damage.

Operate screw compressors only in the prescribed rotation direction.

Despite the phase sequence control by the INT69VSY-II protection device, a test is recommended.

Rotation direction check with mounted suction shut-off valve:

- Connect a gauge to the suction shut-off valve.
- Close the valve and then open it again with one turn.
- Start the compressor briefly (approx. 0.5 .. 1 s).
- Correct rotating direction: the suction pressure drops immediately.
- Wrong rotating direction: the pressure increases or the protection device shuts off.

Invert the polarity of the terminals on the common supply line.

Rotation direction check without suction shut-off valve:

- Close the solenoid valves (evaporator and economiser).
- Start the compressor briefly (approx. 0.5 .. 1 s).
- The changes in pressure are noticeably reduced compared to a throttled suction shut-off valve.
- Correct rotating direction: the suction pressure drops.
- Wrong rotating direction: the pressure remains unchanged, increases or the protection device shuts off.

Invert the polarity of the terminals on the common supply line.

Start-up

Start the compressor again and slowly open the suction shut-off valve.

Lubrication / oil check

The compressor lubrication should be checked immediately after the unit is started up.

- Oil level visible inside the sight glass or slightly below (repeat this check during the first hours of operation).
- Oil foam can be generated during the starting phase, but should reduce under stable operating conditions, otherwise this can indicate excessive liquid in the suction gas.

WHEN THE UNIT IS RUNNING AT FULL LOAD

Check that the liquid supercooling at the thermostatic intake is 5 to 10°C less than the condensation temperature on the manometer scale and that the superheating is between 5 and 8°C.

NOTE: when charging with R134a check the liquid supercooling value (5 to 10°C) in the sight glass.



SETTING THE SAFETY DEVICE

The function parameter values set on the microprocessor control are given in the enclosed instruction manual. The table below gives the settings of the safety devices; these are also on the data plate on the unit.

Component		Circuit 1	Circuit 2
High pressure swich	barg	22,5	22,5
Low pressure sensor	barg	0,3	0,3
High safety pressure valve	barg	25	25
Low safety pressure valve	barg	16	16

MAINTENANCE AND REPLACING COMPONENTS

Disconnect the unit from the electric power supply before accessing internal components.

All service and maintenance operations which require access to the internal components of the unit while it is operating must be carried out by qualified experts who are aware of the necessary precautions to take.

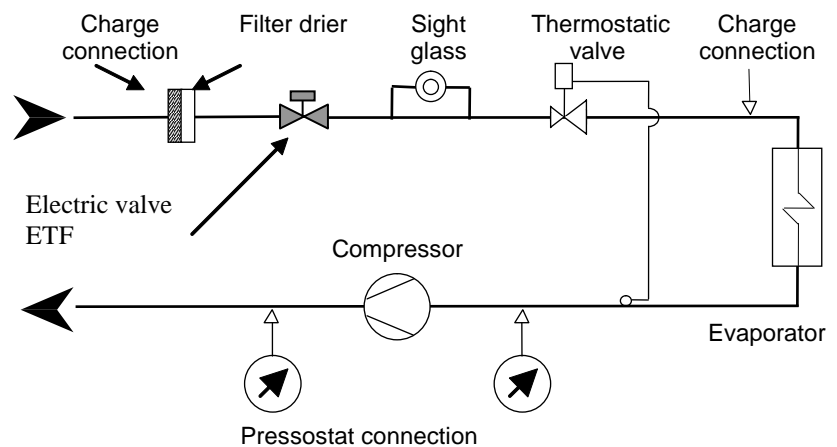


Refrigerant charge

Units are pre-charged in the factory and do not need re-charging unless there have been problems during transport or installation or if the safety valve has intervened. If it is necessary to adjust the charge, follow the instructions below. If the circuit has been drained for the replacement of components, a vacuum must be created in the circuit before re-charging.

CREATING A VACUUM IN THE CIRCUIT

Connect the vacuum pump to the valves in the compressor housing and take the vacuum in the system to 0.3 mbar; remember that the vacuum must not be created too quickly (at least 120 minutes). When the vacuum level is reached, maintain it for at least 60 minutes.



REFRIGERANT CHARGE

The system must be charged with liquid refrigerant fluid via the needle valve between the thermostatic expansion valve and the evaporator until there are no bubbles in the flow sight glass. The charge must be carried out under normal conditions and with an output pressure of 10,5-12,0 bar (43-48°C).

Check the data plate to see the quantity of refrigerant needed and check that the liquid supercooling at the thermostatic intake is 5 to 10°C less than the condensation temperature on the manometer scale and that the superheating is between 5 and 8°C

NOTE: when charging with R134a check the liquid supercooling value (5 to 10°C) in the sight glass.

Refrigerant charge connections

Refrigerant content

The table below shows the refrigerant content for the basic version. These values are indicative and the quantities may vary slightly due to adjustments made during end of line testing.

The above data refer to the basic version of each unit, i.e. it goes without saying that the amount may vary depending on the configuration of the unit itself.

BREC - F		1602A	1802A	2202A	2502A	2802A	3202A	3602A	4202A	4802A
Circuit 1	Kg	47	48	63	64	65	78	80	95	96
Circuit 2	Kg	47	48	63	64	65	78	80	95	96

Check the type of refrigerant used on the unit data plate and on the compressor data plate.

If it is necessary to top up the oil, use only the oils listed.

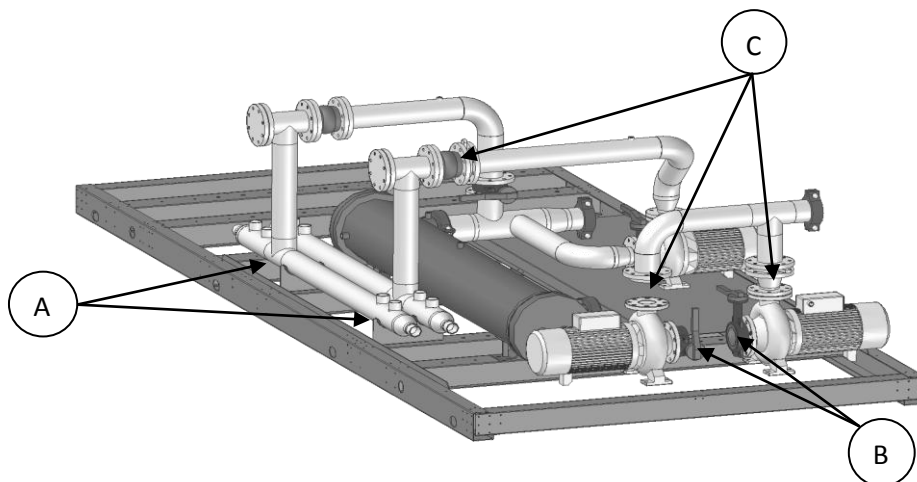
Do not use the compressor to create a vacuum in the system.



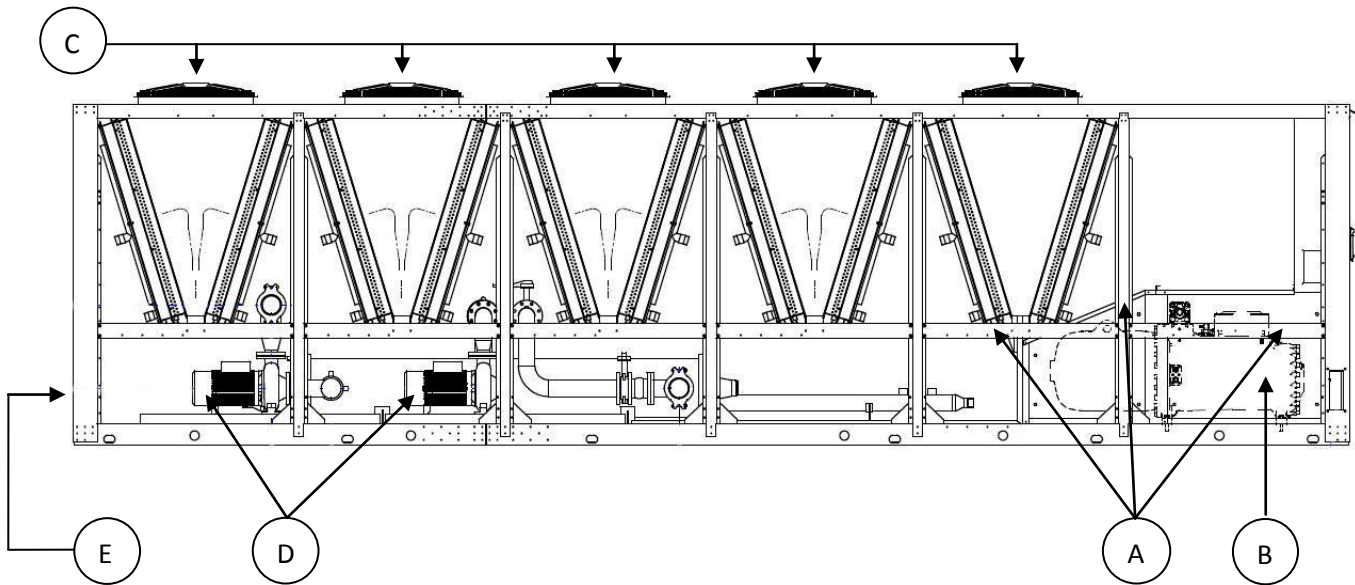
Draining the water circuit

During winter shutdown (cooling-only versions) or for special maintenance, it may be necessary to drain the water circuit.

In the drawing below the positions for the following devices are shown: drain train, shut-off valves and non-return valves.



- A. Drain plugs
- B. Pumps shut-off valves
- C. Non-return valves



Substitution of the compressors

1. Remove the vertical struts and cross bars "A" (the coils remain supported by the internal brackets)
2. Dismantle the sound proofing compressor housing (only present on the Ultra Low Noise version).
3. Disconnect the power supply inside the connection box of the compressor
4. Disconnect the pressure switch, the probes and the partialization coil.
5. Close the shut-off valves of the compressor.
6. Discharge the gas present in the compressor.
7. Remove the compressor shut-off valves in such a way that they remain connected to the pipes so avoiding to completely discharge the refrigerating circuit.
8. With the aid of appropriate equipment extract the compressor "B" by sliding it laterally on to a platform.
9. Arrange installation of the new compressor.
10. Check the correct connection of phases

Substitution of the fans

1. Remove the fan to be substituted "C" working laterally to the unit, or from above the unit taking care to step only in correspondence to the cross bars underneath.

Substitution of the circulation or free cooling pumps.

1. Once the pumps "D" have been disconnected from the plant, proceed with their removal laterally with the aid of appropriate equipment.

Substitution of the water or gas coils

1. On the collection side remove the internal panels relative to the coil to be substituted.
2. Remove the brackets joining the coils together and all rivets fixing them.
3. Extract the water coil by sliding it on the support guides.
4. Extract the gas coil after extracting the water coil following the same procedure.

Substitution of the evaporator

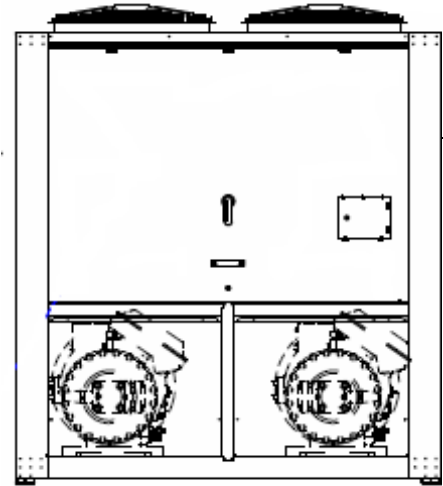
1. If the operating space allows, extract the evaporator from behind the unit "E", however, if not possible proceed by dismantling the pump "D" and extracting the evaporator laterally.

MAINTENANCE AND CLEANING

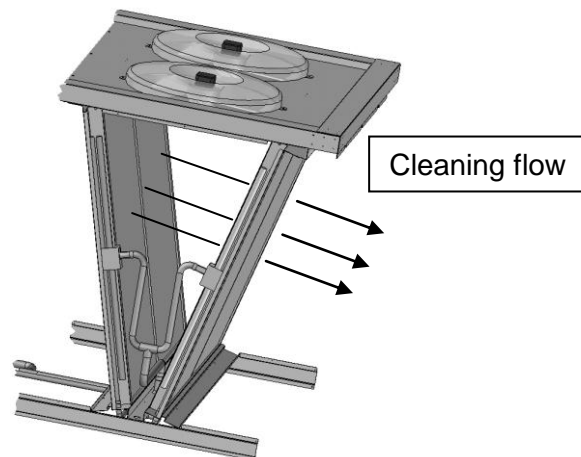
A

To clean the coils proceed in the following manner:

- Dismantle the panels on the left side of the unit (A).
- Use a jet of water directed from the inside to the outside of the coil (reversed flow in respect to normal operation).
- Reclose the panels.



All maintenance and cleaning operations must be carried out safely, following the instructions in this manual. To ensure the correct functioning of the unit, it is advisable to check regularly that the heat exchanger coils, the metal filters and the protection grilles are clean.



MAINTENANCE PROGRAMME

3 MONTHS
Check the power supply
Check the alarm status
Check the working pressures and temperatures
Check the correct operation of the local/remote controls
Check and clean the condensing and free-cooling coil/s and any metal pre-filters

6 MONTHS
Repeat these checks on a three-monthly basis
Check the fittings and the operation of the condensing fans
Check the correct water flow by measuring the thermal gradient of the fluid
Check the fittings, the operation and the absorption of the circulation pump(s) onboard the unit
Check for fouling of the water filters and carry out any cleaning needed

12 MONTHS
Repeat these checks on a six-monthly basis
Check the varnish and the nuts and bolts
Check the hinges, rabbets and gaskets
Check the cables and wiring
Tighten the terminal blocks
Check and reset if necessary the safety device settings (pressure switches, thermostats, water flow switches and protection devices)
Check the fittings, operation and absorption of the compressor/s
Check the flanges and/or Victaulic joints
Check the gas leak detector and if necessary replace the seal of the refrigerant circuit/s and tighten the joints and connections of the unit
Check and if necessary top up the refrigerant gas and/or oil
Check and if necessary reset the regulation devices setting
Check the tightness of the water joints and internal connections and if necessary replace the seals
Check the seals of the regulation valves and/or water shut off valve which are onboard the unit
Check the glycol concentration and if necessary adjust it

60 MONTHS
Check and if necessary replace the gas filters
Check and if necessary replace the compressor oil

Important: if a winter shut down period is planned, it is necessary to empty the hydraulic circuit.



TECHNICAL DATA

WATER CIRCUIT CAPACITY

The table below shows the capacity (litres) of the water circuit in basic units

BREC		1602A	1802A	2202A	2502A	2802A	3202A	3602A	4202A	4802A
Evaporator	litres	140	140	160	160	256	250	250	420	420

The table below shows the capacity (litres) of the water circuit in basic units ("free-cooling").

BREF		1602A	1802A	2202A	2502A	2802A	3202A	3602A	4202A	4802A
Evaporator	litres	140	140	160	160	256	250	250	420	420
Free-cooling coils	litres	150	186	200	200	250	300	300	360	360

RECOMMENDED MINIMUM PLANT CAPACITY

The table below shows the recommended minimum plant capacity

BREF		1602A	1802A	2202A	2502A	2802A	3202A	3602A	4202A	4802A
Recommended minimum plant capacity	litres	1000	1150	1300	1400	1600	1800	2000	2400	2600

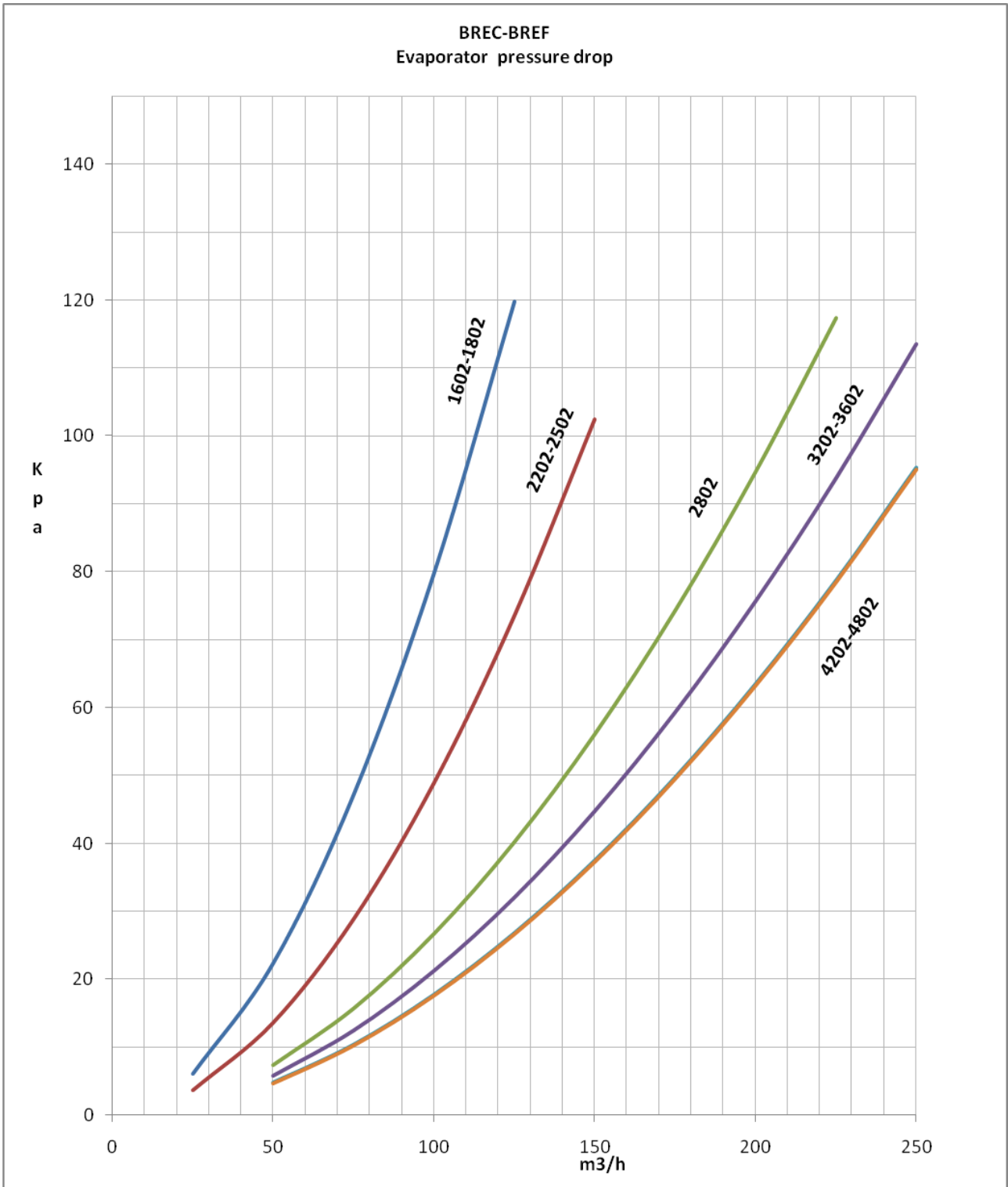
MAXIMUM WORKING PRESSURE OF HYDRAULIC CIRCUIT

Maximum working pressure of hydraulic circuit	P_0	10
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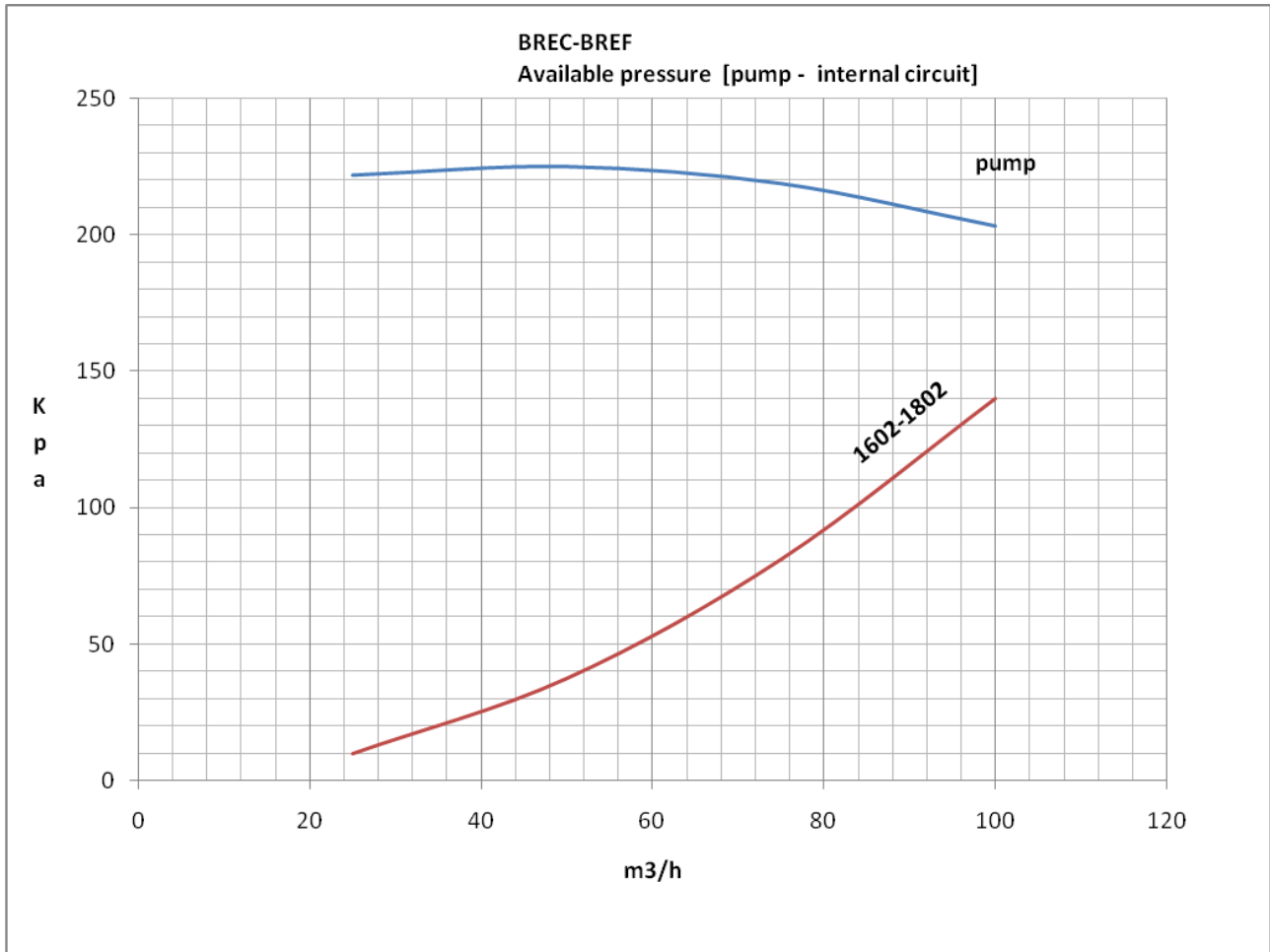
COMPRESSOR OIL

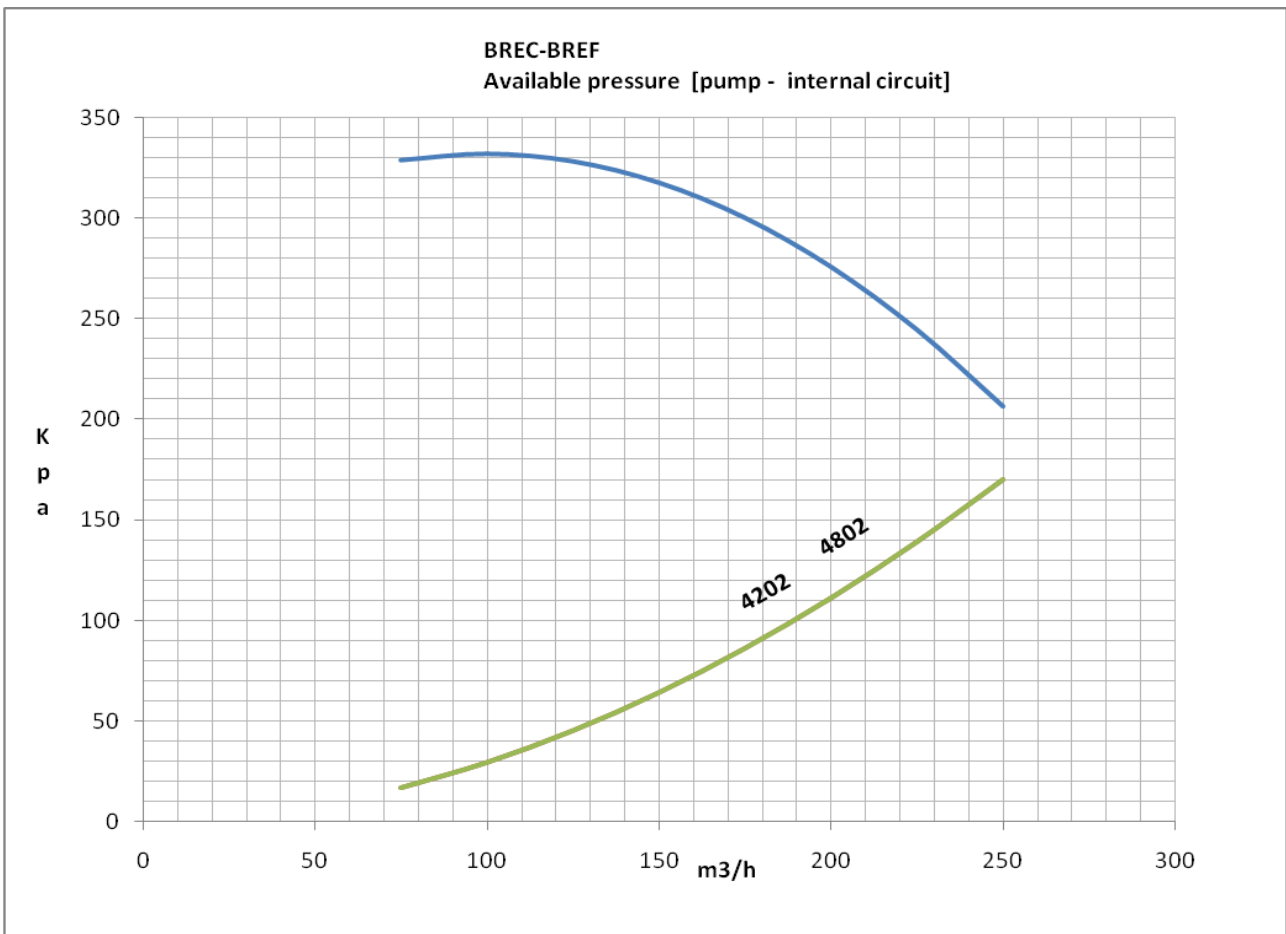
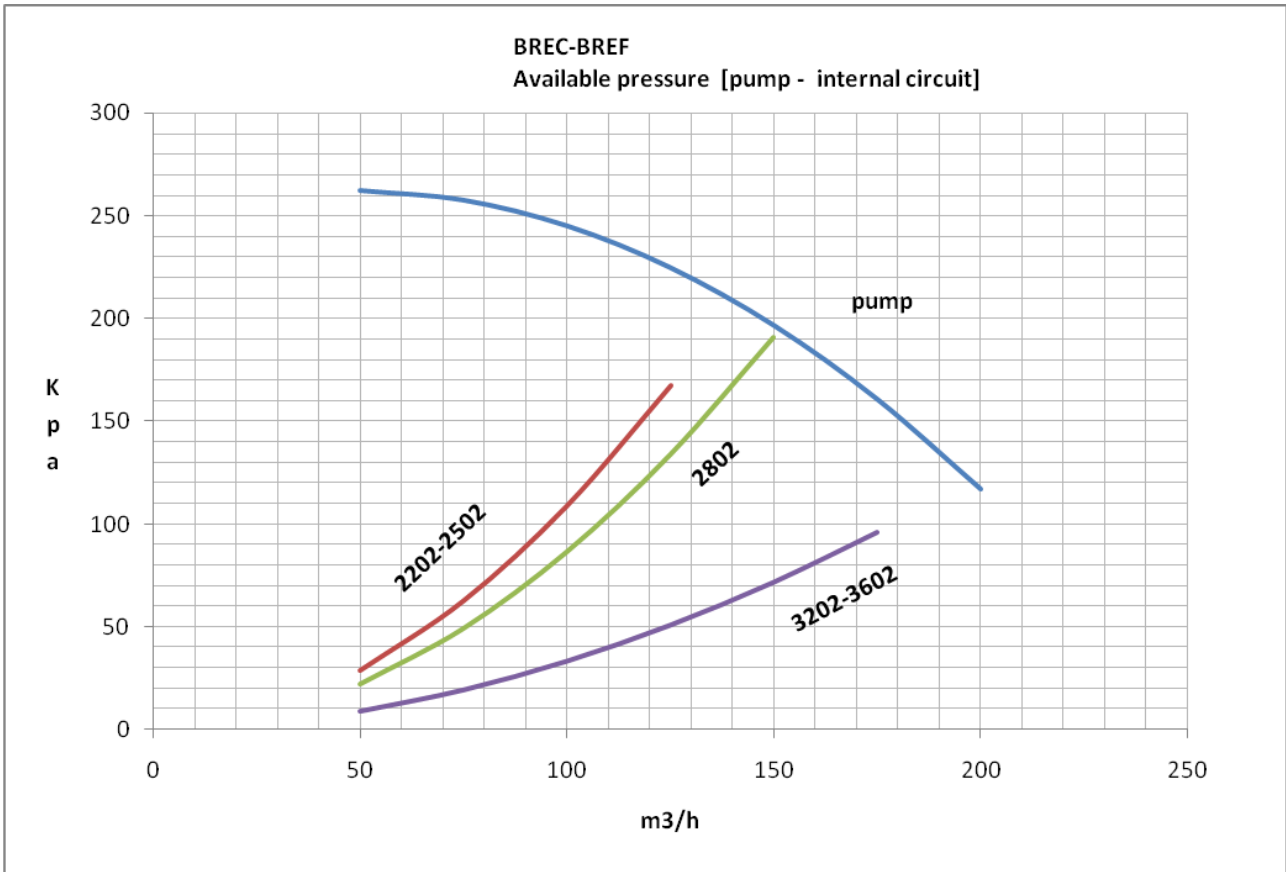
Compressor type	Oil type
Fu Sheng	SOLEST 120 (POE)
Bitzer	BSE 170 (POE)

EVAPORATOR PRESSURE DROP



PUMP HEAD PRESSURE AND UNIT PRESSURE DROPS



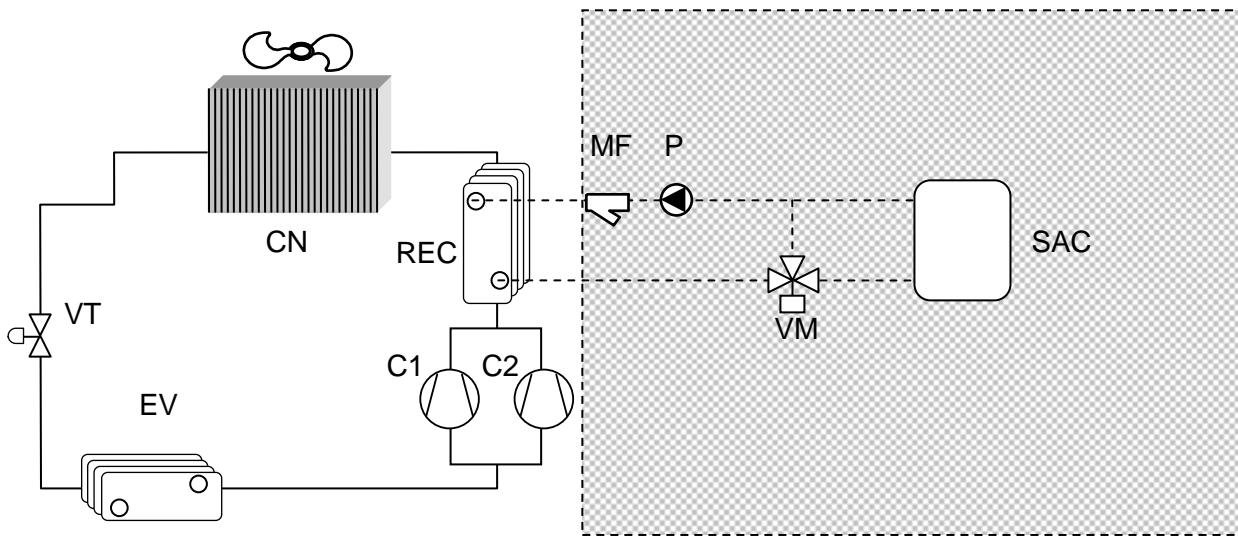


PARTIAL HEAT RECOVERY

In the BREC-BREF range, partial heat recovery is carried out by plate/tubular heat exchangers placed between the discharge section of the compressor and the air condenser; the following diagram shows the recovery circuit within the unit and the circuit used.

For correct operation of the chiller it is necessary to avoid supplying the recovery exchanger (REC) with water which is too cold (temperatures lower than 30°C).

For this reason, it is advisable to install a 3-way valve (VM) as shown in the diagram.



CN Condensing coil
 VT Expansion valve
 EV Evaporator
 C1/2 Scroll Compressors
 VM 3-way valve

SAC Water tank
 P Circulation pump
 REC Recuperator
 MF Mechanical filter

PARTIAL HEAT RECOVERY

Partial condensation heat recovery		1602A	1802A	2202A	2502A	2802A	3202A	3602A	4202A	4802A
Cooling capacity	kW	365	458	519	547	661	728	837	937	1034
Absorbed power	kW	108	141	156	169	206	227	267	290	331
Heat recovery heating capacity	kW	68	91	100	107	135	152	178	192	219
Heat recovery water flow	l/h	11850	15652	17430	18559	23500	26600	31000	33600	38100
Heat recovery pressure drop	kPa	13	23	11,5	13	20	48	64	56	70,5

Data refer to nominal conditions for both heat recovery: inlet / outlet water temperature 12 / 7°C; external temperature: 35°C; Heat recovery water temperature: 40/45°C; glycol 0%

OPERATING LIMIT

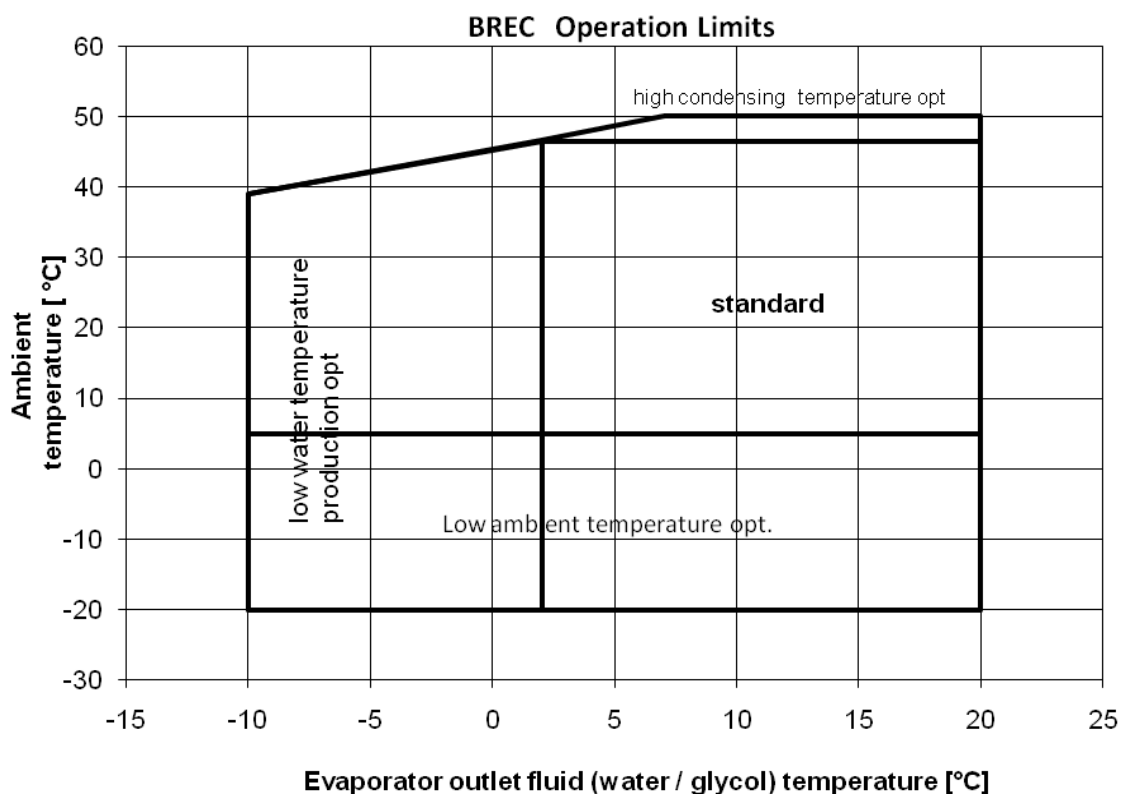
BREC

The BREC units are equipped with modulation control and oil heaters for the mass produced compressors, still, depending on requirements, it is necessary to select the different options: The available options are:

Low ambient temperature: the unit will be equipped with anti-condensation resistance for the circuit board.

High ambient temperature: the unit will be equipped with compressors provided with motors capable of operating with high condensation temperatures. These motors are standard for the models 1602A – 1802A – 2202A – 2502A – 2802A.

Low water temperature production: the units are predisposed for the production of glycoled water at low temperature.

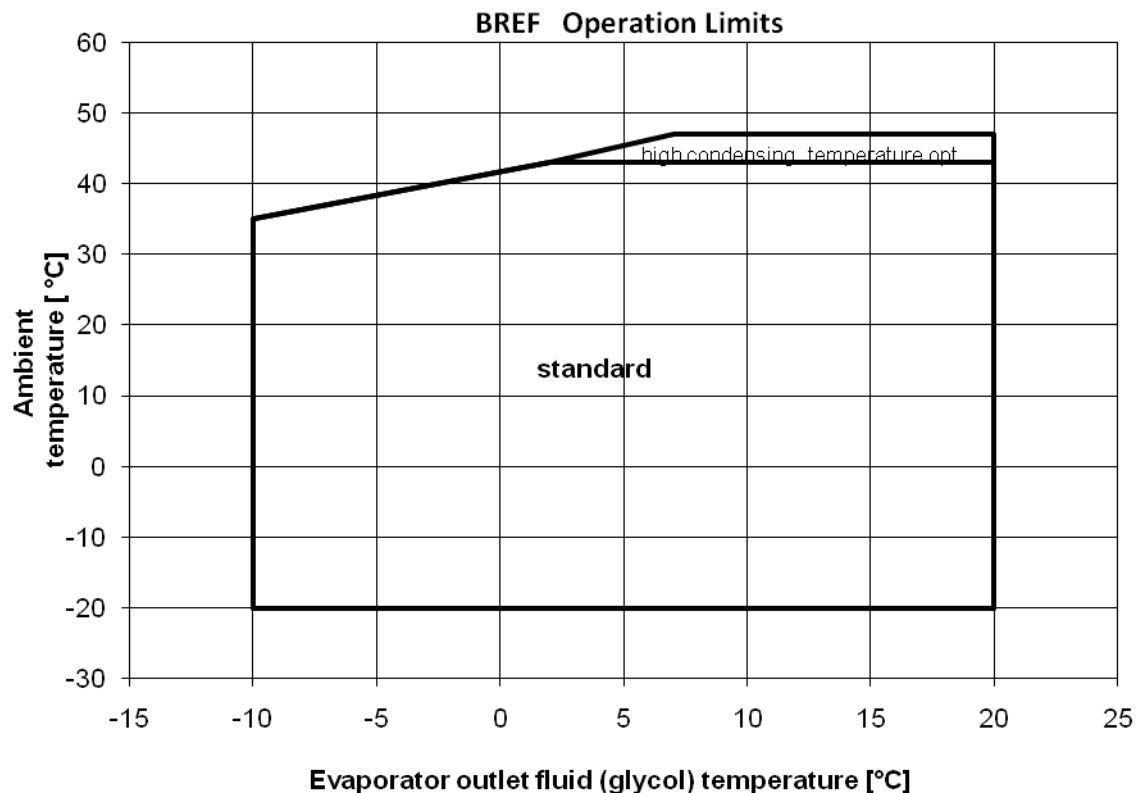


Glycol water mixtures can be cooled down to -15°C as long as the water in the circuit contains sufficient antifreeze to prevent freezing inside the evaporator

Minimum fluid temperature with unit operating	5,0 °C	3,0 °C	-5,0 °C	-10,0 °C	-18,0 °C	-28,0°C
Freezing temperature	0 °C	-4,4 °C	-9,6 °C	-16,1 °C	-24,5 °C	-35,5 °C
Percentage of ethylene glycol by weight	0%	10%	20%	30%	40%	50%

BREF

The BREF units can be predisposed to operate in high ambient temperatures: the unit will be provided with compressors equipped with motors capable of operating in high condensation temperatures. These motors are standard for the models 1602A – 1802A – 2202A – 2502A – 2802A.



External temperature management

The BREC/F units are provided with modulating condensation control, therefore the influence of the external temperature variations on the condensation pressures are managed by varying the speed of the ventilating sections.

In the event the external temperatures are such that the maximum condensation pressure is reached even with the fans at maximum speed, the control software automatically reduces the capacity of the compressors, consequently reducing the condensation pressure and maintaining the unit in operation, even if with a lower capacity (unloading).

ELECTRICAL DATA

COOLING ONLY SERIES

BREC	Compressor circuit 1						Compressor circuit 2					
	OP	OA	FLI	FLA	LRA	ST	OP	OA	FLI	FLA	LRA	ST
1602A	52,1	84,2	85,4	137,7	177	Y/Δ	52,3	84,2	85,4	137,7	177	Y/Δ
1802A	68,4	110,7	110,1	177,6	224	Y/Δ	68,3	110,7	110,1	177,6	224	Y/Δ
2202A	74,2	120,1	122	196,7	279	Y/Δ	74,2	120,1	122	196,7	279	Y/Δ
2502A	80,8	130,9	130,5	210,4	279	Y/Δ	80,7	130,9	130,5	210,4	279	Y/Δ
2802A	96,9	159,2	156,3	243,6	276	Y/Δ	96,7	159,2	156,3	243,6	276	Y/Δ
3202A	108,1	178,7	145,3	280	436	Y/Δ	107,9	178,7	145,3	280	436	Y/Δ
3602A	128,7	207,9	170,7	310	465	Y/Δ	128,7	207,9	170,7	310	465	Y/Δ
4202A	138,4	231,7	191,1	320	586	Y/Δ	138,4	231,7	191,1	320	586	Y/Δ
4802A	160,0	264,0	217	360	650	Y/Δ	160,3	264,0	217	360	650	Y/Δ

BREC	Standard fans		EC fans	
	OP	FLA	OP	FLA
1602A	12	25,8	9,6	15
1802A	12	25,8	9,6	15
2202A	16	34,4	12,8	20
2502A	16	34,4	12,8	20
2802A	16	34,4	12,8	20
3202A	20	43	16,0	25
3602A	20	43	16,0	25
4202A	24	51,6	19,2	30
4802A	24	51,6	19,2	30

BREC	Principal pump		
	OP	OA	LRA
1602A	9,2	18,5	153,55
1802A	9,2	18,5	153,55
2202A	11	21,5	180,6
2502A	11	21,5	180,6
2802A	11	21,5	180,6
3202A	11	21,5	180,6
3602A	11	21,5	180,6
4202A	22	42	378
4802A	22	42	378

COOLING ONLY SERIES WITHOUT PUMPS

BREC	Units without power phase capacitors						
	OP	OA	SC	FLI	FLA	LRA	Cosphi ¹
1602A	116,4	194,2	245,7	182,8	301,2	340,5	0,87
1802A	148,7	247,1	306,1	232,2	381	427,4	0,87
2202A	164,4	274,6	375,4	260	427,8	510,1	0,86
2502A	177,5	296,1	380,4	277	455,2	523,8	0,87
2802A	209,5	352,7	391,8	328,6	521,6	554	0,86
3202A	236,6	401,2	571,3	310,6	603	759	0,85
3602A	278,2	460,1	612,5	361,4	663	818	0,87
4202A	301,6	516,2	759,3	406,2	691,6	957,6	0,84
4802A	345,4	581,9	837,8	458	771,6	1061,6	0,86

BREC	Units with power phase capacitors						
	OP	OA	SC	FLI	FLA	LRA	Cosphi ¹
1602A	116,4	181,4	245,7	182,8	116,4	340,5	0,93
1802A	148,7	231,4	306,1	232,2	148,7	427,4	0,93
2202A	164,4	255,6	375,4	260	164,4	510,1	0,93
2502A	177,5	277,0	380,4	277	177,5	523,8	0,93
2802A	209,5	329,6	391,8	328,6	209,5	554	0,92
3202A	236,6	371,3	571,3	310,6	236,6	759	0,92
3602A	278,2	434,9	612,5	361,4	278,2	818	0,92
4202A	301,6	475,3	759,3	406,2	301,6	957,6	0,92
4802A	345,4	542,3	837,8	458	345,4	1061,6	0,92

COOLING ONLY SERIES WITHOUT PUMPS

BREC	Units with high external temperature option without power phase capacitors						
	OP	OA	SC	FLI	FLA	LRA	Cosphi
1602A	116,4	194,2	245,7	182,8	301,2	340,5	0,87
1802A	148,7	246,6	306,1	232,2	381	427,4	0,87
2202A	164,4	274,6	375,4	260	427,8	510,1	0,86
2502A	177,5	296,1	380,4	277	455,2	523,8	0,87
2802A	209,5	352,7	391,8	328,6	521,6	554	0,86
3202A	236,6	401,2	571,3	340,4	783	999	0,85
3602A	278,2	460,1	612,5	397,8	883	1113	0,87
4202A	301,6	516,2	759,3	448	951,6	1306,6	0,84
4802A	345,4	581,9	837,8	512	951,6	1306,6	0,86

BREC	Units with high external temperature option with power phase capacitors						
	OP	OA	SC	FLI	FLA	LRA	Cosphi
1602A	116,4	181,4	245,7	182,8	301,2	340,5	0,93
1802A	148,7	231,4	306,1	232,2	381	427,4	0,93
2202A	164,4	255,6	375,4	260	427,8	510,1	0,93
2502A	177,5	277,0	380,4	277	455,2	523,8	0,93
2802A	209,5	329,6	391,8	328,6	521,6	554	0,92
3202A	236,6	371,3	571,3	310,6	603	999	0,92
3602A	278,2	434,9	612,5	361,4	663	1113	0,92
4202A	301,6	475,3	759,3	406,2	691,6	1306,6	0,92
4802A	345,4	542,3	837,8	458	771,6	1306,6	0,92

COOLING ONLY SERIES WITH ONBOARD PUMP/S

BREC	Units without power phase capacitors						
	OP	OA	SC	FLI	FLA	LRA	Cosphi
1602A	125,6	212,7	264,2	192	319,7	359	0,85
1802A	157,9	265,6	324,6	241,4	399,5	445,9	0,86
2202A	175,4	296,1	396,9	271	449,3	531,6	0,86
2502A	188,5	317,6	401,9	288	476,7	545,3	0,86
2802A	220,5	374,2	413,3	339,6	543,1	575,5	0,85
3202A	247,6	422,7	592,8	321,6	624,5	780,5	0,85
3602A	289,2	481,6	634,0	372,4	684,5	839,5	0,87
4202A	323,6	558,2	801,3	428,2	733,6	999,6	0,84
4802A	367,4	623,9	879,8	480	813,6	1103,6	0,85

BREC	Units with power phase capacitors						
	OP	OA	SC	FLI	FLA	LRA	Cosphi
1602A	125,6	196,2	264,2	192	319,7	359	0,92
1802A	157,9	249,0	324,6	241,4	399,5	445,9	0,92
2202A	175,4	276,2	396,9	271	449,3	531,6	0,92
2502A	188,5	294,8	401,9	288	476,7	545,3	0,92
2802A	220,5	344,5	413,3	339,6	543,1	575,5	0,92
3202A	247,6	389,0	592,8	321,6	624,5	780,5	0,92
3602A	289,2	452,8	634,0	372,4	684,5	839,5	0,92
4202A	323,6	507,0	801,3	428,2	733,6	999,6	0,92
4802A	367,4	567,6	879,8	480	813,6	1103,6	0,93

COOLING ONLY SERIES WITH ONBOARD PUMP/S

BREC	Units with high external temperature option without power phase capacitors						
	OP	OA	SC	FLI	FLA	LRA	Cosphi
1602A	125,6	212,7	264,2	192	319,7	359	0,85
1802A	157,9	265,1	324,6	241,4	399,5	445,9	0,86
2202A	175,4	296,1	396,9	271	449,3	531,6	0,86
2502A	188,5	317,6	401,9	288	476,7	545,3	0,86
2802A	220,5	374,2	413,3	339,6	543,1	575,5	0,85
3202A	247,6	422,7	592,8	351,4	804,5	1020,5	0,85
3602A	289,2	481,6	634,0	408,8	904,5	1134,5	0,87
4202A	323,6	558,2	801,3	470	993,6	1348,6	0,84
4802A	367,4	623,9	879,8	534	993,6	1348,6	0,85

BREC	Units with high external temperature option with power phase capacitors						
	OP	OA	SC	FLI	FLA	LRA	Cosphi
1602A	125,6	196,2	264,2	192	319,7	359	0,92
1802A	157,9	249,0	324,6	241,4	399,5	445,9	0,92
2202A	175,4	276,2	396,9	271	449,3	531,6	0,92
2502A	188,5	294,8	401,9	288	476,7	545,3	0,92
2802A	220,5	344,5	413,3	339,6	543,1	575,5	0,92
3202A	247,6	389,0	592,8	321,6	624,5	1020,5	0,92
3602A	289,2	452,8	634,0	372,4	684,5	1134,5	0,92
4202A	323,6	507,0	801,3	428,2	733,6	1348,6	0,92
4802A	367,4	567,6	879,8	480	813,6	1348,6	0,93

FREE-COOLING SERIES

BREF	Compressors circuit 1						Compressors circuit 2					
	OP	OA	FLI	FLA	LRA	ST	OP	OA	FLI	FLA	LRA	ST
1602A	52,5	86,6	85,4	137,7	177	Y / Δ	52,5	86,6	85,4	137,7	177	Y / Δ
1802A	71,1	117,0	110,1	177,6	224	Y / Δ	71,1	117,0	110,1	177,6	224	Y / Δ
2202A	76,6	125,8	122	196,7	279	Y / Δ	76,6	125,8	122	196,7	279	Y / Δ
2502A	83,4	137,3	130,5	210,4	279	Y / Δ	83,4	137,3	130,5	210,4	279	Y / Δ
2802A	98,5	170,6	156,3	243,6	276	Y / Δ	98,5	170,6	156,3	243,6	276	Y / Δ
3202A	111,8	188,6	145,3	280	436	Y / Δ	111,8	188,6	145,3	280	436	Y / Δ
3602A	135,5	224,2	170,7	310	465	Y / Δ	135,5	224,2	170,7	310	465	Y / Δ
4202A	146,0	248,5	191,1	320	586	Y / Δ	146,0	248,5	191,1	320	586	Y / Δ
4802A	169,1	285,8	217	360	650	Y / Δ	169,1	285,8	217	360	650	Y / Δ

BREF	Standard fans		EC fans	
	OP	OP	OP	FLA
1602A	12	9,6	9,6	15
1802A	12	9,6	9,6	15
2202A	16	12,8	12,8	20
2502A	16	12,8	12,8	20
2802A	16	12,8	12,8	20
3202A	20	16,0	16,0	25
3602A	20	16,0	16,0	25
4202A	24	19,2	19,2	30
4802A	24	19,2	19,2	30

BREF	Principal pump			Free-cooling pump		
	OP	OA	LRA	OP	OA	LRA
1602A	9,2	18,5	153,55	7,5	16	140,8
1802A	9,2	18,5	153,55	7,5	16	140,8
2202A	11	21,5	180,6	9,2	18,5	153,55
2502A	11	21,5	180,6	9,2	18,5	153,55
2802A	11	21,5	180,6	9,2	18,5	153,55
3202A	11	21,5	180,6	11	21,5	180,6
3602A	11	21,5	180,6	11	21,5	180,6
4202A	22	42	378	18,5	34	329,8
4802A	22	42	378	18,5	34	329,8

FREE-COOLING SERIES WITHOUT PUMP/S

BREF	Units without power phase capacitors						
	OP	OA	SC	FLI	FLA	LRA	Cosphi
1602A	124,5	215,0	261,7	190,3	317,2	356,5	0,84
1802A	161,7	275,8	322,1	239,7	397	443,4	0,85
2202A	178,4	304,5	393,9	269,2	446,3	528,6	0,85
2502A	192,0	327,5	398,9	286,2	473,7	542,3	0,85
2802A	222,2	394,1	410,3	337,8	540,1	572,5	0,81
3202A	254,6	441,7	592,8	321,6	624,5	780,5	0,83
3602A	302,0	512,9	634,0	372,4	684,5	839,5	0,85
4202A	334,5	582,6	793,3	424,7	725,6	991,6	0,83
4802A	380,7	657,2	871,8	476,5	805,6	1095,6	0,84

BREF	Units with power phase capacitors						
	OP	OA	SC	FLI	FLA	LRA	Cosphi ¹
1602A	124,5	194,6	261,7	190,3	317,2	356,5	0,92
1802A	161,7	252,5	322,1	239,7	397	443,4	0,92
2202A	178,4	280,8	393,9	269,2	446,3	528,6	0,92
2502A	192,0	300,7	398,9	286,2	473,7	542,3	0,92
2802A	222,2	349,5	410,3	337,8	540,1	572,5	0,92
3202A	254,6	398,8	592,8	321,6	624,5	780,5	0,92
3602A	302,0	475,9	634,0	372,4	684,5	839,5	0,92
4202A	334,5	522,5	793,3	424,7	725,6	991,6	0,92
4802A	380,7	597,3	871,8	476,5	805,6	1095,6	0,92

¹Cosphi on units equipped with EC fans: EC motors do not have the same effect of asynchronous motors regarding the phase shift between current and voltage. The phenomena is different, in fact these types of motors modify the shape of the wave and the effect on Power Factor cannot be corrected with the traditional solution of condensers.

FREE-COOLING SERIES WITHOUT PUMP/S

BREF	Units with high external temperature option without power phase capacitors						
	OP	OA	SC	FLI	FLA	LRA	Cosphi
1602A	124,5	215,0	261,7	190,3	317,2	356,5	0,84
1802A	161,7	275,8	322,1	239,7	397	443,4	0,85
2202A	178,4	304,5	393,9	269,2	446,3	528,6	0,85
2502A	192,0	327,5	398,9	286,2	473,7	542,3	0,85
2802A	222,2	394,1	410,3	337,8	540,1	572,5	0,81
3202A	254,6	441,7	592,8	351,4	804,5	1020,5	0,83
3602A	302,0	512,9	634,0	408,8	904,5	1134,5	0,85
4202A	334,5	582,6	793,3	466,5	985,6	1340,6	0,83
4802A	380,7	657,2	871,8	530,5	985,6	1340,6	0,84

BREF	Units with high external temperature option with power phase capacitors						
	OP	OA	SC	FLI	FLA	LRA	Cosphi
1602A	124,5	194,6	261,7	190,3	317,2	356,5	0,92
1802A	161,7	252,5	322,1	239,7	397	443,4	0,92
2202A	178,4	280,8	393,9	269,2	446,3	528,6	0,92
2502A	192,0	300,7	398,9	286,2	473,7	542,3	0,92
2802A	222,2	349,5	410,3	337,8	540,1	572,5	0,92
3202A	254,6	398,8	592,8	321,6	624,5	1020,5	0,92
3602A	302,0	475,9	634,0	372,4	684,5	1134,5	0,92
4202A	334,5	522,5	793,3	424,7	725,6	1340,6	0,92
4802A	380,7	597,3	871,8	476,5	805,6	1340,6	0,92

FREE-COOLING SERIES WITH PUMP/S

BREF	Unit complete without power phase capacitors						
	OP	OA	SC	FLI	FLA	LRA	Cosphi
1602A	133,7	233,5	280,2	199,5	335,7	375	0,83
1802A	170,9	294,3	340,6	248,9	415,5	461,9	0,84
2202A	189,4	326,0	415,4	280,2	467,8	550,1	0,84
2502A	203,0	349,0	420,4	297,2	495,2	563,8	0,84
2802A	233,2	415,6	431,8	348,8	561,6	594	0,81
3202A	265,6	463,2	614,3	332,6	646	802	0,83
3602A	313,0	534,4	655,5	383,4	706	861	0,85
4202A	356,5	624,6	835,3	446,7	767,6	1033,6	0,82
4802A	402,7	699,2	913,8	498,5	847,6	1137,6	0,83

BREF	Unit complete with power phase capacitors						
	OP	OA	SC	FLI	FLA	LRA	Cosphi
1602A	133,7	209,3	280,2	199,5	335,7	375	0,92
1802A	170,9	267,2	340,6	248,9	415,5	461,9	0,92
2202A	189,4	298,5	415,4	280,2	467,8	550,1	0,92
2502A	203,0	318,4	420,4	297,2	495,2	563,8	0,92
2802A	233,2	365,6	431,8	348,8	561,6	594	0,92
3202A	265,6	412,3	614,3	332,6	646	802	0,93
3602A	313,0	485,3	655,5	383,4	706	861	0,93
4202A	356,5	555,7	835,3	446,7	767,6	1033,6	0,93
4802A	402,7	630,5	913,8	498,5	847,6	1137,6	0,92

¹**Cosphi on units equipped with EC fans:** EC motors do not have the same effect of asynchronous motors regarding the phase shift between current and voltage. The phenomena is different, in fact these types of motors modify the shape of the wave and the effect on Power Factor cannot be corrected with the traditional solution of condensers.

FREE-COOLING SERIES WITH PUMP/S

BREF	Unit for high external temperatures without power phase capacitors						
	OP	OA	SC	FLI	FLA	LRA	Cosphi
1602A	133,7	233,5	280,2	199,5	335,7	375	0,83
1802A	170,9	294,3	340,6	248,9	415,5	461,9	0,84
2202A	189,4	326,0	415,4	280,2	467,8	550,1	0,84
2502A	203,0	349,0	420,4	297,2	495,2	563,8	0,84
2802A	233,2	415,6	431,8	348,8	561,6	594	0,81
3202A	265,6	463,2	614,3	362,4	826	1042	0,83
3602A	313,0	534,4	655,5	419,8	926	1156	0,85
4202A	356,5	624,6	835,3	488,5	1027,6	1382,6	0,82
4802A	402,7	699,2	913,8	552,5	1027,6	1382,6	0,83

BREF	Units with high external temperature option with power phase capacitors						
	OP	OA	SC	FLI	FLA	LRA	Cosphi
1602A	133,7	209,3	280,2	199,5	335,7	375	0,92
1802A	170,9	267,2	340,6	248,9	415,5	461,9	0,92
2202A	189,4	298,5	415,4	280,2	467,8	550,1	0,92
2502A	203,0	318,4	420,4	297,2	495,2	563,8	0,92
2802A	233,2	365,6	431,8	348,8	561,6	594	0,92
3202A	265,6	412,3	614,3	332,6	646	1042	0,93
3602A	313,0	485,3	655,5	383,4	706	1156	0,93
4202A	356,5	555,7	835,3	446,7	767,6	1382,6	0,93
4802A	402,7	630,5	913,8	498,5	847,6	1382,6	0,92

PROBLEM SOLVING

GUIDE TO TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	CHECKS/CORRECTIVE ACTION
THE CHILLER DOESN'T WORK	The onboard electrical panel isn't connected to the power supply	Check that the unit is connected to the power supply Check that the general cut off switch is closed
	The control base card is not connected to the power supply	Check that the IM9 automatic cut off switch of the auxiliaries is armed Check that the fuse protection of the board hasn't intervened
	The board is connected to the power supply but unit operation is not activated	Check that there are no alarms present
HIGH DISCHARGE PRESSURE OR INTERVENTION OF THE HIGH PRESSURE SWITCH	The air flow to the condenser is insufficient or the inlet temperature is too high	Check to see if there is any recirculation of the condensing air and that the instructions contained in the paragraph "Positioning the chiller" have been followed correctly
		Check that the air temperature is within the unit's operating limits
		Check that the finned pack coils and metal filters are not dirty
		Check the fan rotation direction
	Control of the condensing pressure is inefficient	Control the setting and operation of the fan regulator
	One or more of the fans are out of service	Check to see if the fan protection has intervened
		Repair or replace the fan which is broken
Incondensable air in the circuit which can be detected by the presence of bubbles, even if there is a high level of subcooling	Empty and recharge the circuit	
The circuit is overfilled with refrigerant; the condenser is partially flooded	The subcooling of the liquid on the condenser discharge is excessive, remove some refrigerant from the circuit	
Dirty condenser or metal filters	Remove the material which is blocking the condenser (leaves, paper etc...)	

PROBLEM	POSSIBLE CAUSE	CHECKS/CORRECTIVE ACTION
⇒ HIGH DISCHARGE PRESSURE OR INTERVENTION OF THE HIGH PRESSURE SWITCH	High suction pressure	Check the return water temperature of the chilled water and the values set in the control
LOW DISCHARGE PRESSURE OR INTERVENTION OF THE LOW PRESSURE SWITCH	Thermostatic valve de-calibrated or defective	Check that the superheating of the thermostatic valve is correct (5-8°C)
	Dirty filter dryer cartridge	Check that the filter dryer cartridge doesn't need to be replaced; the difference in temperature measured up and downstream from the filter must be less than 2°C
	With a cold external climate the low pressure switch intervenes before the refrigerant circuit stabilizes	Increase the inhibit time of the low pressure switch start up to 180 seconds
	Insufficient refrigerant load	Check to see if there are any leaks and top up the load until the subcooling of the discharge liquid reaches 5-10°C.
	Insufficient water flow (significant difference between the inlet and outlet chilled water temperatures)	Check the pump and the pressure drop in the piping
INTERVENTION OF THE ANTI-FREEZE SAFETY DEVICE	The outlet temperature of the chilled water is too low	Check that the water flow is sufficient and that the difference between the inlet and outlet water temperatures is not too high
	The anti-freeze alarm setting is wrong or the probe is defective	Check the setting of the alarm on the control

PROBLEM	POSSIBLE CAUSE	CHECKS/CORRECTIVE ACTION
THE COMPRESSOR DOESN'T WORK DESPITE IT BEING REQUESTED BY THE THERMOSTAT	One of the unit's safety devices has intervened	Check to see if there are any alarms present on the display of the user terminal
	The short circuit protection has intervened	Check the cause of the short circuit and reset the thermo-magnetic cut off switch
	One of the unit's safety devices has intervened (high or low pressure switches, anti-freeze safety)	See paragraphs: 'Low discharge pressure or intervention of the low pressure switch', 'High discharge pressure or intervention of the high pressure switch', 'Intervention of the anti-freeze safety device'
	The control is not giving the correct signal	Check the control
	The water flow meter is not giving the go-ahead for the compressors to start up	Check the water flow as well as the water flow meter and pump function
INTERVENTION OF THE COMPRESSOR'S INTERNAL PROTECTION <i>N.B. Before starting up the compressors check the compressor heaters and windings</i>	There is no phase	Check the electrical connections of the compressor
	The motor is overloaded	Check that the power supply voltage is not too high or too low
	Blocked rotor	Replace the compressor
THE COMPRESSOR IS NOISY	Liquid return to the compressor	Check the function and superheating of the expansion valve
	The compressor is damaged	Call the nearest Technical Assistance Centre in order to replace the compressor
LOW DISCHARGE PRESSURE	The control system of the condensing pressure is inefficient	Check the regulatory function of the fan speed Check the function of the air temperature probe
	The chiller is operating with an external temperature which is too low	Check that the unit is operating within its temperature limits
HIGH SUCTION PRESSURE	The return temperature of the chilled water is higher than the nominal value	Check that the unit is operating within its temperature limits
	Return of liquid refrigerant to the compressor	Check the function of the expansion valve
		Check that the superheating of the thermostatic valve is correct (5-8°C)

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