

QBE TOTEM		012	023	033	050
<b>Performances</b>					
Air temperature	[°C]	32	32	32	32
Evaporator inlet water temperature	[°C]	26	26	26	26
Evaporator outlet water temperature	[°C]	21	21	21	21
Ethylene glycol	---	0%	0%	0%	0%
Cooling capacity	[kW]	12,58	23,26	36,65	52,22
Compressors power input	[kW]	3,16	6,06	8,47	13,51
Total power input	[kW]	5,56	9,46	13,09	18,57
Total absorbed current	[A]	11,39	16,75	22,50	32,52
Energy efficiency (pumps excluded)	EER/COP	3,78	3,41	3,66	3,47
Water flow (laser source)	[l/h]	2164	4000	6304	8982
Available pressure (laser source)	[1] [kPa]	397	298	330	331
Water flow (optics)	[l/h]	600	600	600	600
Available pressure (optics)	[1] [kPa]	480	480	480	480
<b>Electrical Data</b>					
Maximum power input (total)	[kW]	7,65	10,33	16,10	21,76
Maximum absorbed current (total)	[A]	13,78	21,47	26,95	37,13
Starting current	[A]	51,80	91,41	131,91	182,26
Fan power	[kW]	0,17	0,77	0,77	0,77
Fan current	[A]	1,80	1,70	1,70	1,70
Fans quantity	[#]	1	1	2	2
Pump power input (laser source)	[kW]	0,91	1,31	1,75	2,20
Pump absorbed current (laser source)	[A]	1,7	2,41	3,21	4,56
Pump power input (optics)	[kW]	1,33	1,33	1,33	1,33
Pump absorbed current (optics)	[A]	2,30	2,30	2,30	2,30
Power supply	[V/Ph/Hz]	400/3/50	400/3/50	400/3/50	400/3/50
IP protection degree	---	IP44	IP44	IP44	IP44
<b>Technical Data</b>					
Refrigerant	---	R407C	R407C	R410A	R410A
Compressor quantity	[#]	1	1	1	1
Refrigeration circuit quantity	[#]	1	1	1	1
Air flow	[m3/h]	3.700	7.300	14.000	12.500
Sound pressure level at 10 m in free field	[dB(A)]	48	50	51	52
Water connections size Source / Auxiliaries / Optics	[inch]	1 1/4"-3/4"-1/2"	1*1/4-3/4"-1/2"	1 1/2"-3/4"-1/2"	1 1/2"-3/4"-1/2"
Tank capacity	[dm3]	100	100	100	100
Width	[mm]	760	760	930	930
Depth	[mm]	780	780	1.570	1.570
Height	[mm]	1.800	1.800	1.510	1.510
Weight (approx.)	[kg]	300	315	380	400

[1] Max head pressure at 26/21@32°C adjustable with the water bypass installed for standard both on the source and on optics sides.  
Contact Friulair offices for more information

#### OPTIONS

Thermal insulation on optics circuit	<b>BK</b>
3 bar available head pressure on optics	<b>P3</b>

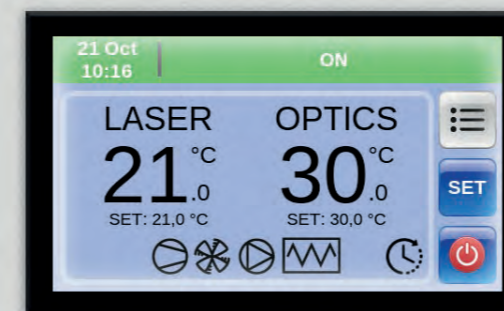
#### OPERATING LIMITS

Refer to the operating limits in the last release of the QBE TOTEM technical manual. >> Contact the company.

#### ELECTRONIC CONTROLLER

QBE TOTEM chillers are equipped with a single controller managing all the functions of the chiller as listed below:

- compressor operation to ensure a constant outlet water temperature;
- pumps operation;
- correct functioning of the variable speed fan;
- operation of the resistor immersed in the tank which guarantees a temperature maintenance when the machine is switched off;
- management of the electronic by-pass valve to ensure the accuracy of the water leaving the main branch (laser source);
- management of the 3-way valve to control the water temperature of the secondary branch (optics);
- alarms management to ensure a correct operation within the machine working limits and to prevent dangerous conditions;
- *unit ready* confirmation when the following conditions are met simultaneously:
  - electrically powered unit;
  - laser source branch water temperature within the expected range;
  - water flow rate on the optics branch.



#### DIAGNOSIS (MONITORING)

The electronic controller manages the following alarms:

- high and low refrigerant pressure switches / transducers;
- low water level inside the tank;
- insufficient water flow to the evaporator;
- temperature probes failure;
- antifreeze alarm;
- maximum fluid temperature alarm;
- reverse phase relay;
- compressor, pump, fan(s) motor protection alarm;
- high compressor outlet temperature;
- laser source branch temperature accuracy;
- low optics branch flow rate.



#### INTEGRATED WEB SERVER



#### ELECTRICAL PANEL

The electrical control panel is manufactured in accordance with EN 60204-1. It is equipped with a main disconnect switch with door lock disconnecter that prevents the user access when the control panel is powered.

It includes:

- compressor thermomagnetic protection;
  - fan thermomagnetic protection;
  - pumps thermomagnetic protection (both laser source and optic lines);
  - electronic microprocessor controller to control and manage the unit, equipped with communication port RS485 or Ethernet with an integrated web server;
  - correct phase sequence rotation device (it prevents the reverse rotation of the motors);
  - transformer for the auxiliary voltage necessary to power supply the electronic controller and to manage all thermal loads;
  - the external cables and the internal wires are identified to facilitate the use and service.
- In the terminal strip a remote ON/OFF operation and a general alarm contact are available.

# FRIULAIR

## Chillers



# QBE TOTEM

CHILLERS from 12 to 50 kW

with double hydraulic circuit

for cooling laser machines



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# QBE TOTEM

## OVERVIEW

The QBE TOTEM serie is specifically designed to meet the application requirements of the laser applications by offering a precise control of the chilled water temperature during long operational periods with different thermal load requirements. It is equipped with two pumps for two different users at different temperatures (water source to cool the laser source and water source to cool the optics).

The refrigeration circuit is designed to meet a fine regulation of the outlet water temperature ( $\pm 0.5$  K), made with an electronic hot gas bypass valve able to manage widely variable thermal load trends and providing a constant temperature of the chilled water (source side).

The water temperature dedicated to the optics cooling is managed by a 3-way valve that guarantees a precise control of the outlet water temperature with a tolerance of  $\pm 1$  K.

QBE TOTEM series units have been designed with the smallest footprint possible and are equipped with wheels for an easy positioning. The hydraulic connections are located below in the rear side and are equipped with shut-off valves.

The frame and the cabinet cover material is powder coated steel. All fasteners are either made of stainless steel or electro-galvanized. The unit has been designed so that all parts, particularly those requiring maintenance and cleaning, are easy to access and assure a safety environment for the operator.

Each QBE TOTEM unit provides the user with a digital input for remote on/off, a digital output for remote signalling of the general alarm, an Ethernet port with an integrated web server for remote monitoring.

The unit can stay switched on to meet the minimum water temperature required (setpoint) on the source and optical branches in partial/total absence of thermal load depending on the features of the system. The user can switch off the unit with the remote on/off contact or on the display during the partial / total absence of thermal load for energy saving purposes.

Each QBE TOTEM unit is available in two power supplies, 400/3/50 or 460/3/60, depending on the user's network and application requirements.



## REFRIGERATION CIRCUIT

### COMPRESSOR

QBE TOTEM series employs scroll compressors (01). In particular, the scroll compressor represents the highest level of technology on this range. It is well known for its reliability and efficiency through its widespread use in the industrial cooling field. A scroll compressor chiller benefits of quiet operations, no vibration and ability to absorb liquid returns. The compressor is mounted on rubber anti-vibration blocks to reduce noise even further.

### EVAPORATOR

The evaporator (02) is a compact and efficient stainless-steel brazed plates type. The electronic anti-freeze control keeps the evaporator's outlet water temperature under control to prevent icing. A differential pressure switch protects the evaporator against a lack of water flow.

### CONDENSER

The condenser (03) is a microchannel aluminium type which guarantees a greater exchange surface than the traditional copper tube condenser and minimizes the refrigerant charge required (between 30-35 lower than a traditional condenser). The full aluminium structure prevents any risk of galvanic corrosion. Aluminium filters (04) protect the condenser and could be easily removed for service and cleaning.

## HYDRAULIC CIRCUIT

The hydraulic circuit consists on completely non ferrous materials (brass, stainless steel, pvc, EPDM, bronze) and is made up of :

- (08) an atmospheric water tank in PVC with a level sensor and the related visual indicator, along with a drain valve placed in the rear part;
- (09) a pump for hydraulic circuit dedicated to cooling the laser source, equipped with a calibrated water by-pass and a water gauge;
- (10) a pump for hydraulic circuit dedicated to cooling the laser source, equipped with a calibrated water by-pass and a water gauge;
- (11) a 3-way mixing valve with actuator to accurately manage the optics water temperature; allows an accuracy of  $\pm 1$  K on the outlet water temperature;
- (12) a pre-heating resistor installed inside the tank;
- (13) shut-off valves in the hydraulic connections.

The condenser is protected with an epoxy coating, which boasts a high corrosion resistance in aggressive atmospheres.

### FAN(S)

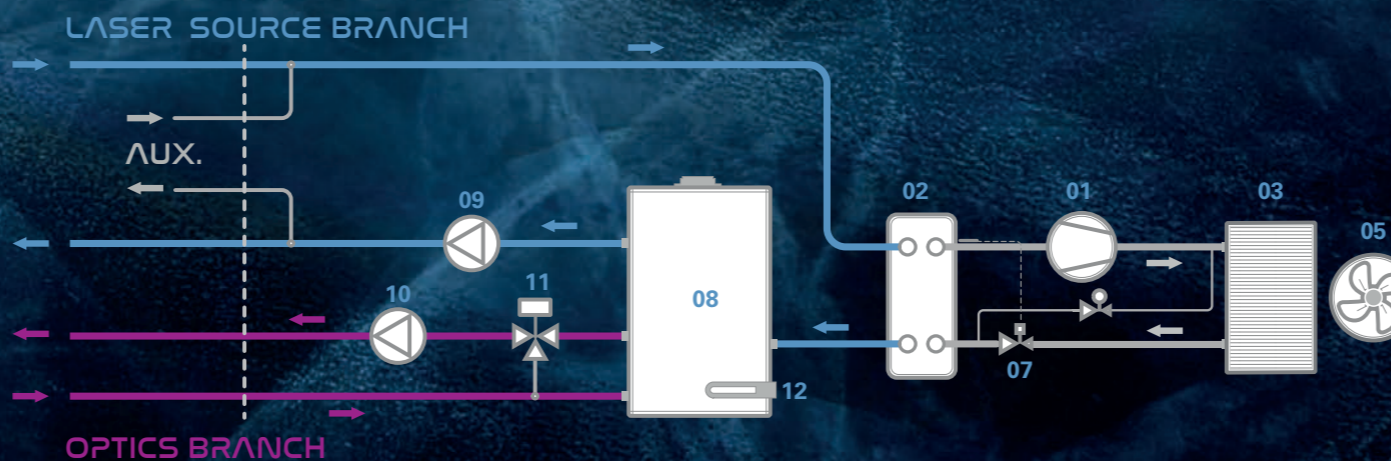
The fans (05) of the QBE TOTEM range are composed of a 4-pole motor and external sickle-shaped blade rotor. They are equipped with a protection grid and internal heat protection with automatic reset. In addition, QBE TOTEM units have a continuous fan speed control system able to satisfy the load demanded by the user while ensuring optimal performances under the required conditions.

### HOT GAS BYPASS VALVE

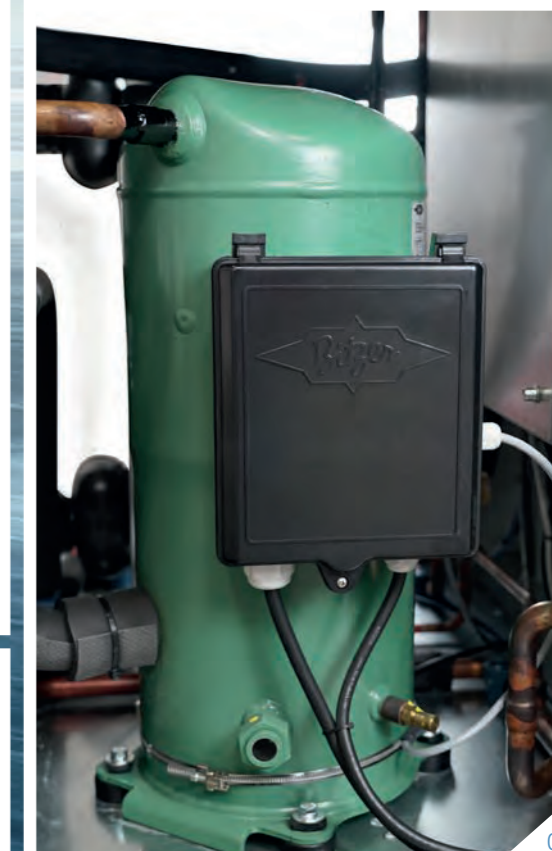
The electronic hot gas bypass (06) valve modulates the machine cooling capacity while ensuring unit constant operation. This valve allows a precise control of the chilled water temperature ( $\pm 0.5$  K) during operation over long periods with varying load requirements.

### THERMOSTATIC EXPANSION VALVE (07)

It modulates the flow of the refrigerant in order to keep constant the superheating of the evaporator outlet gas.



05



01



04



11



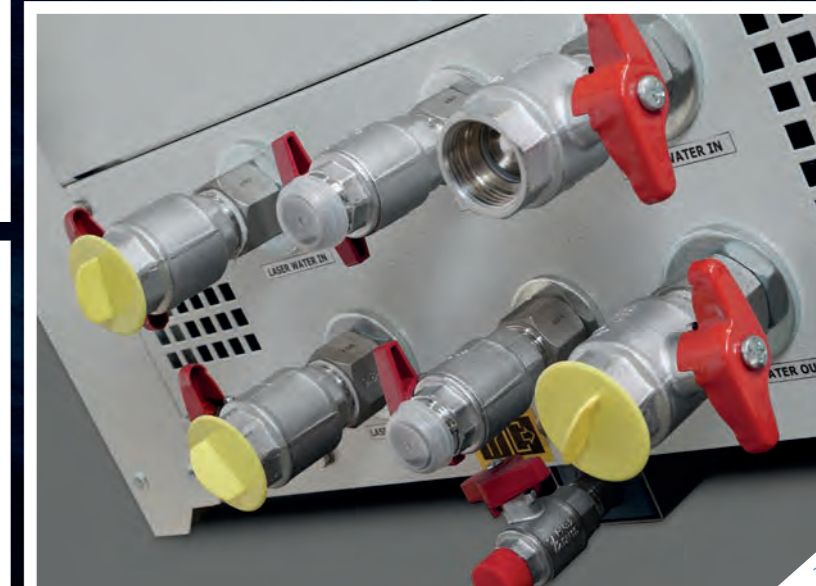
02



06



10



13