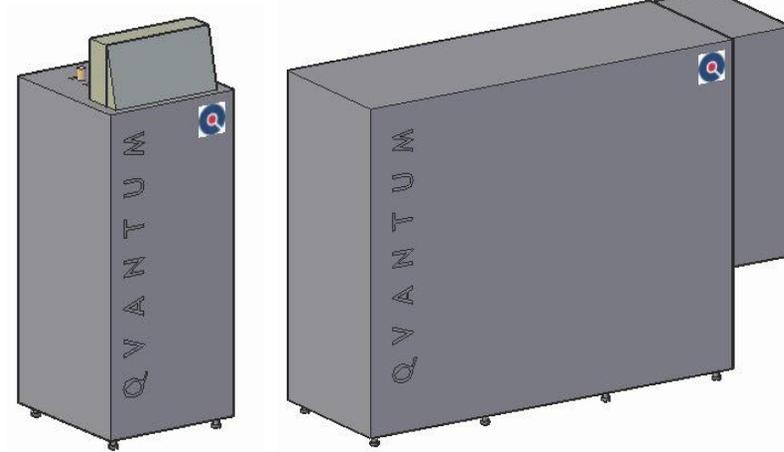




Q V A N T U M

HEAT PUMPS FOR SUSTAINABLE CITIES

Series LB



Air/Water
11 – 165 kW



High efficiency
Simultaneous heat
production & defrosting
Compact design
Flexible installation

Heat pumps for air-based heat sources

Q15-96LB³

Q123-192LB/2

Quantum Series LB – Air/Water heat pumps with simultaneous heat production and defrosting

GENERAL

Quantum Series LB extracts heat from the outdoor air via an outdoor air battery. The heat from the air coil is transferred to the indoor heat pump unit via refrigerant lines, which in turn transfers heat to the heating system. The Quantum Series LB is available in three different versions, LB/3, LB/3 High Power and LB/2 High Power.

SIMULTANEOUS HEAT PRODUCTION AND DEFROSTING

The Quantum LB Series stands out from the competition by not having defrost losses during normal operation. Special technology is used to store free heat that would otherwise not be used. When defrosting needs arise, the stored free heat is used to defrost the air battery. Throughout the defrosting cycle, the heat pump continuously supplies heat to the heating system. The lamellar pitch of the air battery is 4-5 mm. This means that long intervals between defrosts can be allowed.

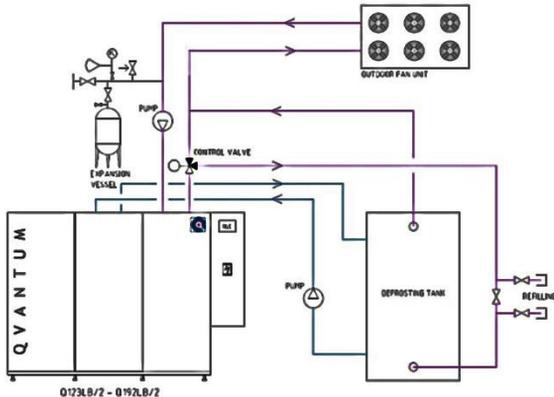


Fig 1. Principal connection between heat pump, defrosting tank and outdoor fan unit (applies to Q123LB/2-Q192LB/2).

PLACEMENT

The outdoor part is placed where it is most appropriate. The standard design of the refrigerant carrier system is dimensioned for a total length of 2 x 25 meters between the indoor heat pump unit and the outdoor air coil. If longer distances are desired, the capacity of the refrigerant pump can be increased. For LB/3 models, the indoor heat pump unit is equipped with a built-in defrosting tank, refrigerant pump and heat carrier pump.

For LB/2 models, the defrosting tank, refrigerant pump and heat carrier pump etc. are intended to be located outside the unit.

QUANTUM QLC-SYSTEM

Quantum Series LB is equipped with the Quantum QLC control system as standard. QLC stands for Quantum Logic Controller. The unit is controlled and operated via the principal of liquid condensation or solid/half solid condensation. All control parameters such as outdoor temperature compensated set-point curve for supply, hot water temperature, auxiliary heat is set via the self-instructing control system. Required operation, protection and safety functions are available in QLC control systems.

The system is managed via a 5,7" panel mounted in the heat pump. All parameters can be set via the panel. The panel displays a dynamic flow diagram with all temperatures and operating modes measured and controlled. The QLC system also logs temperatures and events, facilitating set-up and analysis. The system communicates via Modbus. Modbus TCP is standard. The system has a web server which allows the QLC system to communicate with a web browser on a PC or smartphone (app may be needed).

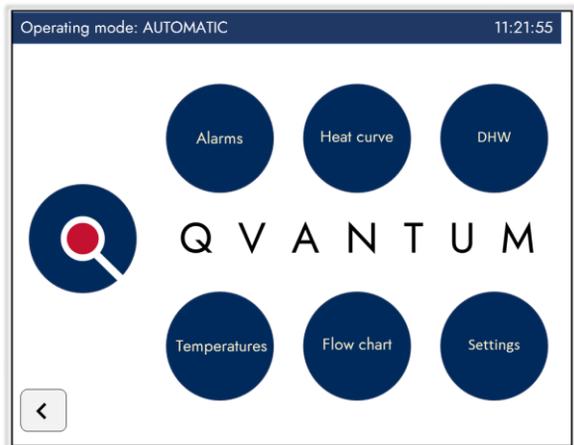


Fig 2. 5,7" panel display.

As an option, the unit can be equipped with an extended display that allows for dynamic flow images and extended network functionality.

The temperature to the heating system is controlled according to the selected outdoor temperature compensated curve. Hot water preparation, if such a function is required, takes place via a switching valve that momentarily raises the temperature in the water heater to the set point as a priority.

In bivalent systems, the control system switches on additional heat when needed and after a time delay. The auxiliary heat can be chosen to "take over" the hot water preparation as a first step and thus release power from the heat pump to the heating system.

The Quantum control system can control up to 8 heat pumps in sequence with automatic operating time equalization between the different heat pumps. The control system is configured at commissioning depending on the selected system solution and the type and number of heat pumps.

The heat pump/control system can be configured for control via a higher-level external control system if required. Set points can be changed via Modbus so that the controller's regulators are set by the master controller. It is also possible to configure the system so that the heat pump is fully controlled by the master system. In this case, the heat pump control system is used only for alarm and protection functions.

E.g., Temperatures readable via Modbus *)

- 1: Heat pump heat carrier - in
- 2: Heat pump heat carrier - out
- 3: Heat pump hot gas temperature
- 4: Heat pump secondary refrigerant - in
- 5: Heat pump secondary refrigerant - out
- 6: Radiator circuit supply
- 7: Outdoor Temperature
- 8: Defrosting tank temperature (LB series)

*) Modbus description for complete information

All relay outputs are also readable. It is thus possible to transmit the operating status of compressors, pumps, fans, etc. controlled by the heat pump.

Set points for hot water temperature and control curve for radiator circuit can be read and adjusted. From the expansion valve control unit, the current evaporating temperature, pressure, overheating, the degree of opening of the expansion valve can be monitored via Modbus.

ELECTRONIC EXPANSION VALVE

Quantum Series LB heat pumps are equipped with an electronic expansion valve. The expansion valve has its own electronic control unit with display that shows evaporating pressure, temperature, superheat, etc. Via Modbus these variables can be transferred to a higher-level control system.

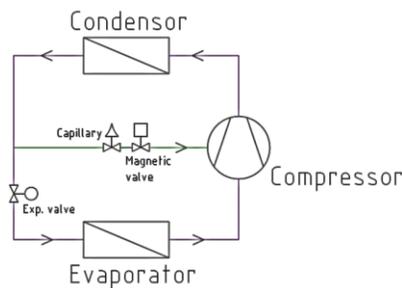


Fig 3. Principal layout showing the refrigerant circuit.

REFRIGERANT

All Quantum Serie LB heat pumps has R-407C refrigerant. See also separate document "Quantum LB – Technical data" for more information.

BRINE CIRCUIT

Quantum Series LB/2 has pipes filled with a mixture of water and antifreeze between the outdoor air battery and the compressor unit/defrosting tank. In most cases, water + ethylene glycol (45%) is used, but a mixture of water and methanol can also be used. Ethanol and propylene glycol cannot be used as anti-freeze agents.

PIPE CONNECTIONS

Q15LB/3 - Q96LB/3 has top connections. See drawings Q-LB3-15-25-001, Q-LB3-32-48-001 and Q-LB3-65-96-001.

Q123LB/2 - Q192LB/2 has back side connections for evaporator and condenser but top connections for the defrosting circuit. See drawings Q-LB2-123-144-001 and Q-LB2-162-192-001.

CONSTRUCTION

The unit is built on a robust stand of galvanized square tubes and covered with an effective sound-absorbing casing, consisting of powder-coated plates with sound-absorbing material inside. The top plate is made of patterned aluminum. The top and bottom are also covered with sound-absorbing material. The stand rests on 4 adjustable rubber feet. All electrical connections are located on the top and directed upwards.

ACCESS

The unit is constructed so that all components inside the heat pump are easily available by removing the cover plates, both for maintenance and replacement.

OPTIONS

The following options are available:

- Larger model of refrigerant pump due to increased distance between heat pump unit and air coil.
- Connecting QLC to network.
- Electrical cabinet mounted on the left side of the unit, seen from the front (applies to Q123LB/2 - Q192LB/2).

EQUIPMENT

Compressor:

All LB units are equipped with fully hermetic scroll compressors, 3-phase 400V.

Q15LBe to Q48LBe are equipped with 1 compressor.

Q65LBe to Q96LBe are equipped with 2 compressors.

Q123LB/2 and Q144LB/2 are equipped with 3 compressors.

Q162LB/2 and Q192LB/2 are equipped with 4 compressors.

Cooling circuit

All LB units are equipped with a L.I.P. (Liquid Injection Power) to the compressor.

Q15LBe to Q96L/3 are equipped with 1 cooling circuit.

Q123LB/2 and Q144LB/2 are equipped with 1 compressor.

Q162LB/2 and Q192LB/2 are equipped with 2 compressors.

Heat exchanger LB/3

- The evaporator is a stainless steel, brazed heat exchanger, insulated with Armaflex insulation.
- The condenser is a stainless steel, brazed heat exchanger.

Heat exchanger LB/2

- The evaporator is a stainless steel, brazed heat exchanger, insulated with Armaflex insulation.
- The condenser is a stainless steel, brazed heat exchanger.
- The subcooler is a stainless steel, brazed plate heat exchanger, insulated with Armaflex insulation.

Defrosting tank LB/3

- Built-in welded steel tank, insulated with Armaflex insulation
- Working pressure max 3.0 Bar.

Defrosting tank LB/2

- External welded steel tank, insulated with Armaflex insulation
- Working pressure max 3.0 Bar.

Heat transfer and refrigerant pump LB/3

- Internal installation.

Heat transfer and refrigerant pump LB/2

- External installation.

Control valve LB/3

- Control valve for heat carrier, internal mounting.
- Control valve for refrigerant, internal mounting.

Control valve LB/2

- Control valve for heat carrier, external mounting.
- Control valve for refrigerant, external mounting.

Refrigerant circuit LB/3

- Drying filter
- Sight glass with moisture indicator
- Solenoid valve with liquid injection power equipment
- Electronic expansion valve
- Pressure/temperature sensor
- Control equipment with display (Modbus) for the main circuit
- Pressure transmitter
- High- and low-pressure switch, manual reset
- Service valves for refrigerant pressure measurement (4 in total, valid for Q15LB/3 to Q48LB/3)
- Service valves for pressure measurement (3 in total, valid for Q65LB/3 to Q96LB/3)
- Rotalock valves
- Pressure protection equipment, high and low pressure

Refrigerant circuit LB/2

- Drying filter
- Sight glass with moisture indicator
- Solenoid valve with liquid injection power equipment, one per Cooling circuit
- Electronic expansion valve
- Pressure/temperature sensor
- Control equipment with display (Modbus) for the main circuit
- Pressure transmitter
- High- and low-pressure switch, manual reset
- Service valves for pressure measurement of refrigerant pressure
- Rotalock valves
- Pressure protection equipment, high and low pressure

TESTING

The units are quality tested and adjusted at the factory under dimensioning conditions using ClimaCheck.

TECHNICAL DATA

See separate document "Quantum LB – Technical data" for more information.



Solution and Heat Pump Experts

Quantum was founded 1993 with a vision to develop innovative high quality heat pumps. Today Quantum continues on this path developing the solutions needed for decarbonization of our cities.

Quantum is also a company with leading experts in the design of the next generation (5th) district heating and cooling solutions for dense urban areas.

By combining these competence areas, Quantum can provide solutions that will make it easier for Engineering consultants, Installers, Project developers and Utilities, to decarbonize the heating and cooling of our cities.



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