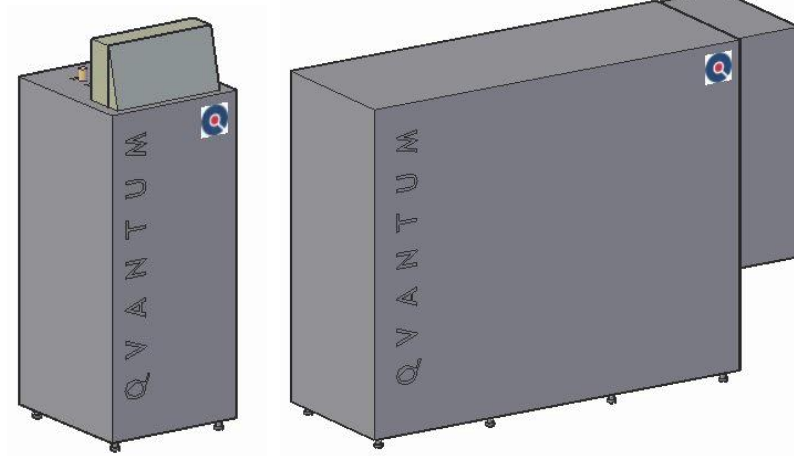




Q V A N T U M

HEAT PUMPS FOR SUSTAINABLE CITIES

Series R



Water/Water
15 – 192 kW



High efficiency
Economizer
Compact design
Flexible installation

Heat pumps for liquid-based heat sources

Q15-96RK/2

Q15-96RS/2

Q123-192RS/2

Quantum Series R – Heat pumps with Economizer

GENERAL

Quantum Series R is available in two different versions, RS/2 and RK/2.

RS/2 is intended for use in systems where the refrigerant consists of water or a mixture of water and antifreeze (e.g., horizontal, and vertical ground source, sea water systems, exhaust air system).

RK/2 is intended for use in refrigerant systems where antifreeze is not used.

RS/2 is equipped with an evaporator in the form of a plate heat exchanger.

Unlike RS/2, RK/2 is equipped with an evaporator in the form of a coaxial heat exchanger. The coaxial heat exchanger is available in different material designs depending on the quality of the circulating liquid.

V.I.P. (VAPOR INJECTION POWER) AND ECONOMIZER

Quantum Series R heat pumps are of the type vapor injection where the compression phase is divided into two parts.

In step 1, refrigerant gas from the evaporator is sucked in the same way as in a normal cooling circuit.

In step 2, the gas compressed in step 1 is supplemented with new cold gas from the economizer (sub cooler).

This means that the generated heat output capacity increases at the same time as the coefficient of performance, COP, also increases. The gas temperature is lowered during the compression process, which means that a higher supply temperature can be achieved.

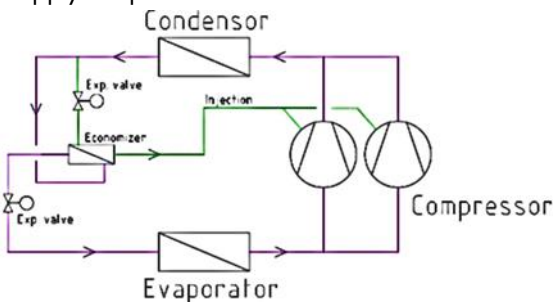


Figure 1. Principal layout showing the refrigerant circuit

The unit can deliver up to 65 °C supply temperature.

Thus, V.I.P. via economizer results in:

- higher supply temperature can be achieved
- the heat capacity increases by higher supply temperature
- increased efficiency and COP are obtained

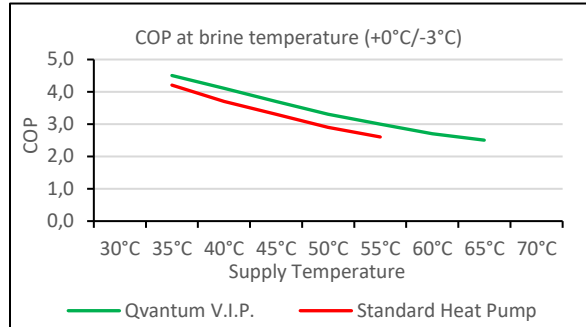


Figure 2. Change in heat factor as a function of flow temperature, at brine +0 °C/-3 °C. Refers to Quantum RS/2.

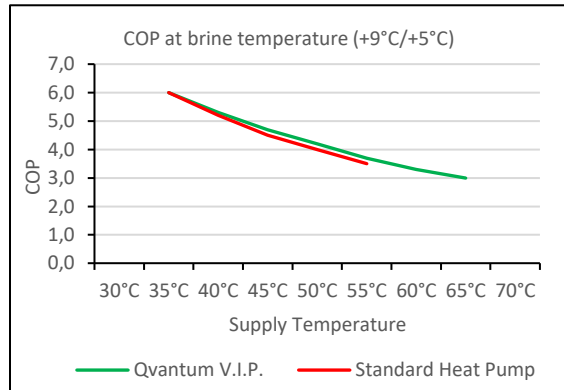


Figure 3. Change in heat factor as a function of flow temperature, at brine +9 °C/+5 °C. Refers to Quantum RK/2.

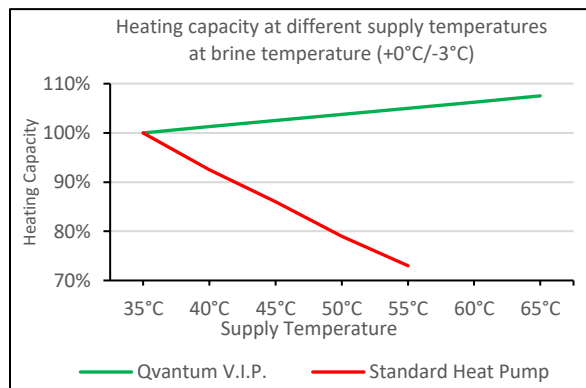


Figure 4. Change in heat output as a function of flow temperature, at brine +0 °C/-3 °C. Refers to Quantum RS/2.

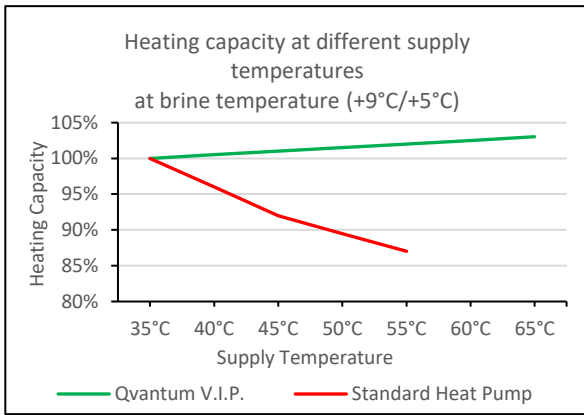


Figure 5. Change in heat output as a function of flow temperature, at brine +9 °C/+5 °C. Refers to Quantum RK/2.

QVANTUM QLC CONTROL SYSTEM

Quantum Series R 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, and auxiliary heat, are set via the self-instructing control system. Required protection and safety features are built into the QLC control system.

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 chart panel with all temperatures and operating modes measured and controlled. The QLC system also logs temperatures and events, which facilitates setup and analysis. The system communicates via Modbus. Modbus TCP is standard. The system also has a webserver which allows the QLC system to communicate with a web browser on a PC or smartphone (app may be needed).

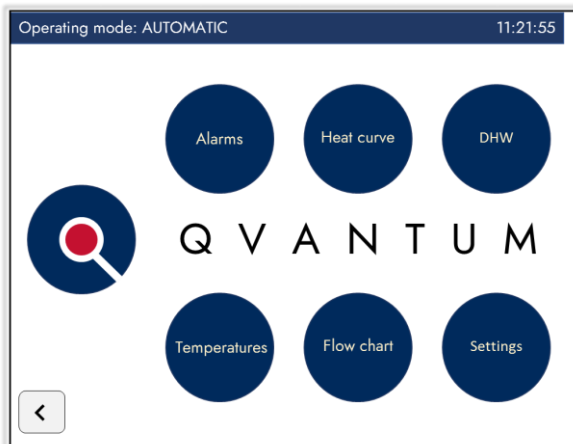


Fig 6. 5,7" panel display.

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 necessary and after a time delay. The auxiliary heat can be selected to "take over" the hot water preparation as the first step and thereby 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 type and number of heat pumps.

The heat pump/control system can be configured for control via an overlaying 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 brine - in
- 5: Heat pump brine - out
- 6: Radiator circuit supply
- 7: Outdoor temperature
- 8: Defrosting tank temperature (Series LB)

*) See Modbus description for complete information

All relay outputs are also readable. You can thus transfer the operating status of compressors, pumps, fans, etc. which are controlled via 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 RS/2 heat pumps are equipped with two electronic expansion valves. A valve for the evaporator circuit and a valve for the economizer circuit.

The expansion valves have their own electronic control unit with display that shows evaporation pressure, temperature, overheating etc. for the two circuits. Via Modbus, these variables can be transferred to an overlaying control system.

REFRIGERANT

All Quantum Serie R heat pumps has R-407C refrigerant. See also separate documents "Quantum RS2 – Technical data" and "Quantum RK2 – Technical data" for more information.

BRINE CIRCUIT

Quantum Series R are as standard configured for water. As an option, however, the unit can be configured for brine with antifreeze, e.g. bioethanol.

PIPE CONNECTIONS

Q15RK/2-Q41RK/2 has top connections while Q48RK/2 has top and back side connections, see drawings Q-RK2-15-48-001.

Q65RK/2 has top connections while Q81RK/2 and Q96RK/2 has top and back side connections, see drawings Q-RK2-65-96-001.

Q15RS/2-Q41RS/2 has top connections while Q48RS/2 has back side connections, see drawings Q-RS2-15-48-001.

Q65RS/2-Q96RS/2 has back side connections, see drawing Q-RS2-65-96-001.

Top connection is optional for Q65RS/2 and Q81RS/2, see drawing Q-RS2-65-96-001.

Q123RS/2-Q192RS/2 has back side connections, see drawings Q-RS2-123-144-001 and Q-RS2-162-192-001.

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 on the inside. The top plate is made of patterned aluminum. The top and bottom are also covered with sound-absorbing material. The stand rests on adjustable rubber feet.

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:

- Bioethanol as refrigerant.
- Connecting QLC to network.
- Electrical cabinet mounted on the left side of the unit, seen from the front (applies to Q123RS/2 - Q192RS/2).

EQUIPMENT

The units are equipped with a fully hermetic EVI scroll compressor, 3-phase 400V.

Heat exchanger Quantum RS

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

Heat exchanger Quantum RK

- The evaporator is a coaxial heat exchanger in copper, insulated with Armaflex insulation. The evaporator is also available in copper/nickel as an option.
- The condenser is a fully soldered plate heat exchanger in stainless steel.
- Economizer is a fully soldered plate heat exchanger in stainless steel.

Refrigerant circuit Quantum RS

- Drying filter
- Sight glass with moisture indication
- Electronic expansion valve, pressure transmitter, control equipment with display (Modbus) for the main circuit
- Electronic expansion valve for economizer/subcooler circuit (Modbus)
- High- and low-pressure switch, manual reset
- Service valves for pressure measurement
- Rotalock valves
- Pressure protection equipment, high- and low-pressure

EQUIPMENT CONT...

Refrigerant circuit Quantum RK (equipment per refrigerant circuit, Q15-48RK/2 = one circuit, Q65-Q96RK/2 = two circuits)

- Drying filter
- Sight glass with moisture indication
- Electronic expansion valve, pressure transmitter, control equipment with display (Modbus) for the main circuit
- Electronic expansion valve for economizer/subcooler circuit (Modbus)
- High- and low-pressure switch, manual reset
- Service valves for pressure measurement
- 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 documents "Quantum RS2 – Technical data" and "Quantum RK2 – 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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