



WATER CHILLER

Model: QBE-Twin Circuit Laser Chiller

User and Maintenance Manual

Editions Record

Code	Revision	Edition	Note
7425MUMBD1	09	10/2023	

Original instructions: **ITALIAN**

EN Translation of the original instructions

Dear valued Customer,

thank you for placing your trust in our Company. Please read this manual carefully before using to improve product performance.

In order to avoid inadequate working conditions and any danger for the operators, it is essential to follow the guidelines meticulously as well as the current safety and accident prevention regulations of the Country where the product is used.

Each **QBE LSR** chiller is rigorously tested before being approved for shipping.

Testing procedures check for any manufacturing defect and for a correct performance of all functions for which the product has been designed.

This manual must be retained for future reference and is an integral part of the article purchased.

Due to continuous technical development, we reserve the right to make the necessary modifications without any obligation to give advance notice.

The nameplate stucked on the equipment contains all the essential information about the product itself.

If you experience any issues or need more information, do not hesitate to contact us.

Warranty conditions:

The warranty is valid for 12 months from the machine being started-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 supplied free of charge. This does not include transport costs, travel, room, labour 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;
- Recyclable chiller and its packing materials.

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 **QBE TTM LSR** chillers contain R407C refrigerant (QBE TTM LSR 012-023), R410A (QBE TTM LSR 033-050). 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

QBE LSR units are packaged air cooled water chillers.

They are intended for use in industrial process 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 following chapters.

1.4 INSTRUCTIONS FOR USING THE 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 subject 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 REFRIGERATING CIRCUIT

QBE LSR chillers use a vapour-compression cycle in a refrigeration circuit that essentially consists of the following components: evaporator, compressor, condenser, lamination device (thermostatic expansion valve or capillary tube).

Evaporator: brazed-plates heat exchanger which 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.

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 HYDRAULIC CIRCUIT

The water circuit consists of laser circuit pump, evaporator optics circuit pump, tank, three-way mixing valve, calibrated bypass between the pump delivery and the return from the system, pump delivery pressure gauge, and a level sensor.

The water flows first into the evaporator, where it is chilled, and then to the tank; afterwards it is aspirated by the pumps, which send it to the system (see Chapter **11 P&ID diagram**). **QBE LSR** has an open water circuit, with an atmospheric pressure tank made of non-ferrous material.

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.

QBE TTM LSR 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 WATER TEMPERATURE CONTROL

The chiller maintains the laser branch (main) supply water, the optics branch (secondary) water and the produced tank water temperatures within a desired range, as the system load varies. The main branch and tank control uses two temperature probes located near the tank inlet and the main pump outlet. This is achieved using an electronic by-pass valve which varies the heat exchange, avoiding continuous compressor shutdowns and restarts and ensures a storage temperature low enough to meet the system's needs and a constant and accurate outlet temperature. The secondary branch control uses a three-way valve that mixes the hot water returning from the system with cooler water from the tank.

2.6 MAINTENANCE TEMPERATURE CONTROL

When the machine is switched off, there is a control to maintain the water temperature in the tank and a recirculation function if the ambient temperature is too low. If the tank temperature falls below a certain value when the system is not used, an electrical heater is activated to maintain the temperature at an acceptable level. If the ambient temperature drops too low when the system is not used, the pumps are activated to circulate warm water through the system and prevent freezing and breakage.

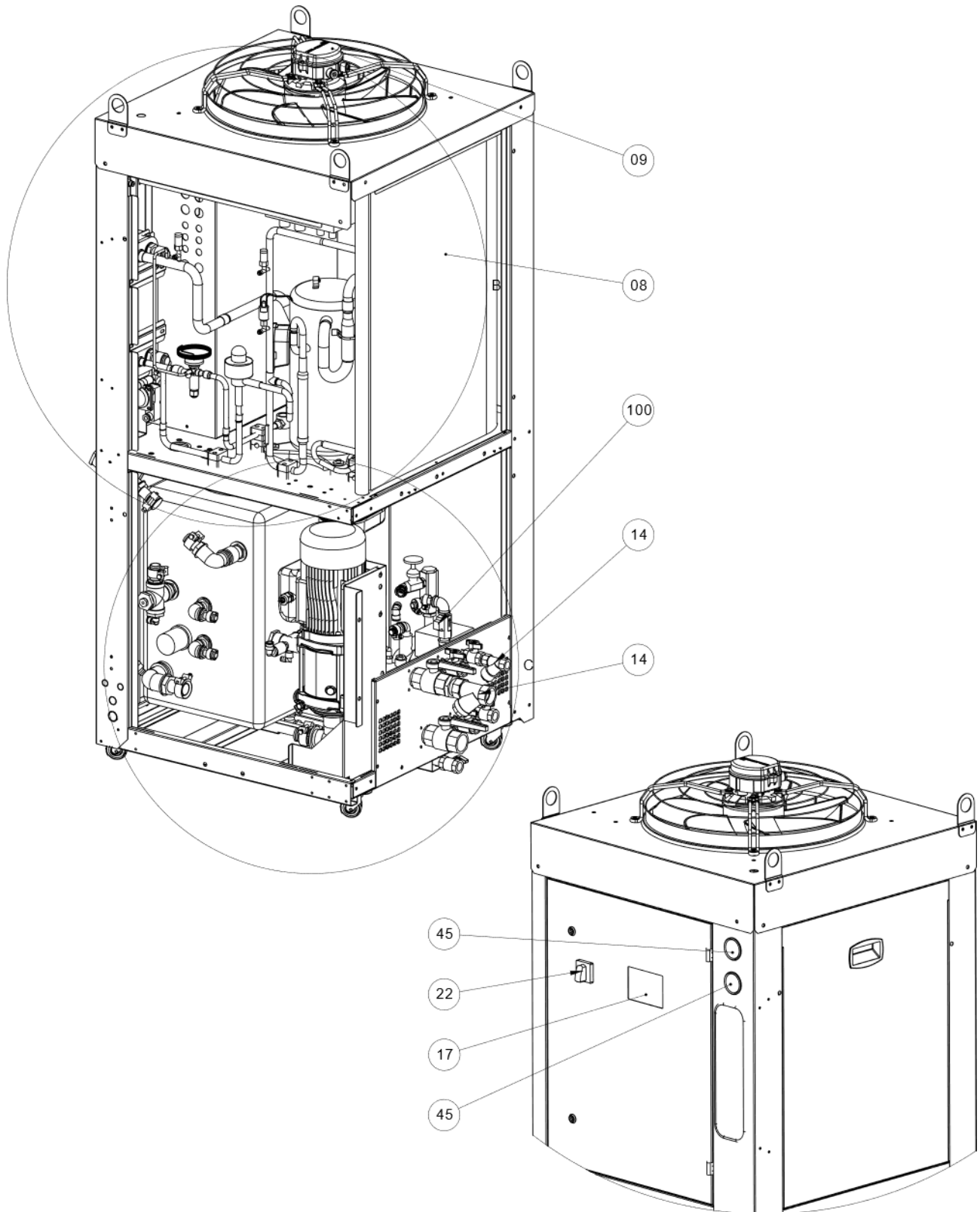
2.7 PROTECTION OF THE INTEGRITY OF THE MACHINE

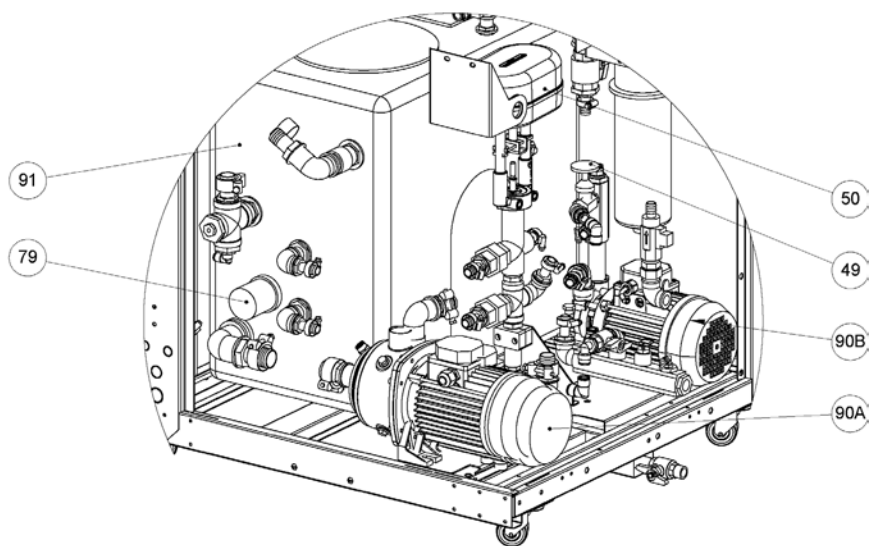
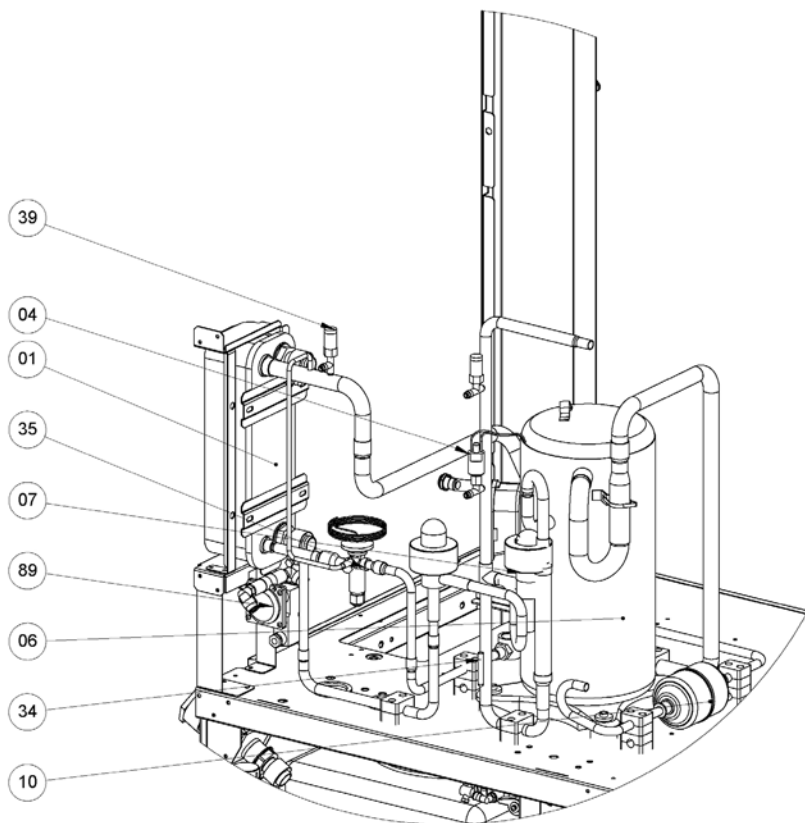
In addition to controlling the temperature, the electronic controller uses pressure switches, thermostats and timers to prevent and handle situations that could compromise the integrity of the machine (also see Chapter **6 Safety Devices**).

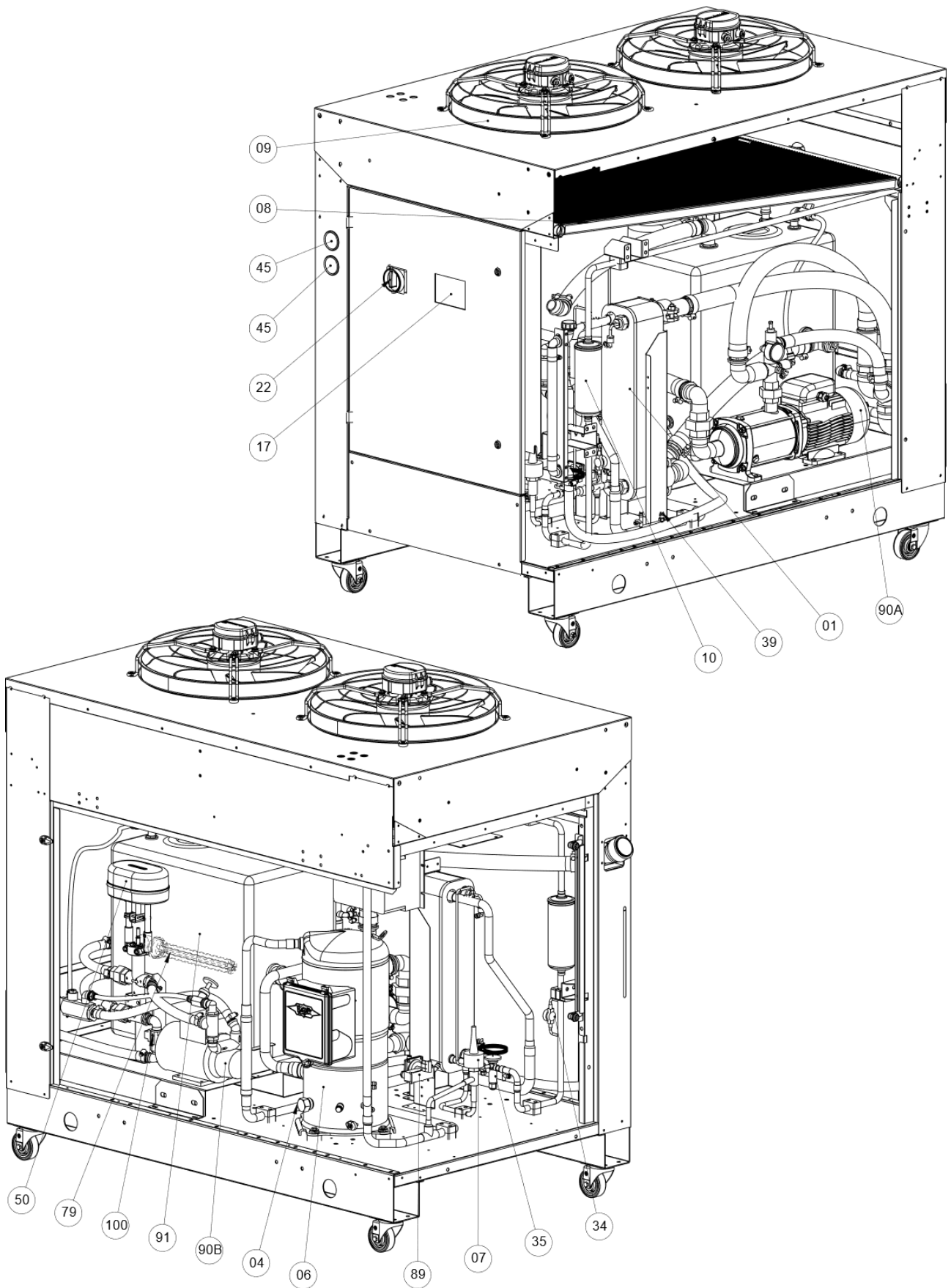
2.8 IDENTIFICATION OF THE MAIN COMPONENTS

See component descriptions (ID n°) in the table in the paragraph **2.9 Spare Parts**.

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2.9 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 No.	Description	Quantity of components for QBE TTM LSR	
		012-033	033-050
01	Evaporator	1	1
04	High-pressure switch	1	1
06	Compressor	1	1
07	Hot gas bypass valve	1	1
08	Condenser	1	1
09	Fan	1	2
10	Refrigerant filter	1	1
14	Water strainer	2	2
17	Electronic controller	1	1
22	ON/OFF switch	1	1
34	Liquid peep hole	1	1
35	Thermostatic valve	1	1
39	Low-pressure transducer	1	1
45	Water manometer	2	2
49	By-pass	1	1
50	Three-way mixing valve	1	1
79	Crankcase heater	2	2
89	Water differential pressure switch	1	1
90 A	Laser source pump	1	1
90 B	Optics pump	1	1
91	Tank	1	1
100	Flow switch	1	1

INSTALLATION

3.1 TRANSPORT

The units are 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.



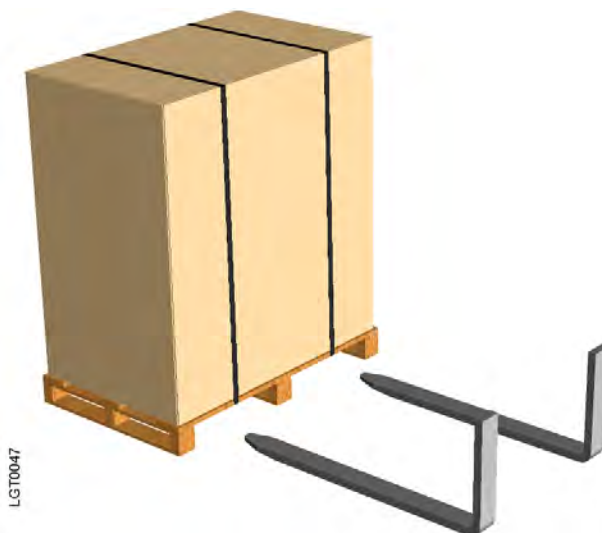
Always keep the chiller vertical: turning it upside down can irreparably damage several parts of the unit.



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 INSTALLATION



QBE LSR units can be installed both outside and inside.



Warning! Check that the support surface is suitable to support the weight of the unit and that it is perfectly horizontally levelled.

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;
- 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 **7 Operating limits**).



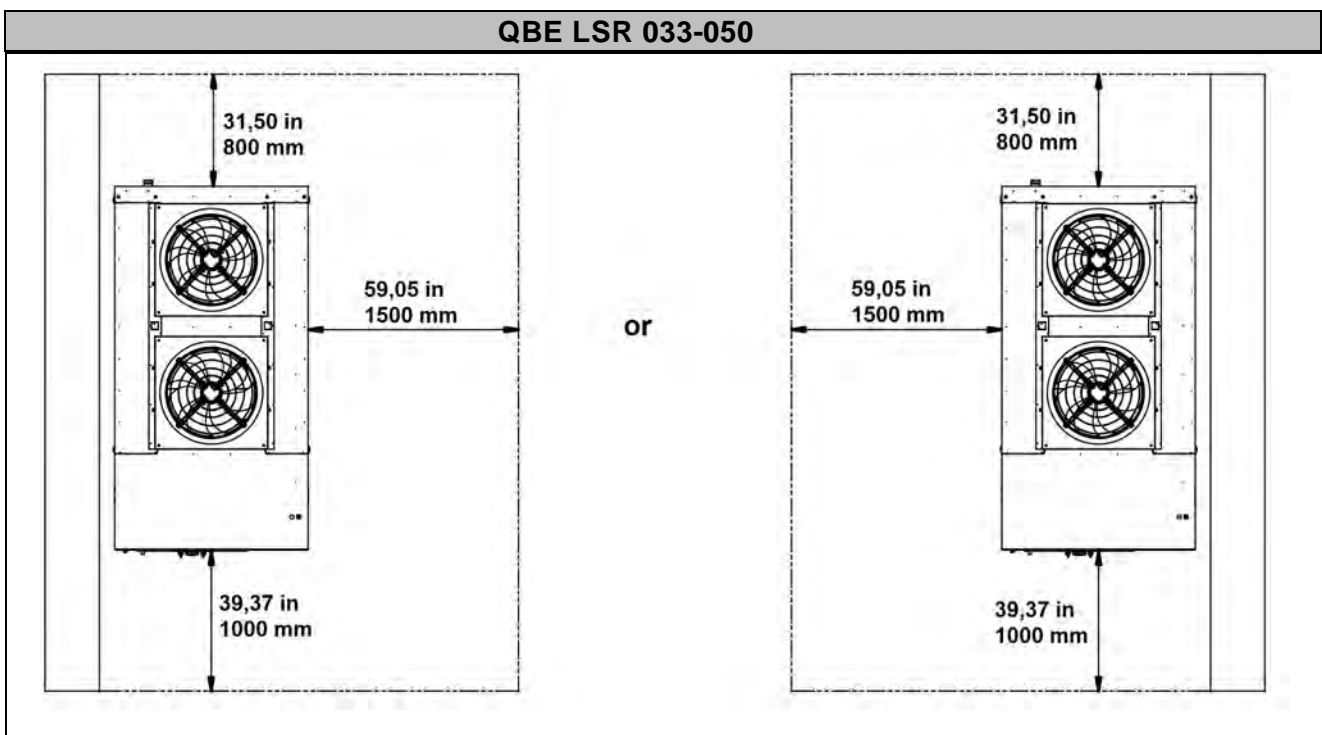
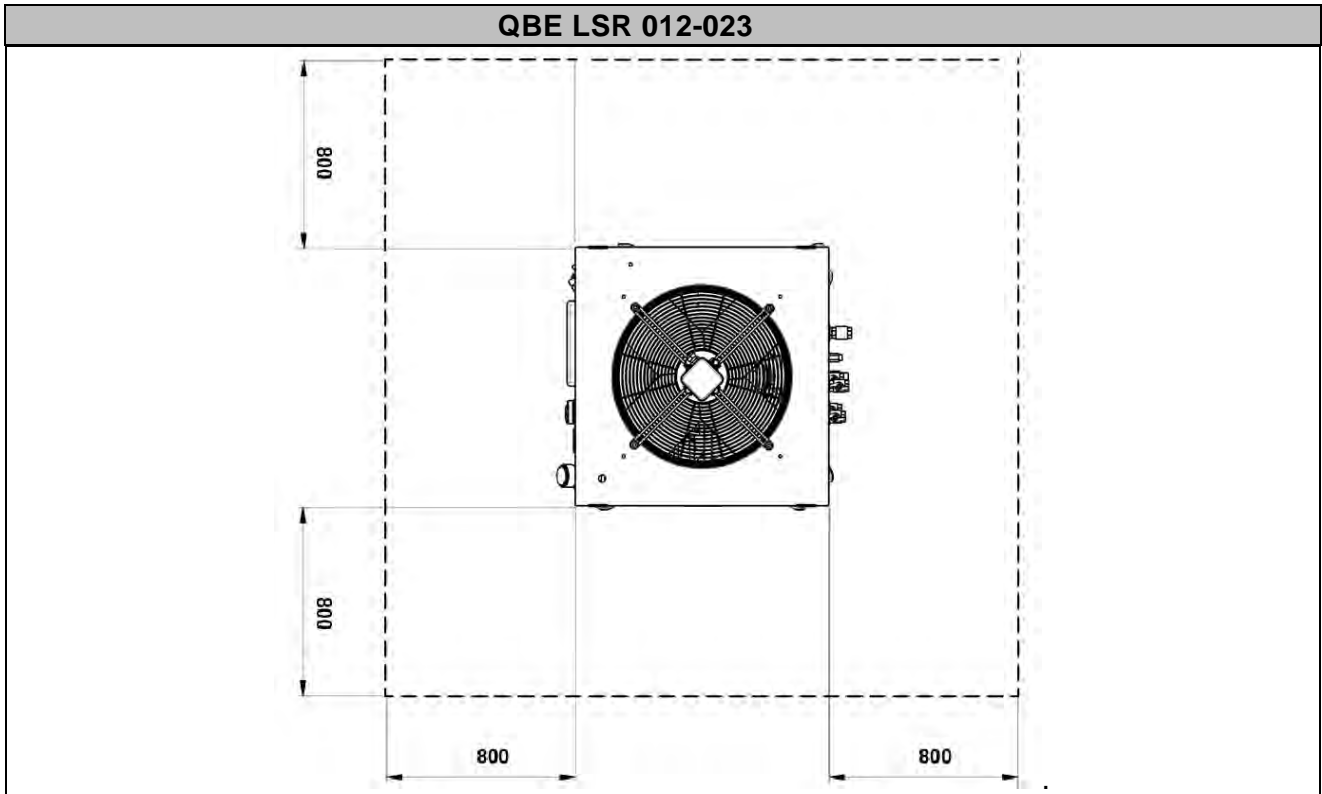
Attention! If the machine is installed outside, it could find itself at a temperature lower than 0°C//32°F, when stopped; the formation of ice could damage the evaporator. If you do not intend to drain the machine during the winter, you must add **anti-freeze to the water circuit** (see paragraph **3.4.3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

3.3.1 Installation clearances

To ensure the good functioning of the unit and access for maintenance, you must respect the minimum installation clearances 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

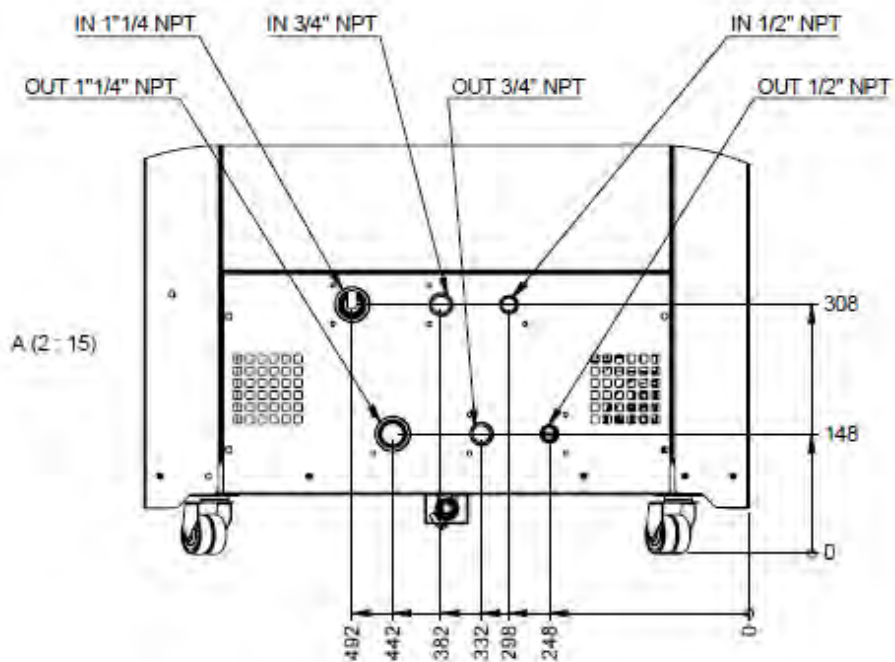
Connect the machine to the water pipes following the instructions located near its water fittings.

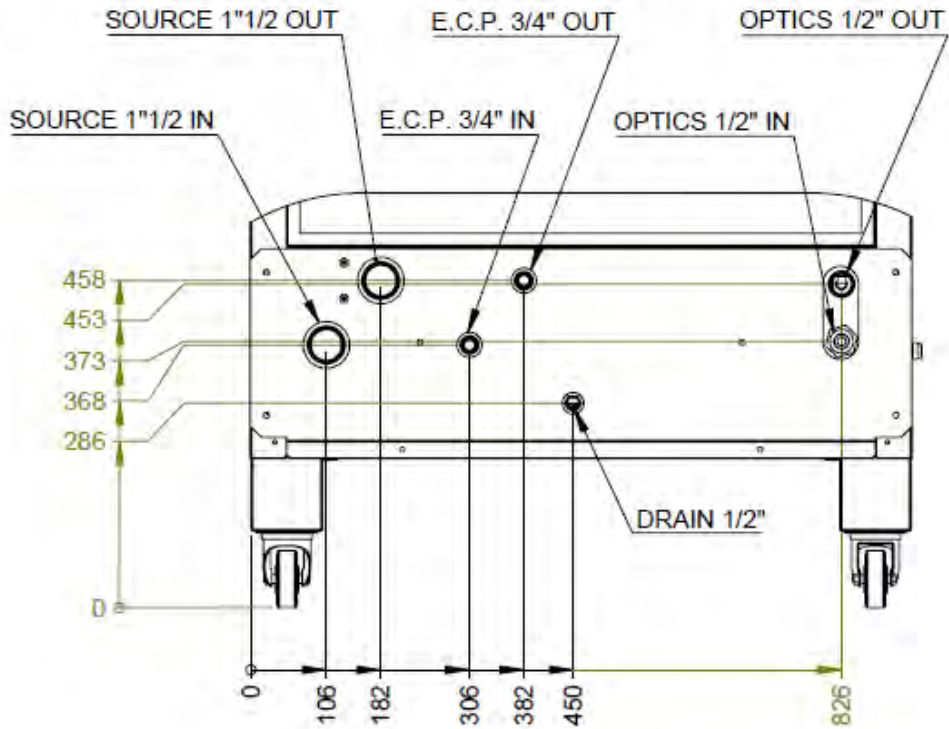
The installation of outlet and inlet taps on the machine is recommended, which will enable machine maintenance without emptying the entire system, and emptying of the machine only during winter downtime.



We recommend an extraordinary cleaning of the mechanical water strainer after the machine has been running for the first week (also see Chapter 8 **Maintenance, inspections and periodic checks**).

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

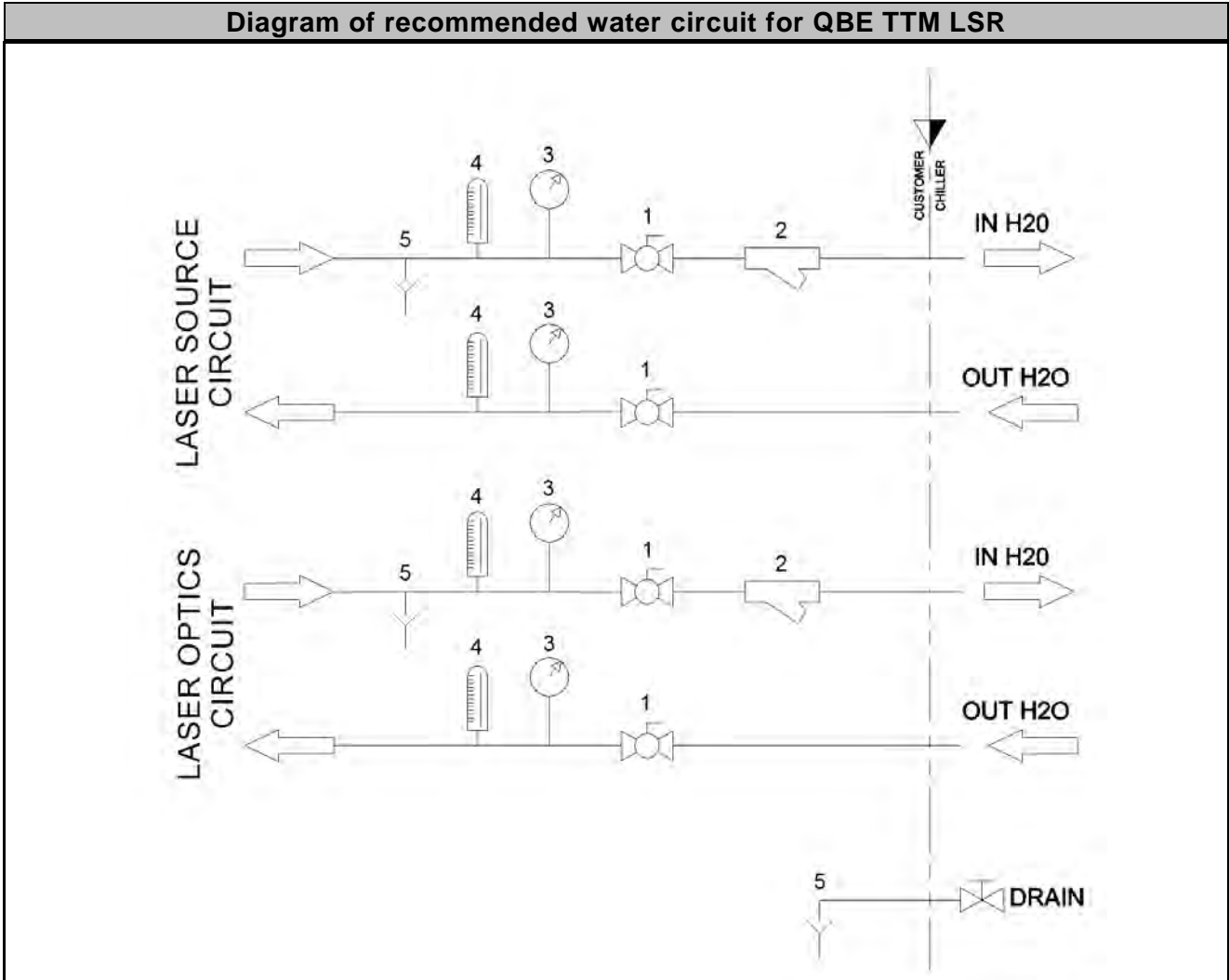
NOTE

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

3.4.1 Recommended water system

QBE SR units come as standard with a tank at atmospheric pressure, pump and bypass; it is advisable to also provide the water circuits of both sides (optics and source) with:

- Inlet and outlet pressure gauges and thermometers for water from the machine, to control its operation.



Key	
1	Taps (supplied with the unit)
2	Water strainer (supplied with the unit)
3	Gauge
4	Thermometers
5	Drain



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

3.4.2 Water quality

For unit safe and durable operation, the quality of the process water in the system must comply with the parameters in the table below. If this is not the case, it is recommended to use suitable chemicals or additives such as corrosion inhibitors, hardness stabilisers and anti-algae¹.

Total hardness	6.0...15 dH°	Cl ⁻	<5 mg/l - ppm
PH	7.5...9.0	Cl ₂	0.5 mg/l - ppm
Conductivity	10...500 µS/cm	H ₂ S	<0.05 mg/l - ppm
Residual solid particles	<30 mg/l - ppm	NO ₂ ⁻	<5 mg/l - ppm
Saturation Index SI	-0.2 < 0 < 0.2	NO ₃ ⁻	<100 mg/l - ppm
HCO ₃	<300 mg/l - ppm	Fe	<0.2 mg/l - ppm
SO ₄ ²⁻	<100 mg/l - ppm	Al	<0.2 mg/l - ppm
Aggressive free carbonic acid	<20 mg/l - ppm	Mn	<0.1 mg/l - ppm
Free chlorine	<0.5 mg/l - ppm	NH ₄ ⁺	<2 mg/l - ppm
PO ₄ ³⁻	<2 mg/l - ppm	Oxygen content	<0.1 mg/l - ppm
HCO ₃ / SO ₄	>1.0 mg/l - ppm	S ²⁻	<1 mg/l - ppm
NH ₃	<0.5 mg/l - ppm		



The use of demineralised water is allowed only with the addition of anticorrosive liquids.



Any damage caused by failure to comply with the water requirements is excluded from the warranty.

¹ Please get in touch with the company for product recommendations..

3.4.3 Use of glycol as anti-freeze

3.4.3.1 In environments where the outside air temperature is close to zero, if the system is not drained during the winter shutdown, the water system must be loaded with a mixture of water and glycol, using the percentages shown in the table below:

Percentages of glycol required as a function of the expected temperature of the outside air.	
Outside air temperature [°C]	0
Outside air temperature [°F]	32
Percentage of ethylene glycol by volume [%]	10
Percentage of propylene glycol by volume [%]	10

3.4.3.2 Based on the desired outlet water temperature, the water system must be loaded with a mixture of water and glycol, based on the percentages shown in the table below:

Recommended glycol percentages based on the desired water temperature			
Desired water temperature [°C]	0	+3	+5
Desired water temperature [°F]	32	37.4	41
Percentage of ethylene glycol by volume [%]	20	15	15
Percentage of propylene glycol by volume [%]	25	15	15

Attention! Maximum concentration of 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



Important! We do not recommend using automotive glycols, as they may contain incompatible substances or be aggressive for the mechanical seals of the hydraulic pumps.



Any damage caused by failure to comply with the water/glycol percentage is excluded from the warranty.

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 conductors with a suitable cross-section according to the type of cable and the installation conditions based on the wiring diagram (refer to the cable data sheet and current regulations)



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.

NOTE For how to switch the machine on and off, see the paragraphs **4.1**.

A remote alert warning indicator can be installed using the terminal clamps in the switchboard cabinet.



Consult the electrical diagram.

PRELIMINARY CHECKS AND 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;
- Check that the surrounding temperature is in the range for the machine to function (see section **7 Operating Limits**);
- Check that the cut-off switch on the electrical panel of the machine is open (0 position);
- 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;
- Ensure that sufficient thermal load is supplied to the system to allow the chiller to start for the first time. Monitor its correct operation during the first few moments;
- Close the cut-off switch on the machine's electrical panel (1 position). This puts the machine under voltage without starting it.



Attention! Apply voltage to the machine at least two hours before start-up to give the heating elements in the compressor housing time to heat the oil inside.

Our company reserves the right to void the warranty if there is a premature compressor failure, if it is ascertained that this operation is not regularly performed by the system user.

The heating elements limit the quantity of refrigerant dissolved in the oil and prevent the oil from migrating when the compressors start. Before start-up, check that the temperature of the lower part of the compressors is at least 10-15 °C higher than the surrounding temperature.

4.1 PUMP START-UP PROCEDURE

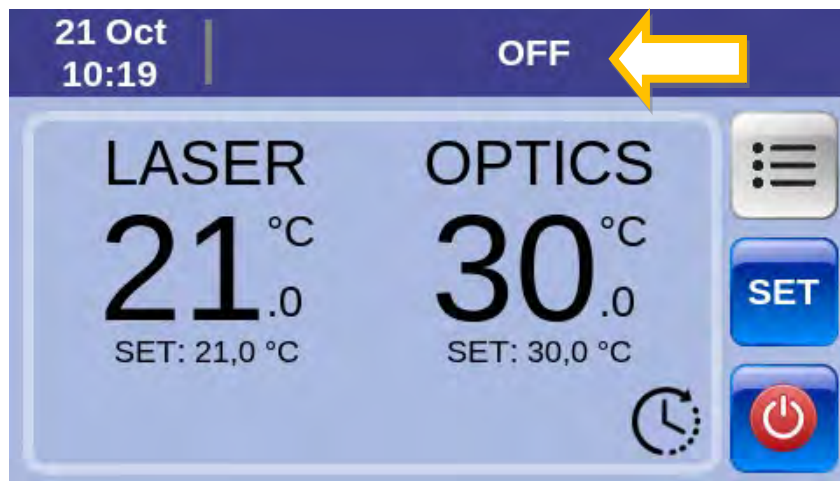
The pump-priming procedure must be performed:

- At the machine during the first field start-up.
- If there is a water circuit leakage;
- When it is necessary to drain the water circuit for maintenance or prolonged system shutdown, conditions that could cause air bubbles in the circuit.

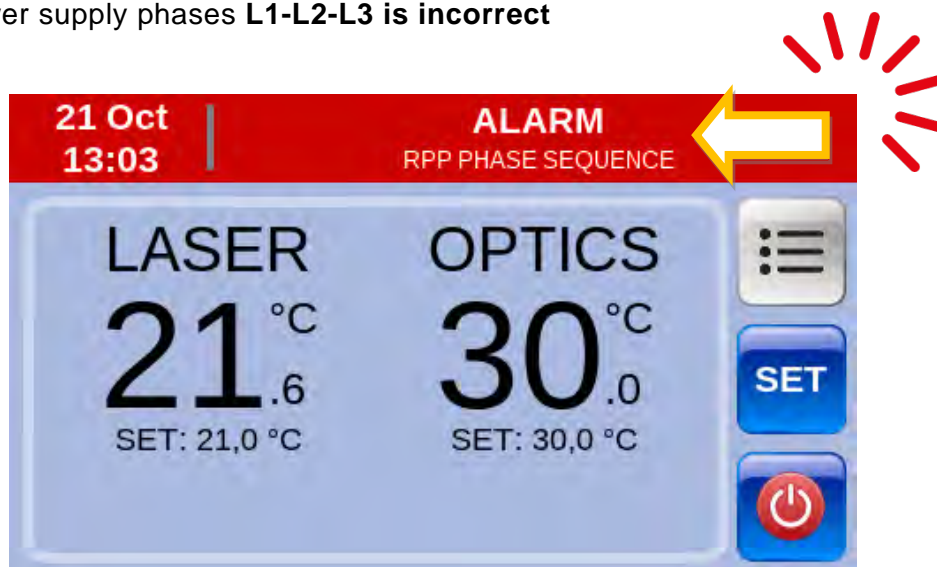
4.1.1 Checking power supply phase sequence

At the first start-up, check the correct sequence of the power supply phases:

- Close the main power supply switch to the chiller.



- Wait about 10 seconds, if the display shows the RPP alarm it means that the sequence of the power supply phases **L1-L2-L3 is incorrect**



In this case, turn off the main power switch upstream from the machine and reverse the two phases immediately downstream from the main switch.



Warning! Never reverse the wires downstream from the cut-off switch on the electrical panel as this may change the correct sequence of other devices, such as, the pump and fan.

Resume operations from the beginning.

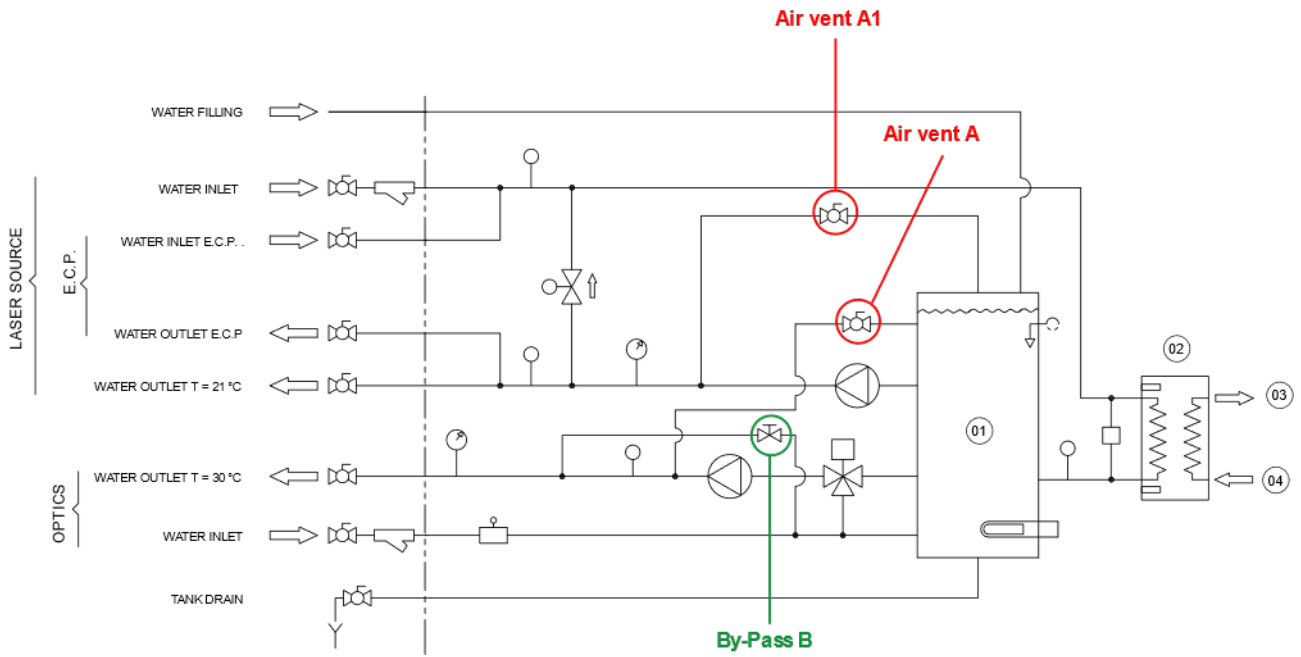


Note:

The phase sequence relay inside the electrical panel must have both LEDs on to confirm the correct phase sequence.

- If the LED is not lit, check the phases
- If the LED is orange, the phase sequence is correct

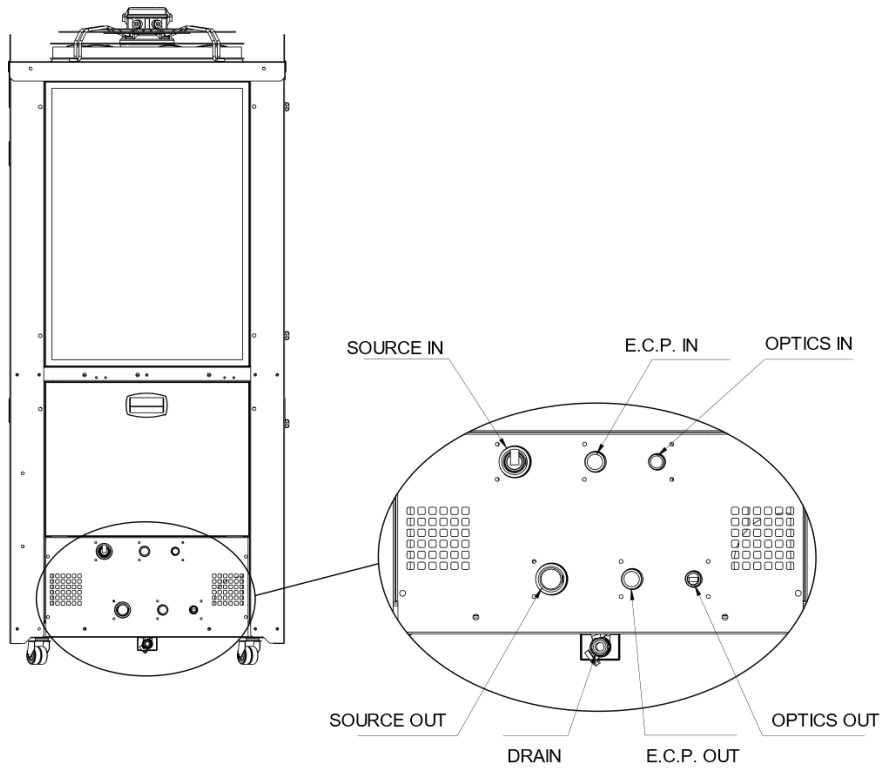
4.1.2 Identification of main components



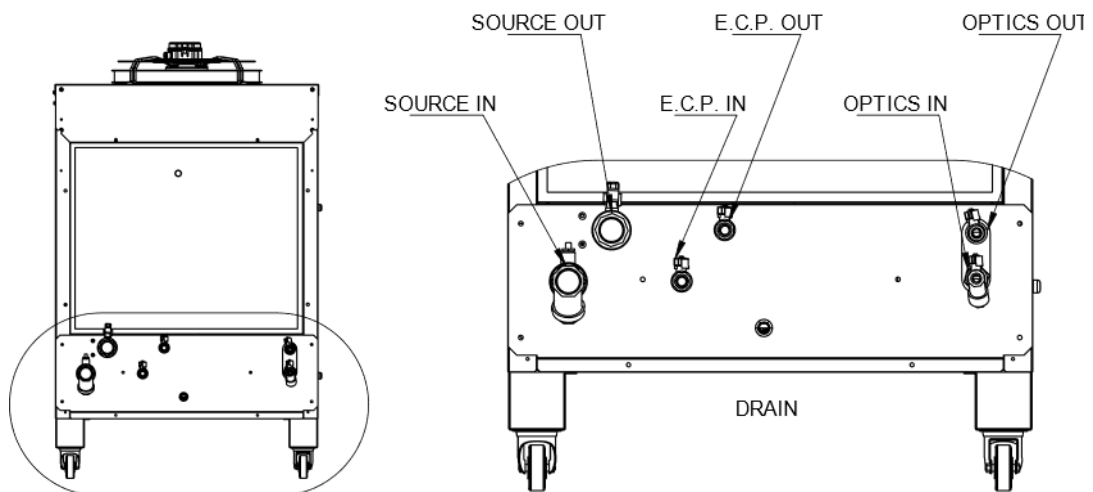
4.1.3 Step-by-step procedure

01. Open the system supply and return valves on the laser source side (SOURCE), optics side (OPTICS) and electrical panel if connected (ECP).

QBE LSR 012 ÷ 023

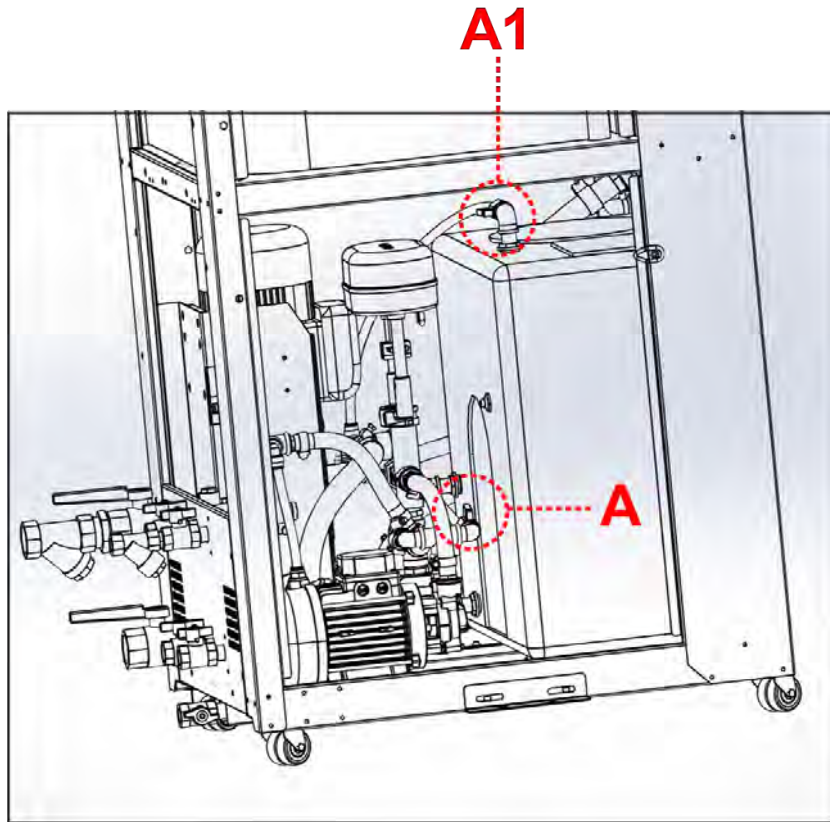


QBE LSR 033 ÷ 050

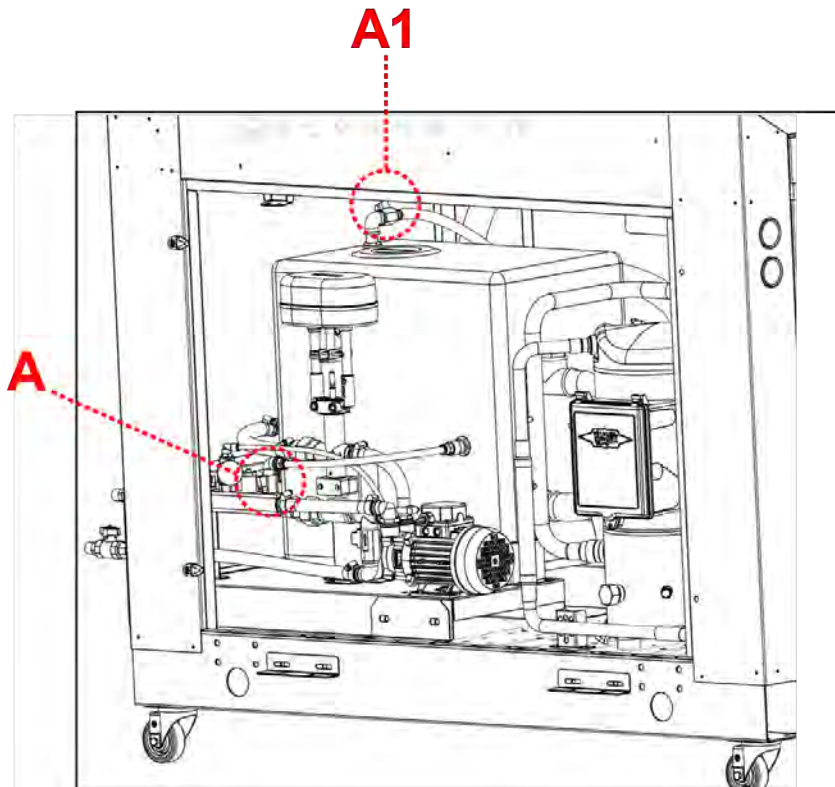


02. Open air vent valve A (optics cooling water circuit pump) and air vent valve A1 (laser source cooling water circuit pump).

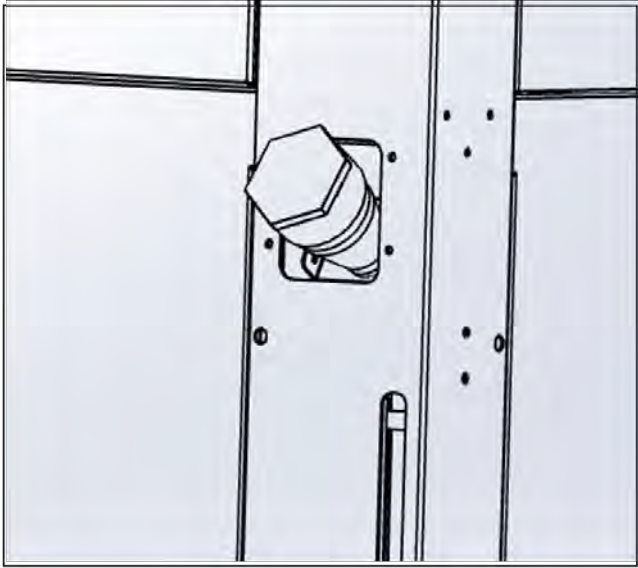
QBE LSR 012 ÷ 023



QBE LSR 033 ÷ 050



03. Unscrew the brass cap and fill the tank with fluid.



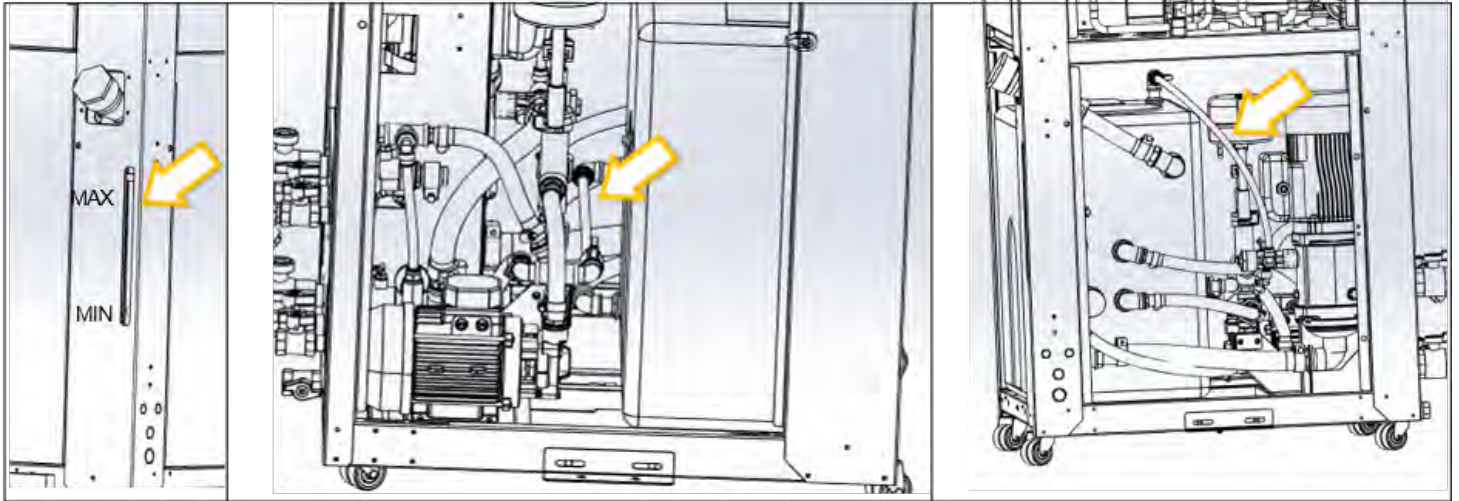
- 04.** Once the tank has been filled (MAX), check the presence of liquid in the transparent tubes, close vent valves A and leave valve A (optics) open (images point 02).

QBE TTM LSR 012 ÷ 023

Tank level

Transparent tube
on optics circuit pump side

Transparent tube
on laser source circuit pump side

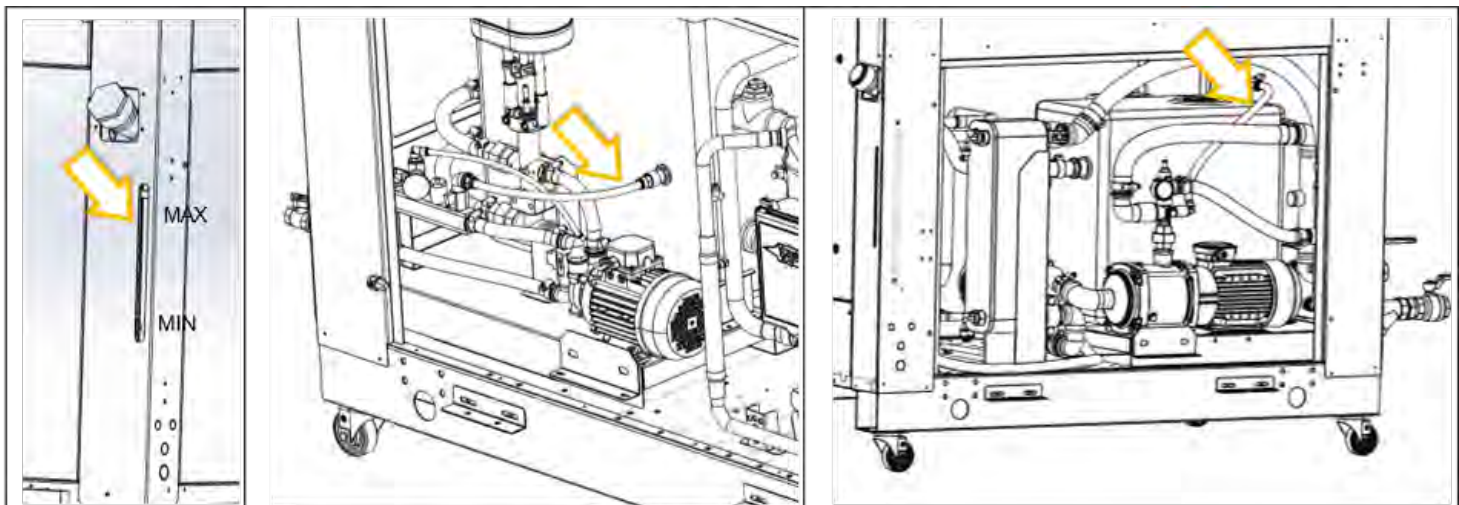


QBE TTM LSR 033 - 050

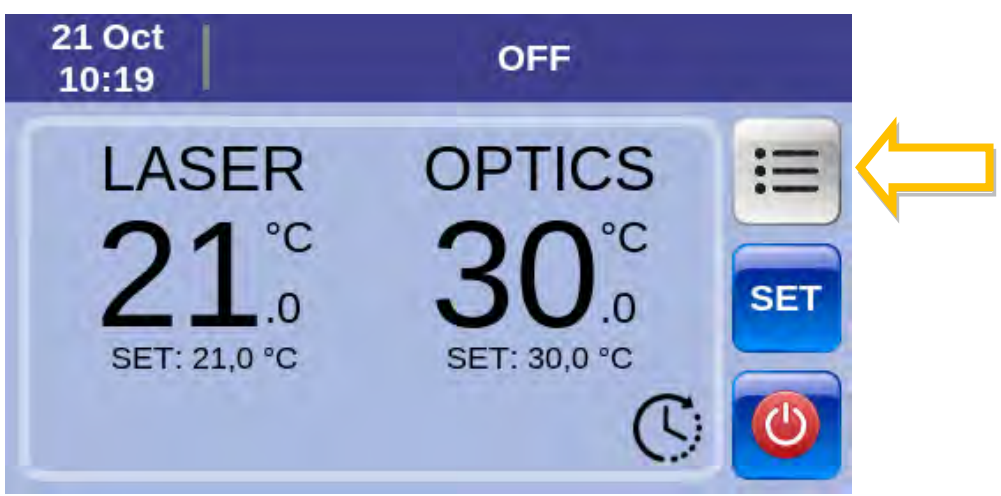
Tank level


Transparent tube
on optics circuit pump side

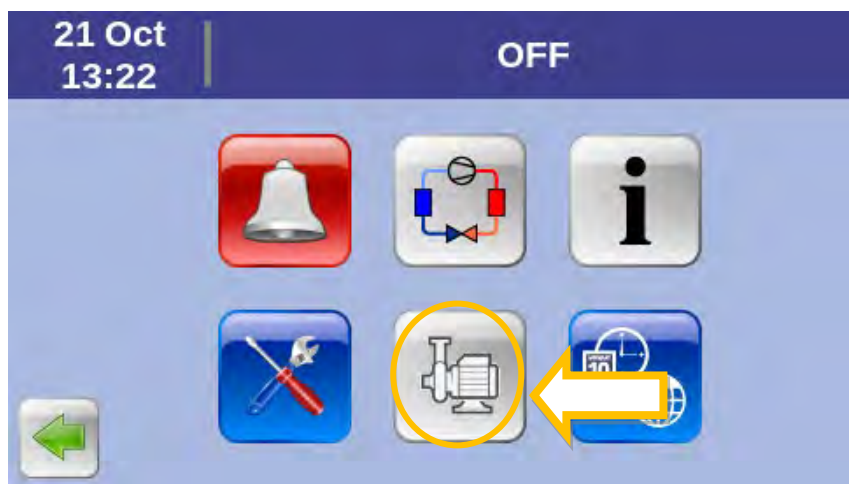
Transparent tube
on laser source circuit pump side



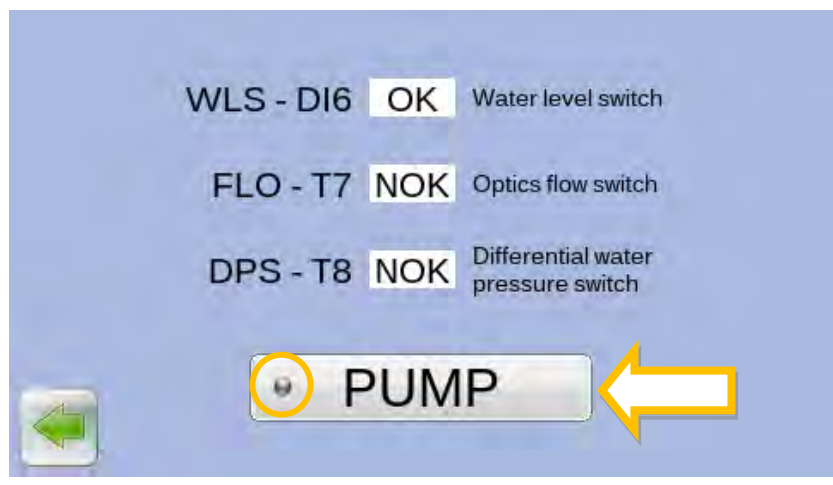
05. Press the menu button indicated by the yellow arrow 



06. From the menu page press the PUMP button .



07. Press the **PUMP** button. Both pumps will start simultaneously and the LED on the left side will turn red.





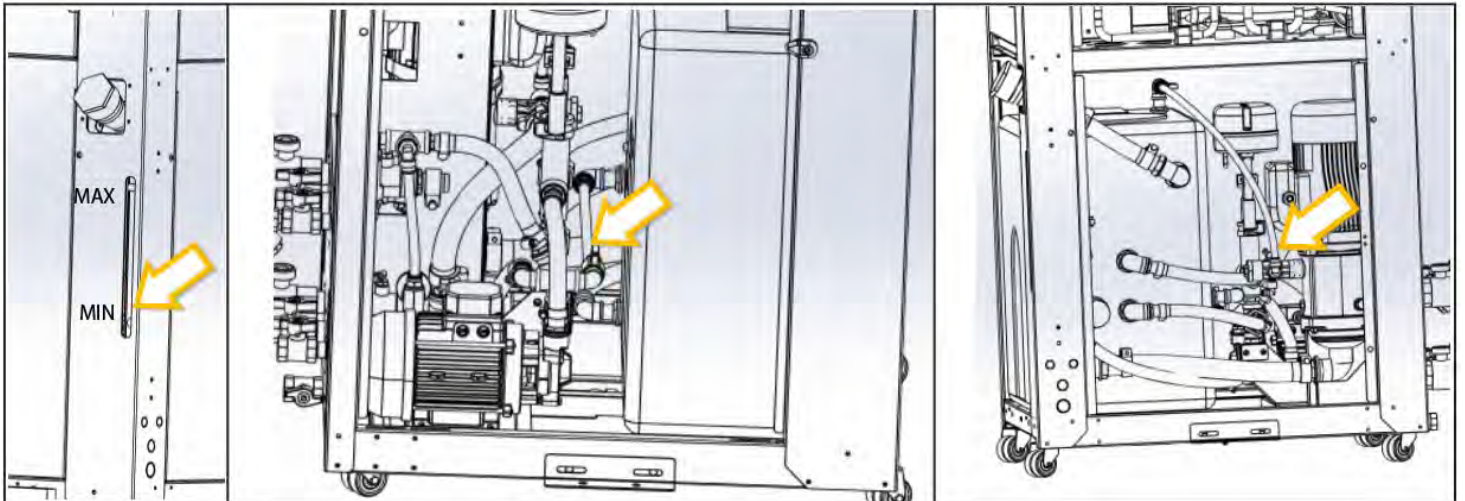
Check the water level in the tank and in the transparent tubes.

QBE TTM LSR 012 / 023

Tank level

Transparent tube
on optics circuit pump side

Transparent tube
on laser source circuit pump side

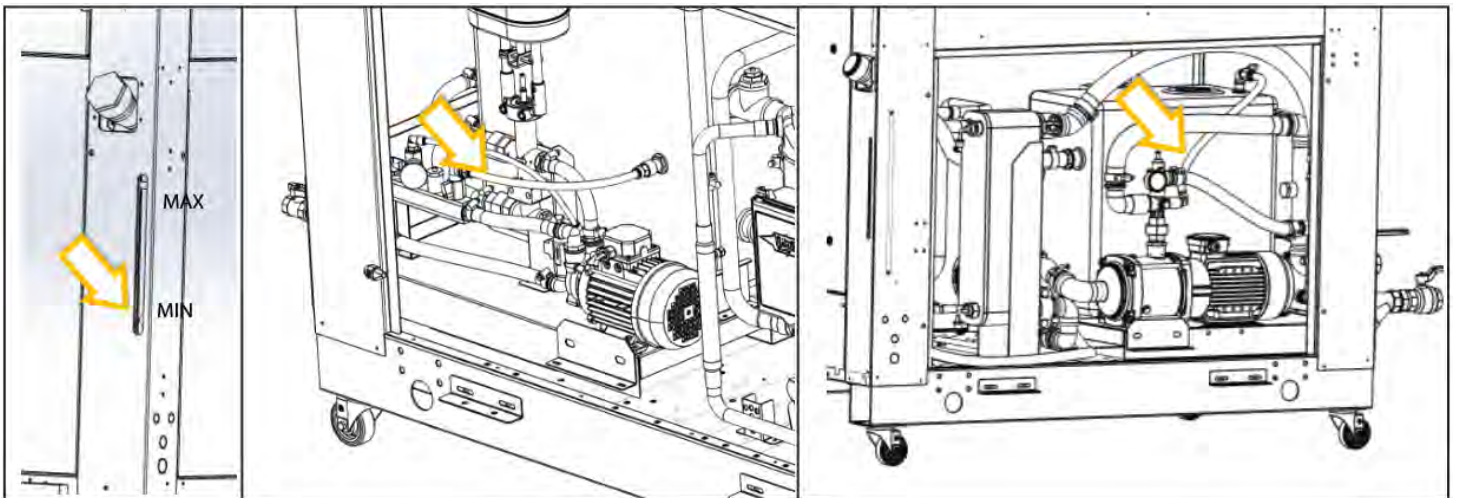


QBE TTM LSR 033 QBE TTM LSR 033

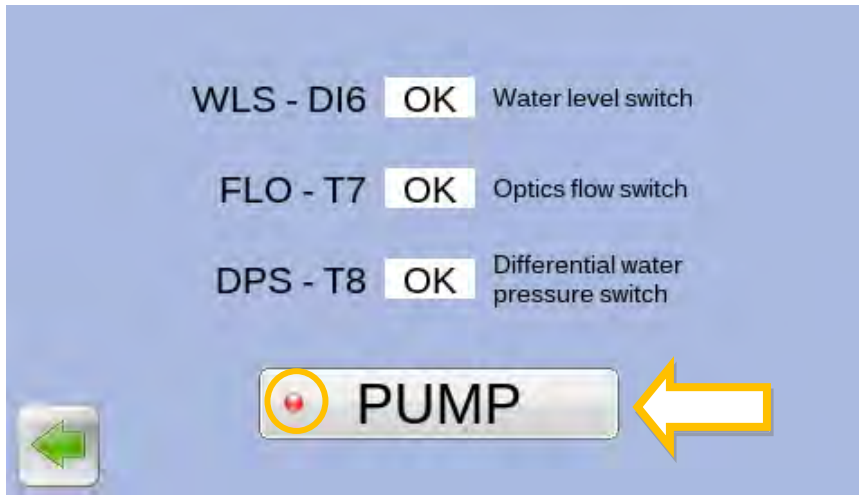
Tank level

Transparent tube
on optics circuit pump side

Transparent tube
on laser source circuit pump side



If the water level has dropped or there are air bubbles, the pumps must be stopped: press the **PUMP** button. Both pumps will stop immediately and the LED on the left side will turn grey.



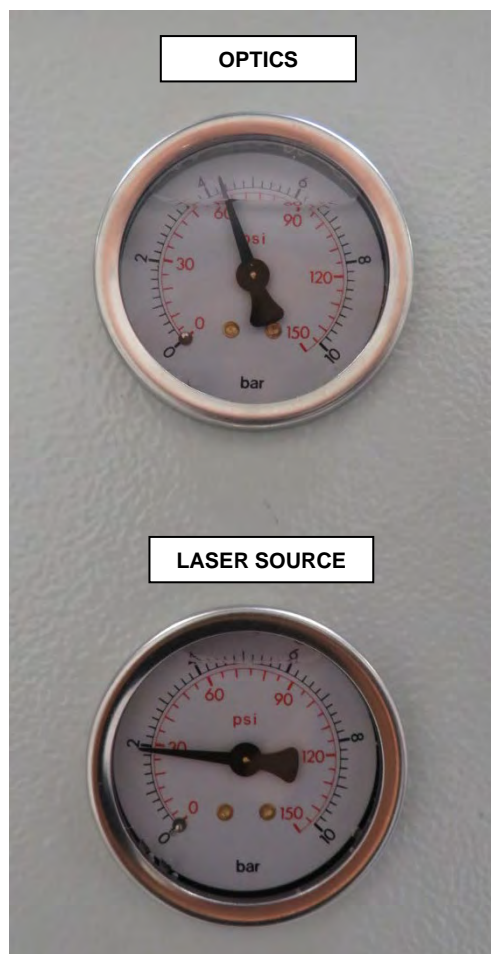
Repeat the procedure from step 01.

08. Checking the pressure gauges

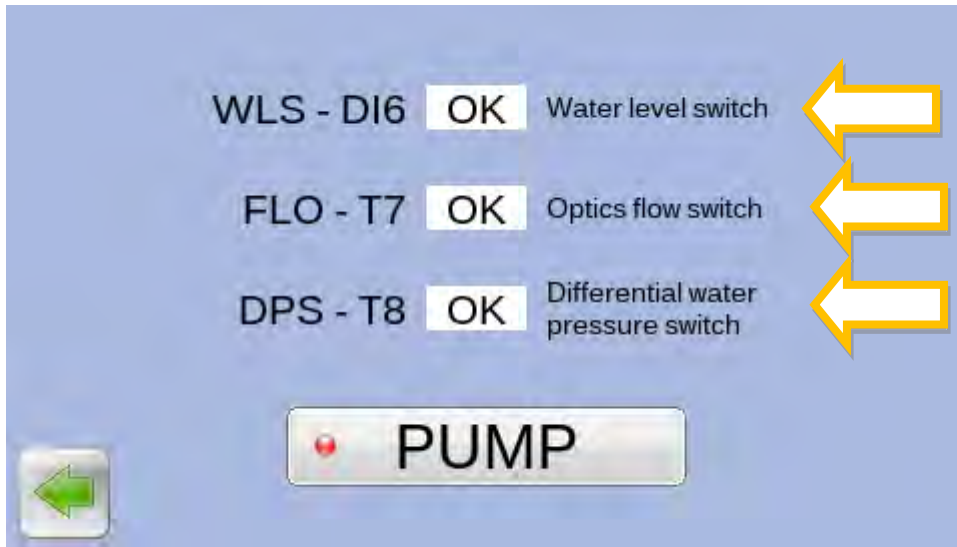
"**OPTICS**" pressure gauge: When the pressure is > 0.2 Bar and the air bubbles are no longer visible through the transparent rilsan, close the priming valve A on the optics side.


"**LASER SOURCE**" pressure gauge: check that the pressure is higher than 0.5 Bar.

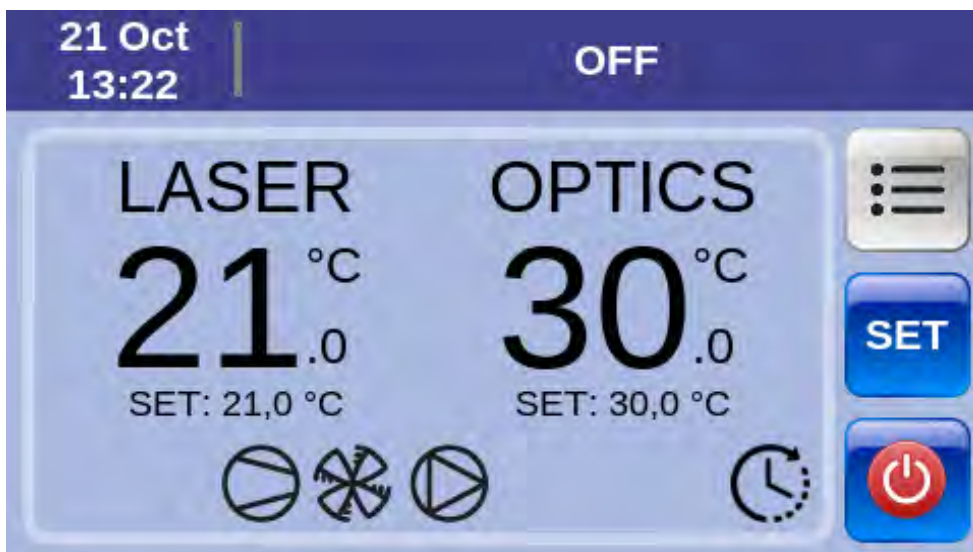
If the pressure is lower, repeat the procedure from step 01 and check if air is present.



09. At the end of the procedure all three status indicators should be on OK.

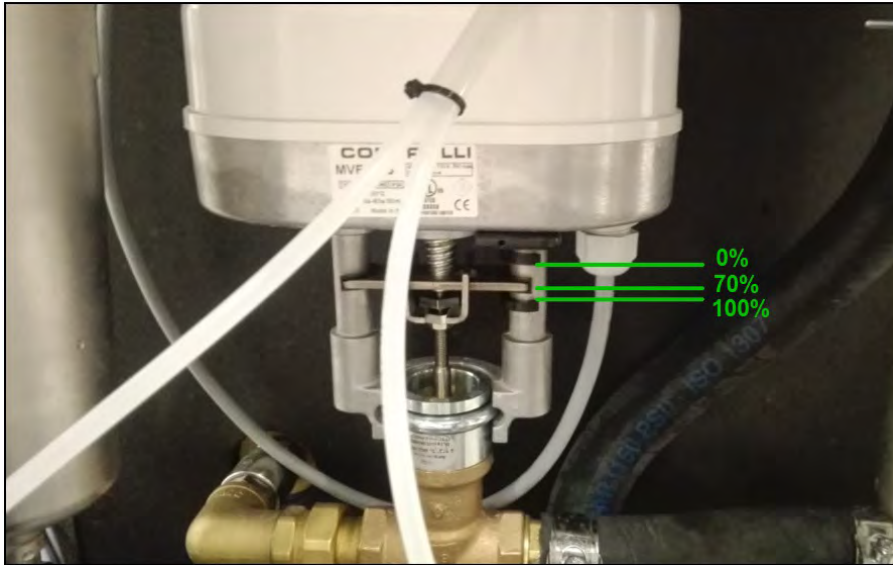


10. Press the PUMP button to stop the pumps, then press the green arrow button  to return to the main screen



11. THREE-WAY VALVE

Check that the three-way valve stem's displacement is according to the percentage on display during normal operation.



12. Press and hold the ON button to start the Chiller.

4.2 START-UP UNDER CRITICAL CONDITIONS

If the water and air temperatures are high and exceed the operating limits, it is possible that the chiller will work during excessively difficult situations.

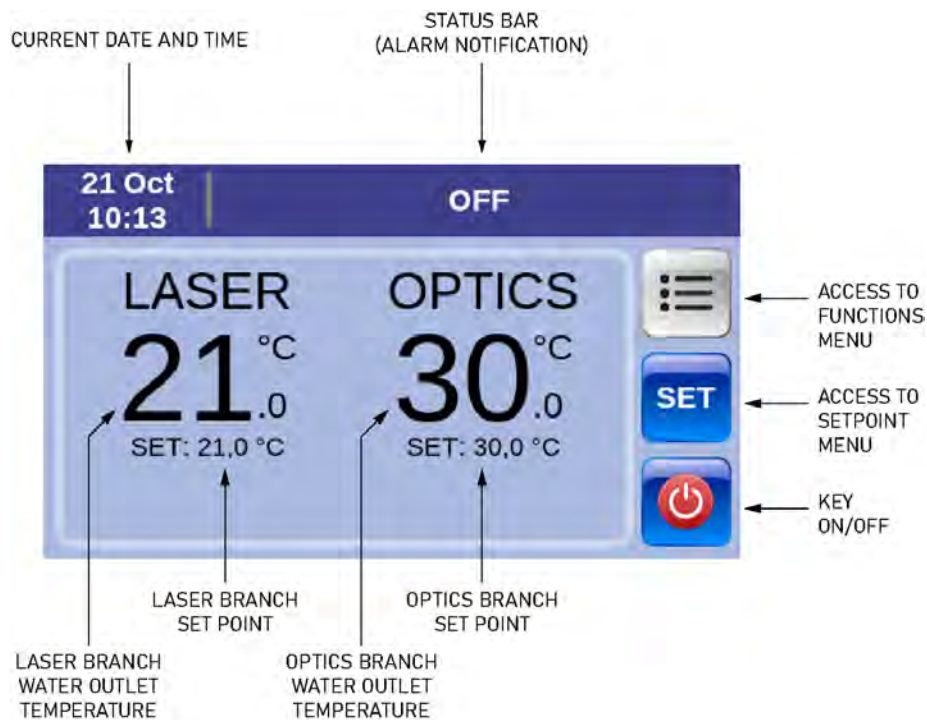
To overcome this problem, you will have to reduce the thermal load on the machine by shutting off some of the uses or, if this is not possible, by reducing the flow of water into the evaporator: partially close the output tap from the chiller and restart the machine.

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 **TCC10** electronic control unit is a device which controls the chiller's functional processes, provides a dialogue interface for the operator, and consists of a power module within the control panel and a touch screen display positioned on the door of the electrical panel.

Once the unit is powered on, wait for the display to initialise. This will display the main screen after approximately 45 seconds showing:



Electronic controller


It manages:

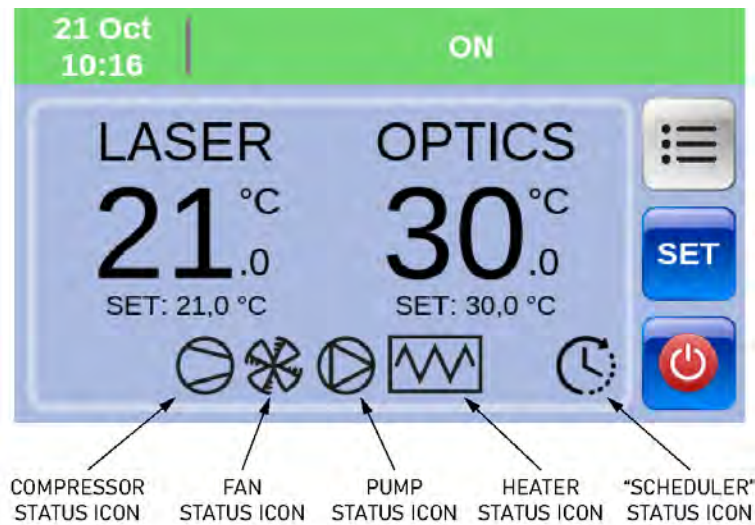
- Compressor operation
- Pump operation (laser and optics source)
- Adjustment of the fans speed;
- Adjustment of the by-pass valve to ensure the temperature accuracy of the laser source branch.
- Adjustment of the three-way valve to ensure the temperature accuracy of the optics branch

Displays:


- Unit status;
- Compressor status;
- Fans status;
- Pump status;
- Temperature setting for the laser source branch
- Temperature setting for the optics branch
- Produced water temperature for the laser source branch
- Produced water temperature for the optics branch
- All the alarms that can occur.

5.1 TURNING ON AND OFF

To turn the unit on, hold down the  key for three seconds. The chiller will start up, and the status bar will turn green and display **ON**.



During operation, icons at the bottom of the display will indicate the status of each load.

To turn the unit off, hold down the  key for three seconds.

5.2 REMOTE ON/OFF


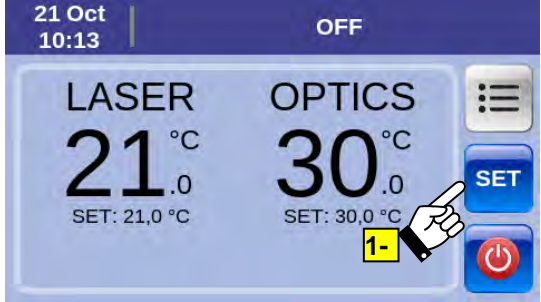
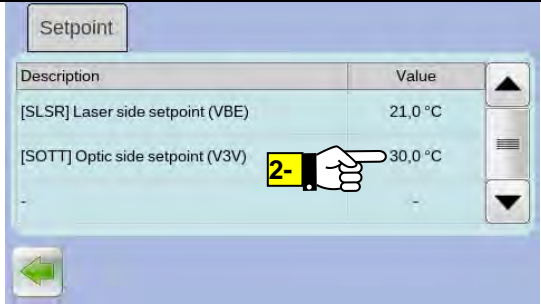

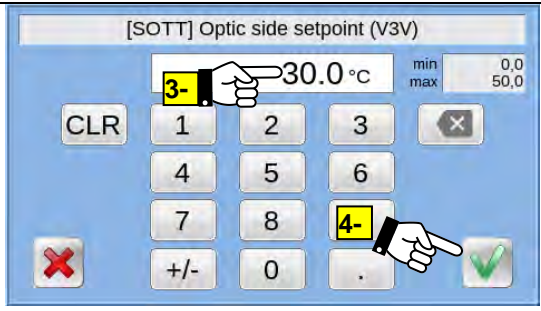

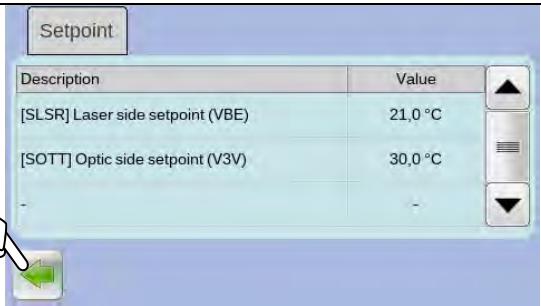
Using **PG04** parameter (available at Installer level) the unit's remote control function can be enabled, and will depend on the status of the **D8** digital input, found in the terminal board of the control panel.



Consult the electrical diagram.

5.3 CHANGING THE SET POINT

To change the setpoint of the outgoing water of the laser and optics source branch, proceed as follows:


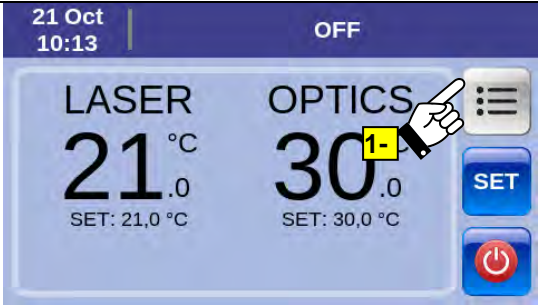

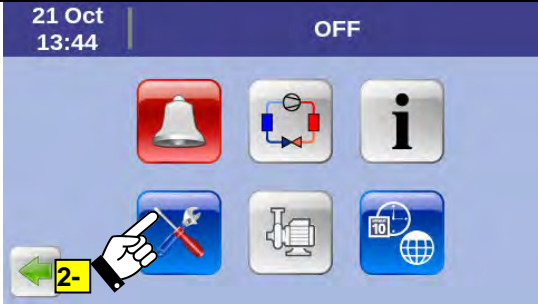

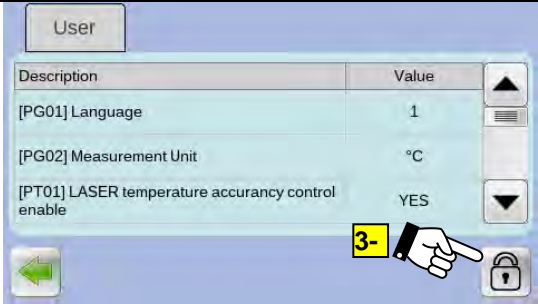

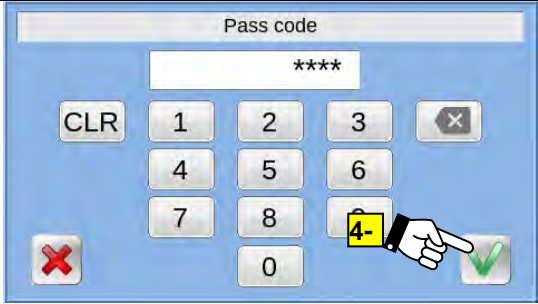
<p>1- From the main screen, press  to access the Setpoint menu.</p>	
<p>2- Select the setpoint you wish to change: SLSR: Laser source branch setpoint SOTT: Optics branch setpoint</p>	
<p>3- Enter the new desired setpoint value. 4- Confirm the value entered by pressing .</p>	
<p>5- Press  to return to the main menu.</p>	

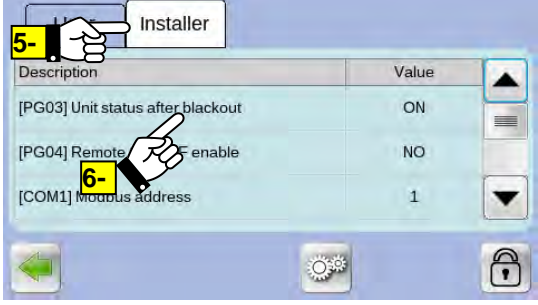

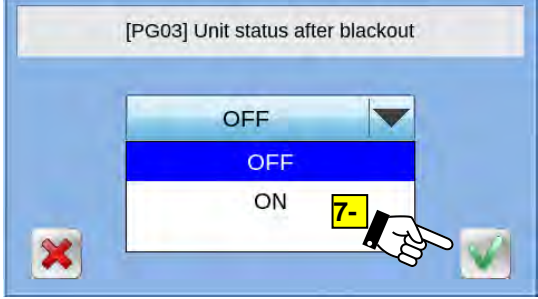


5.4 CHANGING THE TYPE OF RESTART AFTER A POWER FAILURE

If there is a power failure, the chiller can behave in two different ways described by the **PG03** parameter when power is restored:

- **ON - Switch on;**
- **OFF - Remain off while waiting for an ON command.** Start;


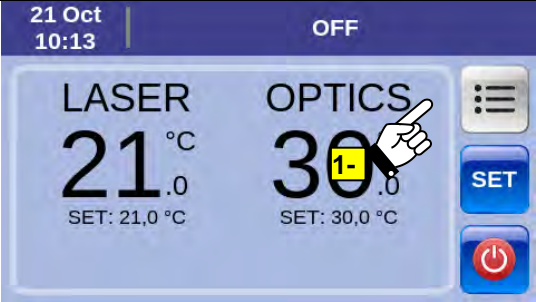



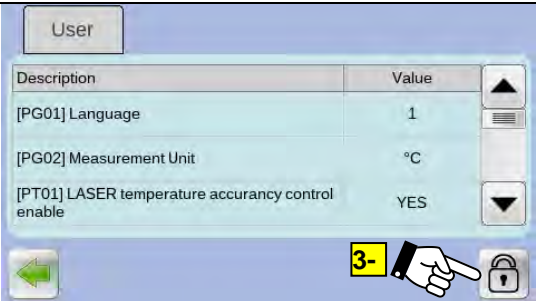

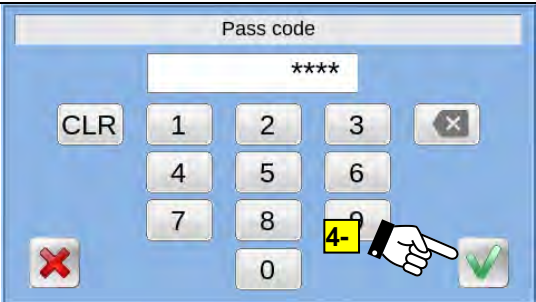
To select one of these options, proceed as follows:

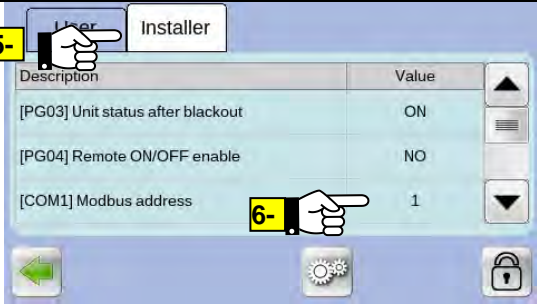

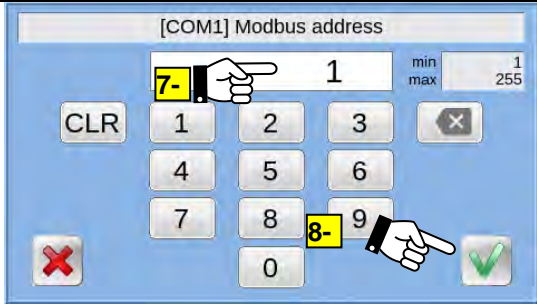


<p>1- From the main screen, press  to access the main menu.</p>	
<p>2- Press  to access the parameter menu.</p>	
<p>3- Press  and the password entry screen will appear.</p>	
<p>4- Enter the Installer password and confirm with .</p>	

<p>5- Press the "Installer" tab to display the parameters. Scroll down until you find the PG03 parameter.</p> <p>6- Press the parameter you wish to change.</p>	
<p>7- Select the desired effect and confirm with .</p>	
<p>8- Press  to return to the main screen.</p>	

5.5 CHANGING THE SERIAL ADDRESS (MODBUS AND CAN)


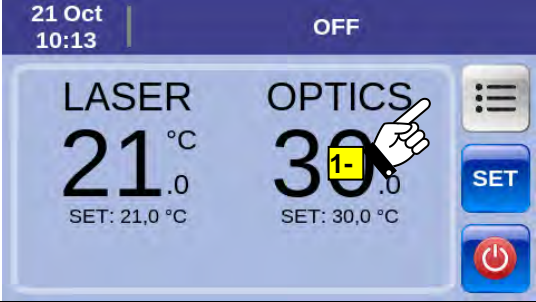


If you wish to use the unit's serial communication (non-isolated RS485 port), it may be necessary to change the electronic controller serial address, which is set to 1 at the factory.

<p>1- From the main screen, press  to access the main menu.</p>									
<p>2- Press  to access the parameter menu.</p>									
<p>3- Press  and the password entry screen will appear.</p>	 <table border="1" data-bbox="831 1070 1369 1370"> <thead> <tr> <th>Description</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>[PG01] Language</td> <td>1</td> </tr> <tr> <td>[PG02] Measurement Unit</td> <td>°C</td> </tr> <tr> <td>[PT01] LASER temperature accuracy control enable</td> <td>YES</td> </tr> </tbody> </table>	Description	Value	[PG01] Language	1	[PG02] Measurement Unit	°C	[PT01] LASER temperature accuracy control enable	YES
Description	Value								
[PG01] Language	1								
[PG02] Measurement Unit	°C								
[PT01] LASER temperature accuracy control enable	YES								
<p>4- Enter the Installer password and confirm with .</p>									

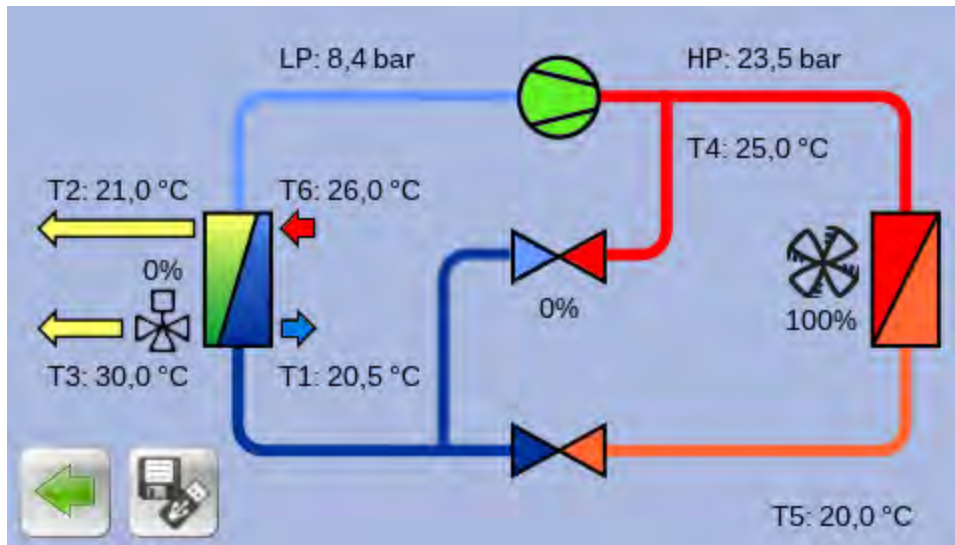
<p>5- Press the "Installer" tab to display the parameters. Scroll down until you find the following parameters: COM1: Modbus address COM2: Modbus baud rate COM3: Modbus no. of bits/Parity/Stop bits</p> <p>6- Press the parameter you wish to change.</p>	
<p>7- Enter the desired value.</p> <p>8- Confirm with .</p>	
<p>9- Press  to return to the main menu.</p>	

5.6 DISPLAY OF INPUTS AND OUTPUTS

The chiller's temperatures and working status can be displayed via the synoptic page. To access it, proceed as follows:

<p>1- From the main screen, press  to access the main menu.</p>	
<p>2- Press  to access the synoptic page.</p>	

The following screen will appear:




T1	Evaporator Outgoing Water Temperature
T2	Laser Source Water Outlet temperature
T3	Optics Water Outlet Temperature
T4	Compressor Gas Exhaust Temperature
T5	Room Temperature
T6	Evaporator Inlet Water Temperature
HP	Compressor Gas Outlet Pressure
LP	Compressor Gas Suction Pressure

5.7 DISPLAYING ELECTRONIC CONTROL SOFTWARE RELEASE AND COMPRESSOR AND PUMP HOUR METERING

<p>1- From the main screen, press  to access the main menu.</p>	
<p>2- Press  to access the information page.</p>	

The following screen will display the working hours of the pumps, compressor and fan.

Compressor operating hours	2	Reset
Pump operating hours	4	Reset
Fan operating hours	2	Reset

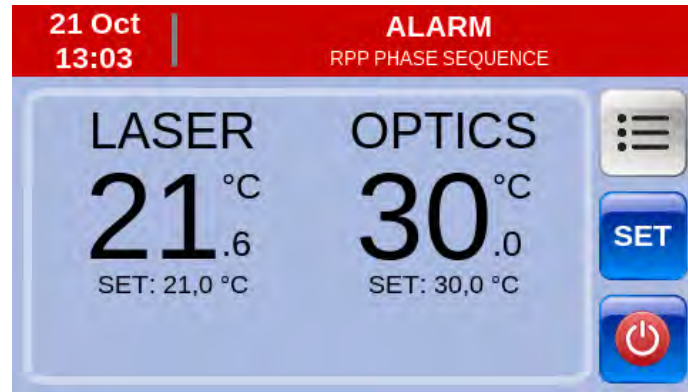

 PU Version: 0.9 - 18/10/2022
 DU Version: 1.3 - 05/10/2022

The same screen will display the software release of the Power Unit (**PU**) and Display Unit (**DU**).

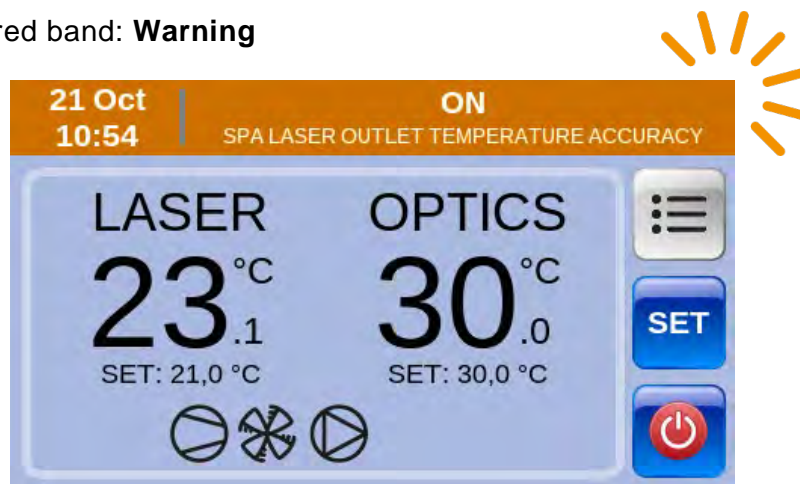
5.8 ALARMS

An alarm or warning condition is signalled in the upper status bar.

- Red-coloured band: **Alarm**




- Orange-coloured band: **Warning**



Some alarms must be rearmed manually while for others, the rearm is automatic or semi-automatic.

- **Manual rearm:** these alarms must be reset, which can only be done when the alarm condition no longer exists; only then can the machine resume operation;
- **Automatic rearm:** the alarm is automatically deactivated as soon as the alarm condition ceases and the machine restarts by itself. However, the signal (Alarm icon) remains on the display until the alarm code is displayed;
- **Semi-automatic rearm:** semi-automatic alarms behave like automatic alarms; but if the same semi-automatic alarm occurs three times in 60 minutes, that alarm switches to manual. To restart the machine, you must remove the cause of the alarm and reset it.

5.8.1 Displaying and resetting alarms

From the main menu, press the red button with the bell .



Active alarms will be highlighted in red, those not highlighted are part of the alarm history, the alarm start and end date and time will be displayed.

If the alarm is still present, its description line will be highlighted in red and flashing and the alarm end date column will be blank. The alarm cannot be reset.

Code	Start	End	Description
CTF	21/10 10:26:06	-	COMPRESSOR THERMAL OVERLOAD
PTF	21/10 10:12:16	21/10 10:12:27	LASER/OPTICS PUMP THERMAL OVERLOAD
PTF	21/10 10:12:01	21/10 10:12:04	LASER/OPTICS PUMP THERMAL OVERLOAD
DPS	21/10 10:01:14	21/10 10:01:17	LOW EVAPORATOR FLOW RATE

The first row of the table is highlighted in red and has a red flashing sunburst effect next to it. A green back arrow is in the bottom left, and a printer icon is in the bottom right.

If the alarm stopped, the line will remain highlighted in solid red and the alarm end date column will display the date and time it stopped.

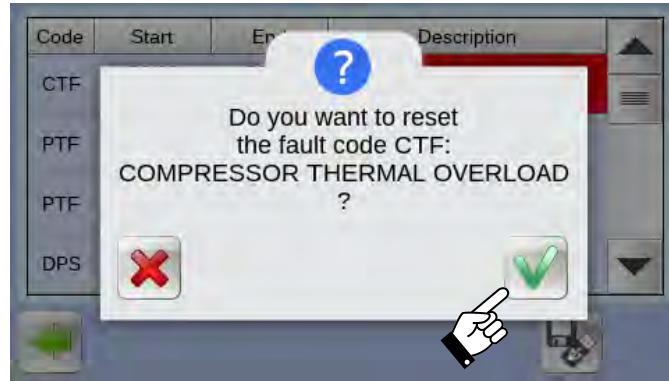
Code	Start	End	Description
CTF	21/10 10:26:06	21/10 10:26:47	COMPRESSOR THERMAL OVERLOAD
PTF	21/10 10:12:16	21/10 10:12:27	LASER/OPTICS PUMP THERMAL OVERLOAD
PTF	21/10 10:12:01	21/10 10:12:04	LASER/OPTICS PUMP THERMAL OVERLOAD
DPS	21/10 10:01:14	21/10 10:01:17	LOW EVAPORATOR FLOW RATE

The first row of the table is highlighted in solid red. A hand cursor is pointing at the 'End' column of the first row. A green back arrow is in the bottom left, and a printer icon is in the bottom right.



To reset an alarm, the condition that caused it must no longer exist: for example, if the low-pressure pressure switch has intervened, the alarm can only be reset when the pressure has risen beyond the reset value (see paragraph **6.1 Safety device calibration and rearm type**).

To reset the alarms, touch the alarm line, the Reset confirmation message will appear:



Click on the confirmation button.

5.8.2 Table of alarm codes

Alarm code	Alarm description	Rearm type
PF1	COMPRESSOR HIGH PRESSURE TRANSDUCER FAILURE	M
PF2	COMPRESSOR LOW PRESSURE TRANSDUCER FAILURE	M
PF3	EVAPORATOR INLET PROBE FAILURE	W
PF4	EVAPORATOR OUTLET PROBE FAILURE	M
PF5	LASER OUTLET PROBE FAILURE	M
PF6	OPTICS OUTLET PROBE FAILURE	M
PF7	COMPRESSOR OUTLET PROBE FAILURE	M
PF8	AMBIENT TEMPERATURE PROBE FAILURE	W
DPS	EVAPORATOR LOW FLOW RATE	M
WLS	LOW FLUID LEVEL	M
FLO	OPTICS LOW OUTLET FLOW RATE	W
ICE	EVAPORATOR ANTIFREEZE	SA
SPA	LASER OUTLET TEMPERATURE ACCURACY	W
PTF	LASER/OPTICS PUMP THERMAL PROTECTION	M
CTF	COMPRESSOR THERMAL PROTECTION	M
FTF	FAN THERMAL PROTECTION	M
HTF	RESISTOR THERMAL PROTECTION	M
RPP	PHASE SEQUENCE	M
HPS	REFRIGERANT HIGH PRESSURE FROM MECHANICAL PRESSURE SWITCH	M
VCP	COMPRESSOR EMPTY	M
LPT	REFRIGERANT LOW PRESSURE FROM TRANSDUCER	M
HPT	REFRIGERANT HIGH PRESSURE FROM TRANSDUCER	SA
HTC	COMPRESSOR HIGH OUTLET TEMPERATURE	SA
HTI	EVAPORATOR HIGH INLET TEMPERATURE	SA

Key terms	A	Automatic	M	Manual
	SA	Semi-automatic	W	Warning

5.8.3 Using the Unit Ready Function

For units equipped with optics circuit flow switch, the **Unit Ready** function can be activated. This enables the user to connect to a normally open contact.



Consult the electrical diagram.

This can be enabled via the **PT04** parameter found in the "User" menu.

If the function is activated, the contact will close if both of the following conditions are met:

- Optics circuit water flow presence
- Laser circuit temperature within the range of +/- 2°C from the laser branch setpoint

(The 2°C differential is a factory value, this can be changed via the **PT02** parameter in the **User** menu. Access to this parameter is allowed by using the first level password, if this is the case please contact the unit supplier)

SAFETY DEVICES

QBE 023 LSR 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
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
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

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 5.8**). The following paragraph lists the characteristics of each safety device.

6.1 CALIBRATION OF THE SAFETY DEVICES AND REARM TYPE

QBE012 - 023			
Safety device	Intervention value	Reset value	Rearm Type
High-pressure gauge	30 barg//435 psi	23 barg//334 psi	Manuale
Water differential pressure switch	85mbar//1,24psi	105mbar//1,53psi	Semiautom.
Water-level sensor	--	--	Selectable
Anti-circulation timer*	5 min.	--	--
QBE033-050			
Safety device	Intervention value	Reset value	Rearm Type
High-pressure gauge	41,5 barg // 602 psi	33 barg // 478 psi	Manuale
Water differential pressure switch	85 mbar // 1,24 psi	105 mbar // 1,53 psi	Semiautom.
Water-level sensor	--	--	Selectable.
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 SWITCH

L'intervento del pressostato di alta pressione è l'unico caso in cui, oltre al riarmo manuale del controllo elettronico, è necessario riarmare anche il pressostato stesso.

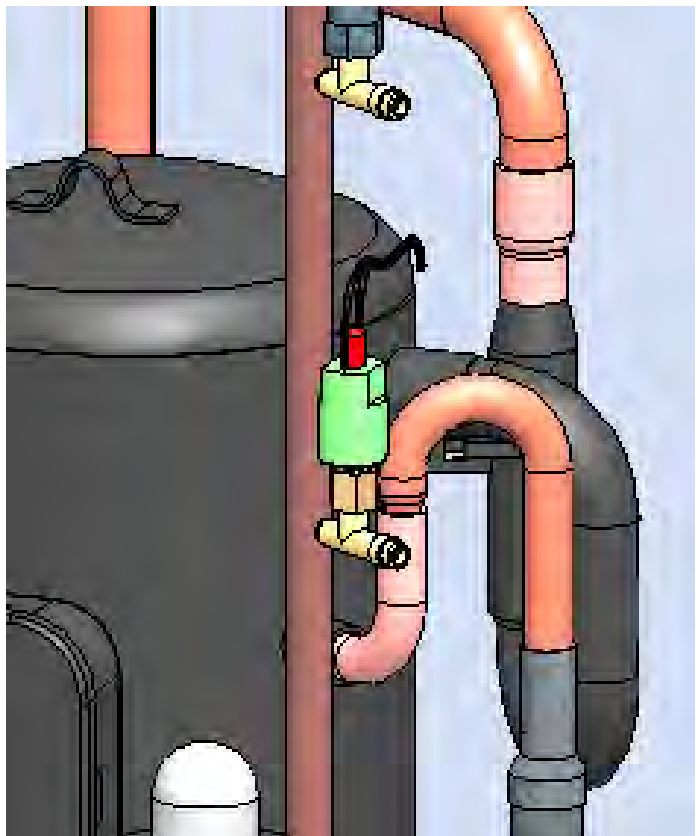
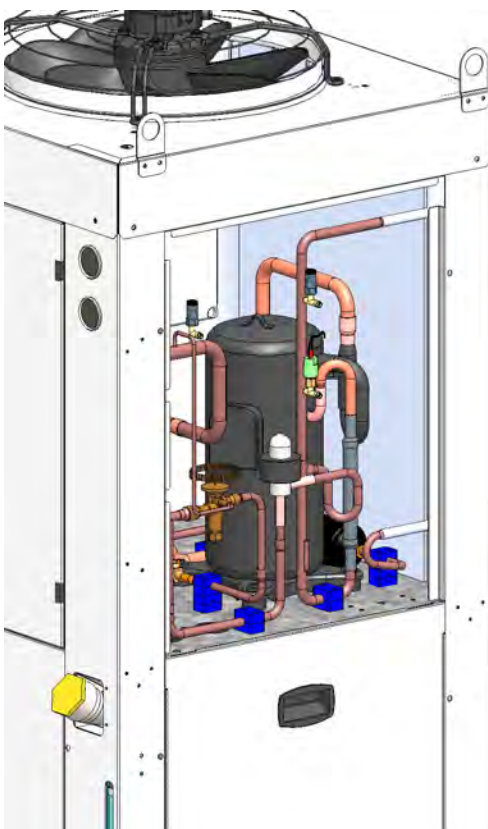
Il pressostato di alta pressione si trova all'interno del vano compressore, sulla tubazione in rame non coibentata, che porta dal compressore alla batteria condensante; esso è dotato sulla sua sommità, di un pulsante rosso per il riarmo manuale.

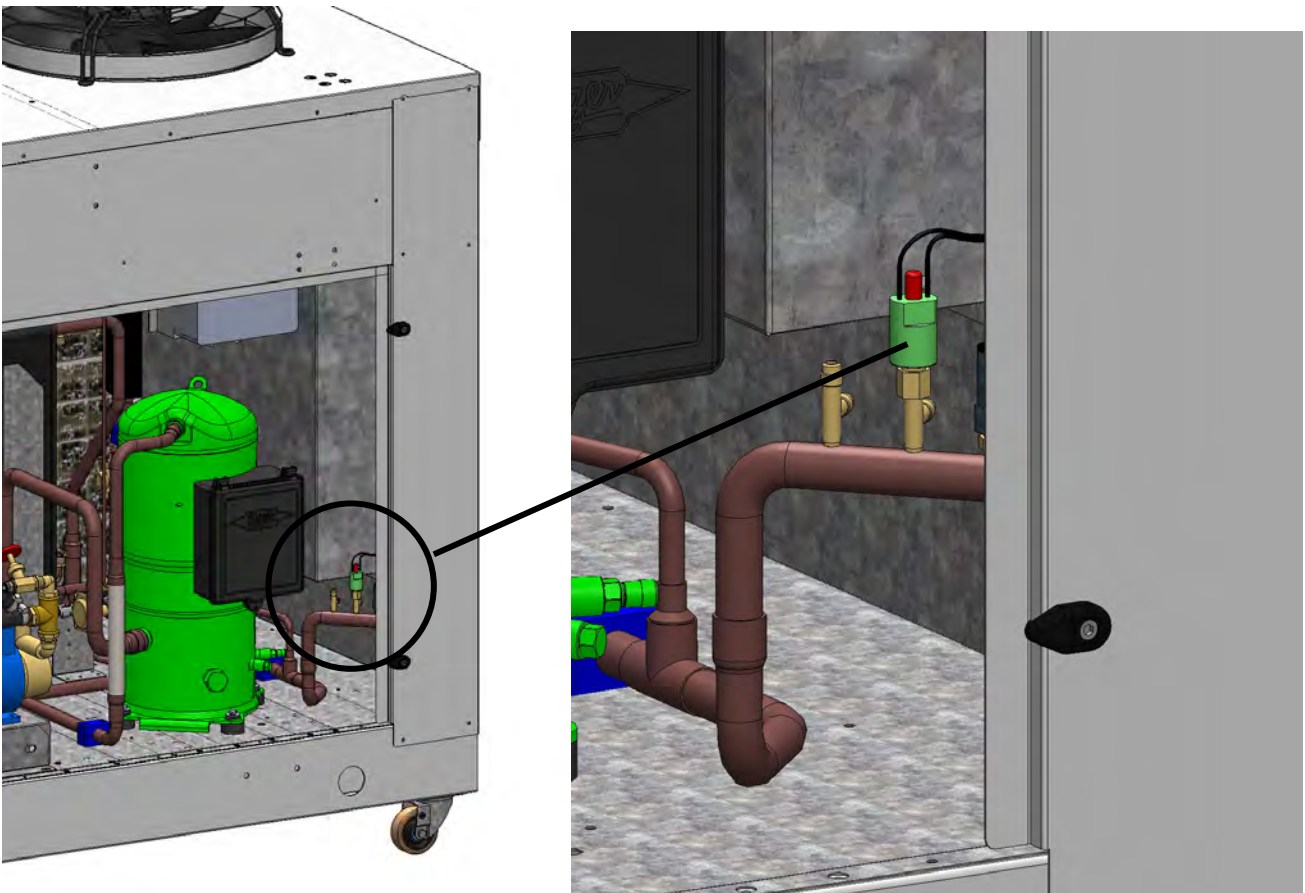


Attenzione! La parte superiore dell'involucro del compressore e la tubazione di mandata si trovano a temperatura elevata. Prestare particolare attenzione quando si opera nelle loro vicinanze.

Il riarmo può avvenire solo quando la pressione nel circuito è scesa al di sotto del valore di ripristino (vedi tabella al **paragrafo 6**).

QBE LSR 012 -023





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 **9 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 rearm type”** in paragraph 6.1);
- 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 **5.8.1 Displaying and resetting alarm**).



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

OPERATING LIMITS

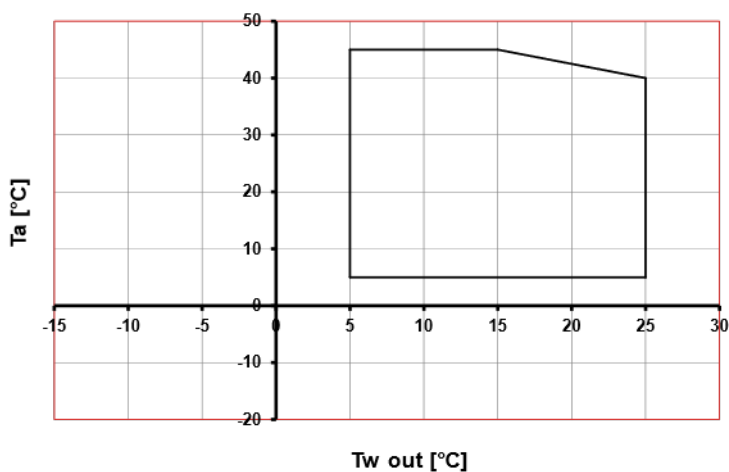
7.1 OPERATING TEMPERATURES

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

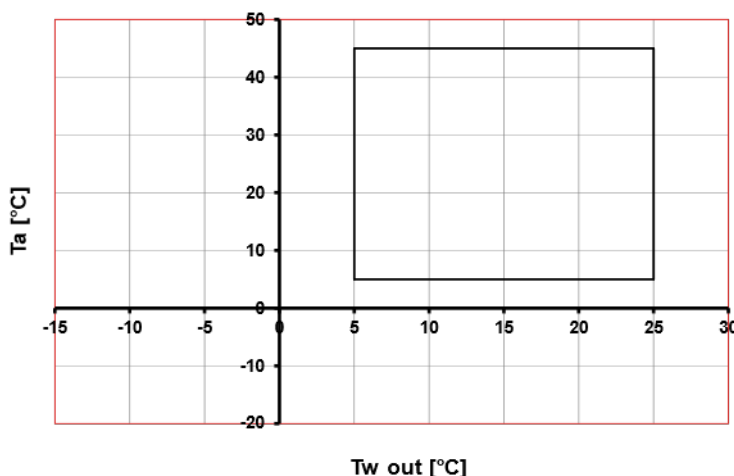
Legend

----- Mandatory glycol - please contact our company

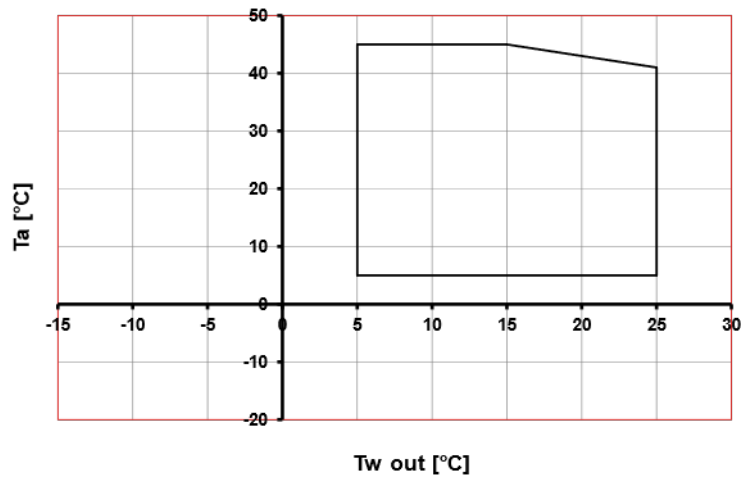
QBE012 LSR 60Hz



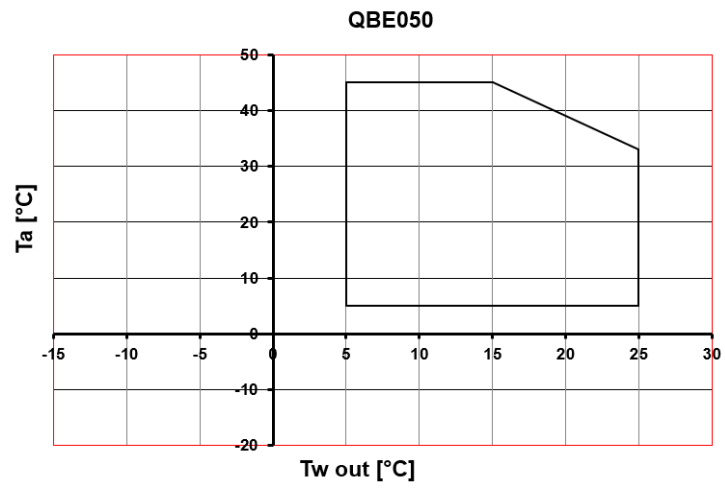
QBE023 LSR 60Hz



QBE033 LSR 60Hz



QBE050 LSR 60Hz



7.2 MINIMUM AND MAXIMUM WATER FLOW RATE

Operation with water flow rates lower than the minimum permitted could trigger a safety device (antifreeze thermostat - low pressure - empty) and difficulties in adjusting the water temperature.



Problems could occur with the maximum water flow rate: too high pressure drops on the water side, too high fluid velocity in the evaporator creating difficulties in heat exchange between water and refrigerant.

QBE LSR Model 60 HZ		012	023	033	050
Laser Source branch	Minimum water flow* [l/h]	1400	3000	3000	4000
	Maximum water flow* [l/h]	3700	5200	7800	9500
Optics branch	Minimum water flow* [l/min]	5	5	5	5
	Maximum water flow* [l/min]	20	20	20	20

* as the minimum flow rate with the bypass (closed).
(100 kPa = 1 bar - 1000 l/h = 1 m³/h)

7.3 SOUND PRESSURE LEVEL

QBE LSR model		012	023	033	050
Sound pressure at 10 m in an open field	[dB(A)]	51	52	55	56

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 3.4.4 - (only units with open water circuit)	Daily	
Check for the presence of any alarm signals	Daily	
Check the functioning of the fans	Monthly	
Check that the temperature of the air is compatible with the operating limits of the machine	Monthly	
Check for any dirt on the exchanger plates inside (see paragraph 8.1)	Yearly (1)	
Clean the air filters	Monthly(1)	
Clean the condensing coil with a jet of compressed air	Annual (1)	
Replace the water in the tank	Annual (1)	
Clean the water filter	Monthly(2)	
Clean the flow switch filter (see par. 8.3)	Monthly(2)	
Check that the refrigerant liquid sight glass is clear or, at most, with a few bubbles	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	
Carry out the correct maintenance of the fluid loaded into the system (see par.8.2)	Yearly	
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	
If the unit must remain out of service for a long period, drain the water from the pipes and from the machine to prevent ice formation during the winter season (3) (4)	Extraordinary	

- (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 glycol as anti-freeze**).
- (4) After restoring the system unit's water volume, carry out the pump-priming procedure described in the **paragraph 4.1**.



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.

8.1 CLEANING THE PLATE EXCHANGER

The plate exchangers' mobility in the **QBE TTM LSR** range creates a self-cleaning effect. Dirt on the heat exchange surfaces is considerably reduced compared to traditional heat exchangers. This means that the plate heat exchanger can remain in operation for longer between cleaning.

It is advisable to **check for hydraulic pressure drops at least once a year**, comparing the previously recorded with the current value, to establish if the plate needs cleaning.

Recommendations for plate cleaning:

- Use high head centrifugal pumps with a maximum fluid temperature of 50°C;
- To remove biological material, grease, oil and other organic deposits from heat exchangers and connected equipment, use a strong caustic soda-based alkaline cleaning solution.



The cleaning liquid must comply with environmental regulations and be readily biodegradable. It must ensure that plates, gaskets or adhesives are undamaged. It can be used in combination with other additives to reduce foaming during the cleaning process.

The recommended basic concentration is one part cleaning solution to nine parts water. Start by adding water first and then the cleaner.

The pH level should never be less than 12 during the cleaning process. Add more cleaner to increase the pH level.

This cleaning procedure is only for the heat exchanger. The pump and the other fluid circuit components are not compatible with the cleaning solution

Estimated time for cleaning: 2 - 6 hours, depending on the deposits in the heat exchanger, size of the heat exchanger, cleaning temperature and cleaning liquid concentration.

8.2 MAINTENANCE OF THE FLUID LOADED IN THE SYSTEM

For water circuits with open cup systems:

it is advisable to **annually replace the fluid** loaded in the system (water, glycol, chemical products or additives) and restore the parameters shown in the table in paragraphs **3.4.2 Water quality** and **3.4.3 Use of glycol as anti-freeze**.

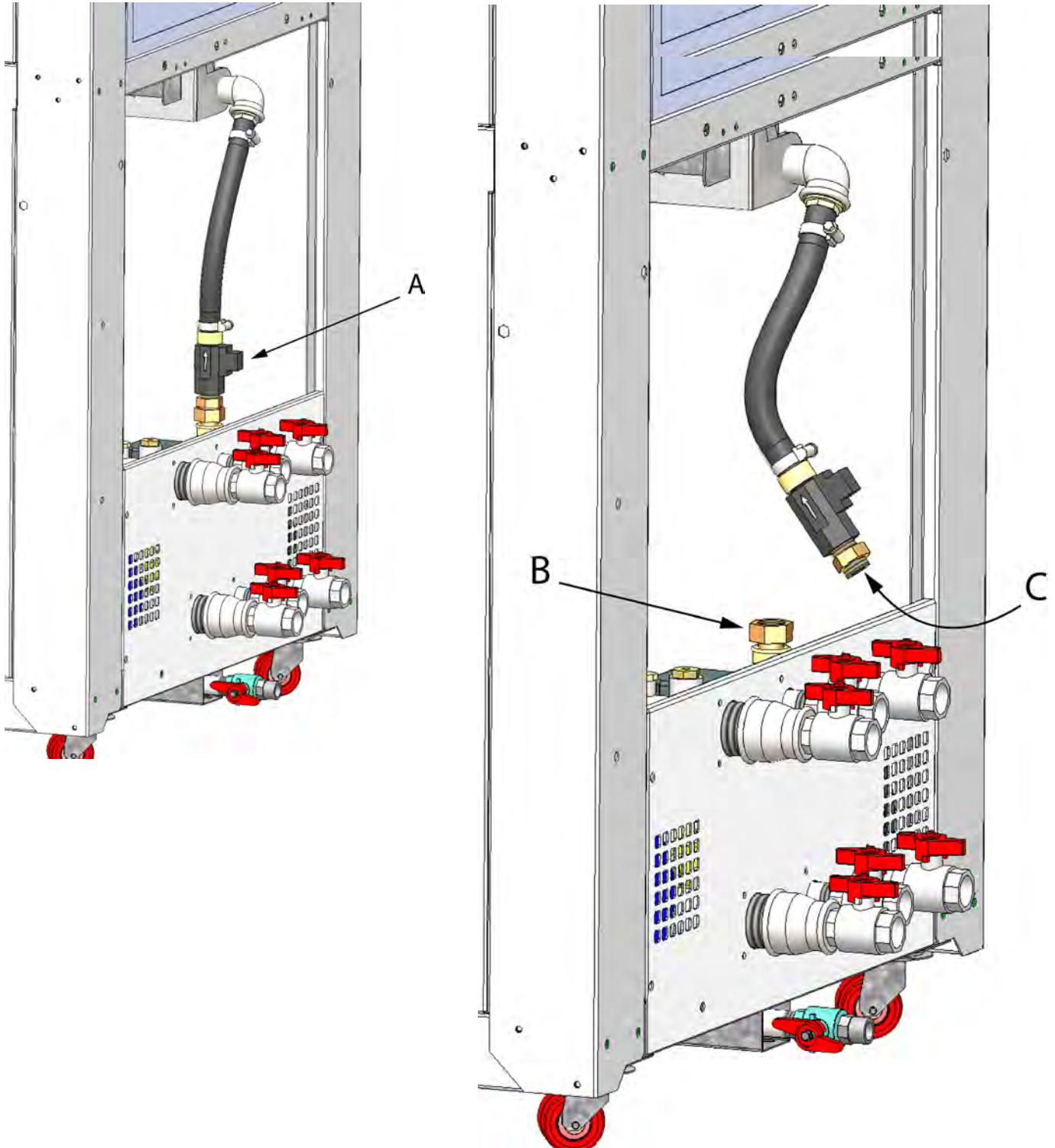
For water circuits with pressurised systems:

it is advisable to **annually check** the features of the fluid loaded in the system. They must meet the parameters in table **3.4.2 Water quality** and **3.4.3 Use of glycol as anti-freeze**.












8.3 CLEANING THE FLOW SWITCH



For flow switch **A** proper cleaning, carry out the following procedure:




- unscrew the lower ring nut **B** of the three-piece fitting;
- remove the internal filter **C** by levering it out with a small screwdriver;
- clean the filter with a jet of compressed air and replace it in the space provided;
- close the three-piece fitting.













TROUBLESHOOTING

Alarm and fault	Cause	Solution	Carried out by
Electronic controller off	The main differential switch contacts are open	Close the contacts	User 
Electronic controller off	The cut-off switch on the unit's electrical panel is open	Close the contacts	User 
Electronic controller off	Tripping of the main differential switch	Check for any current leakage inside the machine	Specialised personnel 
Electronic controller off	Protection fuse Transformer Power supply blown	Replace fuse, if the problem persists call for service	User 
Electronic controller off	AL1 power supply not working	If there is input power supply and no output AL1 power supply unit, replace the power supply unit	Specialised personnel 
WLS <i>Tank low water level alarm</i>	Water level below sensor level	Top up water in the tank to maximum level	User
DPS <i>Evaporator low water flow alarm</i>	No water differential pressure switch consent	Check the operation of the laser pump, bleed air from the pump (see pump start-up and priming procedure)	User
DPS <i>Evaporator low water flow alarm</i>	Low water flow differential pressure switch failure	Check water inlet filter on laser side, clean/replace and restart, replace tank water if necessary.	User
DPS <i>Evaporator low water flow alarm</i>	Water circulation pump blocked or defective	Unlock or replace the pump	Specialised personnel 
DPS <i>Evaporator low water flow alarm</i> Pump icon lit	Circulation pump not working	Check the voltage at the coil of the remote switch or relay of the pump and the continuity of the coil.	Specialised personnel 
DPS <i>Evaporator low water flow alarm</i>	Machine taps are closed	Open the taps	User
RPP <i>Phase sequence protection</i>	Triggering of phase sequence relay	Reverse the two phases upstream from the cut-off switch of the unit's electrical panel.	Specialised personnel 
The compressor icon is on but the compressor does not work	Compressor remote switch or relay is off	Check the voltage at the coil of the compressor remote switch or relay and the continuity of the coil.	Specialised personnel 
CTF <i>Compressor thermal protection</i>	QC1 compressor thermal protection triggered	Check for possible input overcurrent due to low voltage, the supply voltage and operating conditions.	Specialised personnel 
CTF <i>Compressor thermal protection</i>	QC1 compressor thermal protection triggered	Check for short circuits in the compressor motor windings.	Specialised personnel 

Alarm and fault	Cause	Solution	Carried out by
HPS Refrigerant high pressure from mechanical pressure switch	Blocked condenser or insufficient air flow resulting in high-pressure switch triggered	Remove dirt from the condenser and any obstacles to the air flow. Wait for the pressure to drop below the reset value, then reset the high-pressure switch by pressing the button above it	User
HPS Refrigerant high pressure from mechanical pressure switch	High-pressure switch triggered. Insufficient air flow to condenser	Check that all side panels are closed and the fan is working properly. Reset the pressure switch and restart the Chiller, if the problem persists call for service	User
HPS Refrigerant high pressure from mechanical pressure switch	High-pressure switch triggered. Fan does not work	Check fan protection fuse and any short circuits on fan motor windings	Specialised personnel 
FTF Fan thermal protection	Internal fan thermal protection triggered	Check that the machine operating conditions (outside air temperature) correspond to the operating limits. Wait for the fan motor to cool down. If the problem persists, call for service	User
Fan icon off. Normal condensation pressure	Very low outside air temperature and consequent condensation control triggering	The machine can work anyway	
The compressor icon is on but the fan does not work	No voltage output from the fan-speed regulator	Check the voltage output from the regulator and replace fan, if necessary	Specialised personnel 
The compressor icon is on but the fan does not work	Electrical connections of the fan are loose	Check and tighten	Specialised personnel 
The fan icon is on but the fans do not work	Fan fuse blown	Check for short circuits in the fan motor windings. Check the rolling resistance of the fan bearings.	Specialised personnel 
PTF Pump thermal-magnetic protection	Failure of the electric motor of one of the pumps	Check for short circuits or ground faults in the electric motor windings	Specialised personnel 
PTF Pump thermal-magnetic protection	Mechanical failure of one of the two pumps	Check that the pumps' motor turns freely. Contact service if needed	User 
PTF Pump thermal-magnetic protection	One of the two pumps is working out of range	Check the electrical absorption of the pumps and working pressures, bring the pumps back within operating limits.	Specialised personnel 
HTF Resistor thermal-magnetic protection	Possible resistor short-circuit	Check electrical resistance and possible short circuit.	Specialised personnel 
ICE Evaporator anti-freeze alarm	Evaporator outlet temperature has fallen below the alarm limit	Check BWOE probe temperature calibration	Specialised personnel 
ICE Evaporator anti-freeze alarm	Evaporator outlet temperature has fallen below the alarm limit	Check water flow rate, check chiller water inlet filters. If the problem persists, call for service	User

Alarm and fault	Cause	Solution	Carried out by
ICE <i>Evaporator anti-freeze alarm</i>	Possible compressor control switch or hot gas injection valve malfunction	Check compressor control switch and hot gas injection valve operation	Specialised personnel 
HP1 <i>High-pressure alarm from transducer</i>	Condensers are dirty	Clean condensers	User
HPT <i>Refrigerant high pressure from transducer</i>	Insufficient air flow to condensers	Check correct fan operation and make sure that all Chiller panels are tightly closed. If the problem persists, call for service.	User
HPT <i>Refrigerant high pressure from transducer</i>	High ambient temperature outside operating limits.	Properly ventilate the room and area where the Chiller is installed.	User
LPT <i>Refrigerant low pressure from transducer</i>	Lack of refrigerant gas	Check the chiller circuit with a leak detector. Repair any ruptures and recharge the circuit.	Specialised personnel 
LPT <i>Refrigerant low pressure from transducer</i>	Dryer filter blocked or expansion valve malfunctioning	Check and replace	Specialised personnel 
LPT <i>Refrigerant low pressure from transducer</i>	Low water flow rate	Clean water filter. Check the correct pump rotation direction. Check that the taps on the circuit are open	User
VCP <i>Compressor empty alarm</i>	Refrigerant gas leak	Check the chiller circuit with a leak detector. Repair any ruptures and recharge the circuit.	Specialised personnel 
VCP <i>Compressor empty alarm</i>	Expansion valve not opening	Valve is blocked, replace expansion valve.	Specialised personnel 
GA1 General alarm	Generic	Check for additional alarms	User
HTI <i>Evaporator high water inlet temperature alarm</i>	High thermal load	Bring the thermal load into the range for Chillers. If the problem persists, call for service	User
HTI <i>Evaporator high water inlet temperature alarm</i>	The Chiller was exposed to high ambient temperatures during standby	Remove some of the water from the tank and add fresh water to bring the temperature below the alarm limit (38°C)	User
HTI <i>Evaporator high water inlet temperature alarm</i>	The water temperature has risen due to compressor blockage caused by other faults.	Check for other alarms, remove cause and restart (if necessary, add fresh water to the tank, see previous point). If the problem persists, call for service	User
HTC <i>Compressor high outlet temperature</i>	Lack of refrigerant gas	Check the chiller circuit with a leak detector. Repair any ruptures and recharge the circuit.	Specialised personnel 
HTC <i>Compressor high outlet temperature</i>	Compressor mechanical failure	Check electrical absorption and abnormal compressor noise	Specialised personnel 
HTC <i>Compressor high outlet temperature</i>	Condensers or condenser filters are dirty	Clean condensers and filters	User
HTC <i>Compressor high outlet temperature</i>	High ambient temperature outside operating limits.	Properly ventilate the room and area where the Chiller is installed.	User

Alarm and fault	Cause	Solution	Carried out by
SPA <i>Laser outlet temperature accuracy</i> If the laser outlet temperature remains 2°C above or below the SLSR laser branch setpoint for more than 300 seconds, the warning will appear	Temperature low compared to the setting; the chiller has been without power in low ambient temperature conditions.	Leave the chiller running and wait for the temperature to rise to the setpoint value	User
SPA <i>Laser outlet temperature accuracy</i> If the laser outlet temperature remains 2°C above or below the SLSR laser branch setpoint for more than 300 seconds, the warning will appear	Low temperature despite the chiller being powered	Check tank resistor function and resistor setting	Specialised personnel 
SPA <i>Laser outlet temperature accuracy</i> If the laser outlet temperature remains 2°C above or below the SLSR laser branch setpoint for more than 300 seconds, the warning will appear	High temperature compared to setpoint Thermal load conditions or ambient temperature exceed the permissible limits	Ventilate the room where the chiller is installed, check that the condensers are clean	User
SPA <i>Laser outlet temperature accuracy</i> If the laser outlet temperature remains 2°C above or below the SLSR laser branch setpoint for more than 300 seconds, the warning will appear	Possible reduced refrigerant load or malfunction of refrigerant circuit components	Check for refrigerant gas leaks and refrigerant circuit operation	Specialised personnel 
SPA <i>Laser outlet temperature accuracy</i>	If the Unit ready function is activated, the signal contact will be open (see electrical circuit diagram)		
FLO <i>Optics low outlet flow rate</i>	Water filter dirty	Clean the filter and restart	User
FLO <i>Optics low outlet flow rate</i>	Air in the optics circuit	See pump priming procedure	User
FLO <i>Optics low outlet flow rate</i>	Optics flow switch filter dirty	See optics flow switch filter cleaning (see paragraph 8.3)	User
FLO <i>Optics low outlet flow rate</i>	If the Unit ready function is activated, the signal contact will be open (see electrical circuit diagram)		
PF1 <i>Compressor high pressure transducer failure</i>	Defective BHP1 pressure transducer	Check the contacts and replace the probe if necessary	Specialised personnel 
PF2 <i>Low pressure transducer failure</i>	Defective BLP1 pressure transducer	Check the contacts and replace the probe if necessary	Specialised personnel 
PF3 <i>Evaporator inlet water temperature probe failure</i>	BT6 inlet water temperature probe failure	Check the contacts and replace the probe if necessary	Specialised personnel 
PF4 <i>Evaporator outlet water temperature probe failure</i>	BT1 inlet water temperature probe failure	Check the contacts and replace the probe if necessary	Specialised personnel 
PF5 <i>Laser outlet temperature probe failure</i>	BT2 inlet water temperature probe failure	Check the contacts and replace the probe if necessary	Specialised personnel 
PF6 <i>Optics outlet temperature probe failure</i>	BT3 inlet water temperature probe failure	Check the contacts and replace the probe if necessary	Specialised personnel 
PF7 <i>Compressor outlet temperature probe failure</i>	BT4 inlet water temperature probe failure	Check the contacts and replace the probe if necessary	Specialised personnel 
PF8 <i>Ambient temperature probe failure</i>	BT5 inlet water temperature probe failure	Check the contacts and replace the probe if necessary	Specialised 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 (012-023), R410A (033-050), Oil
Panelling and supports	Carbon steel, epoxy paint
Chiller compressor	Steel, Copper, Aluminium, Oil
Plate exchanger	Steel, Copper
Coaxial exchanger	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

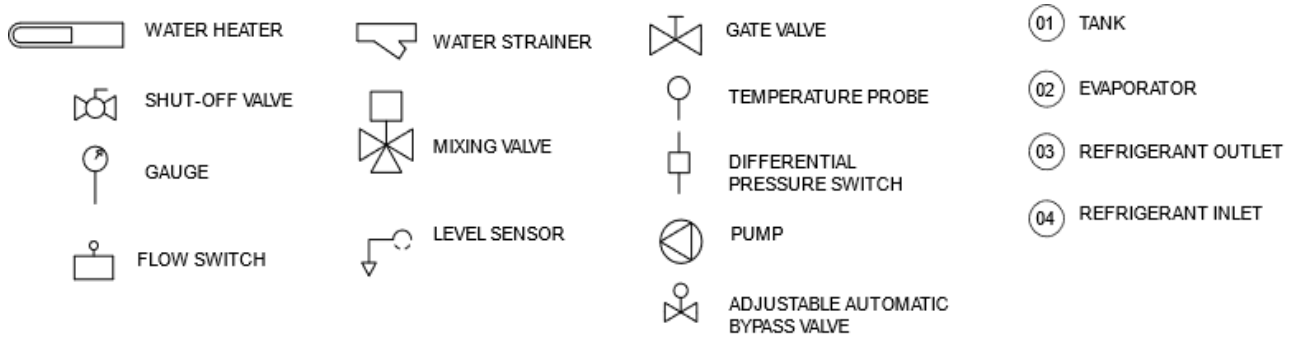
We recommend that you follow current safety norms for the disposal of each single material. The refrigerant contains particles of lubrication oil from the chiller compressor.



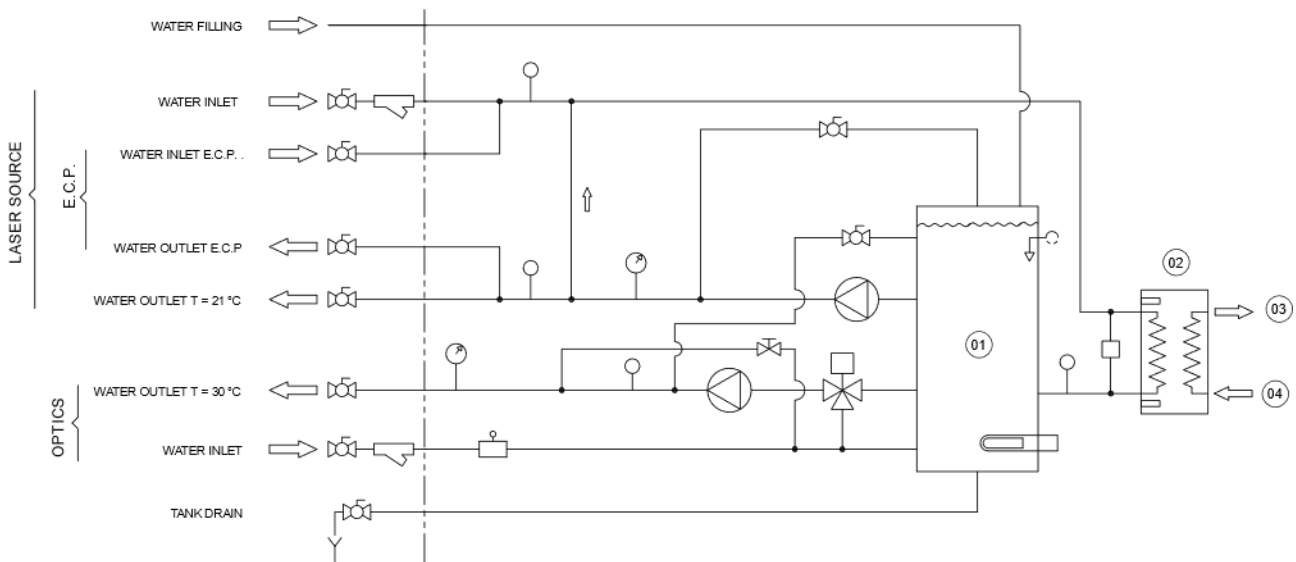
Dispose of refrigerant properly. Remove it from the chiller with suitable tools and deliver it to authorized collection centres that will treat it and make it reusable.

P&ID DIAGRAM

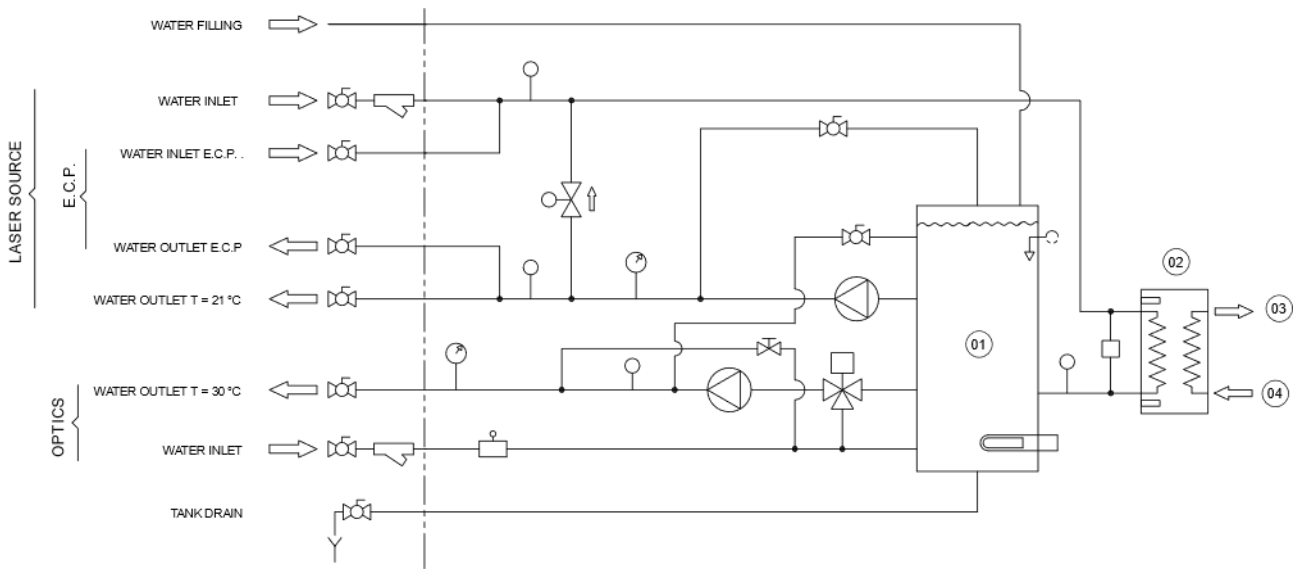
Legend



QBE LSR 012 - 023

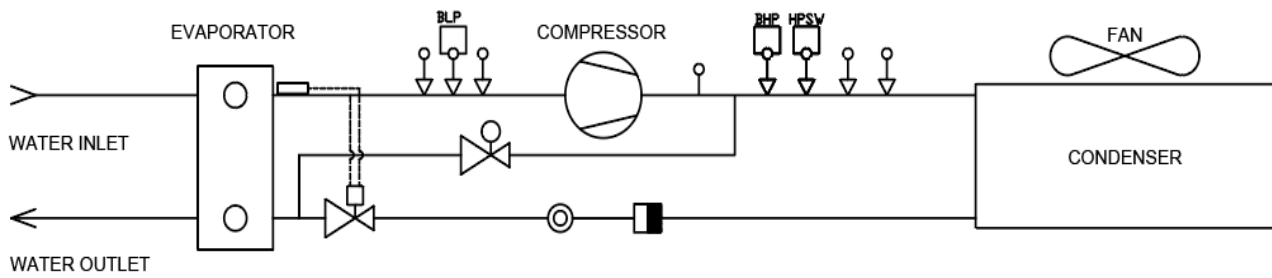


QBE LSR 033 -050











REFRIGERATION CYCLE DIAGRAM

QBE LSR

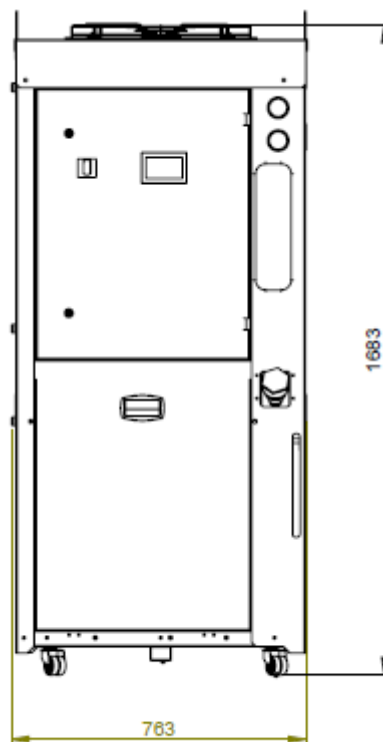
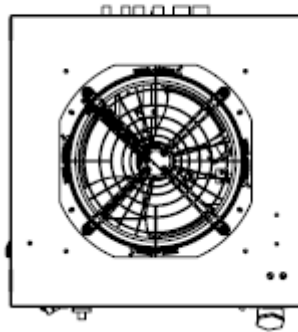


KEYS

	VALVOLA DI ESPANSIONE TERMOSTATICA THERMOSTATIC EXPANSION VALVE		PRESSOSTATO DI BASSA PRESSIONE LOW PRESSURE SWITCH
	SPIA DI FLUSSO SIGHT GLASS		PRESSOSTATO DI ALTA PRESSIONE HIGH PRESSURE SWITCH
	FILTRO DEIDRATATORE DEHYDRATOR FILTER		PRESA DI PRESSIONE OUTLET PRESSURE
	POZZETTO PER SONDA TEMPERATURA TEMPERATURE PROBE WELL		VALVOLA DI BYPASS BYPASS VALVE

DIMENSIONAL DRAWINGS

QBE LSR 012-023

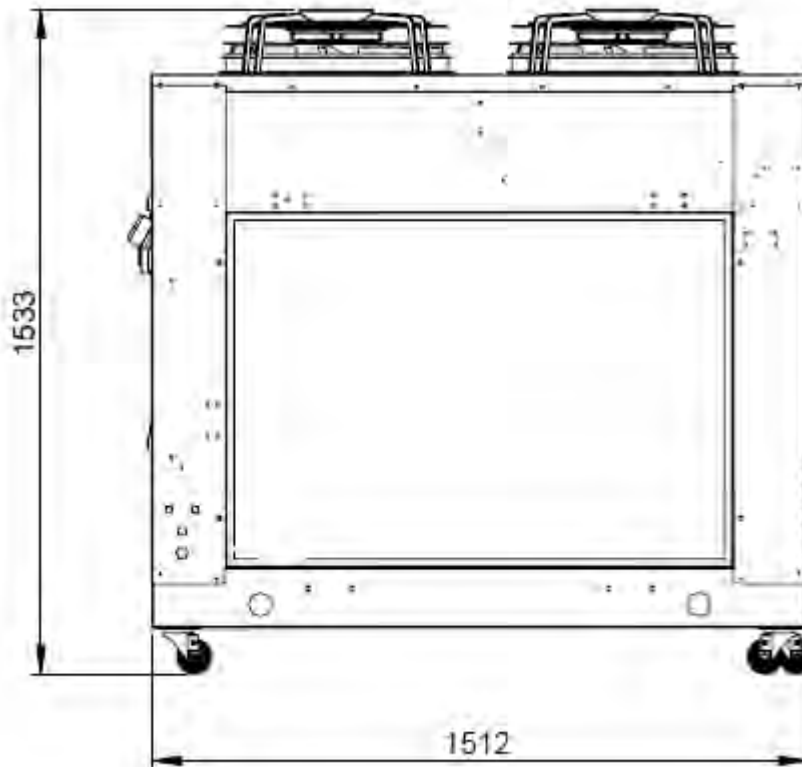
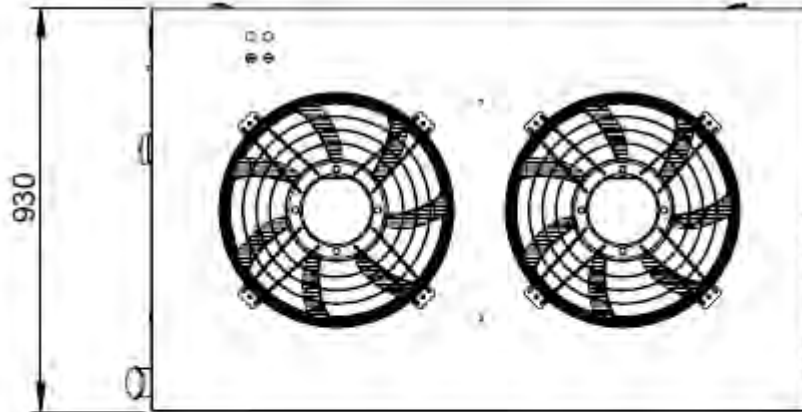


MASS

QBE LSR 012	300 kg
QBE LSR 023	315 kg

Water connections size		QBE012-R	QBE023-R
Source / E.C.P. / Optics <i>all male NPT</i>	[inch]	1 1/4" - 3/4" - 1/2"	1"1/4 - 3/4" - 1/2"

QBE LSR 033 -050



Mass	
QBE LSR 033	380 kg
QBE LSR 050	395 kg

Water connections size		QBE033 050 -R
Source / E.C.P. / Optics <i>all male NPT</i>	[inch]	1 1/2" - 3/4" - 1/2"

QBE LASER SERIES		QBE012 - R	QBE023 - R	QBE033 - R
Air temperature	[°C]	32	32	32
Evaporator inlet water temperature	[°C]	26	26	26
Evaporator outlet water temperature	[°C]	21	21	21
Ethylene glycol percentage	---	0%	0%	0%
Cooling capacity	[kW]	12.28	25.55	34.73
Compressors power input	[kW]	3.20	5.88	7.10
Total power input	[kW]	5.00	9.34	11.56
Total absorbed current	[A]	9.25	13.95	18.92
Energy efficiency (pumps excluded)	EER/COP	3.65	3.72	3.82
Water flow (laser source)	[l/h]	2112	4395	5974
Available pressure (laser source)*	[kPa]	443	302	413
Water flow (optics)	[l/h]	600	600	600
Available pressure (optics) *	[kPa]	580	580	580
Maximum power input (total)	[kW]	5.66	11.97	15.25
Maximum absorbed current (total)	[A]	10.90	18.38	23.09
Starting current	[A]	43.89	76.79	105.21
Fan power	[kW]	0.17	1.00	1.00
Fan current	[A]	1.80	1.42	1.42
Fans quantity	[#]	1	1	2
Pump power input (laser source)	[kW]	0.9	1.72	1.72
Pump absorbed current (laser source)	[A]	1.53	2.81	2.81
Pump power input (optics)	[kW]	0.74	0.74	0.74
Pump absorbed current (optics)	[A]	1.56	1.56	1.56
Power supply	[V/Ph/Hz]	460/3/60	460/3/60	460/3/60
IP protection degree	---	IP44	IP44	IP 44
Refrigerant	---	R407C	R407C	R410A
Compressor type	---	Scroll		
Evaporator type	---	Brazen plates		
Condenser type	---	Micro channel		
Compressor quantity	[#]	1	1	1
Refrigeration circuit quantity	[#]	1	1	1
Air flow	[m3/h]	3.700	8.900	16.300
Sound pressure level at 10 m in free field	[dba]	51	52	55
Water connections size Source / E.C.P. / Optics all male NPT	[inch]	1 1/4" - 3/4" - 1/2"	1 1/4" - 3/4" - 1/2"	1 1/2" - 3/4" - 1/2"
Tank capacity	[dm3]	100	100	100
Width	[mm]	760	760	930
Depth	[mm]	780	780	1.570
Height	[mm]	1.800	1.800	1.510
Weight (approx.)	[kg]	300	315	380

*max. head at 26/21@32 conditions, adjustable by hydraulic bypass, which is supplied as standard on the source and optics sides. Please get in touch with us for further information.



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