



WATER CHILLER

Model: CHILL-CUBE QBE VBM/VBE

Use and Maintenance Manual

Editions Record

Code	Revision	Edition	Note
7425MUM748	05	09/2020	

Original instructions: **ITALIAN**

EN Translation of the original instructions

Dear Customer,

Thank you for the trust you have placed in us. Please read this manual carefully to obtain the best performance from our product.

In order to avoid incorrect operating conditions and danger for the operators, it is essential that you follow the directions meticulously as well as the current accident-prevention laws in the country of use. Each **CHILL-CUBE QBE** chiller is rigorously tested before being packed.

This verifies that there are no manufacturing defects and that the machine performs correctly the functions for which it was designed.

This manual must be kept for future reference and is an integral part of the chiller you have purchased. Due to continuous technical development, we reserve the right to make the necessary modifications without any obligation to give advance notice.

Do not hesitate to contact us if you have any problems or need more information.

The product identification plate, located on the side of the chiller, contains all essential information about the machine.

You will have to give this data to the manufacturer, or reseller, whenever you request information, replacement parts, etc., during the warranty period.

Removing or tampering with the identification plate will void the warranty.

Warranty conditions:

The warranty is valid for 12 months from the machine being powered-up and no longer than 14 months from the delivery date. Any part which is recognised as being faulty at source shall be repaired or replaced free of charge. This does not include transport costs, travel, room and board for technicians. The warranty excludes any liability for direct or indirect damage to persons, animals and/or property that are caused by incorrect use or inadequate maintenance and is exclusively limited to manufacturing defects.

Repair under warranty is subject to compliance with the installation, use and maintenance instructions contained in the "User manual and maintenance."

The warranty is considered void if the product is modified or tampered with in any way. When making a warranty request, please supply the information available in the product identification label.












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SAFETY RULES

1.1 DEFINITIONS OF THE SYMBOLS USED

	Read this use and maintenance manual carefully before performing any repairs on the chiller.
	Warnings of a general character; risk of danger or possibility of damaging the machine, pay particular attention to the phrase following this symbol.
	Risk of electrical danger; the phrase highlights conditions that could be fatal. Follow the instructions provided meticulously.
	Risk of danger; component or system under pressure.
	Risk of danger; component or system that can reach high temperatures during operation.
	Risk of danger; it is absolutely forbidden to use water to extinguish fires near or on the chiller.
	Risk of danger; it is absolutely forbidden to operate the machine with the panel open.
	Service that can be performed by the machine's operator, if qualified (1).
	Water input connection point.
	Water output connection point.
	Dispose of each type of material in accordance with the requirements of the country of use.
NOTE	Phrases to be emphasized that do not contain safety rules.



This chiller has been carefully designed and constructed to be environmentally friendly:

- Refrigerants without CFC;
- Expanded foam insulation without CFC;
- Energy-saving techniques;
- Reduced noise;
- The chiller and its packing materials are recyclable.

In order not to hinder our efforts, the user is required to obey the simple ecological warnings indicated by this symbol.

- (1) These are persons with the experience, technical preparation and knowledge of standards and regulations who are qualified to perform the necessary actions and able to recognize and avoid possible dangers while handling, installing, using and maintaining the machine.

1.2 WARNINGS



Only qualified persons may use and maintain electrically-powered equipment. Before commencing maintenance operations ensure no parts of the machine are live and it cannot be re-connected to the electrical power supply.



The **CHILL-CUBE QBE** chillers contain R407C refrigerant. Operations on the cooling circuit must only be performed by specialist personnel with suitable equipment.



Any modifications to the machine or related operating parameters not previously verified and authorised by the Manufacturer may be hazardous and will invalidate the guarantee.



Do not use water to extinguish fires near or on the chiller.

1.3 PROPER USE OF THE CHILLER

CHILL-CUBE QBE units are packaged aircooled water chillers.

They are intended for use in industrial process or air-conditioning systems requiring chilled water. Any other use is considered as incorrect.

The manufacturer is not liable for damage resulting from inappropriate use; in all cases, the user is liable for any resulting hazards.



Proper use requires conforming to the installation conditions and limits of operation (see sections 3.5 and 8). In particular:

- Power voltage and frequency;
- Pressure, temperature of incoming water;
- Water flow rate;
- Surrounding temperature.

The chiller has been tested and completely assembled. The user must only make the connections to other systems, as described in the chapters that follow.

1.4 INSTRUCTIONS FOR USING EQUIPMENT UNDER PRESSURE CONFORMING TO PED DIRECTIVE 2014/68/EU

The proper use of equipment under pressure is an essential prerequisite for ensuring safety. To this end, the user must proceed as follows:

- Use the equipment properly within the temperature limits shown in the operating limits stated on the manufacturer's name/data plate;
- Do not solder on the exchangers or refrigerant fluid pipes;
- Do not install the equipment in insufficiently ventilated rooms, areas exposed to sources of heat or near inflammable substances;
- During operation, the equipment must not be subjected to vibrations that could cause fatigue failures;
- Keep the documentation attached to the equipment (user manual, declaration of conformity, etc.) for future reference;
- The maximum working pressure stated on the manufacturer's data plate must not be exceeded. Prior to use, the user must fit safety/pressure relief devices.

OPERATION AND MAIN COMPONENTS

2.1 REFRIGERANT CIRCUIT

CHILL-CUBE QBE chillers use a vapour-compression cycle in a refrigerant circuit that essentially consists of the following components: evaporator, compressor, condenser, lamination device (thermostatic expansion valve) and the hot gas bypass valve.

Evaporator: heat exchanger (co-axial or brazed-plates) to enable heat exchange between the water and the refrigerant liquid without them coming into contact with each other. The water is cooled when it passes through the evaporator.

Compressor: compresses the steam from the evaporator to send it to the condenser at a higher pressure.

Condenser: microchannel exchanger to enable heat exchange between the refrigerant and the air; it creates refrigerant gas condensation (which flows inside the microchannel) transferring the gas refrigerant condensation heat to the air (which flows externally); high pressure refrigerant liquid is thus produced.

Lamination device: reduces the pressure of the liquid refrigerant coming from the condenser, which is then sent to the evaporator. In particular, the thermostatic valve can modulate refrigerant flow such as to maintain continuous heating of the gas exiting the evaporator, during various operating conditions and therefore guaranteeing gas flow without liquid parts inside the compressor.

Hot gas bypass valve: the valve provides an artificial load on the evaporator by introducing a portion of high pressure, high temperature gas. The hot gas bypass valve monitors the outlet pressure of the evaporator and will begin to modulate open as the load on the unit decreases to the point where the evaporator temperature is at the setpoint of the bypass valve. This means that the compressor can be operated continuously and the minimum evaporator temperature will be maintained constant.

Thanks to these components, **the vapour-compression cycle** works as follows: the refrigerant liquid evaporates in the evaporator, chilling the water; the refrigerant vapours are then aspirated from the compressor, which compresses them and sends them to the condenser under high pressure; here, thanks to a flow of forced air from the fans, the high-pressure refrigerant gas is cooled, making it condensed and undercooled. The flow of refrigerant liquid then passes through the lamination valve (thermostatic expansion valve), which drastically reduces its pressure: the refrigerant liquid returns to the evaporator at a reduced pressure where it again evaporates, taking heat from the water.

The refrigerant circuit also includes a **water pump**, which ensures the flow of water to be chilled by evaporation, and the **fan** which ensures the condenser is cooled.

2.2 WATER CIRCUIT

The water circuit mainly consists of a pump, evaporator, tank, bypass calibrated between the pump discharge and the system backflow, pressure gauge on the pump discharge, and level sensor (standard). The water flows into the evaporator first where it is cooled, then into the tank, and is then suctioned by the pump which sends it to the system.

All **CHILL-CUBE QBE** units have an open circuit with a tank at atmospheric pressure. The closed circuit with a pressurized tank is optional for all models; these models are also equipped with a differential pressure switch to protect the evaporator, automatic air bleeder valve, safety valve and expansion tank. For **CHILL-CUBE QBE** 003÷007 units, if there are equipped with pressurized tank, the evaporator is a brazed plate heat exchanger.

All **CHILL-CUBE QBE** units have a regulable water by-pass valve: it is used in systems with a fixed speed circulating pump. This valve ensures that the head pressure of the pump is according to the real needs of the user. It will by-pass the differential pressure created by the pump, eliminating water hammer noise.
Installation and maintenance fast, easy and efficient. It provides a perfect leak proof seal when completely pressed.

See chapter **12 Water diagram**.

2.3 FAN

The fan forces air through the condenser fins to remove the refrigerant gas condensation heat, therefore limiting the pressure inside the condenser.

CHILL-CUBE QBE chillers are equipped with axial fans and have internal heat protection for the motor windings.

2.4 CONDENSATION CONTROL

When the ambient air temperature decreases, air flow cooling capacity increases slightly, causing a reduction in pressure inside the condenser; to limit this decrease in condensation pressure from falling below acceptable limits for good cooling circuit operation the fan stops temporarily.

2.5 CONTROL OF THE WATER TEMPERATURE

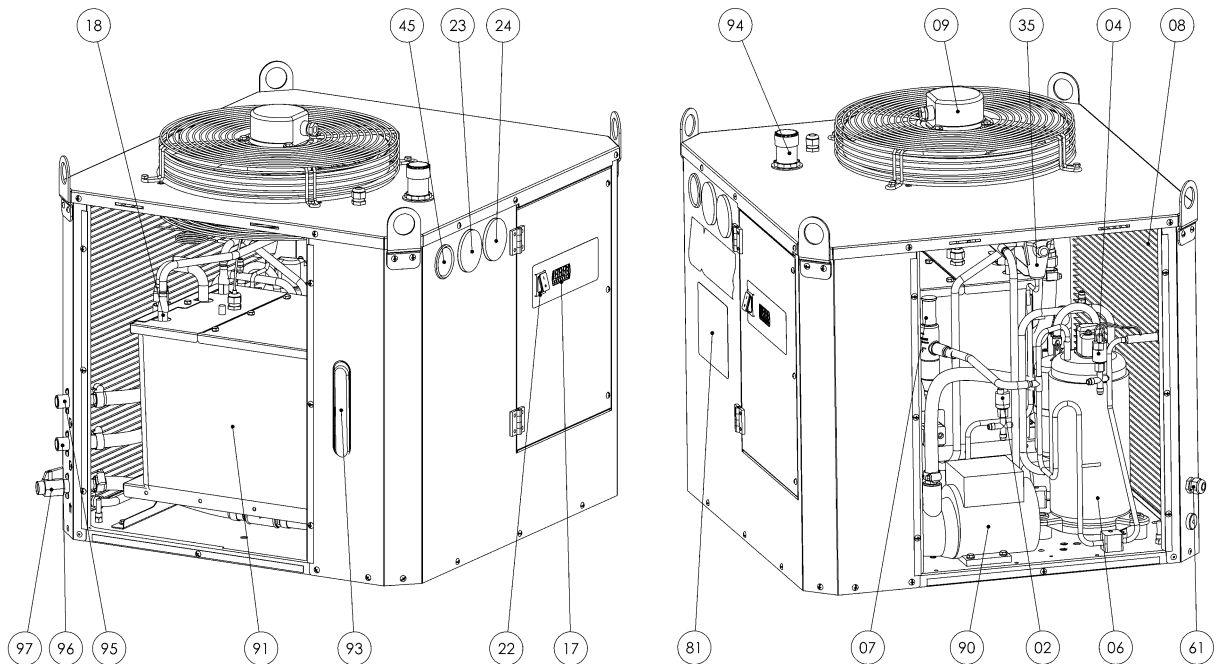
The purpose of the chiller is to maintain the temperature of the water produced within a desired interval as the load on the system varies; this is handled by an electronic controller and a temperature probe that turn the compressors on and off appropriately (see also sections 5.1.3 and 5.2.5).

2.6 PROTECTING THE INTEGRITY OF THE MACHINE

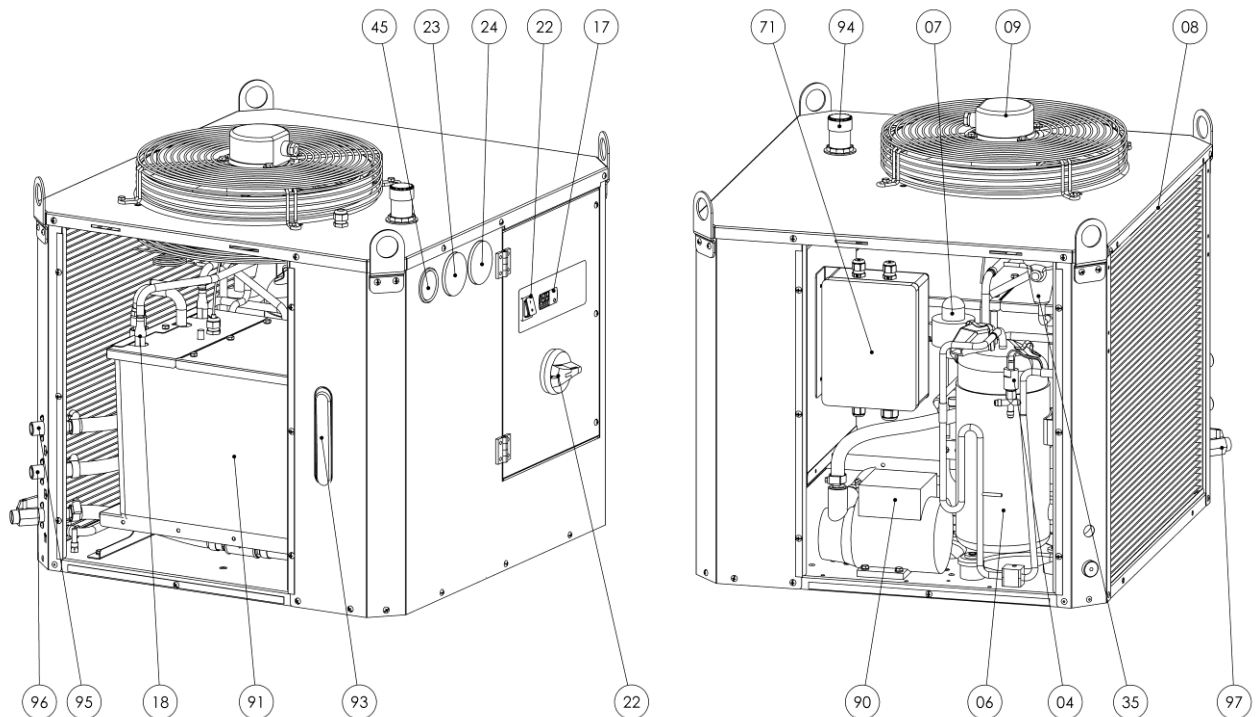
In addition to controlling the temperature, the electronic controller uses pressure switches, thermostats and timers to prevent and handle situations that could compromise the integrity of the machine (also see Chapter **7 Safety Devices**).

2.7 CHILL-CUBE QBE UNITS: IDENTIFICATION OF THE MAIN COMPONENTS

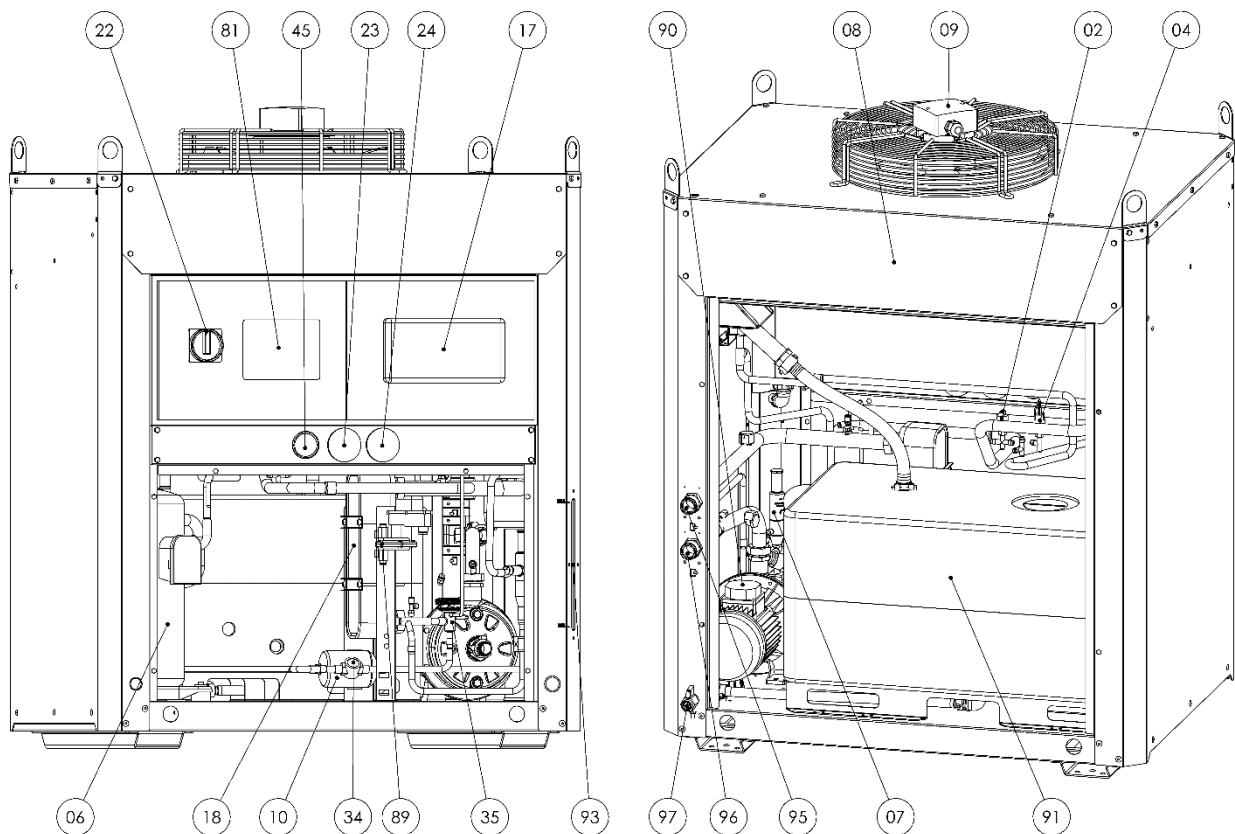
2.7.1 CHILL-CUBE QBE 003÷007 VBM – Mechanical hot gas bypass valve



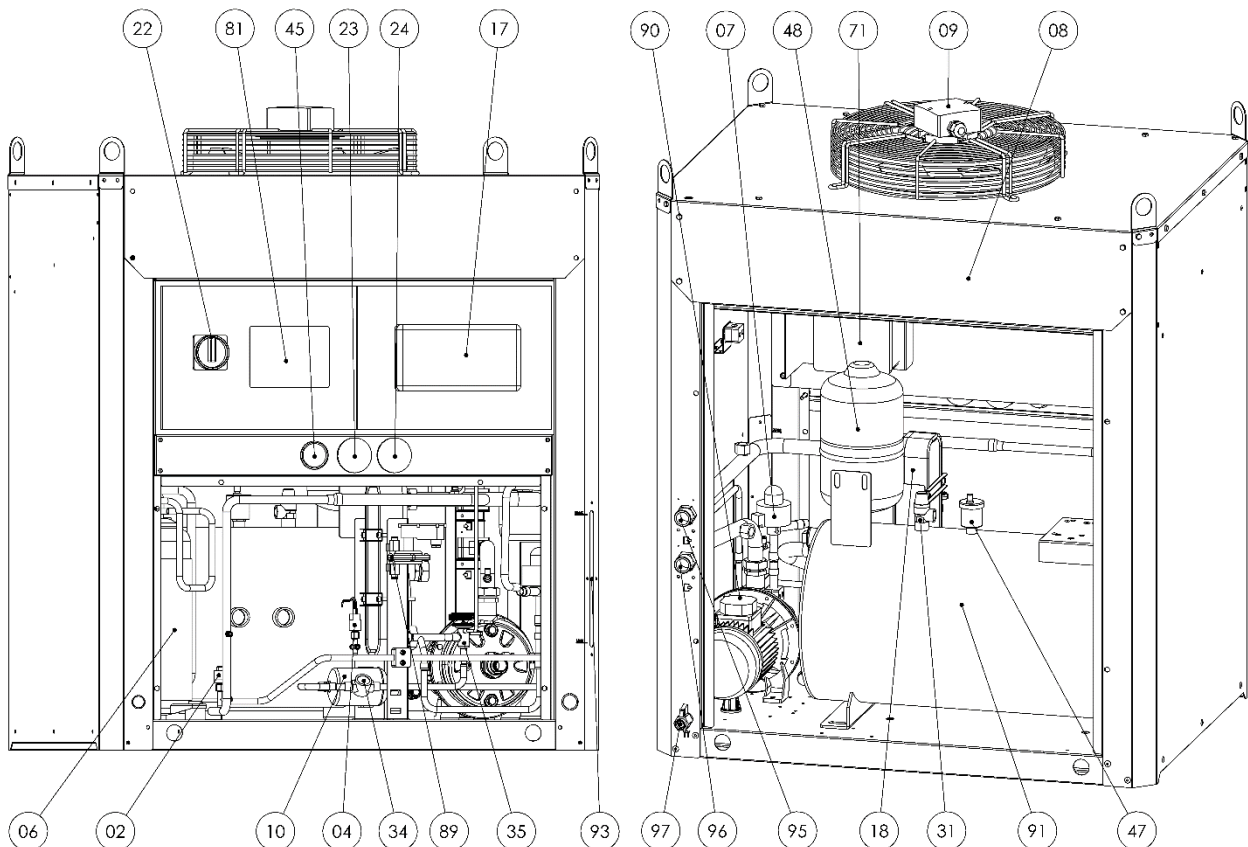
2.7.2 CHILL-CUBE QBE 003÷007 VBE – Electronic hot gas bypass valve



2.7.3 CHILL-CUBE QBE 008÷025 VBM – Mechanical hot gas bypass valve



2.7.4 CHILL-CUBE QBE 008÷025 VBE TP – Electronic hot gas bypass valve with pressurized water circuit



02 Low pressure switch
04 High pressure switch
06 Compressor
07 Hot gas bypass valve
08 Condenser
09 Fan
10 Refrigerant filter
17 Electronic controller
18 Evaporator
22 Disconnect switch
23 High pressure manometer
24 Low pressure manometer
31 Safety valve
34 Sight glass
35 Thermostatic valve
45 Water manometer

47 Relief valve
48 Expansion vessel
49 Automatic water bypass valve
61 Power input
71 Hot gas bypass valve driver
78 Flow switch
81 Refrigerant diagram
89 Differential pressure switch
90 Pump
91 Tank
93 Level indicator
94 Water filler
95 Water inlet
96 Water outlet
97 Drain

2.8 SPARE PARTS

Spare parts list is printed on a dedicated sticker applied inside the chiller. On this sticker each spare part is identified with its ID Number and related Spare Part Number. Here below the cross reference table between ID Number and exploded drawings Ref. With their description and quantity installed inside chillers.

NOTE To order the suggested spare parts or any other part, it is necessary to quote the data reported on the identification plate.

ID N.	DESCRIPTION	NOTE	PART QUANTITY FOR QBE VBM/VBE MODEL															
			1 Phase						3 Phase									
			003	004	005	006	007	009	012	005	006	007	008	009	012	014	020	025
1	EVAPORATOR GROUP		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	LOW PRESSURE SWITCH		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	HIGH PRESSURE SWITCH		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	COMPRESSOR		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	HOT GAS BYPASS VALVE		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	CONDENSER		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9	FAN		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9.3	FAN GRID		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
10	REFRIGERANT FILTER		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12	TEMPERATURE PROBE		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
17	COMPLETE ELECTRONIC CONTROLLER		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
18	EVAPORATOR		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
22	DISCONNECTOR SWITCH		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
23	HIGH PRESSURE GAUGE		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
24	LOW PRESSURE GAUGE		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
25	COMPRESSOR CRANKCASE HEATER	[A]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
35	THERMOSTATIC EXPANSION VALVE		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
89	DIFFERENTIAL PRESSURE SWITCH	[B]	[B]	[B]	[B]	[B]	[B]	1	1	1	[B]	[B]	1	1	1	1	1	1
90	WATER PUMP		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
91	WATER TANK		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
92	WATER LEVEL SENSOR	[C]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

[A]	Optional.
[B]	Equipped with TP EXP option.
[C]	Only for open circuit version.

INSTALLATION

3.1 TRANSPORT

The units are supplied packed in a cardboard box on a wooden pallet. After checking that the packing is undamaged, position the unit near the installation site and unpack it.



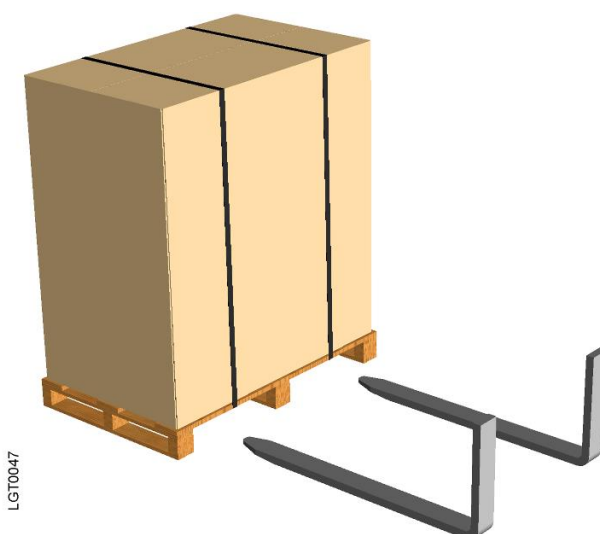
Always keep the chiller vertical: turning it upside down can irreparably damage several parts of the unit.



Handle with care. Violent falls can cause irreparable damage.



The centre of the machine is approximately its centre of gravity. In any case, when handling the machine with a forklift truck or pallet jack, always check its stability before lifting.



3.2 STORAGE

Protect the machine from bad weather, even if packed. Always keep the chiller vertical, even when in storage. Turning it upside down can irreparably damage several parts of the unit. If not used, the chiller can be stored packed in an enclosed place, free of dust, with a maximum temperature of 50 °C//122°F and specific humidity of not higher than 90%.



The packing material is recyclable. Dispose of each type of material in accordance with the requirements in the country of use.

3.3 PLACE OF INSTALLATION



Warning! The **CHILL-CUBE QBE 003÷007** models are suitable for indoor installation only. Optionally, version IP44 is available.

All other **CHILL-CUBE QBE** units can be installed indoors or outdoors.

To determine the best place to install the unit, it is important to consider the following aspects:

- The dimensions and source of the water pipes;
- The location of the power supply;
- The solidity of the support surface;
- Avoid any obstacles to the flow of the fan which could cause the recirculation of air to the condenser;
- Avoid the possible reflection of sound waves: (do not install in narrow or tight spaces);
- Provide access for maintenance or repair (see paragraph **3.3.1 Installation spaces**);
- Average air temperature in the chosen installation area (see Section **8 Operating limits**).



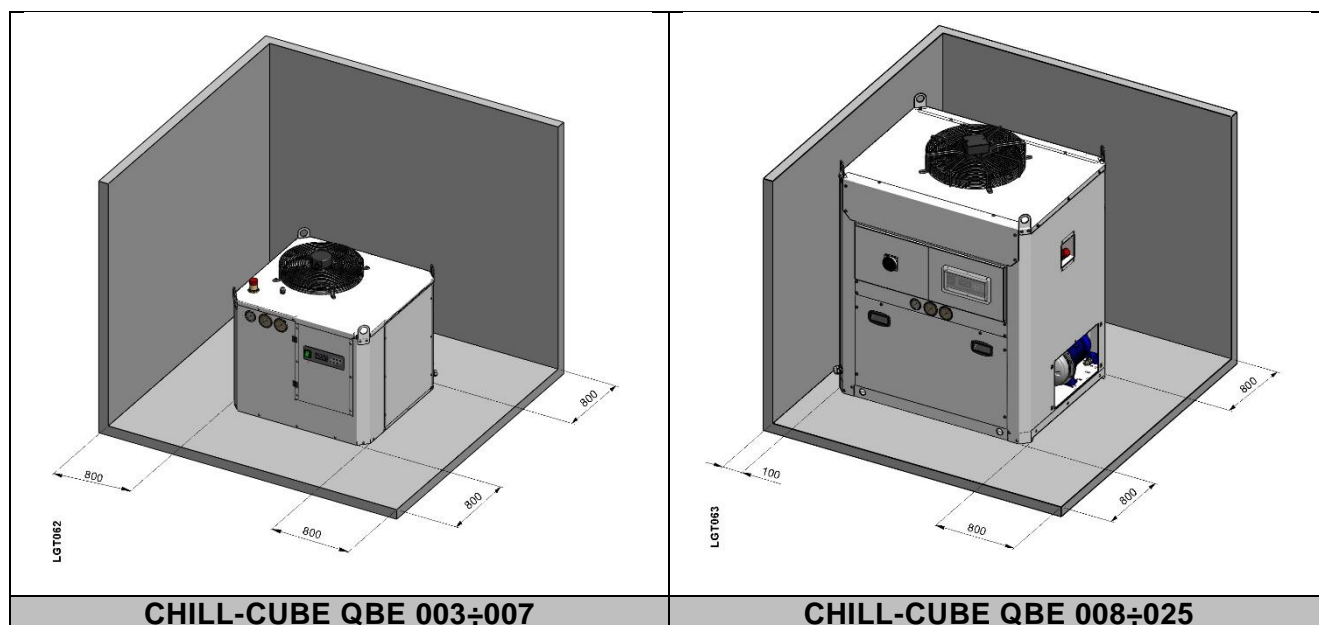
Attention! If the machine is installed outside, it could find itself at a temperature lower than 0°C//32°F, when stopped; the formation of ice could damage the evaporator. If you do not intend to drain the machine during the winter, you must add **anti-freeze to the water circuit** (see paragraph **3.4.3 Use of ethylene glycol as a winter anti-freeze**).

3.3.1 Installation spaces

To ensure the good functioning of the unit and access for maintenance, you must respect the minimum installation space shown in the figure in this paragraph.

The exit of air from the fan must not be obstructed.

In any case, avoid all situations in which hot air can circulate between the output of the fan and the intake of the machine. Contact our office to verify feasibility in all cases where one of the preceding conditions cannot be met.



3.4 WATER CONNECTIONS

Connect the machine to the water pipes following the instructions located near its water fittings (see figures).

The installation of outlet and inlet taps on the machine is recommended, which will enable machine maintenance without emptying the entire system, and emptying of the machine only during winter downtime.



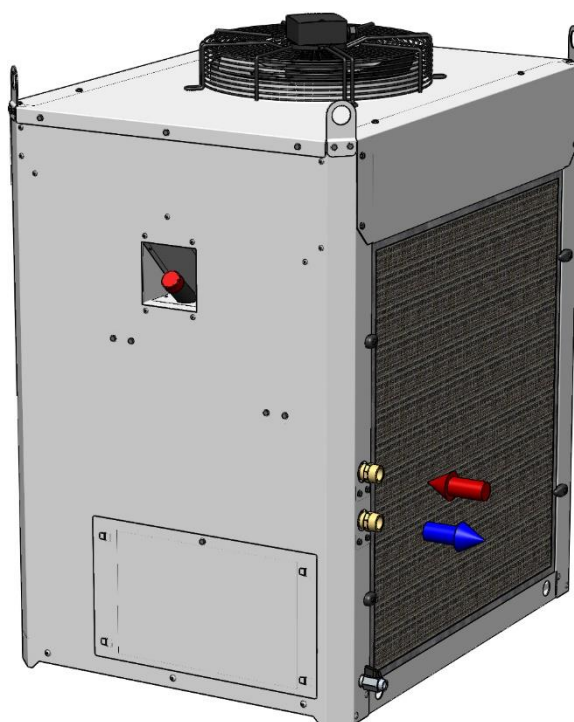
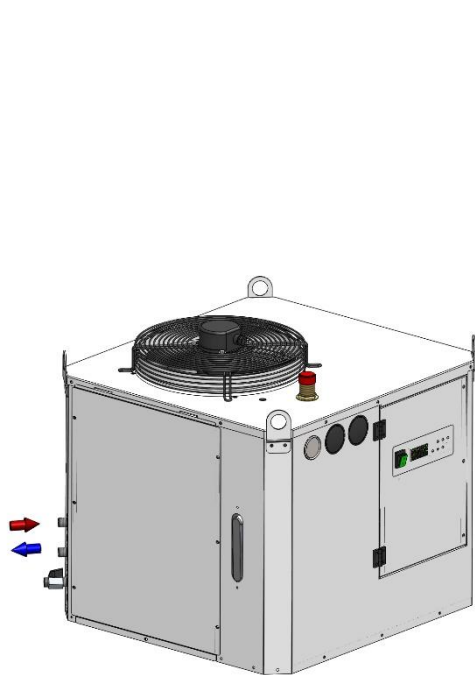
Important! Install the mechanical water filter on its input: scum and impurities can seriously damage the evaporator.



We recommend an extraordinary cleaning of the mechanical water filter after the machine has been running for the first week (also see Chapter **9 Maintenance, inspections and periodic checks**).

CHILL-CUBE QBE 003÷007

CHILL-CUBE QBE 008÷025



Warning! No naked flames should be used during water connection operations, in the vicinity of or inside the unit.

NOTE It is a good rule that the diameters of the arriving and departing pipes be not less than the water fittings.

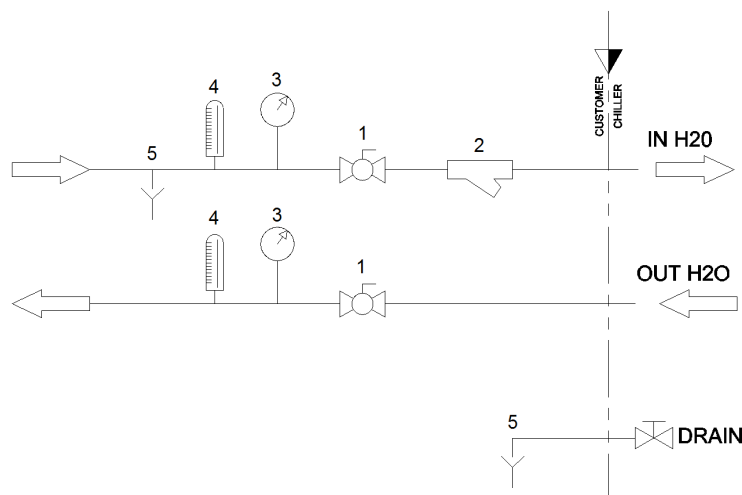
CHILL-CUBE QBE Models 60Hz	003÷007	009÷025
Diameter of the in/out water fittings	1/2" NPT FF	1" NPT FF

3.4.1 Recommended water system for CHILL-CUBE QBE 002÷025

CHILL-CUBE QBE 003÷025 units come as standard with a tank at atmospheric pressure, pump and bypass; it is advisable to also provide the water circuit with:

- A mechanical filter for water in the machine inlet pipes, with mesh no greater than 1mm;
- Machine inlet and outlet taps;
- Inlet and outlet pressure gauges and thermometers for water from the machine, to control its operation.

Diagram of recommended water circuit for CHILL-CUBE QBE003÷025 models



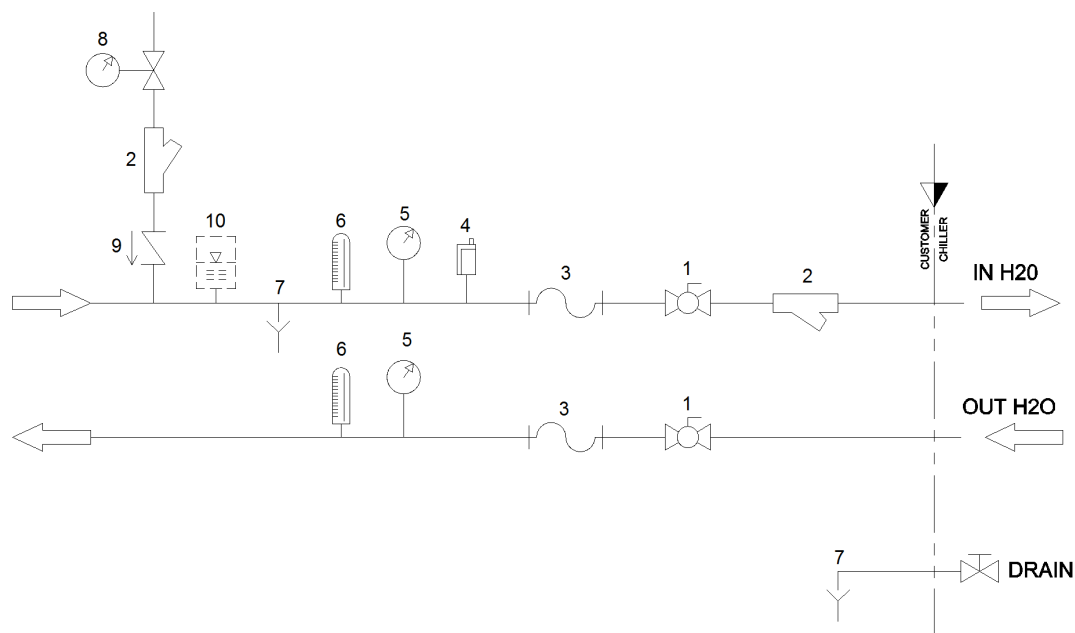
Key			
1	Tap	4	Thermometer
2	Mechanical filter	5	System/unit discharge
3	Pressure gauge		

3.4.2 Recommended water system for QBE 003÷025 with pressurized tank

CHILL-CUBE QBE 003÷025 units can be equipped with pressurized water tank, pump, expansion vessel, automatic air bleeder valve, safety valve. It is however advisable to also provide the water circuit with:

- A mechanical filter for water in the machine inlet pipes, with mesh no greater than 1mm;
- Machine inlet and outlet taps;
- A mechanical filter and a backflow valve on the filling line, upstream of the feed tap;
- An air bleeder at the highest point of the system;
- A discharge tap at the lowest point of the system;
- Inlet and outlet pressure gauges and thermometers for water from the machine, to control its operation;
- Anti-vibration pipe joints to prevent vibrations from being transmitted to the system;
- In the case of water circuits of considerable capacity it is advisable to check if it is necessary to combine the existing expansion tank on the unit with an additional tank. The capacity of the expansion tank provided with the **CHILL-CUBE QBE 003÷007** models is 3 l/0.8 gallons, however for **CHILL-CUBE QBE 008÷025** models are equipped with a 5 l/1.32 gallons expansion vessel.

Diagram of the recommended water circuit for the CHILL-CUBE QBE 003÷025 with pressurized tank



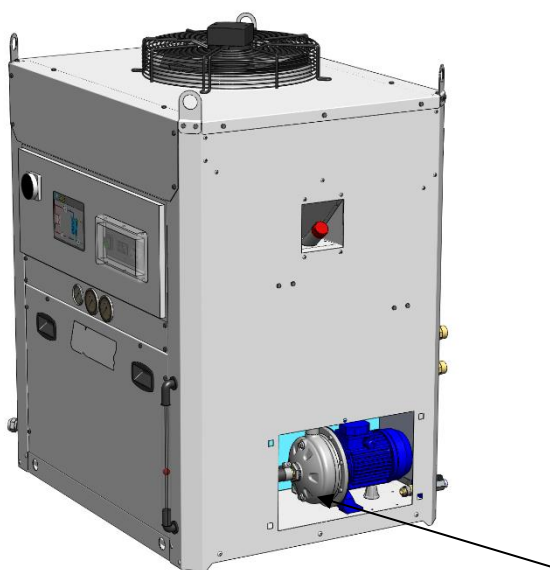
DGT0039

Key			
1	Tap	6	Thermometer
2	Mechanical filter	7	Drain
3	Anti-vibration joints	8	Filling unit
4	Bleeder valve	9	Check valve
5	Pressure gauge	10	Expansion vessel (if required)



Important! During winter downtime empty the system (or just the refrigerator) to prevent damage from the cold.

Any residual water inside the pump (**CHILL-CUBE QBE 008÷025**) must be discharged using the proper screw on the lower part of the pump (see diagram).



Pump Drain screw

LOT061

3.4.3 Use of ethylene glycol as a winter anti-freeze

Instead of emptying the system in the winter, you can charge the system with a mixture of water and a suitable percentage of ethylene glycol, chosen as a function of the lowest expected temperature of the outside air.

Percentages of ethylene glycol recommended as a function of the expected temperature of the outside air

Outside air temperature [°C]	0	-3
Outside air temperature [°F]	32	23
Percentage of ethylene glycol [%]	10	15

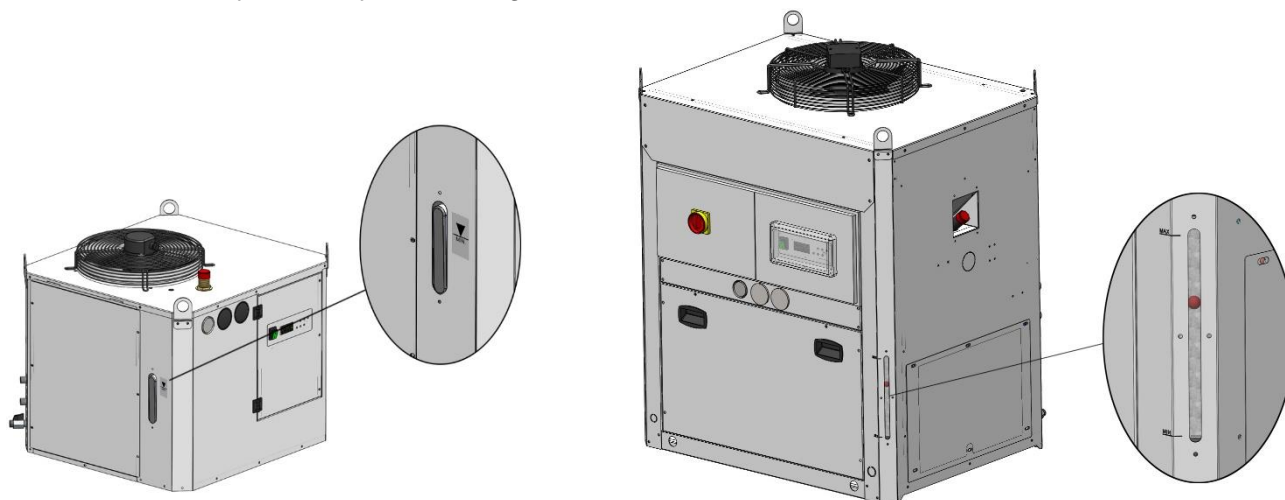


Attention! Maximum concentration of ethylene glycol allowed: **40%**

For higher glycol concentrations contact our company's sales offices to make sure that the mechanical seal and the pump motor are suitable for the type and concentration of fluid loaded in the hydraulic system

3.4.4 Charging the water circuit CHILL-CUBE QBE 003÷025

- Check that the drain taps are turned off;
- Open the system interception devices;
- Feed the water from the filling inlet above the machine until the water reaches the required level (near the transparent level indicator – see diagram). When the pump starts check the level again and top up if necessary;
- Check for any leaks by examining the circuit.



3.5 ELECTRICAL CONNECTIONS



The machine must be connected to the electricity following the electrical diagram and conforming to the current laws and regulations in the place of installation.

- The voltage, frequency and number of phases must conform to the data shown on the machine's identification plate;
- The power supply voltage must not vary by more than $\pm 10\%$ from its nominal value;
- The frequency must not vary by more than $\pm 1\%$ from its nominal value ($\pm 2\%$ for brief periods);
- The imbalance between power phases must be $< 2\%$;
- Upstream from the electrical panel, install a differential switch ($ID_n = 0.03A$) (main power switch) and slow-blow fuses with the specifications shown on the electrical diagram;
- Use wires of the section shown on the electrical diagram and in the following table.



Attention! Never change the internal electrical connections, as the warranty will be immediately voided.



Important! Screw the wires solidly to the terminal strip of the cut-off switch and lock the wire with a cable-gland.



Important! Make the cable entering the machine enters the cable-gland from below: this prevents rain from dripping inside the machine.



Important! The earth connection is mandatory: connect the earth wire to the terminal provided in the electrical panel. The ground wire must be longer than the other wires so that it will be the last one to be pulled if the device holding the cable loosens.

3.5.1 Connecting a remote on/off switch and a remote alert warning indicator

A remote ON/OFF switch can be installed using the terminal clamps on the switchboard terminal board, as shown in the following table:

A remote alert warning indicator can be installed using the terminal clamps in the switchboard cabinet, as shown in the following table:

Remote on/off	QBE003÷007	QBE005÷007 3Ph	QBE008÷025
Terminals	6 – 7	X1.7 – X1.8	X1.7 – X1.8
Voltage	Free contact	Free contact	Free contact

NOTE

For all **CHILL-CUBE QBE** units, any remote switch installed must be enabled on the electronic controller setting the “i8” parameter to value 1 (see par. 5.2.2).

Remote alert	QBE003÷007	QBE005÷007 3Ph	QBE008÷025
Terminals	11 – 12	X1.16 – X1.17	X1.16 – X1.17
Voltage	230V	Free contact	Free contact



Consult the electrical diagram.

PRELIMINARY CHECKS AND START-UP

4.1 PRELIMINARY CHECKS AND PREPARATION FOR THE FIRST START-UP


Before starting up the unit, it is a good idea to do the following:

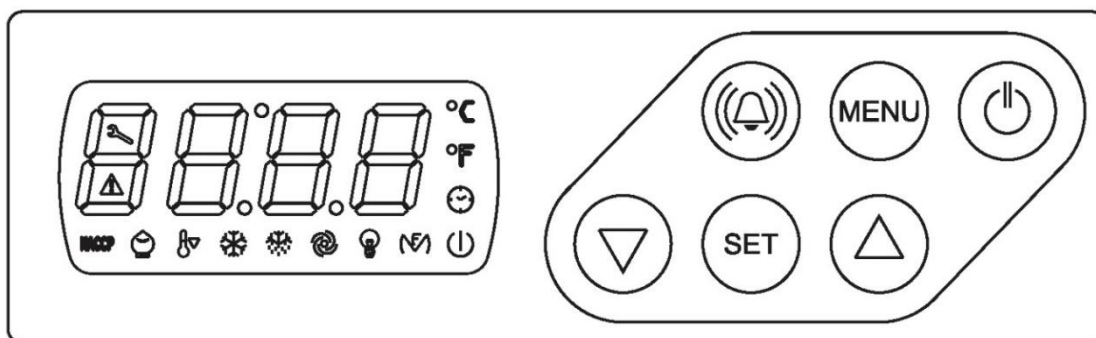
- Check that the water shut-off valves are open;
- Verify the regular water level in the tank;
- Check that the surrounding temperature is in the range for the machine to function (see Chapter **8 Operating Limits**);
- Check the cut-off switch on the machine switchboard is open;
- Check that the mains voltage matches the voltage on the machine's identification plate with a tolerance of $\pm 10\%$;
- Close the main power supply switch;
- Close the cut-off switch on the machine's electrical panel.


4.2 STARTUP

4.2.1 CHILL-CUBE QBE 003÷007 Startup

On closing the cut-off switch the electronic controller will light the led .
To proceed with startup:



- Turn on the unit by pressing  key on the electronic controller for more than 2 seconds;



- Check pump startup (light );
- The display will show the temperature detected by the temperature probe; if it is higher than the set value the compressor will start up.



Attention! At start-up after couple of days, you must adjust date and time (see paragraph **5.7 Setting the date and time**).




Turn off the unit by holding the  key on the electronic controller for more than 1 second; the led  will light to signal the status of OFF. The electronic controller will first switch off the compressor then shortly after the pump.



Attention! It is important not to turn off the unit using the main power switch or cut-off switch on the machine switchboard because this would not provide for the delayed power-off of the pump regarding the power-off of the compressors, with the risk of damaging the evaporator; in addition, it would prevent the functioning of the heating element in the compressor housing.

4.2.2 CHILL-CUBE QBE 008÷025 Startup

On closing the cut-off switch the electronic controller will light the led .
To proceed with startup:

- Turn on the unit by pressing  key on the electronic controller for more than 2 seconds;
- Check the alert symbol  does not appear on the electronic controller; if it does appear press  key to see which type of alert has been flagged.

Attention! On first starting up an alert could occur in relation to an error sequence in the R/S/T phases, shown by the code **HPLP**.



This safety system safeguards the compressor from the possibility of turning in the wrong direction.

Note: the phase sequence relay located inside the electrical panel must have both LEDS lit to confirm the correct electromagnetic field.




Should this occur open the main power switch upstream of the machine, and invert two phases between them immediately downstream of the main switch itself.





Attention! Do not interfere with cabling downstream of the unit switchboard cut-off switch at any time, as doing so could compromise the correct sequence of other devices, such as the pump or fans.

Repeat operations from the beginning.

- Check the pump has started (light ); possibly by checking the pressure of the water upstream and downstream of the machine on the previously installed pressure gauges;
- Wait for the electronic controller to verify continuity of water flow via the signal of the differential pressure switch; if the differential pressure switch intervenes (alarm code **FL**), vent the system, check the shut-off valves are open and pump operation (see **par. 5.2.12** for alarm's rearm);
- The display will show the temperature detected by the probe; if it is higher than the set value the compressor will start up.



Attention! At start-up after couple of days, you must adjust date and time (see paragraph **5.7 Setting the date and time**).

Turn off the unit by holding the  key on the electronic controller for more than 1 second; the led  will light to signal the status of OFF. The electronic controller will first switch off the compressor then shortly after the pump.



Attention! It is important not to turn off the unit using the main power switch or cut-off switch on the machine switchboard as this could cause a delayed switch-off of the pump with respect to the compressor, which could damage the evaporator.

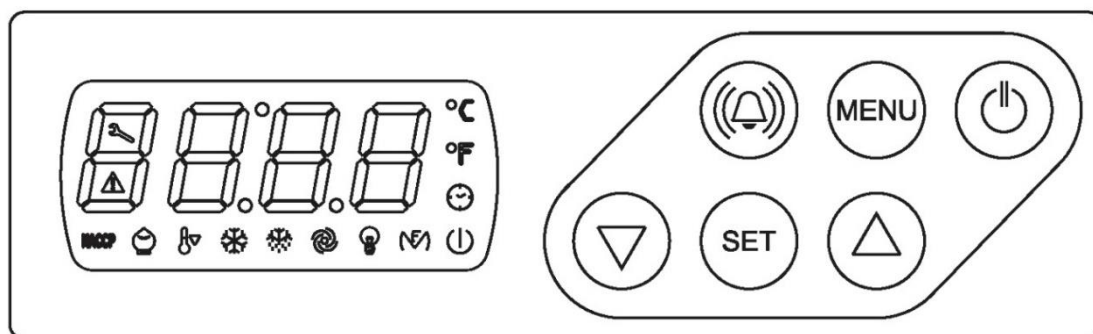
4.3 START-UP UNDER CRITICAL CONDITIONS

The consequence of starting up under critical conditions could be the intervention of the high-pressure pressure switch (to rearm the high-pressure pressure switch, see paragraph **7.2 Rearming the high-pressure pressure switch**).

To overcome this problem, you will have to reduce the thermal load on the machine by shutting off some of the uses or, if this is not possible, by reducing the flow of water into the evaporator: partially close the output tap from the chiller and restart the machine.

Operate the chiller under these conditions until the water temperature gradually returns within operating limits; then, you can turn on the tap completely.

ELECTRONIC CONTROLLER



The electronic controller has a 4 number display, 14 integrated signaling leds and 6 function buttons.

It manages:

- Compressor operation to ensure temperature control of the chilled water;
- Pump operation;
- Fan operation;
- Alarms.

5.1 MAIN FUNCTIONS OF THE ELECTRONIC CONTROLLER BUTTONS AND MEANINGS OF THE ICONS

The following tables resume all the buttons and icons display on the electronic controller.

Button	Function
	Alarm menù
	Access the menù
	On/Off (pressed for more than 1 second) Returns to the previous menu level (pressed once)
	Down key
	Setting setpoint Confirms value entered for a parameter Alarm reset (pressed for 2 seconds)
	Up key

Display/Led	Function
	Water temperature and other contents available in the menu
	°Celsius unit
	°Fahrenheit unit
	Indicates the date, hour and clock alarm
	Indicates that the machine is off
	Indicates the state of the pump: On: pump ON Off: pump OFF Slow flashing: with compressor off, the pump verifies the state of the water temperature Fast flashing: pump about to turn off
	Not used
	Indicates the state of the fan: On: fan ON Off: fan OFF
	Not used
	Indicates the state of the compressor: On: compressor ON Off: compressor OFF Slow flashing: compressor about to turn on Fast flashing: compressor about to turn off
	Indicates the setpoint setting (flashing)
	Energy saving on
	Not used
	Indicates the presence of one or more active alarms
	Indicates the request of maintenance

5.2 TURNING ON AND OFF



Attention! At start-up after couple of days, you must adjust date and time (see paragraph **5.7 Setting the date and time**).

Turn on the unit by pressing key on the electronic controller for more than 2 seconds. The display will show the temperature detected by the probe.

Turn off the unit by pressing key on the electronic controller for more than 2 seconds. The led will light to signal the status of OFF.

The electronic controller can be turn on/off using the keypad or by remote operation, the choice of this modes is done via “i8” parameter (refers to par. **5.8 Parameters changing**).

If “i8” = 0, the chiller can be switched on/off only with key.

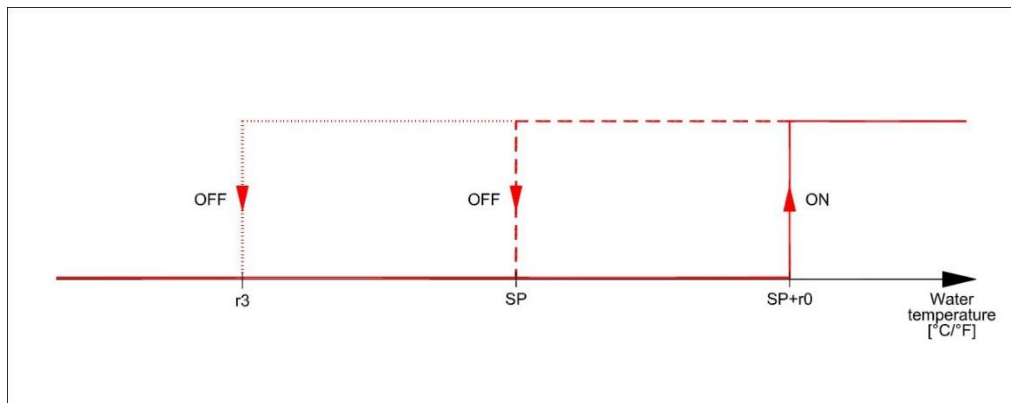
If “i8” = 1, the chiller can be switched on/off only through the digital input available on the terminals in the electric board (refers to par. **3.5.1 Connecting a remote on/off switch**).

The choice of one mode excludes the other mode.

5.3 CONTROLLING WATER TEMPERATURE

The **CHILL-CUBE QBE 003÷025**'s electronic controller regulates the water temperature with a proportional logic.

This type of control is based on setpoint value "**SP**" and on a temperature differential "**r0**" above it: the compressor is switched off when water temperature goes under the set point "**SP**". Due to a low thermal load and/or a low water flow rate, set point could be reached when compressor has not yet reached the minimum ON time ("**C3**" parameter). In this case, water temperature can decrease under the set point. If minimum value ("**r3**" parameter) is reached, the compressor will be switched off apart from its protection times.



The two temperature probes act as follow:

- **A11** takes the outlet water temperature (evaporator exit → antifreeze function);
- **A12** takes the condensing temperature (fan regulation).






5.4 CHANGING THE CHILLER SETPOINT




Warning! Setting the chiller setpoint at least $-2^{\circ}\text{C}/-2\text{K}/-3,6^{\circ}\text{F}$ from the hot gas bypass valve setpoint (see par. **5.17.2 Regulation and changing setpoint of the hot gas bypass valve**).



Attention! If it was not specified during the proposal phase that the unit is required to produce water at temperatures near to $0^{\circ}\text{C}/32^{\circ}\text{F}$ or below contact the company (see section **5.16 Low water temperatures**).




- Press  key; the living set point value will be shown and the yellow icon  will flash.
- Use  and  keys to set desired value and press  key to confirm.

Attention! The new value will be saved after 15 seconds, even if the  key has't been pressed.




NOTE The setpoint value can be changed also when the keyboard is locked.

5.5 QUICK MENU



At the unit switches on, the display will show the outlet water temperature, but quickly it is possible to access to the following parameters.

- Press  key one time to access to the quick menu;
- Using  and  keys it is possible to access to the following parameters:






Parameter	Function/Value
Pb2	Temperature of the second water temperature probe
bU	Buzzer activation/disactivation
rtC	Setting time and date (see par. 5.2.7)
PH	Pump operating time
CH	Compressor operating time

- Press  key for see the set or the current value of the selected parameter;
- Press  key for return to the quick menu;
- Press  key for exit.





















5.6 LOCK AND UNLOCK THE KEYBOARD

To lock the keyboard press at the same time  and  keys for 2 seconds. The display will show text **“Loc”** for one second to confirm the keyboard locking. When the keyboard is locked, if you press any keys, text **“Loc”** will appear. When the keyboard is locked, it's not allow to:

- Turn on and turn off the chiller from the controller;
- Show the temperature of AI2 probe;
- Show information about alarms;
- Show compressor working hours;
- Show pump working hours.












When the keyboard is locked, the changing setpoint is allowed pressing  key and after  and  keys. For unlock the keyboard press at the same time  and  keys for 2 seconds. The display will show text **“UnL”** for one second, to confirm the keyboard unlocking.

5.7 SETTING THE DATE AND TIME

- Push the button ;
- Use  and  in order to see **“rtC”**;
- Push the button , the led  flashes, the display will show “yy”, followed by the last two digits of the year. (i.e. “yy15”). Use  and  to modify the value;
- Push the button  to continue to the month's adjustment; then the display shows “MM”, followed by the last two digits of the month. (i.e. “MM08”). Use  and  to modify the value;
- Push the button  to continue to the day's adjustment; then the display shows “dd”, followed by the last two digits of the day. (i.e. “dd04”). Use  and  to modify the value;
- Push the button  to continue to the time's adjustment; then the display shows “hh”, followed by the last two digits of the time in hours, considered in the 24h format. (i.e. “hh15”). Use  and  to modify the value;
- Push the button  to continue to the minute's adjustment; then the display shows “nn”, followed by the last two digits of the minutes. (i.e. “nn19”). Use  and  to modify the value;
- Push the button  to return to the main menu.

5.8 PARAMETERS CHANGING

The electronic control can be personalized to adapt at different use of the chiller, through parameters setting, using a password.












- Press  key for 4 seconds;
- The display will show **“PA”** text;
- Press  key;
- Use  key to insert the password¹;
- Press  key. Appear the first parameter;
- Press  and  keys for scroll down the list;
- Press  key for see the current value of the selected parameter;
- Press  and  keys to change the value;
- Press  key to confirm the new value and return to parameters menu or wait for 15 seconds without touch the keyboard;
- Press  key to exit from parameters menu or wait for 60 seconds without touching the keyboard.

5.9 CHANGING THE TYPE OF RESTART AFTER A POWER FAILURE

In the case of a power failure, the chiller can behave in three different ways when power is restored:

- Stay off;
- Start;
- Return to the same condition it was in when the power failed.

To select one of these options, proceed as follows:

- Press  key for 4 seconds;
- The display will show **“PA”** text;
- Press  key;
- Use  key to insert the password²;
- Press  key. Appear the first parameter;
- Press  and  keys for scroll down the list until reach **“r7”** parameter;
- Press  key to set the parameter;
- Press  and  keys to change the value:
 - a) 0 when the power returns, the machine will stay off;
 - b) 1 when the power returns, the machine will start;
 - c) 2 when the power returns, the machine will work in the same way as before the power failed;
- Press  key to confirm the new value and return to parameters menu or wait for 15 seconds without touch the keyboard;
- Press  key to exit from parameters menu or wait for 60 seconds without touching the keyboard.




Attention! If remote control is active (i8=1), the parameter **r7** must be set as 2.

¹ Contact our company


² Contact our company

5.10 DISPLAYING THE FIRMWARE RELEASE VERSION OF THE ELECTRONIC CONTROLLER

It is possible to display the software release version only in startup phase. Follow this instructions:


- Connect the device power supply;
- While the display is flashing, press and hold  key;
- On the display will appear 3 values sequentially:
 - The first value is the firmware's number;
 - The second value is the firmware's release;
 - The third value is a not used parameter.





5.11 ALARMS

An alarm is displaying with its code and the led  lights up. There are 3 type of rearm:

- **Manual rearm:** these alarms must be reset, this can only be done when the alarm condition no longer exists; at that point the unit is enabled to run;
- **Automatic rearm:** the alarm is automatically deactivated as soon as the alarm condition ceases and the machine restarts by itself;
- **Semi-automatic rearm:** semi-automatic alarms behave like automatic alarms; but if the same semiautomatic alarm occurs 5 times in 60 minutes, that alarm becomes a manual one; therefore to restart the machine, you will have to remove the cause of the alarm and reset it.

5.12 DISPLAYING ALARM

The led  indicates the presence of an alarm. Alternately the display shows the occurred alarm code (or the most important alarm code, if there are many) and the water temperature value. In case of multiple alarms intervention, it is possible to display the alarm history in this way:

- Press  key;
- Use  and  key to display active alarms;
- Press  key to return to main menu.

The last 20 active alarms are saved; further new alarms will overwrite the oldest ones.

5.13 ALARM CODE TABLE

Code	Description	Type of rearm	Compressor's effect	Pump's effect	Fan's effect
FL	Level sensor/Flow switch	Manual	OFF	NO ACTION*	OFF
HPLP	<i>For QBE VBE/VBM 003÷007</i> High/Low pressure	Manual	OFF	NO ACTION	NO ACTION
	<i>For QBE VBE/VBM 008÷025</i> High/Low pressure Compressor protection Pump protection Fan protection Wrong phase sequence				
Pr1	AI1 temp. probe failure	Automatic	OFF	NO ACTION	OFF
Pr2	AI2 temp. probe failure	Automatic	OFF	NO ACTION	OFF
AL	Min. temp. AI1/AI2 probe - Antifreeze	Semi-Auto	OFF	ON	OFF
AH	Max. temp. AI1 probe	Semi-Auto	OFF	NO ACTION	OFF
COH	Superheated condenser	Semi-Auto	NO ACTION	NO ACTION	NO ACTION
CSD	Blocked condenser	Manual	OFF	NO ACTION	OFF

* Pump's effect in case of FL alarm is a programmable parameter : ib=0 OFF, ib=1 ON, ib=2 NO ACTION

5.14 RESETTING ALARM



To reset an alarm, the condition that caused it must no longer exist. For example, if the low-pressure switch has occurred, the alarm can only be reset when the pressure has risen beyond the reset value (see paragraph **7.1 Calibration of the safety devices and type of rearm**).

Proceed at manual rearm in this way:

- Press key;
- Use and key to select the alarm to reset (a manual rearm's alarm lights up and leds);
- Press key will appear code **"dEL"**;
- Press for 1 second key to cancel the memory;
- Press key for return to upper level menu.

5.15 DISPLAYING AND RESETTING ALARM HISTORY

Make sure that the keyboards is not locked and that no procedure is in progress.

- Press key;
- Use and keys to select **"LS"** label;
- Press key to exit the procedure or key to acces the alarm history;
- Il display visualizzerà l'indicazione dell'allarme più recente nella seguente forma **"1.AL"**
- Use and keys to select desired alarm;
- Press to return to **"LS"** label or press key.

The display will show in sequence the information in the following form:

StA (StArt), by15, bM03, bd17,bh14, bn20, Sto (Stop), Ey15, EM03, Ed17, Eh14, En45











they provide information about the date, starting and ending time alarm;

- If the alarm is still active, the display will show for 1 second:

StA (StArt), by15, bM03, bd17,bh14, bn20;

- Press  key to exit.

To reset alarm history:

- Press  key for 4 seconds;
- The display will show **"PA"** text;
- Press  key;
- Use  key to insert the password³;
- Press  key. The first parameter appears;
- Press  and  key to scroll down the list until **"rLS"** parameter is reached;
- Press  key and use  key to set **"149"** value;
- Press  key, the display will flash "----" for 4 seconds after the device will exit the procedure;
- Press  key to return at main screen.

NOTE It is recommended to clear the alarm history when you change the parameters.

5.16 LOW WATER TEMPERATURE



If it was not anticipated that the chiller unit offered was to produce water at temperatures close to 0°C//32°F, or below, you should contact our company.



To achieve temperatures that are negative, or near zero, it is necessary to use anti-freeze (ethylene glycol) in percentages that depend on the desired temperature; it is also necessary to change the calibration of the anti-freeze thermostat.



In case of RH and/or RA1 / RA2 / RA3 (HEATING or ANTI-FREEZE RESISTORS) option installed on the machine, check that the Chiller setpoint does not conflict with the one chosen for this option. Contact our Service Assistance to request instructions.

5.16.1 Changing the setting of the anti-freeze thermostat



Warning! Setting the chiller setpoint at least -2°C// -2K// -3,6°F from hot gas bypass valve setpoint (see par. **5.17.2 Regulation and changing setpoint of the hot gas bypass valve**).



Attention! Verify the minimum working temperature for each model (see chapter **7 Operating limits**). The working limits differ depending on the model.

For operating with low water temperature (under 5°C//41°F), it is recommended to set the electronic controller parameters as per the following table, in function of desired outlet water temperature.

Outlet water temperature [°C] Outlet water temperature [°F]		Unit	-3 [26,6]	0 [32]	2 [35,6]	5 [41]	7 [44,6]
SP	Chiller Setpoint	°C [°F]	-3 [26,6]	0 [32]	2 [35,6]	5 [41]	7 [44,6]

³ Contact our company

r0	Cooling differential temperature	°C [°F]	2 [3,6]	2 [3,6]	2 [3,6]	2 [3,6]	2 [3,6]
r1	Setpoint minimum limit	°C [°F]	-4 [24,8]	-1 [30,2]	1 [33,8]	4 [39,2]	6 [42,8]
r3	Minimum temperature compressor OFF	°C [°F]	-5 [23]	-2 [28,4]	0 [32]	3 [37,4]	5 [41]
A1	Ice alarm setpoint	°C [°F]	-7 [19,4]	-4 [24,8]	-2 [28,4]	0 [32]	4 [39,2]
	Percentage of ethylene glycol	%	25	20	15	15	0

* Recommended choice

5.17 MECHANICAL HOT GAS BYPASS VALVE – VBM

5.17.1 Working mode – VBM

The mechanical valve of the hot gas bypass is used to adapt the evaporator capacity to the heat load. It is installed between the high and low pressure line of the refrigerant circuit and is designed to bring the hot refrigerant gas directly to the evaporator inlet port.

The mechanical bypass valve keeps constant the evaporation pressure and consequently, in an indirect way, regulates and stabilizes the water outlet temperature.

The factory setting of the bypass valve is such as to ensure a 15°C//59°F outlet water temperature at nominal working conditions, corresponding to an evaporation temperature of 10°C//50°C. Any other setting is customizable (see section **4.3.2 Regulation**).

5.17.2 Regulation – VBM

If you want to change the outlet water temperature from the refrigerator, you need to act on the screw present on the bypass valve head (use an 8 mm hex wrench).

To decrease the water temperature, counterclockwise rotate the valve screw, vice versa to increase the temperature. The table below shows the correspondence between the values of the desired outlet water temperature and numbers of spin respect to the factory setting.

Desired outlet water temperature	[°C//°F]	5//41	10//50	15//59	20//68	25//77
Corresponding evaporating temperature	[°C//°F]	0//32	5//41	10//50	15//59	20//68
Numbers of spin	[#]	4	2	0	2	5
Rotation direction		Counterclockwise			Clockwise	



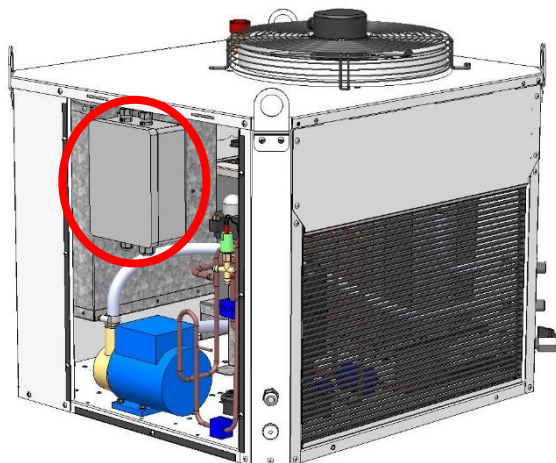
Attention! For each of the valve control variation, observe the trend of the temperature for a significant working time (for example a complete processing cycle of the system).



Note all changes made from the factory configuration, so they can be restored in case of need.

5.18 ELECTRONIC HOT GAS BYPASS VALVE – VBE

The electronic hot gas bypass valve is regulated by a stand-alone driver (see picture below).

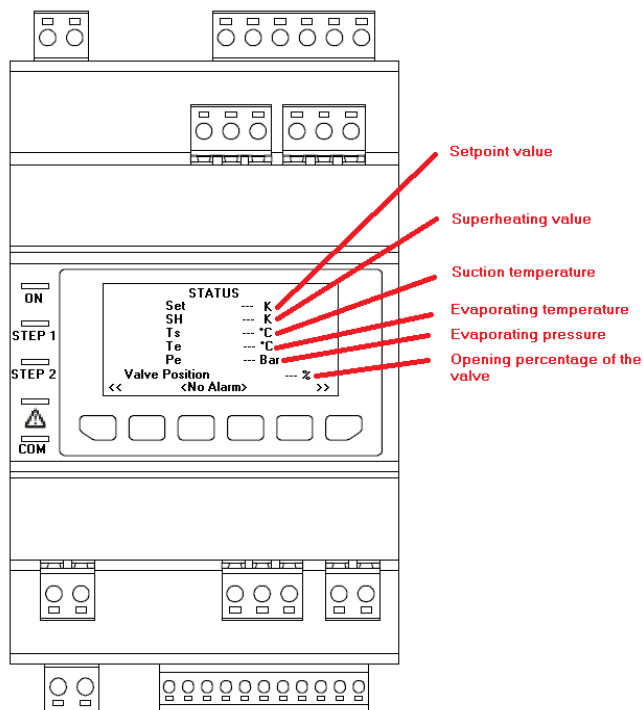


In case of valve and/or driver failure, the chiller continues to normally work.

5.18.1 Working mode – VBE

The electronic hot gas bypass valve regulates the refrigeration power of bypassing a suitable amount of heat directly to the evaporator refrigerant gas.

A temperature sensor on the water line in the output controls the hot gas bypass valve through the electronic controller and the valve driver.

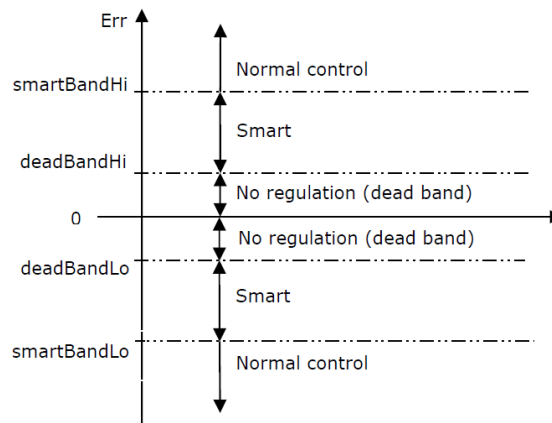


5.18.2 Regulation and changing setpoint – VBE

The electronic hot gas bypass valve is automatically adjusted by the driver as a function of the desired outlet water temperature.










The algorithm activates different type of regulation mode as a function of the working point:

- Positive error:
 - If the error is greater or equal to zero but lower than *deadBandHi*, there is no regulation;
 - If the error is greater of *deadBandHi* but lower than *smartBandHi*, the “Smart” algorithm is active;
 - On the other cases, the “Normal” control is active;
- Negative error:
 - If the error is lower than zero but greater than *deadBandLo*, there is no regulation;
 - If the error is lower than *deadBandLo* but grater than *smartBandLo*, the “Smart” algorithm is active;
 - On the other cases, the “Normal” control is active;




Warning! Setting the hot gas bypass valve setpoint at least +2°C//2K//3,6°F from chiller setpoint (see par. **5.4 Changing the chiller setpoint**).

If you wish to change the valve setpoint, use the following procedure:

- From the main screen press  for 3 seconds;
- Press  at **User** menu;
- Use  and  to rech the parameter **PB01**;
- Press  to select the value and use  and  to change the value;
- Press  to confirm the value;
- Press  to exit from the procedure.

5.18.3 Alarms and alarm history – VBE

It is possible to display the alarm history in this way:

- From the main screen press  one time;
- Choose the menu **“Alar”** or **“HiSt”** for display the active alarms or the alarm history respectively.

The last 100 active alarms are saved on the alarm history; further new alarms will overwrite the oldest ones.

The table below show the possible alarms:

Alarm	Description
AL01	Temperature probe
AL02	Pressure transducer
AL03	Discharge temperature probe
AL04	Superheat low
AL05	Superheat high
AL06	Low operating pressure
AL07	High operating pressure
AL08	Low pressure
AL09	High discharge pressure alarm

















The rearm is automatic so the alarm is automatically deactivated as soon as the alarm condition ceases and the driver restarts by itself.

5.18.4 Changing the factory setting of the valve regulation – VBE

The factory setting of the regulation parameter of the hot gas bypass valve are:

Parameter	Description	Factory Setting
PB02	PID – Proportional band	5°C//9°F
PB03	PID – Integral time	120 s
PB10	Dead zone	0,2°C//0,3°F
PB11	Smart band	0,5°C//0,9°F

Follow this procedure for changing the parameters:

- From the main screen press  for 3 seconds;
- Press  at **Inst** menu;
- Press  at **IS-V** menu;
- Use  and  to reach the parameter **PSd3**;
- Press  to select the parameter and use  and  to insert the password⁴;
- Press  to confirm the value;
- Use  and  to scroll the parameter list and find the value on the table;
- Press  to select the parameter and use  and  to change the value
- Press  to confirm the value;
- Press  to exit from the procedure.

⁴ Contact our company.

SAFETY DEVICES

CHILL-CUBE QBE chillers have a series of safety devices that limit the machine's temperature and pressure values to ensure that it operates within the expected limits and to avoid dangerous situations.

Here is a list of dangerous situations, including the relative safety device and its location.

Dangerous situation	Safety device	Location	QBE 003÷007	QBE 008÷025
High condensation pressure	High-pressure switch	Compressor output pipe	✓	✓
Low evaporation pressure	Low-pressure switch	Compressor intake pipe	✓	✓
Low water flow-capacity	Water differential pressure switch	Plate evaporator	Opt.	✓
Low water temperature	Anti-freeze thermostat	Water exit from the evaporator	✓	✓
Frequent compressor start-ups	Anti-circulation timer	Electronic controller	✓	✓
Low water level in the tank	Water-level sensor	Tank	✓	✓

Legend: Opt.: optional

When they reach their calibration value, most of the security devices trigger an alarm managed by the electronic controller.



For some safety devices, once the cause of the alarm times out, the machine resumes operation automatically as soon as the reset value is reached. Others must be manually reset to restart the machine (also see paragraph 5.2.14).

The following paragraph lists the characteristics of each safety device.

6.1 CALIBRATION OF THE SAFETY DEVICES AND TYPE OF REARM

Safety device	Intervention value	Reset value	Type of rearm	QBE 003÷007	QBE 008÷025
High-pressure gauge	30 barg//435 psi	23 barg//334 psi	Manual	✓	✓
Low-pressure gauge	2,5 barg//36 psi	4,2 barg//61 psi	Manual	✓	✓
Water differential pressure switch	85mbar//1,23psi	105mbar//1,53psi	Manual	Opt.	✓
Anti-freeze thermostat	4°C//39,2°F	8°C//46,4°F	Semiautom.	✓	✓
Water-level sensor	--	--	Semiautom.	✓	✓
Anti-circulation timer*	5 min.	--	--	✓	✓

* This is a function of the electronic controller that prevents the same compressor from stopping and starting too frequently: at least 5 minutes must elapse between one compressor's power up and the next.

6.2 REARMING THE HIGH-PRESSURE PRESSURE SWITCH

The intervention of the high-pressure pressure switch is the only case in which, in addition to manually rearming the electronic controller, it is also necessary to reset the pressure switch itself.

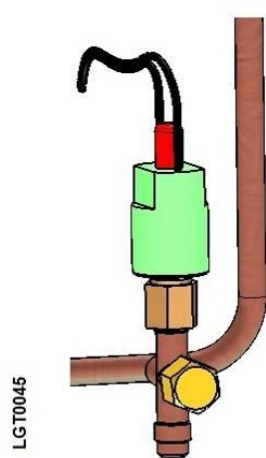
The high-pressure pressure switch is located in the compressor compartment on the uninsulated copper pipe that goes from the compressors to the condensation coil; there is a manual-reset button on top of it.



Warning! The upper part of the compressor casing and discharge pipe are at a high temperature.

Be especially careful when working in their vicinity.

This can only be rearmed when the pressure in the circuit has fallen below the reset value (see table **Calibration of the safety devices and type of rearm** in paragraph 7.1).



For this reason, when dealing with an intervention of the high-pressure switch, it is necessary to:

- A) Identify the cause of the rise in pressure (fan not working, condensation coil dirty or obstructed, obstacles to the flow of exiting air, operating temperature outside operating limits, etc. (also see Chapter **10 Troubleshooting**) and remove the cause, if possible;
- B) Wait until the high-pressure manometer falls below the reset value (see the table, **“Calibration of the safety devices and type of rearm”** in paragraph 7.1);
- C) Rearm the pressure switch by pressing the red button: if you do not hear a click, it is not rearmed;
- D) Then rearm the electronic controller (see paragraph **5.14 Resetting alarm**).

High pressure switch



Attention! The high-pressure gauge stops the compressor while it keeps the condenser fan running to lower the pressure in the condenser.

OPERATING LIMITS

7.1 OPERATING TEMPERATURES

The various units in the **CHILL-CUBE QBE** line guarantee several operating limits depending on the model and accessories provided. The graphs show the limits for continuous operation of the **CHILL-CUBE QBE** units, in relation to the temperature of the water exiting the machine and the temperature of the external air.



Warning! Produced water temperatures less than 5°C//41°F require the use of glycolate mixtures and the setting of suitable electronic controller parameters. Contact the company (**see section 5.16**).



Warning! External air temperatures lower than 10°C//50°F can only be achieved with condensation control and continuous fan speed control (optional CA or CE, only with **CHILL-CUBE QBE** 008÷025).



Warning! According to the condensation control chosen and applied on the machinery, verify the real operating limit of the ambient temperature sustainable by the unit.

Legend



Mandatory ethylene glycol - please contact our company

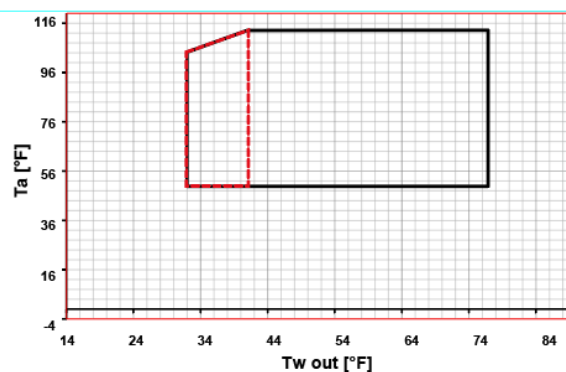
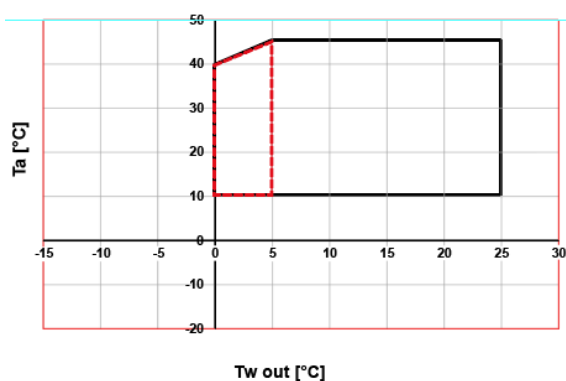


Mandatory continuous fan(s) speed control - phase cut type (CA)

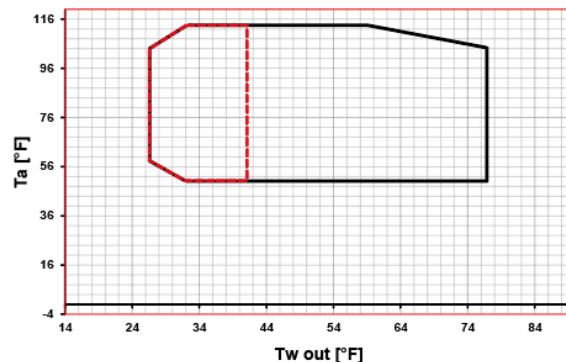
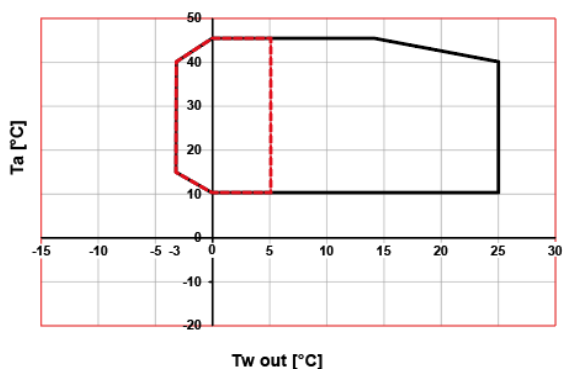


Mandatory continuous fan(s) speed control - electronic fan(s) (CE)

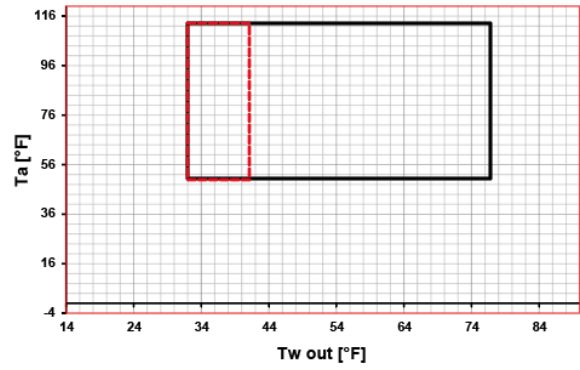
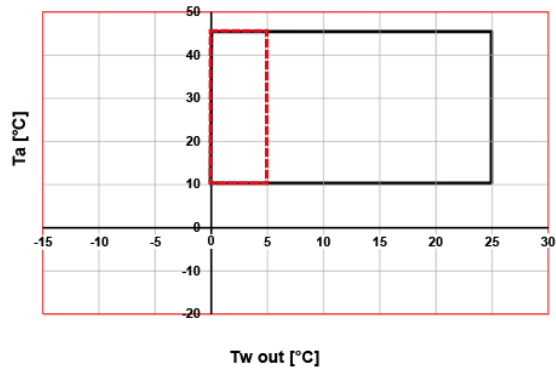
QBE003÷006



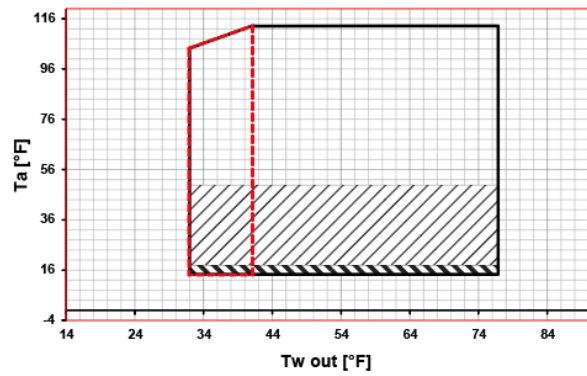
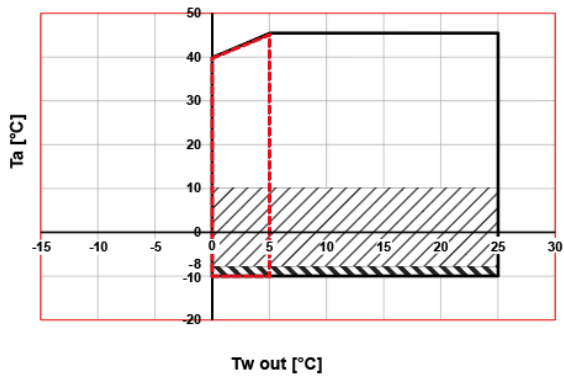
QBE005÷007 3PH



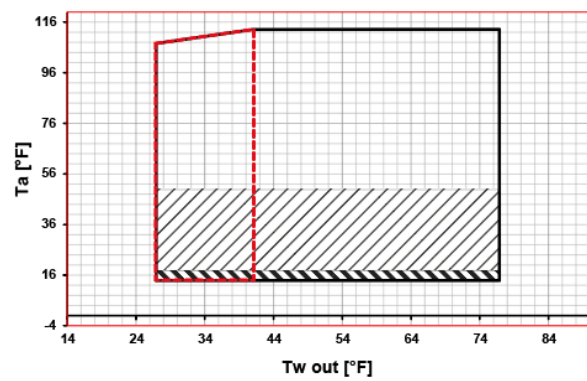
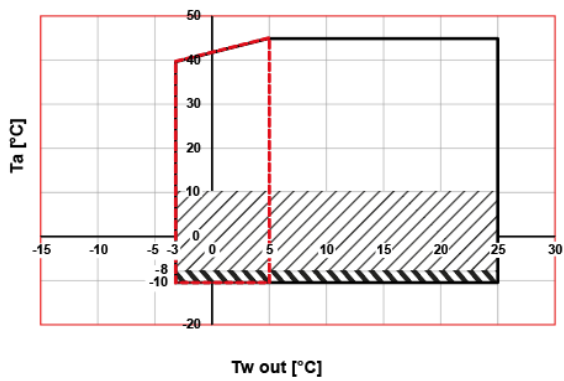
QBE007



QBE008÷012



QBE014÷025



7.2 MINIMUM WATER FLOW RATE


Operation with water flow rates lower than minimum limits could cause the anti-freeze thermostat to intervention and make it difficult to regulate water temperature.

CHILL-CUBE Model	Unit	QBE 003	QBE 004	QBE 005	QBE 006	QBE 007	QBE 008	QBE 009	QBE 012	QBE 014	QBE 020	QBE 025
Minimum water flow rate	[l/h]	200	300	350	450	500	600	600	1000	1000	1200	1200

MAINTENANCE, INSPECTIONS AND PERIODIC CHECKS



To keep the machine running properly and providing the guaranteed performance required, it is necessary to make some periodic checks.

Operation	Frequency	Execution
Check that the temperature of the water produced is in the required interval	Daily	User
Check tank water level using level indicator – see section 3.4.2 - (only units with open water circuit)	Daily	
Check for the presence of any alarm signals	Daily	
Check the functioning of the fans	Monthly	
Check the pressure of the water circuit with the pump stopped (verify that it is about 1bar//15psi) [ONLY FOR PRESSURIZED WATER CIRCUIT OPTION]	Monthly	
Check that the temperature of the air is compatible with the operating limits of the machine	Monthly	
Clean the air filters (only QBE 008÷025)	Monthly(1)	
Clean the condensing coil with a jet of compressed air	Annual (1)	Specialized personnel 
Clean the water filter	Monthly(2)	
Check that the refrigerant liquid sight glass is clear or, at most, with a few bubbles (check with the compressor running – only QBE 008÷025)	Every 6 months	
Check that the subcooling and superheating values are, respectively between 3÷5K//5,4÷9°F and 5÷7K//9÷12,6°F	Every 6 months	
Check for traces of oil on the pipes of the refrigerant circuit (symptom of refrigerant leaks)	Every 6 months	
Check the tightness of the electrical terminals both inside the electrical panel and on the terminal strips of the compressors	Yearly	
Check the contacts of the contactors; if they show signs of deterioration, replace them	Yearly	
Check that the current absorbed by the machine is within the values on the identification plate	Every 6 months	

- (1) It may be necessary to carry this out more frequently in the case of particularly dirty environments.
- (2) We recommend an extraordinary cleaning of the filter after the machine has been operating for the first week.
- (3) It is not necessary to do this if the system has been charged with an anti-freeze solution (water and a suitable percentage of glycol) (see paragraph **3.4.3 Use of ethylene glycol as a winter anti-freeze**).











Attention! Before carrying out any maintenance on the unit or accessing internal parts, make sure you have cut-off the electricity.















Attention! The upper part of the compressor housing and the output pipe are hot. Be especially careful when working near them.

TROUBLESHOOTING

Cause	Alarm or symptom	Solution	Execution
1. The unit does not start			
Contacts of the main differential switch are open	Electronic controller off	Close the contacts	User 
Unit's electrical panel cut-off switch is open	Electronic controller off	Close the contacts	User 
No consent from the water differential switch (only QBE VBM/VBE 003÷025)	FL	Check the functioning of the pump, bleed the system	User
Compressor timer active	The compressor icon on the display of the electronic controller is flashing	Wait (5 mins at the most)	User
No consent from the service thermostat	System water at temperature (see display)	Apply a thermal load to the machine or lower the set point	User
No consent from the antifreeze thermostat	AL	Reset a temperature of the water (set point) compatible with the calibration of the antifreeze thermostat (see par. 5.2.15)	User
Service and anti-freeze probe defective	Pr1/Pr2	Check contacts and replace, if necessary	Specialized personnel 
Intervention of the main differential switch	Electronic controller off	Look for current leakage inside the machine	Specialized personnel 
2. The compressor does not start			
Intervention of the thermal protection inside the compressor	The contactor of the compressor is on but the compressor is stopped	Wait for cooling: check that the compressor is working under normal conditions. Check for insufficient refrigerant in the circuit (see point 6).	Specialized personnel 
Contactor of the compressor off (only QBE VBM/VBE 003÷025)	The compressor icon is on but the compressor is stopped	Check the voltage at the coil of the contactor of the compressor and the continuity of the coil itself	Specialized personnel 
Intervention of the phase sequence relay (only QBE VBM/VBE 008÷025 three phase power input models)	HPLP	Reverse the two phases upstream from the cut-off switch of the unit's electrical panel (see par. 4.2.3)	Specialized personnel 

Cause	Alarm or symptom	Solution	Execution
Intervention of the thermal protection inside the compressor OR magnetothermic protection of the compressor open (QC1)	HPLP	Look for short circuits in the motor windings of the compressors. Check for possible over-absorption of current due to too low voltage; near the limit conditions: check the power supply voltage and operating conditions.	Specialized personnel 

Cause	Alarm or symptom	Solution	Execution
3. Intervention of the high pressure switch			
Condenser obstructed or insufficient air flow-capacity	HPLP	Remove dirt from the condenser and any obstacles to the flow of air. Wait for the pressure to drop below the reset value, then rearm the high-pressure pressure switch by pressing the button on top of it (see figure in paragraph 7.2).	User
The unit has operated outside its operating limits (such as air or water too hot)	HPLP	If possible, restore conditions that are compatible with the operating limits. Reset the high pressure switch (paragraph 7.2).	User
Fan not working	HPLP	See point 7	
Excessive refrigerant charge	High subcooling (greater than 10K/18°F)	Drain excess refrigerant	Specialized personnel 
Presence of air or incondensable gas in the refrigerant circuit	Presence of bubbles on the flow peep hole, also with subcooling values greater than 5K/9°F	Drain the circuit, create vacuum and recharge	Specialized personnel 
Refrigerant filter clogged or thermostatic valve stuck	Pipe downstream from the component covered with frost	Check and replace	Specialized personnel 
4. Intervention of the water differential pressure switch			
Water circulation pump blocked or defective (QBE 003÷025)	FL	Unlock or replace the pump	Specialized personnel 
Circulation pump stopped	FL	Check the voltage at the coil of the contactor of the pump and the continuity of the coil itself	Specialized personnel 
5. Intervention of the low pressure switch			
Refrigerant filter clogged or thermostatic valve stuck	Pipe downstream from the component covered with frost HPLP	Check and replace	Specialized personnel 
Insufficient refrigerant charge	HPLP	See point 8	

Cause	Alarm or symptom	Solution	Execution
6. Compressor intake pipe covered with frost			
No refrigerant	High overheating, low undercooling and high output temperature of the compressor. Traces of oil on the refrigerant circuit.	Check the chiller circuit with a leak detector. Repair any ruptures and recharge the circuit.	Specialized personnel 
7. Fan does not start			
Very low outside air temperatures and consequent intervention of the condensation control	Fan icon off. Condensation pressure normal	The machine can working anyway	
No voltage output from the fan-speed regulator (only QBE VBM/VBE 008÷025 with optional condensation control)	Fan icon on and fans stopped	Check the voltage output from the regulator and replace, if necessary	Specialized personnel 
Electrical connections of the fan loose	Fan icon on and fans stopped (only QBE008÷025)	Check and tighten	Specialized personnel 
Intervention of the thermal protection inside the fan OR magnetothermic protection of the fan open (QV1)	HPLP	Check that the working conditions of the machine (outside air temperature) are compatible with the operating limits. Wait for the fan motor to cool	User
8. The unit is working without ever stopping			
Excessive thermal load		Reduce the thermal load. Reduce the temperature of the incoming water and/or the flow-capacity of the exit tap of the unit a little.	User
No refrigerant		See point 6	
9. The pump doesn't start. Magnetothermic protection of the pump open.			
Excessive water flow capacity; the pump is absorbing too much current. Intervention of the thermal protection inside the fan OR magnetothermic protection of the fan open (QP1)	HPLP	Reduce the flow capacity of the water by closing the output tap of the pump a little bit. Rearm the thermomagnetic protection of pump QP1.	User 
Short circuit or overcurrent	HPLP	Look for a short circuit in the winding of the pump motor. Check for possible over-absorption of current due to too low voltage; check the power supply voltage.	Specialized personnel 
10. The unit stops and starts repeatedly; water temperature changes suddenly			
Insufficient water flow rate		Check water flow rate (see section 8.2). Open the system tap fully. If possible reduce system feed leaks. If possible add a pump in series with suitable head.	Specialized personnel 

DISMANTLING THE CHILLER



If the chiller is being dismantled, you must separate it into parts of homogeneous material.

The following table lists the main materials of the various components of the machine.

Part	Material
Refrigerant fluid	R407C, Oil
Panelling and supports	Carbon steel, epoxy paint
Chiller compressor	Steel, Copper, Aluminium, Oil
Plate exchanger (evaporator QBE008÷025)	Steel, Copper
Coaxial exchanger (evaporator QBE002÷007)	Copper
Condenser	Aluminium, Carbon Steel
Pipes	Copper
Fan	Aluminium, Copper, Steel
Valves	Steel, Bronze
Insulation	Synthetic rubber without CFC, EPS, Polyurethane
Pump	Steel, Copper
Tank	ABS, PVC
Electrical wires	Copper, PVC
Electrical parts	PVC, Copper, Bronze

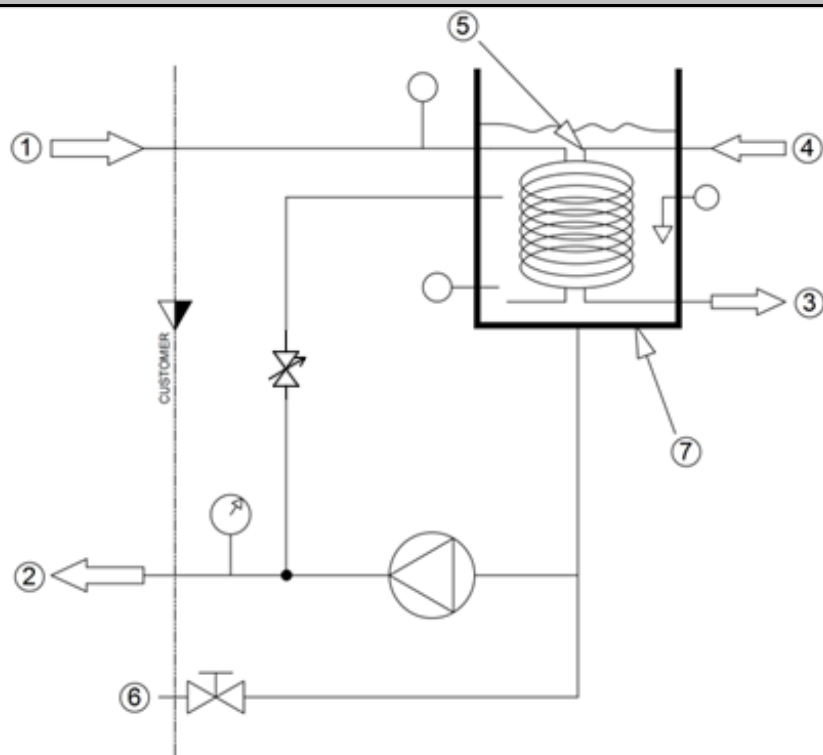
We recommend that you follow current safety norms for the disposal of each single material. The refrigerant contains particles of lubrication oil from the chiller compressor.



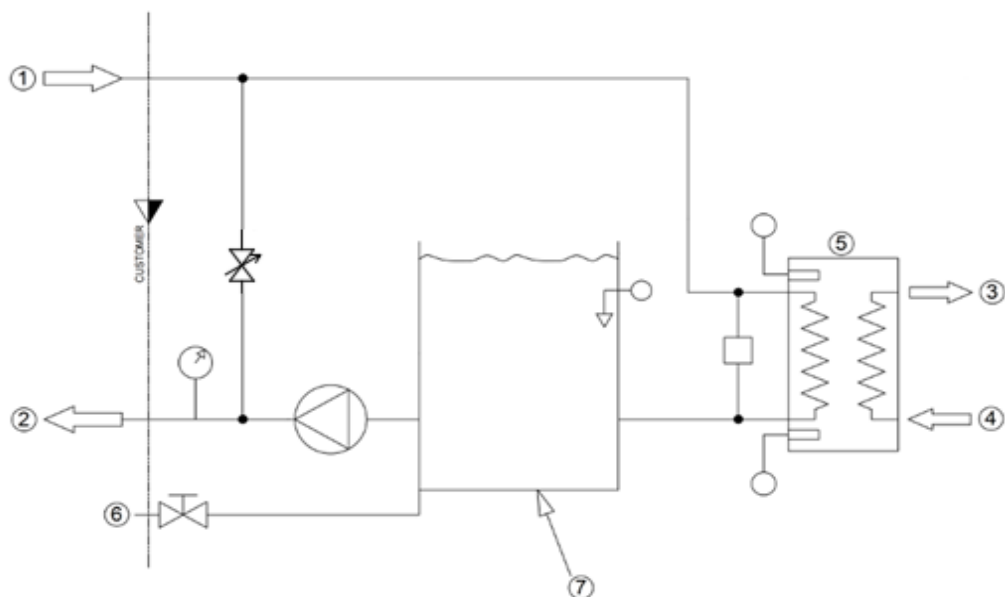
Dispose of refrigerant properly. Remove it from the chiller with suitable tools and deliver it to authorized collection centres that will treat it and make it reusable.

WATER DIAGRAMS

QBE 003÷007 STANDARD

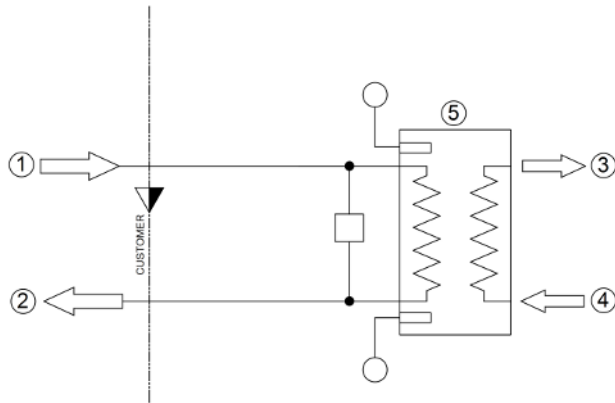


QBE 008÷025 STANDARD

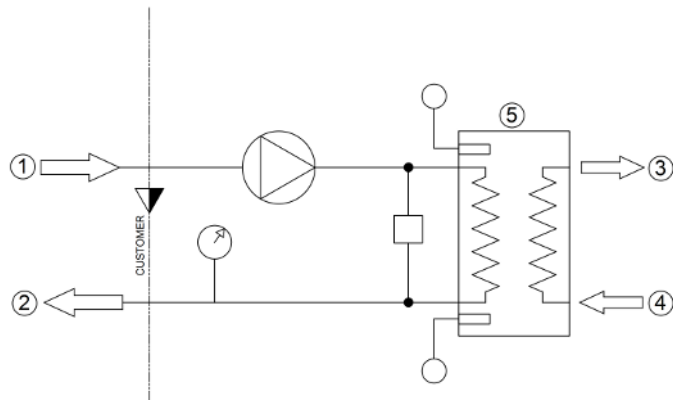


11.1 OPTIONAL VERSION

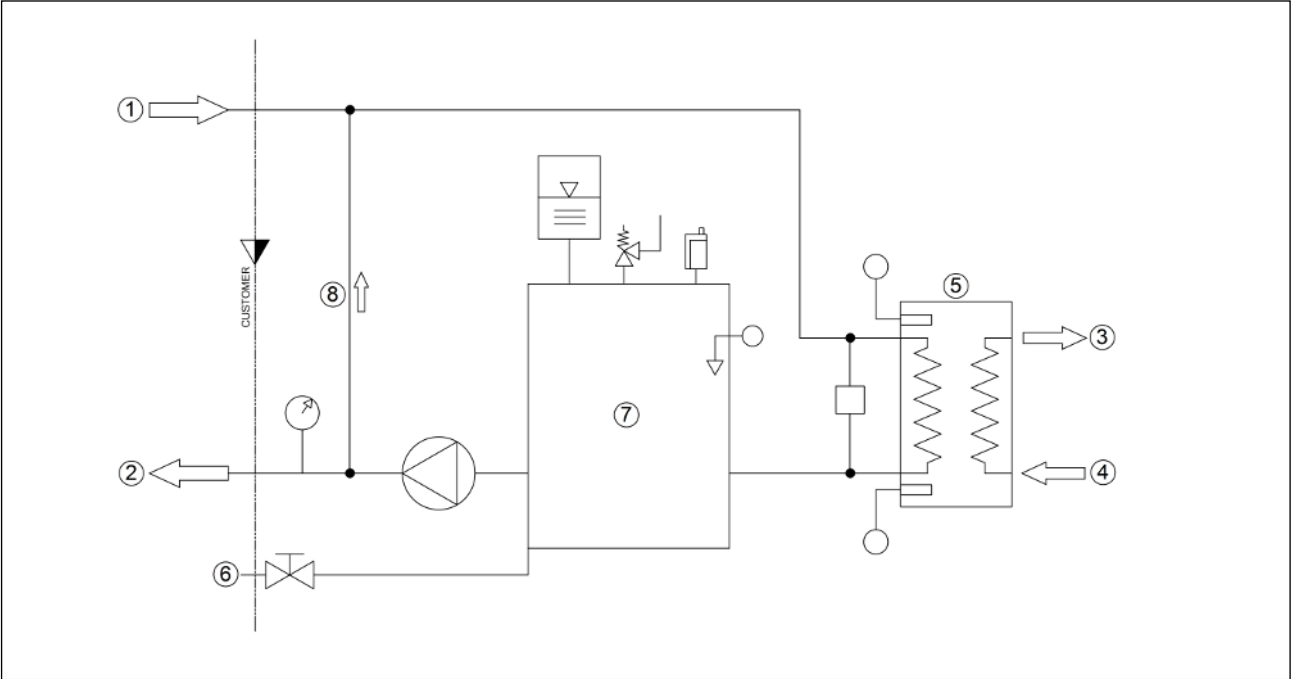
QBE 003÷025 PLATE HEAT EXCHANGER (EXP P0 T0)



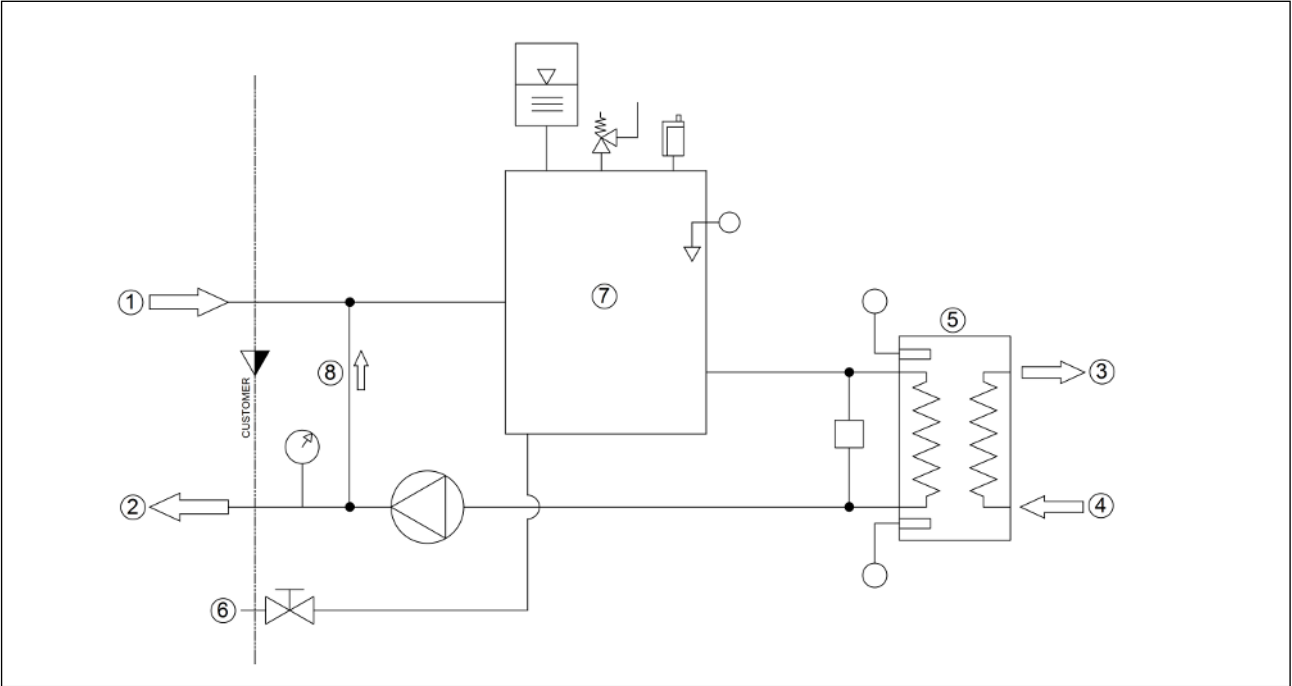
QBE 003÷025 PLATE HEAT EXCHANGER AND PUMP (T0 EXP + P2/P3/P5)



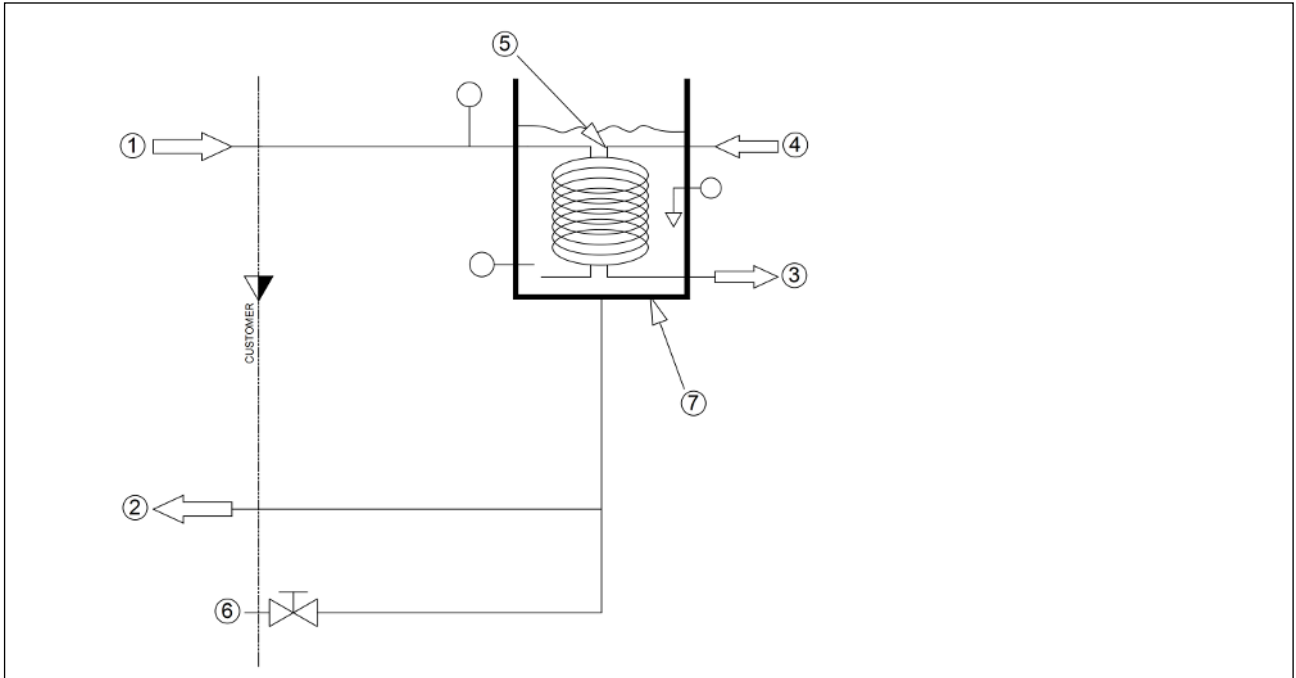
**QBE 003÷025 PLATE HEAT EXCHANGER, COLD PRESS. TANK AND PUMP
(TP EXP + P2/P3/P5)**



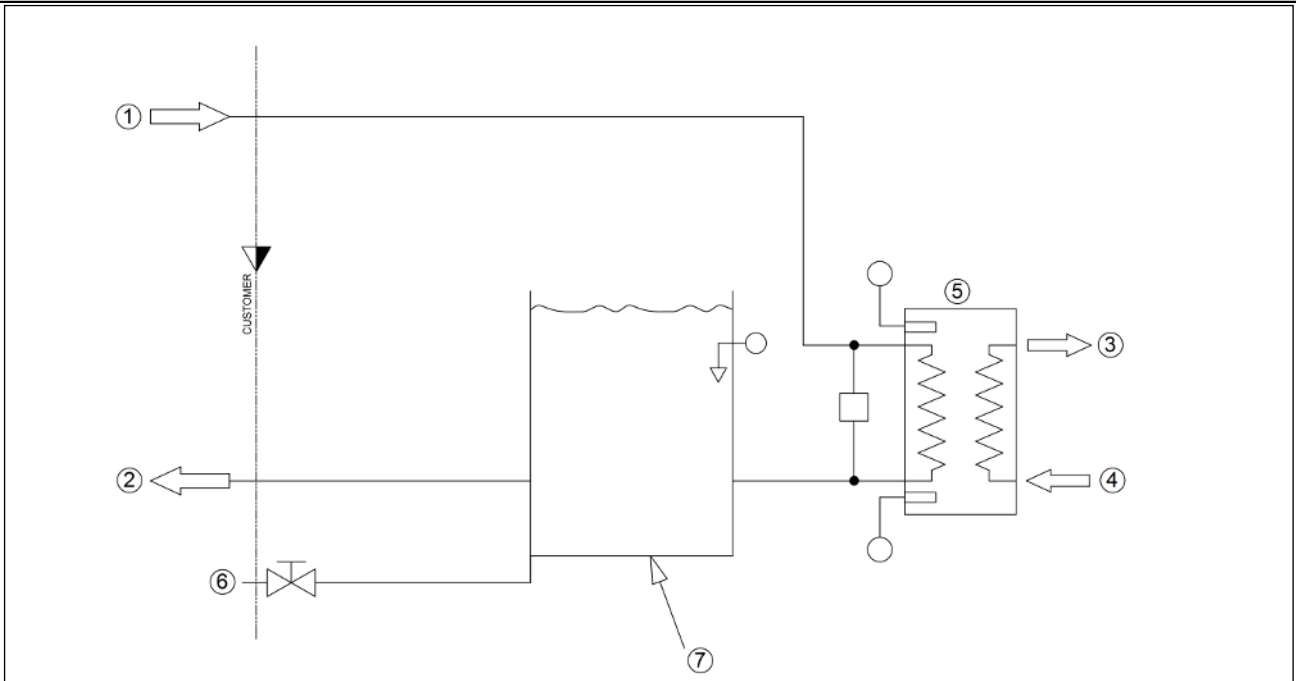
**QBE 003÷025 PLATE HEAT EXCHANGER, WARM PRESS. TANK AND PUMP
(TP EXP + P2/P3/P5)**



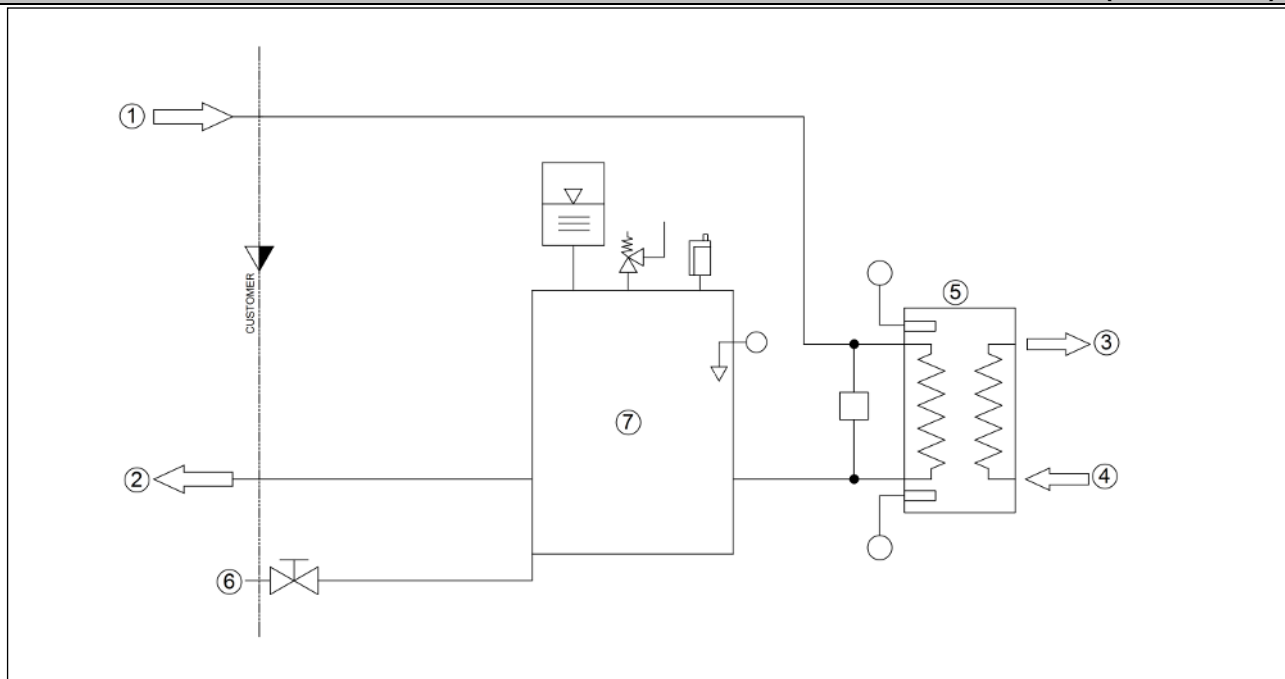
QBE 002÷007 OPEN TANK NO PUMP (P0)



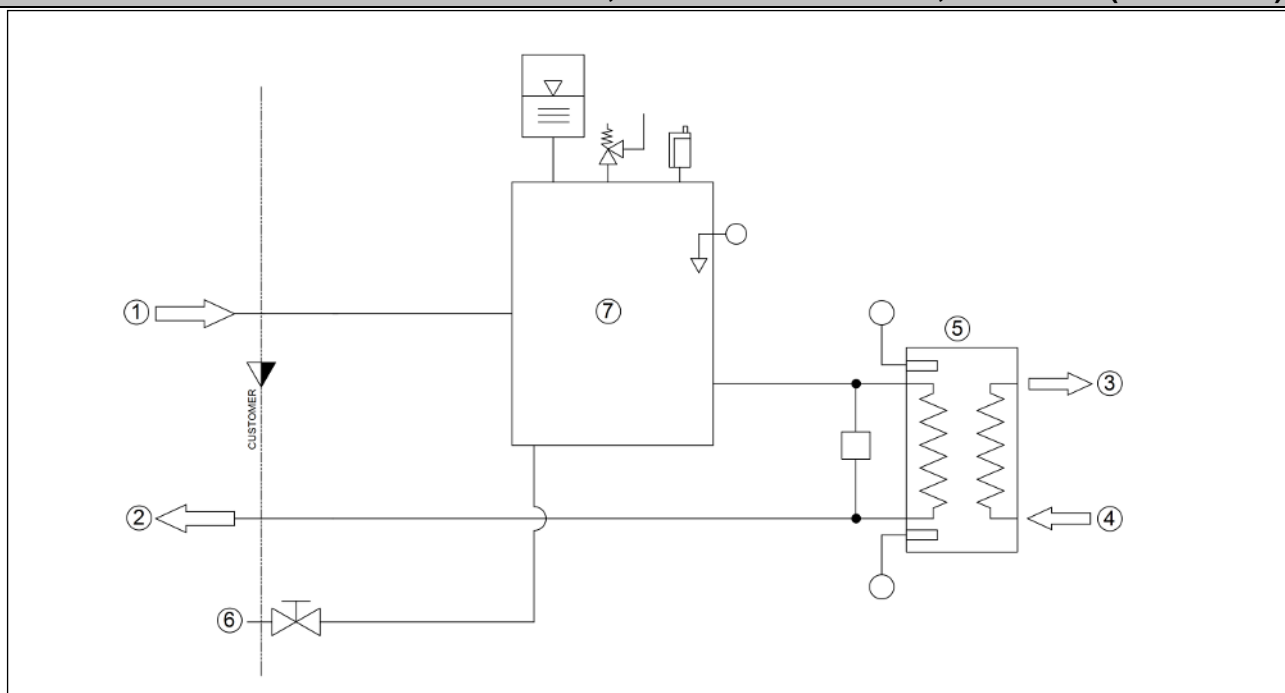
QBE 008÷025 OPEN TANK NO PUMP (P0)



















QBE 003÷025 PLATE HEAT EXCHANGER, COLD PRESS. TANK, NO PUMP (TP EXP P0)



QBE 003÷025 PLATE HEAT EXCHANGER, WARM PRESS. TANK, NO PUMP (TP EXP P0)

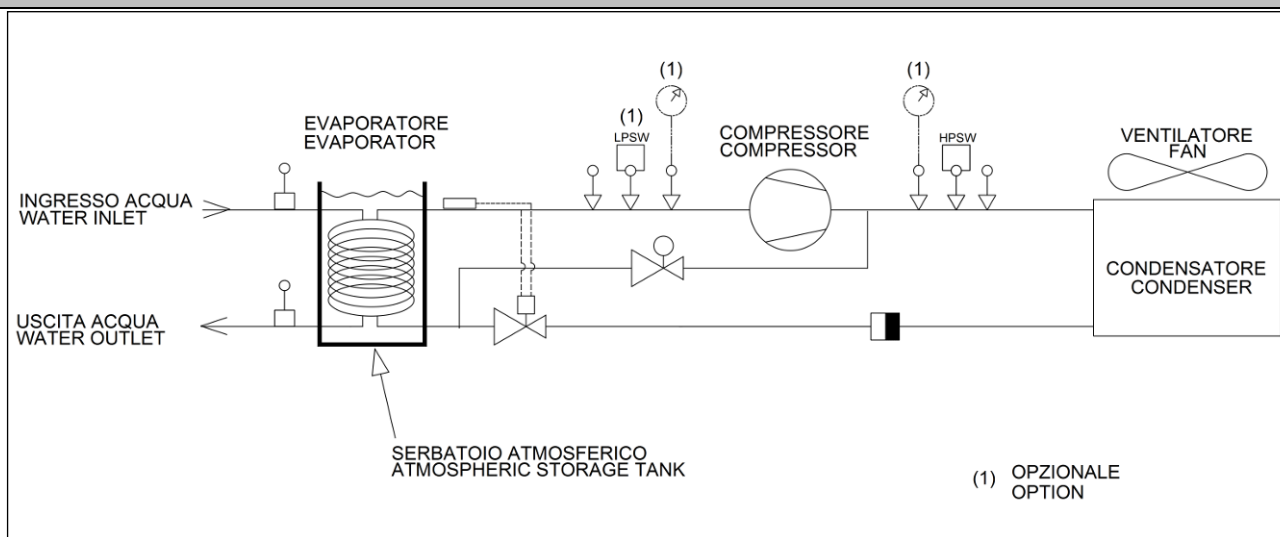


LEGEND

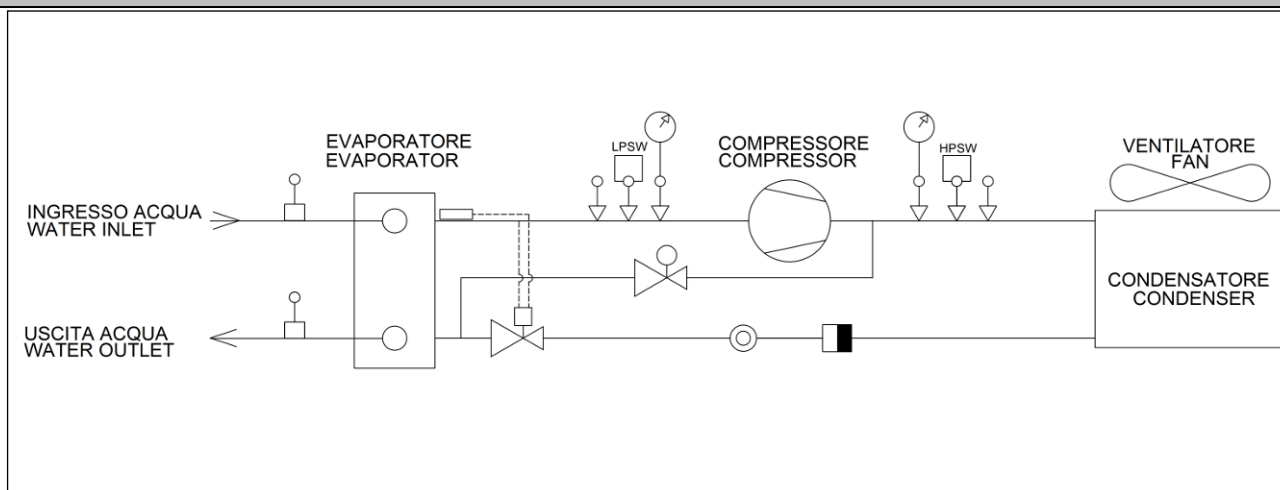
	GAUGE		TEMPERATURE PROBE	①	WATER INLET
	CHECK VALVE		DIFFERENTIAL PRESSURE SWITCH	②	WATER OUTLET
	SAFETY VALVE		PUMP	③	REFRIGERANT OUTLET
	EXPANSION VESSEL		RELIEF VALVE	④	REFRIGERANT INLET
	DRAIN TAP		LEVEL SENSOR	⑤	EVAPORATOR
	SHUT OFF VALVE		THERMOMETER	⑥	DRAIN
	FILTER		PLANT DISCHARGE	⑦	STORAGE TANK
	MUFFLER		REGULABLE WATER BYPASS		

REFRIGERANT DIAGRAMS

QBE 003÷007



QBE VBM/VBE 008÷025

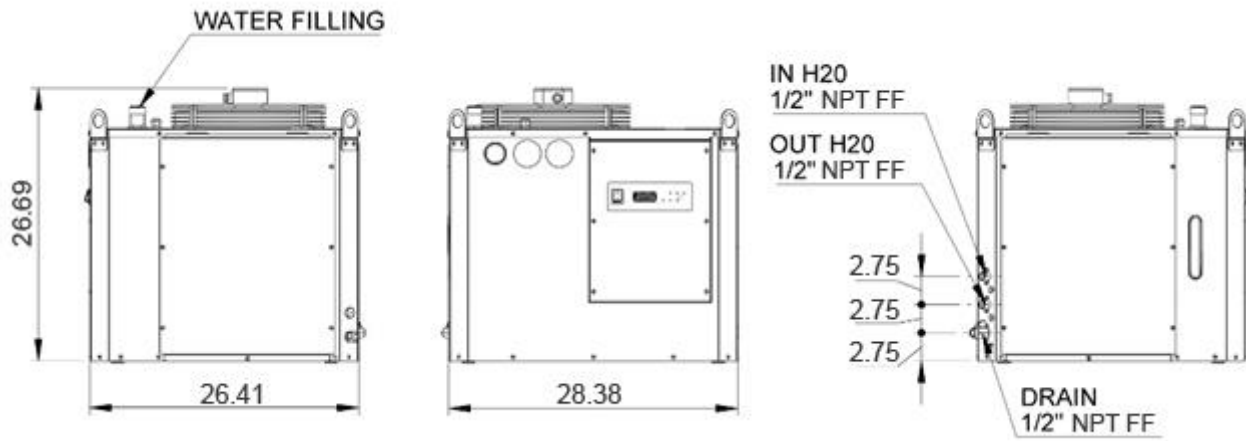


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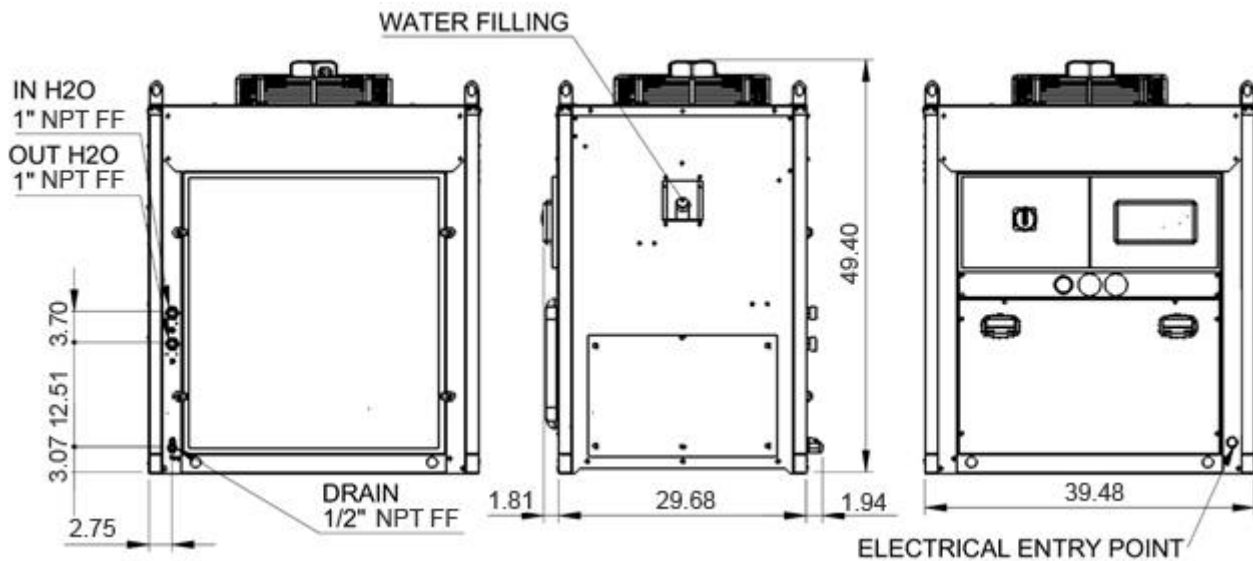
LPSW	PRESSOSTATO DI BASSA PRESSIONE LOW PRESSURE SWITCH	MANOMETRO GAUGE
HPSW	PRESSOSTATO DI ALTA PRESSIONE HIGH PRESSURE SWITCH	VALVOLA DI ESPANSIONE TERMOSTATICA THERMOSTATIC EXPANSION VALVE
	PRESA DI PRESSIONE OUTLET PRESSURE	SPIA DI FLUSSO SIGHT GLASS
	FILTRO DEIDRATATORE FILTER DRYER	VALVOLA BYPASS GAS CALDO HOT GAS BYPASS VALVE
	POZZETTO PER SONDA TEMPERATURA TEMPERATURE PROBE WELL	PT TRASDUTTORE DI PRESSIONE PRESSURE TRANSDUCER

DIMENSIONAL DRAWINGS [INCH]

QBE 003÷007



QBE 008÷025





CAG PURIFICATION INC. Unit 2, 3770B Laird Road, Mississauga ON. L5L 0A7
Toll 1-800-951-0777 Fax 905-820-3490 www.cagcooling.com email: chillers@cagcooling.com
