MITSUBISHI ELECTRIC
HYDRONICS & IT COOLING SYSTEMS S.p.A.

RC Data Book
FR-FC-Z 1502 - 6002_201707_EN HFC R134a
ELCA_Engine ver.3.8.2.3

COOLING
FREE C.

FR-FC-Z 1502 - 6002

332-1450 kW

Air cooled chiller with free-cooling

HFC R134a
SCREW
SHELL&T.
GREEN CERTIFICATION RELEVANT

(The photo of the unit is indicative and may vary depending on the model)

- ENERGY SAVING
- POSITIVE TEMPERATURE OF TOTAL FREE-COOLING
- WIDE RANGE
- UNIQUE PROPOSAL - PATENT PENDING
- INTEGRATED HYDRONIC GROUP

CERTIFICATIONS

Product certifications

System certifications

MITSUBISHI ELECTRIC HYDRONICS & IT COOLING SYSTEMS S.p.A.

Quality System complying with the requirements of UNI EN ISO 9001:2008 regulation
Environmental Management System complying with the requirements of UNI EN ISO 14001:2004 regulation
Occupational Health and Safety Management System complying with the requirements of BS OHSAS 18001:2007

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The units highlighted in this publication contain HFC R134a [GWP_{100} 1430] fluorinated greenhouse gases.

LEGEND

Functions

Cooling

Free cooling

Refrigerant

R-134a

Compressors

Screw compressor

Fan

Axial fan

Exchangers

Shell & Tubes

Other features

GREEN Certification relevant

GREEN CERTIFICATION RELEVANT

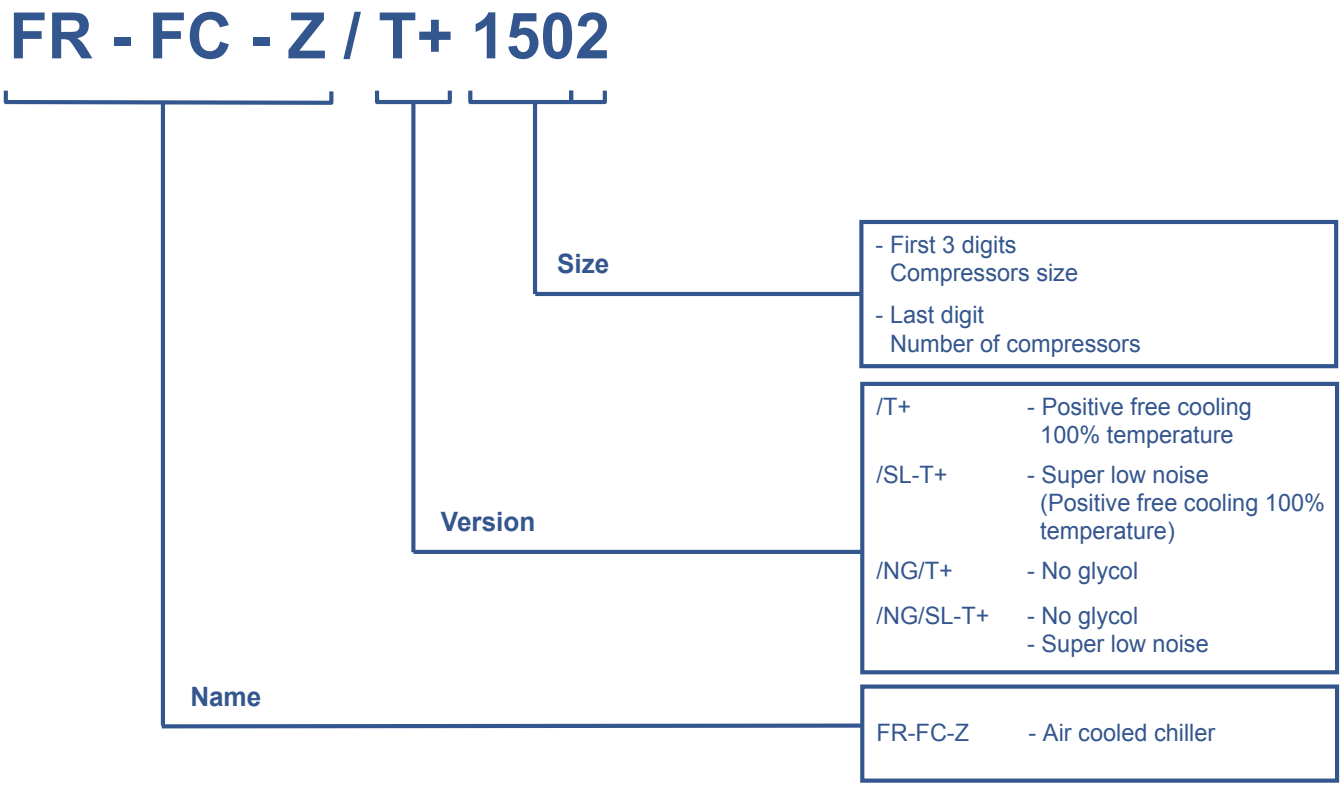
Mitsubishi Electric Hydronics & IT Cooling Systems S.p.A., as a major player in the world HVAC market and a leading manufacturer of energy efficient, sustainable HVAC solutions, recognizes and supports the diffusion of green certification systems, as an effective way to deliver high performance buildings and improve the quality and the sustainability of the built environment.

Since the first certification system was introduced at the beginning of the 1990s, the demand for certified buildings has grown considerably, as well as the number of standards, rating and certification programs. Operating worldwide Mitsubishi Electric Hydronics & IT Cooling Systems S.p.A., has extensive experience with many of them and is active member of Green Building Council Italy.

Mitsubishi Electric Hydronics & IT Cooling Systems S.p.A., commitment to develop responsible and sustainable HVAC solutions, is reflected by a full range of premium efficiency products and systems, designed with special care to improve building energy performance ratings, according to major certification protocols, including LEED, BREAM, GREENSTAR, BCA, NABERS, DNGB, HQE and BEAM.

To find out more about how our products contribute to enhanced green certification rating and energy performance of a building, please refer to:
https://www.melcohit.com/GLOBAL/Company/Green-Certifications/QR%20code/

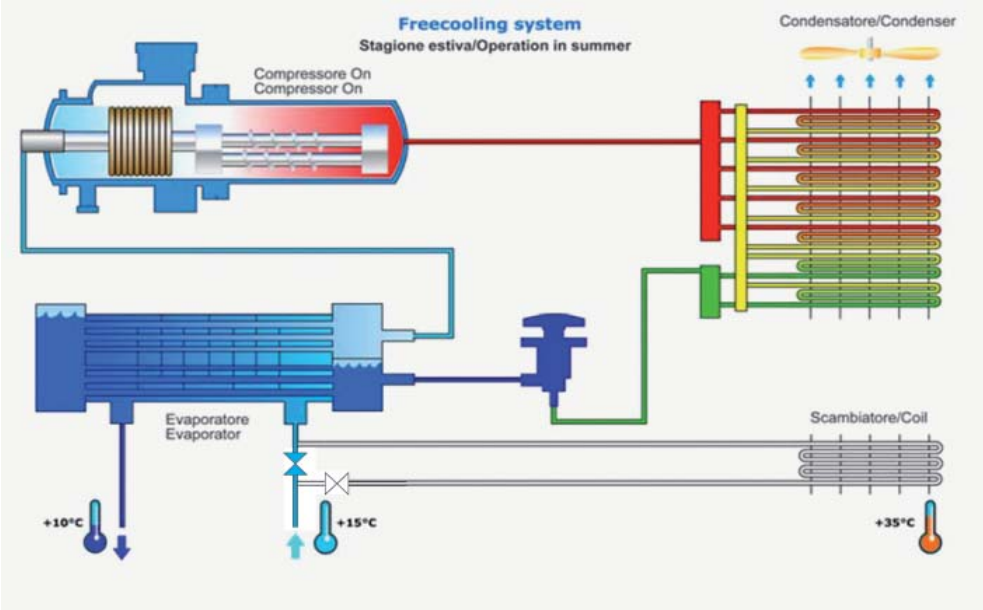
INCIPIT


FR - FC - Z / T+ 1502
Size
- First 3 digits
Compressors size
- Last digit
Number of compressors
Version
/T+ - Positive free cooling 100% temperature
/SL-T+ - Super low noise (Positive free cooling 100% temperature)
/NG/T+ - No glycol
/NG/SL-T+ - No glycol - Super low noise
Name
FR-FC-Z - Air cooled chiller

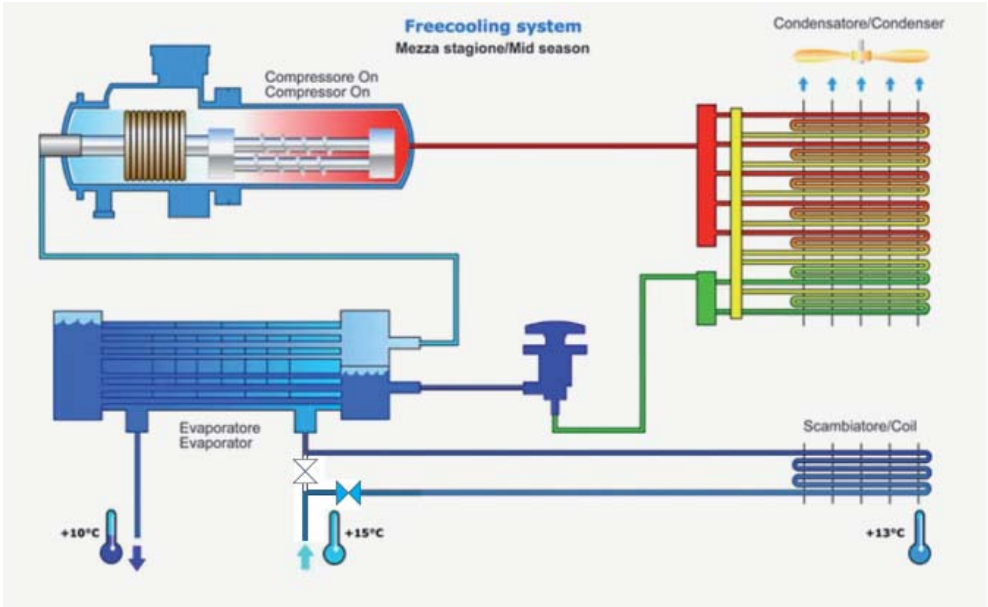
FREE-COOLING SYSTEM REPRESENT

The use of the free-cooling unit becomes a compulsory choice whenever load demands are practically constant, and equal to the nominal power of the unit, all year round.
The benefit gained from the use of this unit is much higher the higher the temperature difference between chilled water temperature desired and the outdoor air temperature.
There are many uses for this unit for both civil and for industrial processes. For example: shopping centres, data elaboration rooms, the plastics industry , the food industry and industrial processes in general.
When the outdoor air temperature is lower than the water temperature at the unit entrance by at least 1°C, the free-cooling system is activated. This unit requires the use of glycol-water or other similar solutions to prevent the formation of ice in the water coil during the exchange with outdoor air at a low temperature.
There are three typical use methods:

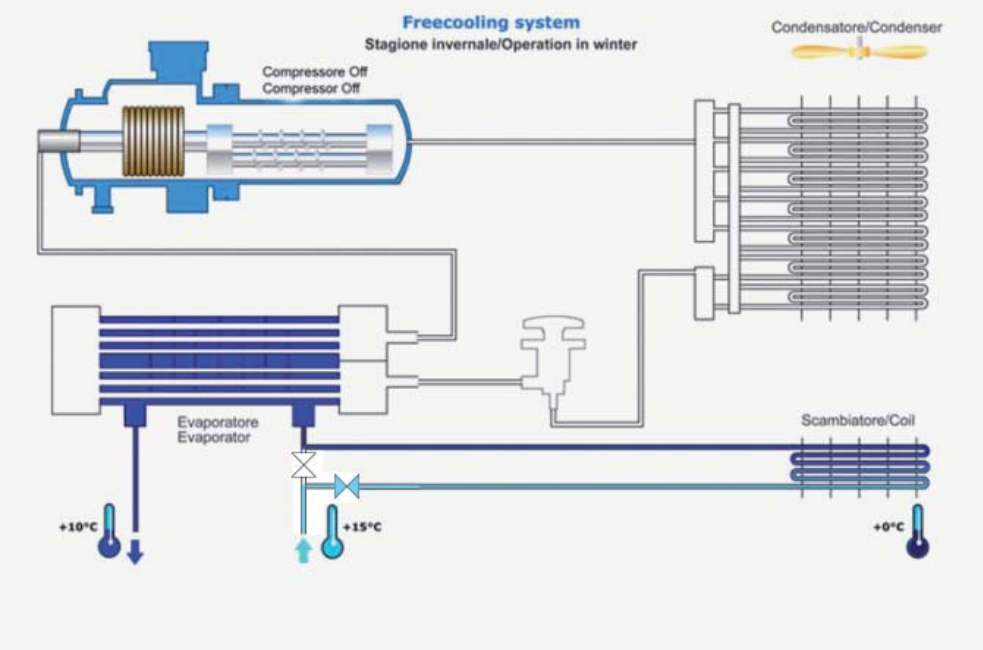
Summer Season
The water is completely chilled by the compressors during the normal chilling cycle.
The water coil is completely off.



Mid-Season
The water is partly chilled by the water coil thanks to the action of the outdoor air and partly chilled by the compressors.
The percentage of precooling obtained by freecooling system activity depends on the outdoor air temperature A threeway valve is used to involve the water coils.
This phase is very important: the freecooling unit makes optimum use of all resources available in order to optimize electrical power consumption.



Winter Season
The water is chilled only by the water coil because the outdoor air temperature is already low enough.
In this type of chilling, the only power consumed is for the fans.



1.5 The advantage of FR-FC-Z: elevated energy efficiency in all operating modes

Thanks to their advanced design and the innovative patent-pending solutions, the FR-FC-Z chillers with free-cooling optimise efficiency in each of the three operating modes:

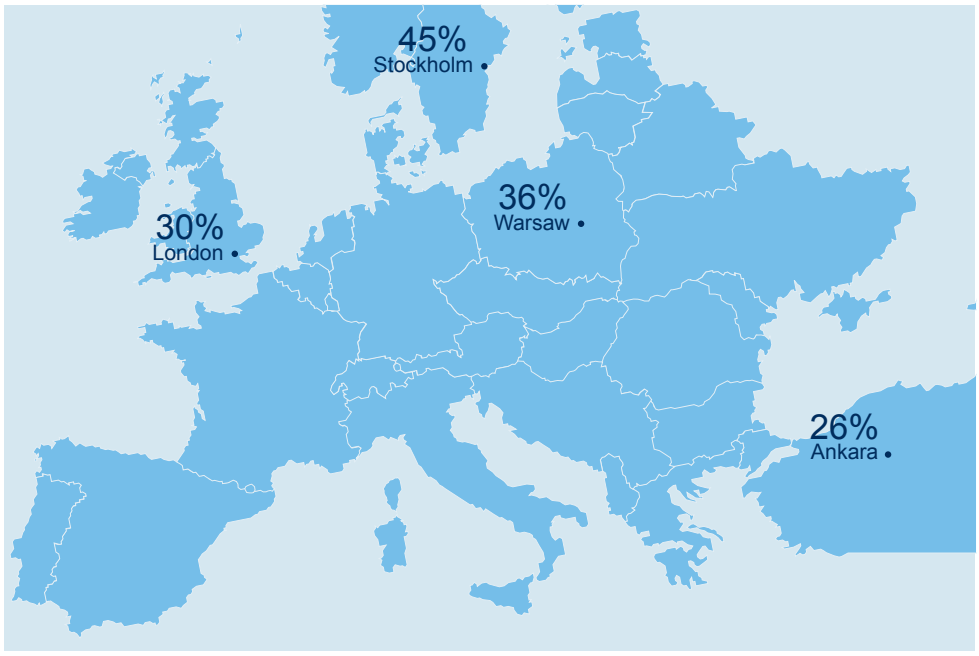
Summer Season
The innovative BOOSTER, a patented device, increases the efficiency of the unit in the chiller mode, thus guaranteeing unprecedented EER values (@15/10°C, EG30%, Taria 35°C, EER=3.2).

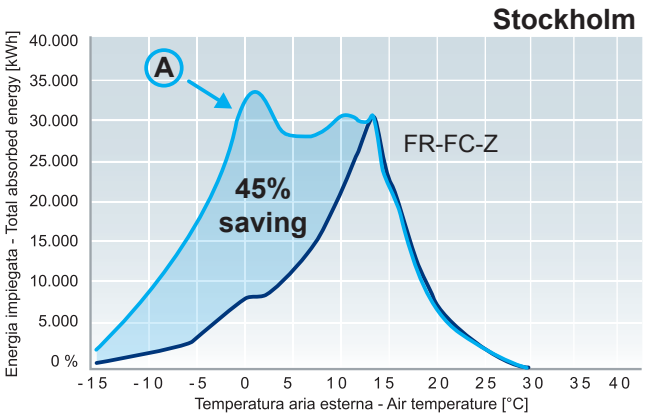
Mid Season
- the activation of free-cooling at an external temperature of 1°C lower than the temperature of the system return water
- the cooling setpoint variation management
- the ventilation control logic combined with independent condensation circuit ventilation help maximise the effect of direct free-cooling.

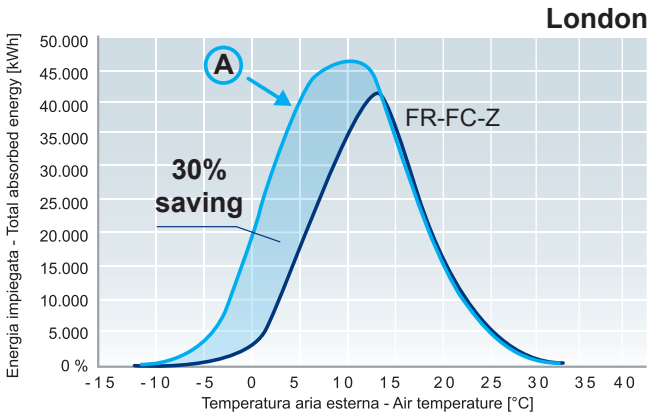
Winter Season
The generously sized free-cooling exchange surfaces already achieves total free-cooling at positive external air temperatures: the entire FR-FC-Z range is available in theT+ configuration, 100% positive free-cooling temperature and equal to 2°C for the standard version. (CC @15/10°C, EG30%, Taria 35°C)
This design choice increases the number of annual unit operating hours in the full free-cooling mode, thus assuring higher energy saving.

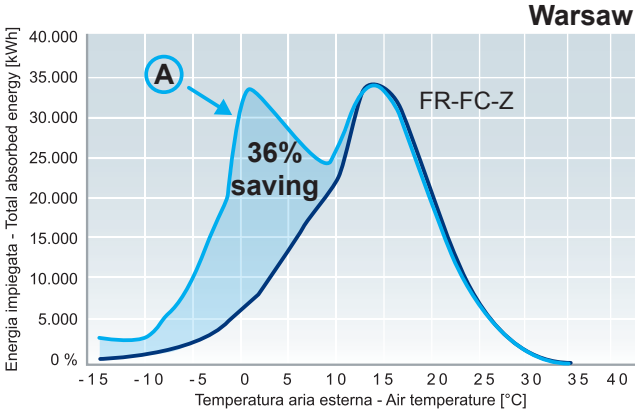
The result of these innovations, some of which are patented, is an FR-FC-Z range that is positioned as an elevated energy-saving product, in both the standardT+ version and the super low noise SL-T+ version.
The FR-FC-Z series offers an average saving of 35% compared with the energy used by similar last-generation chillers.

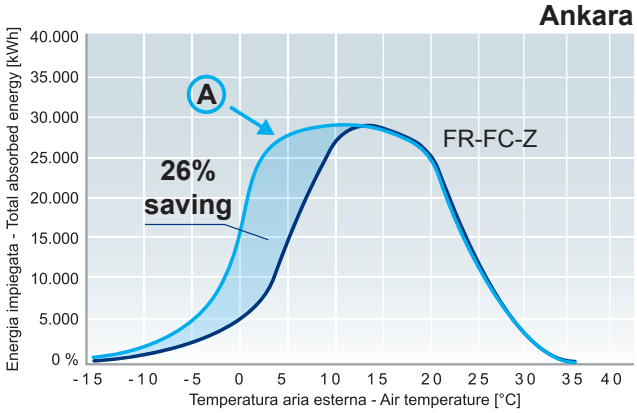
Why use the free-cooling system?
We compared the performance of an air cooled fixed speed screw compressor chiller unit with a FR-FC-Z/T+ unit in 4 different European cities.
The units being compared were both used under the following conditions: Evaporator water temperature 15/10°C, with 30% ethylene glycol solution. The latitude, type of climate, temperature distribution in hours/year determine the advantages of the freecooling unit and the percentage of energy saved.











A Air cooled fixed speed screw compressor chiller

Maximum capacity of adaptation
The adjustments that can be activated for all the FR-FC-Z units can support the various applications.
They set out to improve load adaptability , reduce the number of on and of f sequences and maintain a constant evaporator outlet temperature.

Adjustments
The unit leaves the factory set to outlet modulating adjustment with PID (derivative integral proportional) logic on the evaporator outlet temperature; these adjustments, combined with continuous compressor adjustment (minimum compressor separation operation 50%), maintain the outlet water temperature stable and reduce the number of compressor on/off sequences.
Traditional inlet step adjustment, however, can always be selected from the parameter.

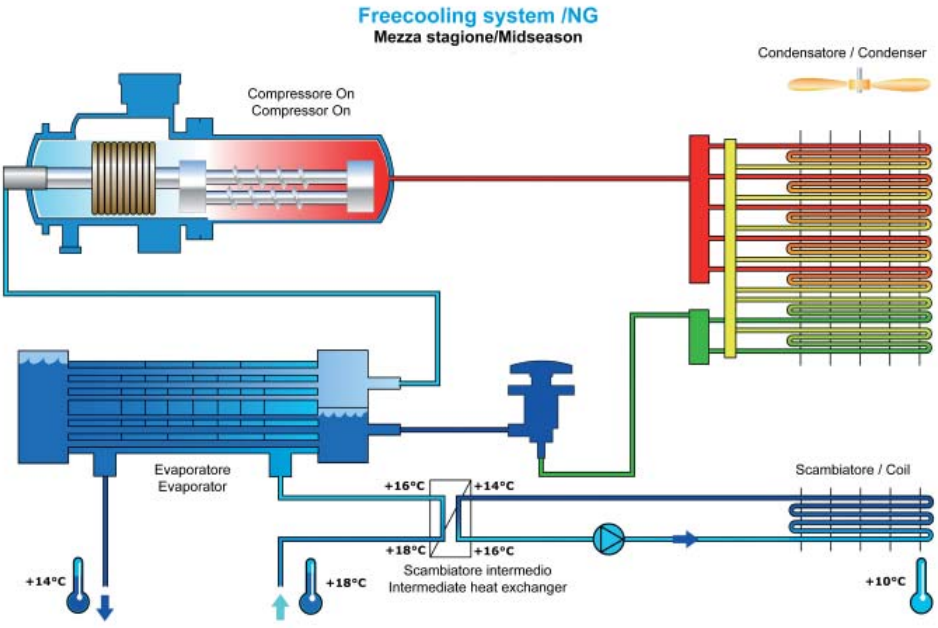
The capacity of adaptation is also the outcome of attentive compressor management combined with precise free-cooling valve activation logic.

Modulating free-cooling valve option
The modulating free-cooling valves (optional) on the water side offer improved outlet temperature control also at low external air temperatures.
When the unit works entirely in the free-cooling mode with very low external temperatures, it is important to guarantee the required temperature of the chilled water This is achieved by suitable mixing which is performed by appropriate modulating valves.

EC fan option
The EC (Electronically Commutated) fans feature motor ef ficiency levels in excess of 90% (EFF-1 classi fication according to European regulation CEMEP/EU).
The elevated ef ficiency assured by the DC brushless motor further increases unit performance in all operating modes: Depending on the ambient air temperature, the increase in EER generated by the EC fans can range from a few percent up to as much as 40%.

Further advantages of the EC fans are the low starting currents and the low noise emissions.

NoGlycol model
FR-FC-Z in the NoGlycol con figuration is a unit that is suitable for all applications where ethylene glycol or other anti-freeze mixtures cannot be used in the system.
Thanks to an intermediate hydraulic circuit, integrated inside the unit, the hydraulic circuit can be isolated from the system, loaded with water, from the Free Cooling circuit which uses glycol solutions to prevent ice from forming in the external coil.
Apart from this, the unit has the same characteristics as those described above.



Outdoor unit for the production of chilled water, equipped with semi-hermetic screw compressors, R134a refrigerant, axial-fans, condensing coil with copper tubes and aluminum fins, shell and tube evaporator single pass and electronic expansion valve. Base, supporting structure and panels are of galvanized epoxy powder coated steel. The unit is supplied with anti-freeze oil and refrigerant and has been factory tested. On-site installation therefore just involves making connections to the mains power and water supplies.
The booster, a patent pending solution, allows to achieve high mechanical cooling efficiency.
These chillers, fitted with free-cooling coils, are used in IT-cooling, industrial and civil applications, when the cooling load is constant all-year-round or the outdoor air temperature is lower than the temperature of the liquid return line. In free cooling mode, the liquid is cooled by outdoor air, thus lowering the load of the compressors until it is reduced to zero; this occurs already at positive outdoor temperature (T+ versions and SL-T+).
The NG configuration complies with applications where it is not allowed or desired the use of ethylene glycol.

1.3 ENERGY SAVING
Energy saving guaranteed by free-cooling, which exploits the low external air temperatures; free-cooling control with optional modulating valve.

1.4 POSITIVE TEMPERATURE OF TOTAL FREE-COOLING
Big heat exchangers surfaces: 100% free-cooling cooling load satisfied at positive environment temperature

1.5 WIDE RANGE
Extended capacity range.

1.6 UNIQUE PROPOSAL - PATENT PENDING
Booster function to increase chiller efficiency

1.7 INTEGRATED HYDRONIC GROUP
The built-in hydronic group (optional) includes the main water circuit components. The 2 pumps are in twin configuration and available with 2 or 4-pole motor, fixed or variable speed, high or low head to satisfy all the different industrial and comfort application requirements.

2.2 Air cooled chiller with free-cooling
Outdoor unit for the production of chilled water with semi-hermetic screw compressors optimized for R134a, axial-flow fans, condensing coil with copper tubes and aluminium fins, shell and tube evaporator and electronic expansion valve. Chiller characterized by high efficiency ensured by booster patent pending solution.
Base and supporting structure and panels are of galvanized epoxy powder coated steel with increased thickness.

2.3 Installation note
The unit is supplied fully refrigerant charged and factory tested. On site installation only requires power and hydraulic connection.

2.4 Structure
Base and frame in galvanized steel. The supporting frame are polyester-painted for the highest resitance to external factors: surfaces´ hue and brightness are preserved. In silenced versions, pipes and compressors´ box are covered with an acoustic layer to reduce global noise emissions.

2.5 Refrigerant circuit
Unit designed with separate and independent refrigerant circuits in order to ensure continuous operation and easy maintenance. In addition to the main components described in the following sections, each refrigerant circuit is fitted as standard with:
- electronic expansion valve
- high and low pressure safety valve
- liquid line shut-off valve
- compressor's discharge valve
- drier filter with replaceable cartridge
- refrigerant line sight glass with humidity indicator
- safety switching device for limiting the pressure
- high and low pressure transducers
- non -return valve in compressor´s discharge line integrated in the compressor
- liquid line shut-off valve
- BOOSTER patent pending

2.6 Water circuit
Free Cooling "FC"
- two way-valve ON-OFF
- water-air heat exchanger

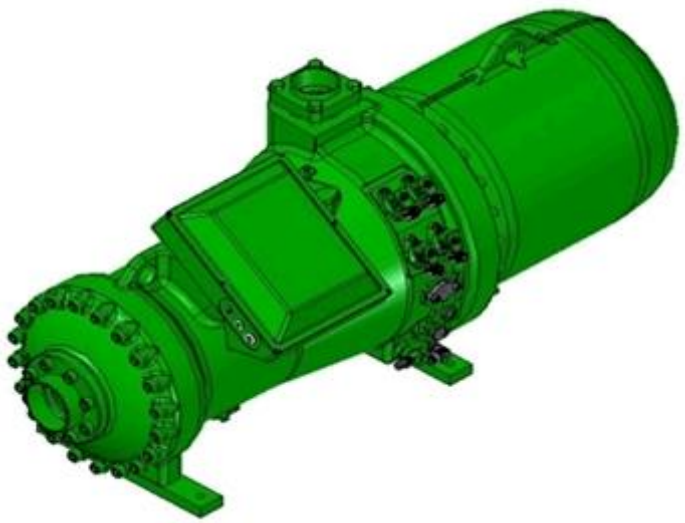
2.7 Water circuit NG
Free Cooling "FC NG"
- The internal water circuit, filled with a 30% ethylene glycol solution and linked to the water-air exchangers, is made up of:
- circulation pump
- intermediate plate heat exchanger
- antifreeze electric heater for plate heat exchanger
- pump shut off valves
- makeup tap
- Inlet valve
- pressure gauge
- expansion tank

2.8 .
Heaters and thermal insulance on the hydraulic circuit:

	Electric (Tair > -15°C)		Thermal insulance (Tair > -15°C)	
	STD FC	FC NG	STD FC	FC NG
Evaporator	NO	YES	YES	YES (double layer)
Pipes	NO	YES	YES	YES (double layer)
Pumps (if present)	NO	YES	YES	YES (double layer)
NG exchanger	-	YES	-	YES (double layer)
NG pumps	-	NO	-	YES
NG pipes	-	NO	-	YES
Booster	NO	NO	NO	NO

	Electric (-15°C < Tair < -		Thermal insulance (-15°C < Tair < -25°C)	
	STD FC	FC NG	STD FC	FC NG
Evaporator	NO	YES	YES	YES (double layer)
Pipes	NO	YES	YES	YES (double layer)
Pumps (if present)	YES	YES	YES	YES (double layer)
NG exchanger	-	YES	-	YES (double layer)
NG pumps	-	YES	-	YES
NG pipes	-	NO	-	YES
Booster	NO	NO	NO	NO

2.9 Compressor
New semi-hermetic screw compressors designed for high efficiency both at full and partial load.
Semi-hermetic screw compressors with 2 five- and six-lobe rotors: the five-lobe rotor is splined directly onto the motor (nominal speed 2950 rpm) without the use of interposed gears. The bearings provided along the rotor axis in a separate chamber isolated from the compression chamber are made in carbon steel. Each compressor is provided with an inlet for refrigerant injection (for the extension of operating limits) and the use of the economizer (for the output capacity and efficiency´s increase). Optimized lubrication guarantees oil´s distribution between mechanical parts, without using an oil pump; the built-in oil separator has 3 stages of separation, and a 10 mm stainless steel mesh filter ensures the constant presence of oil inside. Cooling power is partialized by a slide valve, which depending on the position assumed, permits a stepless compression chamber reduction; each compressor can therefore smoothly partialize from 25% to 100% of its capacity. The two pole motors are fitted as standard with electric devices to limit the absorbed current during compressor start-up, and with empty start-up. Each compressor is fitted with manual-reset motor thermal protection, delivery gas temperature and oil level controls and an electric resistance for the carter´s heating while the compressor is stopped. A check valve fitted on the refrigerant delivery line prevents the rotors from reversing after stopping. On-off cocks on the delivery line of each compressor to isolate the refrigerant charge in the heat exchanger when required.



- Compressors part-winding start for sizes up1502 to 2002, and

- star-delta for all other sizes.

2.10 Plant side heat exchanger
Direct expansion shell and tube exchanger, with evaporator function, with coolant on tube side and water on shell side. The single-step tube nest provides an almost perfect counter-current exchange with the heat transfer fluid. Shell side fitted with baffles to increase turbulence and therefore improve exchange efficiency. Steel shell covered in a condensation-proof lining in closed-cell foamed elastomer with a thickness of 10 mm and a thermal conductivity of 0.033 W/mK at 0°C (in the NG version, the lining is 20 mm thick). The tube nest is made from copper tubes with internal and external grooves for favouring heat exchange and mechanically expanded onto the tube plates.
Only for the NG version, the shell and tube exchanger, the intermediate plate exchanger and the water pipes in the primary circuit (user - intermediate exchanger - evaporator) are fitted with an antifreeze electric heater in order to prevent ice forming inside when the unit is electrically powered but not running. For both solutions (standard FC and NG FC) with the unit running, protection is assured by a differential pressure switch.
The heat exchanger is made in compliance with PED standard work pressure requisites. Upon request, the heat exchanger can be supplied AS1210 compliant or with the SafeWork NSW certificate, depending on the size. For some sizes (versions T+, SL-T+, NG/T+, NG/SL-T+: 5402; versions T+, NG/T+:6002), the AS1210 heat exchanger has another trademark.

2.11 Source side heat exchanger
The finned coil exchanger, made from copper tubes and aluminium fins spaced to optimise heat exchange efficiency, is divided into two sections. One is dedicated to condensation and the other to air-cooling the water in the Free Cooling mode. The exchanger is suitably sized to cater for pressure drops whilst assuring the best heat exchange and full free cooling already at positive air temperatures (T+).

2.12 Fan section source side
Axial electric fans, system of protection IP54 and “F” insulation class, with external rotor, profiled blades, housed in aeodynamic hoods complete with guard grille. 6-poles electric motor with built-in thermal protection. Variable Speed low-temperature Device (DVV) to control condensation adjusting the rotational speed with voltage steps (auto-transformer) is standard for all versions.

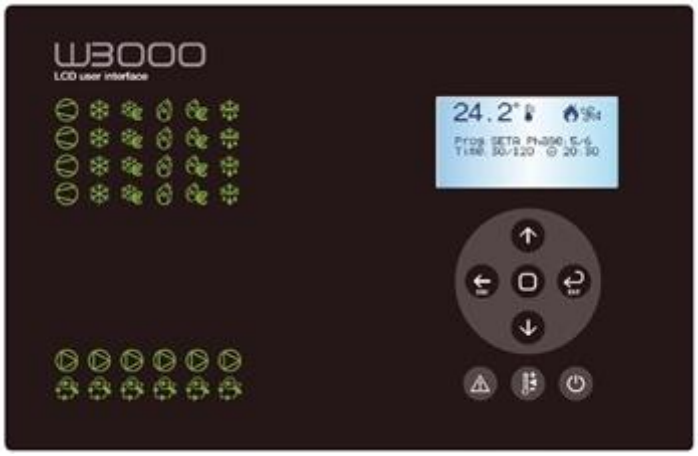
2.13 Electrical and control panel
Electrical and control panel built to EN60204-1 and EC204-1 standards, complete with:
- electronic controller
- control circuit transformer
- general door lock isolator
- power circuit with electric bus bar distribution system
- fuses for compressors
- compressors protection with internal thermal overload
- terminals for cumulative alarm block
- remote ON/OFF terminals
- spring-type control circuit terminal board
- phases sequence control
- relays for voltage monitoring
- Power supply 400V/3ph/50Hz
- Compressors part-winding start for sizes up1502 to 2002, and star-delta for all other sizes.

2.14 Certification and applicable directives
The unit complies with the following directives and relative amendments:
- CE Declaration of conformity certificate for the European Union
- EAC Product quality certificate for Russian Federation
- SAFETY QUALITY LICENCE Product quality certificate for Popular Republic of China
- M&I Product quality certificate for Australia and New Zealand
- Machine directive 2006/42/EC
- PED directive 2014/68/EU
- Low Voltage directive 2006/95/EC
- ElectroMagnetic compatibility directive 2004/108/EC
- ISO 9001 Company´s Quality Management System certification
- ISO 14001 Company´s Environmental Management System certification

2.15 Tests
Tests performed throughout the production process, as indicated in ISO9001.
Performance or noise tests can be performed by highly qualified staff in the presence of customers.
Performance tests comprise the measurement of:
- electrical data
- water flow rates
- working temperatures
- power input
- power output
- pressure drops on the water-side exchanger both at full load (at the conditions of selection and at the most critical conditions for the condenser) and at part load conditions.

During performance testing it is also possible to simulate the main alarm states.
Noise tests are performed to check noise emissions according to ISO9614.

2.16 Electronic control W3000 TE
The brand new W3000TE controller offers advanced functions and algorithms. The large format keyboard and the wide LCD display favour an easy and safe access to the machine setup and a complete view of unit's staus. The assessment and intervention on the unit is managed through a multi-level menu, with selectable user’s language. The led icons immediately show the operating status of the circuits, as well as of the fans and of the water pumps (if present). An optional extra is the touch screen interface: 7.0” WVGA colour display with adjustable LED backlight and front USB port. The touch screen technology allows intuitive navigation between the various screens, safe access to the data with a three-level password protection as well as the graphic display of the performance of some monitored measurements.
The diagnostics comprises a complete alarm management system, with “black box” (via PC) and alarm log functions (via display or also PC) for a better analysis of the unit performance.
For the systems made of several units, the adjustment of the resources is performed by optional proprietary devices.
Consumption metering and performance measurement are possible as well. Supervision can be easily developed via proprietary devices or the integration in third party systems by means of the most common protocols as ModBus, Bacnet-over-IP, Echelon LonWorks, Bacnet MS/TP protocols.
Compatibility with the remote keyboard managing up to 8 units.
The presence of the programmable timer allows the creation of an operating profile containing up to 4 typical days and 10 time bands.
The control is characterized by the continuous modulation of the unit capacity, based on PID algorithms and referring to the water delivery temperature.
Optionally (VPF package), capacity modulation can be integrated with hydraulic flow modulation, thanks to inverter-driven pumps and to specific resources for the hydraulic circuit.



2.17 Versions
/T+ – Version with positive free-cooling temperature 100%
High efficiency thanks to the patent-pending booster, maximum free-cooling already at positive air temperatures.

/SL-T+ - Super low noise version with positive free-cooling temperature 100%
High efficiency thanks to the patent-pending booster, maximum free-cooling already at positive air temperatures and super low noise version.
This configuration features special soundproofing for the compressor chamber and pumps (if present), reduced fan speed and an oversized

condensing section.
However, fan speed automatically increases in particularly tough environmental conditions.

2.18 Configurations
- , standard unit
Standard FreeCooling unit for water and glycol systems.

NG, No glycol unit
This unit does not require any antifreeze solutions on the chilled water circuit. An intermediate plate heat exchanger isolates the water-glycol that flows in the free-cooling coils from the water that flows throughout the plant. A dedicated pump circulates the water-glycol from the free-cooling coils to the intermediate plate heat exchanger.

3.1 OPTIONS

ACCESSORIES	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
1560 **POWER SUPPLY CONFIGURATION**			
1561 DOUBLE POWER SUPPLY (ATS)	An ATS (Automatic Transfer Switch) is installed within the electrical board. The device automatically switches the electrical load between a principal power supply (i.e. mains) and an auxuliary power supply (i.e. backup generator). The ATS automatically senses if one of the sources has lost or gained power. When an outage occurs in the principal power supply, the switch autonomously switches over to the secondary line. When the main line becomes available again the supply is restored to this line. It is possible to set the line priority and frequency of checking.	It enhances system's redundancy and reliability. Reduces unit's downtime in case of mains power outage.	ALL
1562 DOUBLE P.SUPPLY (MOTOR. CH.OVER)	A motorized changeover is installed within the electrical board. The device switches the electrical load between a principal power supply (i.e. mains) and an auxuliary power supply (i.e. backup generator). The changeover is with remote control (i.e. signal of generator start up).	It enhances system's redundancy and reliability. Reduces unit's downtime in case of mains power outage.	ALL
1020 **REGULATIONS**			
1015 HEAT EXCHANGERS NSW CERTIFIED	Heat exchangers with SafeWork NSW certificate		**FR-FC-Z /SL-T+**: 1502, 1702, 1902, 2002, 2202, 2602. **FR-FC-Z /T+**: 1502, 1702, 1902, 2002, 2202, 2602. **FR-FC-Z /T+ /NR**: 1502, 1702, 1902, 2002, 2202, 2602. **FR-FC-Z /NG /SL-T+**: 1502, 1702, 1902, 2002, 2202, 2602. **FR-FC-Z /NG /T+**: 1502, 1702, 1902, 2002, 2202, 2602. **FR-FC-Z /NG /T+ /NR**: 1502, 1702, 1902, 2002, 2202, 2602.
1019 HEAT EXCHANGERS AS1210 CERTIFIED	Heat exchangers AS1210 compliant (Australia Standard)		**FR-FC-Z /SL-T+**: 2702, 3002, 3202, 3402, 3602, 3902, 4202, 4502, 4802, 5402. **FR-FC-Z /T+**: 2702, 3002, 3202, 3402, 3602, 3902, 4202, 4502, 4802, 5402, 6002. **FR-FC-Z /T+ /NR**: 2702, 3002, 3202, 3402, 3602, 3902, 4202, 4502, 4802, 5402, 6002. **FR-FC-Z /NG /SL-T+**: 2702, 3002, 3202, 3402, 3602, 3902, 4202, 4502, 4802, 5402. **FR-FC-Z /NG /T+**: 2702, 3002, 3202, 3402, 3602, 3902, 4202, 4502, 4802, 5402, 6002. **FR-FC-Z /NG /T+ /NR**: 2702, 3002, 3202, 3402, 3602, 3902, 4202, 4502, 4802, 5402, 6002.
1960 **PRESSURE RELIEF VALVES**			
1961 DUAL RELIEF VALVES WITH SWITCH	Dual relief valve with switch	Allows to unselect a relief valve in order to service the unit avoiding medium or long inoperative periods	ALL
380 **NUMBERED WIRING**			
381 NUMBERED WIRING ON EL. BOARD	Electrical board wires are identified by numbered labels. The reference numbers are indicated in the unit's wiring scheme.	Facilitate maintainance interventions to the electrical board connections.	ALL
382 PWR WIRINGS ACC.TO UK REQUEST		Facilitate maintainance interventions to the electrical board connections.	ALL
383 NUMBERED WIRINGS+UK REQUESTS	Electrical board wires are identified by numbered labels. The reference numbers are indicated in the unit's wiring scheme.	Facilitate maintainance interventions to the electrical board connections.	ALL
3300 **COMPRESSOR REPHASING**			
3301 COMPR.POWER FACTOR CORR.	Capacitors on the compressors' power inlet line.	The unit's average cos(phi) increases.	ALL

OPTIONS

ACCESSORIES	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
3410 **AUTOMATIC CIRCUIT BREAKERS**			
3411 AUTOM.CIRC.BREAKERS FOR COMPR.	Over-current switch on the compressors	In case of overcurrent allows resetting of the switch without the replacement of relative fuses.	ALL
3412 AUTOM. CIRCUIT BREAK. ON LOADS	Over-current switch on the major electrical loads.	In case of overcurrent allows resetting of the switch without the replacement of relative fuses.	ALL
3600 **ON/OFF COMPRESSOR SIGNAL**			
3601 COMPRESSOR OPERATION SIGNAL	Auxiliary contacts providing a voltage-free signal.	Allows remote signalling of compressor's activation or remote control of any auxiliary loads.	ALL
4180 **REMOTE CONNECTION ARRANGEMENT**			
4181 SERIAL CARD MODBUS	Interface module for ModBUS protocols.	Allows integration with BMS operating with ModBUS protocol.	ALL
4182 SERIAL CARD FOR LONWORKS	Interface module for Echelon systems.	Allows integration with BMS operating with LonWorks protocols	ALL
4184 SERIAL CARD BACNET MS/TP RS485	Interface module for BACnet protocols.	Allows integration with BMS operating with BACnet protocol.	ALL
4185 SERIAL CARD FOR BACNET OVER IP	Interface module for BACnet OVER-IP protocols.	Allows to interconnect BACnet devices over Internet Protocol within wide-area networks.	ALL
6160 **AUXILIARY INPUT**			
6161 AUXILIARY SIGNAL 4-20mA	4-20 mA analog input	Allows to change the operating set-point according to the value of current applied to the analogue input.	ALL
6162 REMOTE SIGNAL DOUBLE SP	Allows to activate the Energy Saving set-point.	Allows to change the operating set-point according to a remote switch	ALL
6170 **DEMAND LIMIT**			
6171 INPUT REMOTE DEMAND LIMIT	Digital input (voltage free)	It permits to limit the unit's power absorption for safety reasons or in temporary situation.	ALL
6190 **TYPE OF VISUAL DISPLAY**			
6195 7 INCH TOUCH SCREEN	The unit is equipped with the Touch interface, with a 7” WVGA colour display and a front USB port (WARNING: with outdoor temperature below 0°C the display response time may visibly increase).	The touch-screen's technology is characterized by an easy-to-access data, and it allows an effective graphical representation of the main figures protecting the access through 3 privilege levels.	ALL
1510 **SOFT-STARTER**			
1511 UNIT WITH SOFT-START	Electronic device adopted to manage the inrush current.	Break down of the inrush current compared to the direct motor start, lower motor windings’ mechanical wear, avoidance of mains voltage fluctuations during starting, favourable sizing for the electrical system.	ALL
3360 **PUMPS COMAND RELAYS**			
3361 1 RELAY EVAPORATOR PUMP	Relay for the pump(s) on/off.	It controls the operation of 1 evaporator external pump with a devoted on/off signal.	ALL
3362 2 RELAYS EVAPORATOR PUMPS	Relay for the pump(s) on/off.	It controls the operation of 2 evaporator external pumps with 2 devoted on/off signals. The second pump operates in stand-by to the first. The relative operating hours of the two pumps are balanced.	ALL

OPTIONS

ACCESSORIES	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
3420 **LIGHTS ON ELECTRIC BOARD**			
3421 LIGHTS ON ELECTRIC BOARD	Electrical board equipped with lights.	Facilitate electrical board maintainance interventions.	ALL
3430 **REFRIGERANT LEAK DETECTOR**			
3431 REFRIG. LEAK DETECTOR	Refrigerant leak detection system, supplied factory mounted and wired in the electrical board. In case of leak detection it will raise an alarm.	It promptly detects gas leakages	ALL
3433 GAS LEAK CONTACT + COMPR. OFF	Refrigerant leak detection system, supplied factory mountedand wired in the electrical board. In case of leak detection it will raise an alarm and stop the unit.	It promptly detects gas leakages and stops the unit	ALL
5920 **MANAGEMENT & CONTROL SYSTEMS**			
5921 NETWORK ANALYZER FOR DEMETRA	This option includes all following devices on-board the unit panel: - network analyzer operating on ModBUS protocol over RS-485 (without certification MID) - current transformers.	This accesory allows to acquire the electrical data and the power absorbed by the unit and send them via RS-485 bus to an external device for energy metering (DEMETRA - see dedicated manual).	ALL
5922 ClimaPRO ModBUS RS485 - MID	This option includes all following devices on-board the unit panel: - MID certified network analyzer operating on ModBUS over RS-485 - Current transformers - W3000TE controller - Software release LA09 or later version.	This accessory allows to acquire the electrical data and the power absorbed by the unit and communicate with ClimaPRO via high level communication interface based on ModBUS over EIA RS-485. More specifically, the data collected are: power supply, current, frequency, power factor (cos_{φ}), electrical power consumption, energy consumption. This specific energy meter model is MID certified and can therefore be used for billing applications. This option also ensures the compatibility between the units and ClimaPRO, thus allowing ClimaPRO to acquire all the main unit's operating variables and status by means of a high level communication interface to the controller installed onboard the unit panel.	ALL
5923 ClimaPRO BacNET over IP	This option includes all following devices on-board the unit panel: - network analyzer operating on BACnet over IP - Current transformers - W3000TE controller - Software release LA09 or later version.	This accessory allows to acquire the electrical data and the power absorbed by the unit and communicate with ClimaPRO via high level communication interface based on BACnet over IP. More specifically, the data collected are: power supply, current, frequency, power factor (cos_{φ}), electrical power consumption, energy consumption. This network analyzer is not MID certified and cannot therefore be used for billing applications. This option also ensures the compatibility between the units and ClimaPRO, thus allowing ClimaPRO to acquire all the main unit's operating variables and status by means of a high level communication interface to the controller installed onboard the unit panel.	ALL
5924 ENERGY METER FOR BMS	This option includes all following devices on-board the unit panel: - network analyzer with display operating on ModBUS protocol over RS-485 (without certification MID) - current transformers.	This accesory allows to acquire the electrical data and the power absorbed by the unit and send them via RS-485 bus to the BMS for energy metering.	ALL
4500 **FAST RESTART (UPS EXCLUDED)**			
4501 FAST RESTART (UPS EXCLUDED)	Unit fast restart management after power failure	The management of the fast restart allows to minimize downtimes in case of power failure, keeping all the necessary unit safeties. This optiont requires an external 203V AC 300VA UPS power supply, by customer.	ALL

OPTIONS

ACCESSORIES	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
1900 **COMPRESSOR SUCTION VALVE**			
1901 COMPRESSOR SUCTION VALVE	Shut-off valve on compressor's suction circuit.	Simplifies maintenance activities	ALL
890 **CONDENSING COIL**			
881 Cu/Cu EXTERNAL COIL	Finned coil heat exchanger made from suitably-spaced copper tubes and fins designed to ensure maximum heat exchange efficiency.	This type of coil is not subject to galvanic corrosion, being made from just one material. For further information please refer to the Guidelines “Finned coil heat exchangers and protection against corrosion”, available in the download section of the website www.rcitcooling.com, or contact our sales department.	ALL
894 Cu PIPES/PREPAINTED ALL. FINS	Finned coil heat exchanger made from copper tubes and aluminum fins with chemical cleaning treatment to remove impurities, and then coated with protective paint with the following characteristics: - fins treated with protective polyester resin paint; - over 1000 hours of salt spray protection as per ASTM B117 (fins without cross and protected edges); - excellent resistance to UV rays.	Provide a good resistance against corrosion. For further information please refer to the Guidelines “Finned coil heat exchangers and protection against corrosion”, available in the download section of the website www.rcitcooling.com, or contact our sales department.	ALL
895 FIN GUARD SILVER TREATM	Copper-aluminum heat exchanger coils with polyurethane paint Fin Guard Silver SB. Coil completely coated by a protective layer of polyurethane paint with the following characteristics: - polyurethane paint with metallic emulsion; - over 3000 hours of salt spray protection as per ASTM B117; - excellent resistance to UV rays; - high-pressure spray painting system.	Provide a very high resistance against corrosion, also in very aggressive environment. For further information please refer to the Guidelines “Finned coil heat exchangers and protection against corrosion”, available in the download section of the website www.rcitcooling.com, or contact our sales department.	ALL
2000 **COIL PROTECTION**			
2001 COIL PROT.GRILLS IN PERALUMAN	Coil protecting grilles	Protects against the intrusion of solid bodies with mediumlarge dimensions.	ALL
1270 **OPERATING RANGE FR-FC-Y**			
1272 0°<TH2O<+15° / Tair>+46°	Kit to increase the unit's operating range.	It allows to select the correct devices to work in full safety at different air temperatures and outlet evaporator temperatures.	ALL
1273 0°<TH2O<+15° / -25°<Tair<-15°	Kit to increase the unit's operating range.	It allows to select the correct devices to work in full safety at different air temperatures and outlet evaporator temperatures.	ALL
1274 15°<TH2O<+20° / -15°<Tair<+46°	Kit to increase the unit's operating range.	It allows to select the correct devices to work in full safety at different air temperatures and outlet evaporator temperatures.	ALL
1275 15°<TH2O<+20° / Tair>+46°	Kit to increase the unit's operating range.	It allows to select the correct devices to work in full safety at different air temperatures and outlet evaporator temperatures.	ALL
1276 15°<TH2O<+20° / -25°<Tair<-15°	Kit to increase the unit's operating range.	It allows to select the correct devices to work in full safety at different air temperatures and outlet evaporator temperatures.	ALL

OPTIONS

ACCESSORIES	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
820 **FAN CONTROL**			
808 EC FANS	Electronically commutated fans (EC fans). The brushless motor, governed by a special controller, continuously adjust fans' speed.	Reduced energy consumption and minimized current's absorption during start-up phase. The efficiency is increased by apporximately: +1% of EER and +4/5% of ESEER. The noise reduces proportionally to the unit's partialization.	ALL
1800 **EVAPORATOR WATER FLOW SWITCH**			
1801 EVAPORATOR WATER FLOW SWITCH	Flow switch with stainless scoop AISI 316L and IP65 protection suitable for installation in industrial plant pipes. It should be installed in a straight pipe without filters, valves, etc., long at least 5 times its diameter, both upstream and downstream.	Signaling of lack of or excessive reduction of flow, it generates an alarm that is in automatic or manual reset depending on n ° alarms per hour and the maximum time of operation of the pump under conditions of low flow rate.	ALL
2910 **HYDRAULIC CONNECTIONS**			
2911 FLANGED HYDRAULIC CONNECTIONS	Grooved coupling with flanged counter-pipe user/source side.		ALL
1220 **FREE-COOLING TEMPERATURE**			
1221 MODULATION VALVE	2 way modulating valve for the control of the water temperature	Ensure the control of the leaving water temperature when the outdoor temperaure is very low. The use of this option is mandatory when the differenco between the leaving water temperature and the outdoor temperature is higher than 15°K.	ALL
3180 **PUMP ASSEMBLY**			
3181 N.1 PUMP WITH 4 POLES L.P.	Hydronic group (see dedicated section)		ALL
3184 N.2 PUMPS WITH 4 POLES H.P.	Hydronic group (see dedicated section)		ALL
3187 N.2 PUMPS WITH 2 POLES L.P.	Hydronic group (see dedicated section)		ALL
3188 N.2 PUMPS WITH 2 POLES H.P.	Hydronic group (see dedicated section)		ALL
3230 **PUMP ASSEMBLY WITH 2PS SYSTEM**			
3235 N.2 PUMPS 4 POL L.P+2PS	Hydronic group with pre-arrangement for the control of the inverter driven pumps for the plant's primary circuit (see dedicated section). This function adjusts the pump rotational speed according to the free-cooling chiller operating mode. It keeps the water primary flow costant.		**FR-FC-Z /SL-T+**: 1502, 1702, 1902, 2002, 2202, 2602, 2702, 3002, 3202, 3402, 3602, 3902, 4202, 4502, 4802, 5402. **FR-FC-Z /T+**: 1502, 1702, 1902, 2002, 2202, 2602, 2702, 3002, 3202, 3402, 3602, 3902, 4202, 4502, 4802, 5402, 6002. **FR-FC-Z /T+ /NR**: 1502, 1702, 1902, 2002, 2202, 2602, 2702, 3002, 3202, 3402, 3602, 3902, 4202, 4502, 4802, 5402, 6002.
3236 N.2 PUMPS 4 POL H.P+2PS	Hydronic group with pre-arrangement for the control of the inverter driven pumps for the plant's primary circuit (see dedicated section). This function adjusts the pump rotational speed according to the free-cooling chiller operating mode. It keeps the water primary flow costant.		**FR-FC-Z /SL-T+**: 1502, 1702, 1902, 2002, 2202, 2602, 2702, 3002, 3202, 3402, 3602, 3902, 4202, 4502, 4802, 5402. **FR-FC-Z /T+**: 1502, 1702, 1902, 2002, 2202, 2602, 2702, 3002, 3202, 3402, 3602, 3902, 4202, 4502, 4802, 5402, 6002. **FR-FC-Z /T+ /NR**: 1502, 1702, 1902, 2002, 2202, 2602, 2702, 3002, 3202, 3402, 3602, 3902, 4202, 4502, 4802, 5402, 6002.
3237 N.2 PUMPS 2 POL H.P+2PS	Hydronic group with pre-arrangement for the control of the inverter driven pumps for the plant's primary circuit (see dedicated section). This function adjusts the pump rotational speed according to the free-cooling chiller operating mode. It keeps the water primary flow costant.		**FR-FC-Z /SL-T+**: 1502, 1702, 1902, 2002, 2202, 2602, 2702, 3002, 3202, 3402, 3602, 3902, 4202, 4502, 4802, 5402. **FR-FC-Z /T+**: 1502, 1702, 1902, 2002, 2202, 2602, 2702, 3002, 3202, 3402, 3602, 3902, 4202, 4502, 4802, 5402, 6002. **FR-FC-Z /T+ /NR**: 1502, 1702, 1902, 2002, 2202, 2602, 2702, 3002, 3202, 3402, 3602, 3902, 4202, 4502, 4802, 5402, 6002.

OPTIONS

ACCESSORIES	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
3238 N.2 PUMPS 2 POL H.P+2PS	Hydronic group with pre-arrangement for the control of the inverter driven pumps for the plant's primary circuit (see dedicated section). This function adjusts the pump rotational speed according to the free-cooling chiller operating mode. It keeps the water primary flow costant.		**FR-FC-Z /SL-T+**: 1502, 1702, 1902, 2002, 2202, 2602, 2702, 3002, 3202, 3402, 3602, 3902, 4202, 4502, 4802, 5402. **FR-FC-Z /T+**: 1502, 1702, 1902, 2002, 2202, 2602, 2702, 3002, 3202, 3402, 3602, 3902, 4202, 4502, 4802, 5402, 6002. **FR-FC-Z /T+ /NR**: 1502, 1702, 1902, 2002, 2202, 2602, 2702, 3002, 3202, 3402, 3602, 3902, 4202, 4502, 4802, 5402, 6002.
3240 **PUMP ASSEMBLYWITH VPF SYSTEM**			
3245 N.2 PUMPS 4 POL L.P+VPF	Inverter driven pumps with control for the plant's primary circuit (see dedicated section). This option includes: differential pressure transducer on the evaporator, additional control devices to read the signals (4-20 mA) coming from the differential pressure transducers on the evaporator and on the plant and to manage the pumps and the by-pass valve (0-10V signals). [Plant differential pressure transducers and by-pass valve to be supplied by others].		ALL
3246 N.2 PUMPS 4 POL H.P+VPF	Inverter driven pumps with control for the plant's primary circuit (see dedicated section). This option includes: differential pressure transducer on the evaporator, additional control devices to read the signals (4-20 mA) coming from the differential pressure transducers on the evaporator and on the plant and to manage the pumps and the by-pass valve (0-10V signals). [Plant differential pressure transducers and by-pass valve to be supplied by others].		ALL
3247 N.2 PUMPS 2 POL L.P+VPF	Inverter driven pumps with control for the plant's primary circuit (see dedicated section). This option includes: differential pressure transducer on the evaporator, additional control devices to read the signals (4-20 mA) coming from the differential pressure transducers on the evaporator and on the plant and to manage the pumps and the by-pass valve (0-10V signals). [Plant differential pressure transducers and by-pass valve to be supplied by others].		ALL
3248 N.2 PUMPS 2 POL H.P+VPF	Inverter driven pumps with control for the plant's primary circuit (see dedicated section). This option includes: differential pressure transducer on the evaporator, additional control devices to read the signals (4-20 mA) coming from the differential pressure transducers on the evaporator and on the plant and to manage the pumps and the by-pass valve (0-10V signals). [Plant differential pressure transducers and by-pass valve to be supplied by others].		ALL
3020 **VPF CONTROL MANAGER FROM 3000**			
3021 VPF-VPF.D CONT. FROM SUPERVIS.	Variable pump flow control for units managed by group devices.		ALL
3030 VPF CONTROL FROM MANAGER W3000			ALL

OPTIONS

ACCESSORIES	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
3040 **PUMP ASSEMBLY WITH VPF.D SYST.**			
3045 N.2 PUMPS 4 POL L.P+VPF.D	Inverter driven pumps with control for the plant's primary circuit in installation with hydraulic decoupler (see dedicated section). This option includes: temperature sensors to be installed on the plant, additional control devices to read the signals (4-20 mA) coming from the plant temperature sensors and to manage the pump speed (0-10V signal).		ALL
3046 N.2 PUMPS 4 POL H.P+VPF.D	Inverter driven pumps with control for the plant's primary circuit in installation with hydraulic decoupler (see dedicated section). This option includes: temperature sensors to be installed on the plant, additional control devices to read the signals (4-20 mA) coming from the plant temperature sensors and to manage the pump speed (0-10V signal).		ALL
3047 N.2 PUMPS 2 POL L.P+VPF.D	Inverter driven pumps with control for the plant's primary circuit in installation with hydraulic decoupler (see dedicated section). This option includes: temperature sensors to be installed on the plant, additional control devices to read the signals (4-20 mA) coming from the plant temperature sensors and to manage the pump speed (0-10V signal).		ALL
3048 N.2 PUMPS 2 POL H.P+VPF.D	Inverter driven pumps with control for the plant's primary circuit in installation with hydraulic decoupler (see dedicated section). This option includes: temperature sensors to be installed on the plant, additional control devices to read the signals (4-20 mA) coming from the plant temperature sensors and to manage the pump speed (0-10V signal).		ALL
3380 **MINIMUN PART. STEP**			
3381 25% MINIMUM COMPR. STEPS			ALL
3390 **ANTICONDENSATE HEATER EL.BOARD**			
3391 ELECTRIC HEATER ON EL. BOARD	Electrical heater fed directly from the unit, is automatically activated at temperatures internal QE below 30 ° C (off state at T higher than 40 ° C).	It avoids the risk of humidity condensation on the electrical panel.	ALL
2020 **ANTI-INTRUSION GRILLS**			
2021 ANTI-INTRUSION GRILLS	Anti-intrusions grills	Avoid the intrusion of solid bodies into the unit's structure.	ALL

OPTIONS

ACCESSORIES	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
2340 **UNIT ENCLOSURE**			
2301 COMPRESS.ACOUSTICAL ENCLOSURE	Enclosure made from hot galvanised metal plate and painted with epoxy powder coat. The acoustic insulation availability depends on unit model, see the dedicated description in "Accessories notes".	It reduces the noise emissions and improves aesthetics.	ALL
2315 NOISE REDUCER	The option includes the fan speed reduction and the compressors' acoustical enclosure	The dedicated fans' speed calibration together with the soundproofing of the most critical components permit a significant noise reduction (for the precise performance of the unit with the Noise Reducer kit please refer to the selection software ELCA Studio).	**FR-FC-Z /T+**: 1502, 1702, 1902, 2002, 2202, 2602, 2702, 3002, 3202, 3402, 3602, 3902, 4202, 4502, 4802, 5402, 6002. **FR-FC-Z /T+ /NR**: 1502, 1702, 1902, 2002, 2202, 2602, 2702, 3002, 3202, 3402, 3602, 3902, 4202, 4502, 4802, 5402, 6002. **FR-FC-Z /NG /T+**: 1502, 1702, 1902, 2002, 2202, 2602, 2702, 3002, 3202, 3402, 3602, 3902, 4202, 4502, 4802, 5402, 6002. **FR-FC-Z /NG /T+ /NR**: 1502, 1702, 1902, 2002, 2202, 2602, 2702, 3002, 3202, 3402, 3602, 3902, 4202, 4502, 4802, 5402, 6002.
2100 **ANTIVIBRATION MOUNTING**			
2101 RUBBER TYPE ANTIVIBR. MOUNTING			
2102 SPRING TYPE ANTIVIBR. MOUNTING			
1970 **LONG DISTANCE TRANSPORTATION**			
1971 REINFORCING BARS	Bars used to reinforce the structure	Improve resistance during long transportation	ALL
9970 **PACKING**			
9965 NYLON + COIL PROT. PACKING	Unit provided plastic supports, with polypropylene panels for coils protection and covered with nylon		ALL
9967 COIL PROTECTION PACKING	Unit provided plastic supports and covered with nylon		ALL
9979 CONTAINER PACKING	Unit provided with container slides and covered with nylon		ALL

OPTIONS

Additional information - IMPORTANT -

1561 - Double power supply (ATS)
1562 - Double power supply (motorized changeover)
These accessories entail the substitution of the standard general lock door isolator with a door microswitch that switches the changeover to o position (open).
In some units, the transfer switch requires an enlarged electrical board. This entails a unit length increase. For further information, please contact our sales department.

1511 - Unit with soft-start
The device has an effect on 2 phases.
The accessory requires the use of automatic circuit breakers on the compressors.
Please select one of the following accessories:
3411 – Automatic circuit breakers for compressors.
3412 - Automatic circuit breakers on loads.

3431 - Refrigerant leak detector
3433 - Refrigerant leak detector + compressors off
The accessory requires the compressor enclosure.
The compressor enclosure is present as per standard in all the silenced units (version SL-T+; NG /SL-T+).
For the not-silenced units (versions T+; NG /T+), please select one of the following accessories:
2301 - COMPRESS.ACOUSTICAL ENCLOSURE
2315 - NOISE REDUCER.

4501 - Fast restart (UPS excluded)
The following tables show the first compressor start-up time and ramp-up time for 100% cooling capacity.
The time frames shown in Table 1 and 2 are defined by the power restoration.

Table 1 - First compressor start-up time

Standard unit (1)	Unit with fast restart (1)
5’ 40’’	25’’

(1) Minimum time from its previous start-up and minimum off-time need to be fulfilled to start the compressor.

Table 2 - Ramp-up time for 100% cooling capacity

Compressor number	Standard unit (2)(3)	Unit with fast restart (2)(3)
2	11’ 50’’	3’ 00’’

(2) Reference conditions: plant (side) cooling exchanger water (in/out) 12°C / 7°C; Source (side) heat exchanger air (in) 35°C
(3) Minimum time from their previous start-up and minimum off-time need to be fulfilled to start the compressors.

With the fast restart, each compressor can only start after 15’ from its previous start-up and 1’ 30’’ of off-time.
Without the fast restart, each compressor can only start after 15’ from its previous start-up and 5’ 00’’ of off-time.

The fast restart can be activated only 2 times every 24 hours.
It is possible to request the fast restart activation for 4 times every 24 hours (in this case the minimum off-time of each compressor will increase from 1’ 30’’ to 2’ 30’’). For further information, please contact our sales department.

When the maximum number of fast restarts in a single 24-hour period is reached, the fast restart function is disabled and other potential restarts will follow the standard timing. Once the 24 hours have passed, the fast restart function is automatically enabled again.

1272 - 0°<TH2O<+15° / Tair>+46°
1275 - 15°<TH2O<+20° / Tair>+46°
These accessories are not compatible with EC fans (808).

808 - EC fans
These fans are suitable to operate up to 46°C of outdoor temperature.
In case of higher temperatures, fans with oversized motors must be used. For the quotation of these components, please contact our sales department.

1801 - Evaporator water flow switch
This accessory is supplied loose.
A flow switch must be installed on the unit’s hydraulic circuit. For further information please refer to the GENERAL MANUAL FOR INSTALLATION.

2301 – Compressor acoustical enclosure
Soundproofing insulation characteristics: 30mm thick Fiberform (polyester fibres).
Sound power reduction: -2dB(A).

2315 - Noise Reducer
Soundproofing insulation characteristics: 30mm thick Fiberform (polyester fibres).
Fan speed reduction.
Sound power reduction: please refer to ELCA software.

Pump assembly with VPF system
3245 - N.2 PUMPS 4 POL L.P+VPF
3246 - N.2 PUMPS 4 POL H.P+VPF
3247 - N.2 PUMPS 2 POL L.P+VPF
3248 - N.2 PUMPS 2 POL H.P+VPF
Pump assembly with VPF.D system
3045 - N.2 PUMPS 4 POL L.P+VPF.D
3046 - N.2 PUMPS 4 POL H.P+VPF.D
3047 - N.2 PUMPS 2 POL L.P+VPF.D
3048 - N.2 PUMPS 2 POL H.P+VPF.D
With these options, the minimum leaving water temperature admitted is 5°C.

OPTIONS

Chiller Plant Control with Active Optimization System

ClimaPRO DCO

ClimaPRO DCO represents the state-of-the-art platform for chiller plant management and control.
ClimaPRO ensures to actively optimize the entire chiller plant by managing and adjusting each component directly involved in the production and the distribution of the heating and the cooling energies, therefore involving chillers and heat pumps, pumping groups as well as the source-side devices like, for example, the cooling towers.

In particular, ClimaPRO measures in real-time all the operating variables from the field, for each individual device and each of the main system branche, by using serial communication lines as well as dedicated analogue signals.

The acquired data are then compared with the design data of each single unit at any different working conditions, thus allowing to implement control strategies based on dynamic algorithms which take into account the real operating conditions.

On the basis of these values, an advanced diagnostic module also allows to assess the level of efficiency for each individual unit, translating data into easy-to-read information in order to simplify and optimize the maintenance activities.

The “Chart Builder” software module allows to display the trends of the main operating variables. The “Reporting” module allows to send reports to selected users, including data and system’s status of the main devices as well as to perform calculation of the energy indexes for each single unit and for the entire chiller plant.

The accessibility to ClimaPRO DCO is ensured by an integrated web server that makes it visible from any computer equipped with a web browser, either locally or remotely.

4.1 GENERAL TECHNICAL DATA FR-FC-Z /T+

[SI System]

FR-FC-Z /T+			1502	1702	1902	2002	2202	2602	2702	3002	3202	3402
Power supply		V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
PERFORMANCE												
FREE-COOLING OFF (GROSS VALUE)												
Cooling capacity	(1)	**kW**	**335**	**372**	**433**	**481**	**530**	**619**	**665**	**695**	**753**	**826**
Compressors power input	(1)	kW	76,9	86,6	98,6	113	121	148	161	175	183	192
Total power input	(1)	kW	88,9	103	115	133	141	172	185	199	211	224
EER	(1)	**kW/kW**	**3,77**	**3,63**	**3,77**	**3,62**	**3,77**	**3,59**	**3,60**	**3,49**	**3,57**	**3,69**
Free Cooling (Tae = 10,0°C)												
Free cooling capacity	(1)	**kW**	**108**	**122**	**141**	**156**	**173**	**205**	**218**	**223**	**248**	**266**
% Free cooling	(1)	%	32	33	33	32	33	33	33	32	33	32
TOTAL FREE-COOLING (GROSS VALUE)												
Cooling capacity	(2)	**kW**	**335**	**372**	**433**	**481**	**530**	**619**	**665**	**695**	**753**	**826**
Total power input	(2)	kW	12,0	16,0	16,0	20,0	20,0	24,0	24,0	24,0	28,0	32,0
EER	(2)	**kW/kW**	**27,96**	**23,28**	**27,03**	**24,05**	**26,51**	**25,79**	**27,72**	**28,96**	**26,90**	**25,82**
Total free-cooling temperature	(2)	°C	1,2	1,4	1,4	1,4	1,5	1,8	1,8	1,4	1,8	1,2
EXCHANGERS												
HEAT EXCHANGER USER SIDE IN REFRIGERATION												
Glycol	(1)	%	30	30	30	30	30	30	30	30	30	30
Water flow	(1)	l/s	17,77	19,73	22,92	25,48	28,10	32,80	35,24	36,82	39,90	43,78
Pressure drop	(1)	kPa	68,7	84,7	78,3	86,3	63,2	77,5	65,2	71,1	62,4	75,1
REFRIGERANT CIRCUIT												
Compressors nr.		N°	2	2	2	2	2	2	2	2	2	2
Number of capacity steps		N°	0	0	0	0	0	0	0	0	0	0
No. Circuits		N°	2	2	2	2	2	2	2	2	2	2
Regulation			STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS
Min. capacity step		%	25	25	25	25	25	25	25	25	25	25
Refrigerant			R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a
Refrigerant charge		kg	85,0	90,0	108	119	128	141	145	175	180	190
Oil charge		kg	30,0	30,0	30,0	30,0	44,0	44,0	38,0	38,0	38,0	49,0
FANS												
Quantity		N°	6	8	8	10	10	12	12	12	14	16
Air flow		m³/s	35,93	43,27	47,48	54,88	58,82	64,28	67,43	67,43	77,20	90,75
Fans power input		kW	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00
NOISE LEVEL												
Sound Pressure	(3)	dB(A)	67	68	68	68	69	70	69	69	69	69
Sound power level in cooling	(4)	dB(A)	99	100	100	100	101	102	102	102	102	102
SIZE AND WEIGHT												
A	(5)	mm	4000	4000	4900	4900	5800	5800	6400	6400	7000	7900
B	(5)	mm	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260
H	(5)	mm	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
Operating weight	(5)	kg	4880	4990	5520	5700	7000	7410	8270	8310	8750	9600

Notes:
1 Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Source (side) heat exchanger air (in) 30,0°C; Ethylene glycol 30%.
2 Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Ethylene glycol 30%.
3 Average sound pressure level at 10m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.
4 Sound power on the basis of measurements made in compliance with ISO 9614.
5 Unit in standard configuration/execution, without optional accessories.
- Not available

GENERAL TECHNICAL DATA FR-FC-Z /T+

[SI System]

FR-FC-Z /T+			3602	3902	4202	4502	4802	5402	6002
Power supply		V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
PERFORMANCE									
FREE-COOLING OFF (GROSS VALUE)									
Cooling capacity	(1)	**kW**	**881**	**944**	**1013**	**1093**	**1189**	**1325**	**1412**
Compressors power input	(1)	kW	213	234	245	266	270	323	368
Total power input	(1)	kW	245	266	277	306	318	371	416
EER	(1)	**kW/kW**	**3,59**	**3,55**	**3,65**	**3,57**	**3,74**	**3,57**	**3,40**
Free Cooling (Tae = 10,0°C)									
Free cooling capacity	(1)	**kW**	**286**	**295**	**316**	**346**	**383**	**421**	**449**
% Free cooling	(1)	%	33	31	31	32	32	32	32
TOTAL FREE-COOLING (GROSS VALUE)									
Cooling capacity	(2)	**kW**	**881**	**944**	**1013**	**1093**	**1189**	**1325**	**1412**
Total power input	(2)	kW	32,0	32,0	32,0	40,0	48,0	48,0	48,0
EER	(2)	**kW/kW**	**27,54**	**29,51**	**31,66**	**27,33**	**24,77**	**27,60**	**29,42**
Total free-cooling temperature	(2)	°C	1,6	1,1	1,1	1,3	1,2	1,3	1,3
EXCHANGERS									
HEAT EXCHANGER USER SIDE IN REFRIGERATION									
Glycol	(1)	%	30	30	30	30	30	30	30
Water flow	(1)	l/s	46,70	50,03	53,65	57,91	62,98	70,20	74,78
Pressure drop	(1)	kPa	77,0	95,0	98,1	83,3	98,5	89,7	102
REFRIGERANT CIRCUIT									
Compressors nr.		N°	2	2	2	2	2	2	2
Number of capacity steps		N°	0	0	0	0	0	0	0
No. Circuits		N°	2	2	2	2	2	2	2
Regulation			STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS
Min. capacity step		%	25	25	25	25	25	25	25
Refrigerant			R134a	R134a	R134a	R134a	R134a	R134a	R134a
Refrigerant charge		kg	199	220	244	290	295	310	330
Oil charge		kg	60,0	60,0	60,0	60,0	60,0	60,0	64,0
FANS									
Quantity		N°	16	16	16	20	24	24	24
Air flow		m³/s	88,23	88,23	92,43	106,08	132,98	128,57	134,86
Fans power input		kW	2,00	2,00	2,00	2,00	2,00	2,00	2,00
NOISE LEVEL									
Sound Pressure	(3)	dB(A)	70	70	70	72	73	73	73
Sound power level in cooling	(4)	dB(A)	103	103	103	105	106	106	106
SIZE AND WEIGHT									
A	(5)	mm	7900	7900	10000	10000	11800	11800	13000
B	(5)	mm	2260	2260	2260	2260	2260	2260	2260
H	(5)	mm	2500	2500	2500	2500	2500	2500	2500
Operating weight	(5)	kg	10470	10570	12680	13180	13710	14930	15810

Notes:
1 Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Source (side) heat exchanger air (in) 30,0°C; Ethylene glycol 30%.
2 Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Ethylene glycol 30%.
3 Average sound pressure level at 10m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.
4 Sound power on the basis of measurements made in compliance with ISO 9614.
5 Unit in standard configuration/execution, without optional accessories.
- Not available

GENERAL TECHNICAL DATA — FR-FC-Z /SL-T+

[SI System]

FR-FC-Z /SL-T+			1502	1702	1902	2002	2202	2602	2702	3002	3202	3402
Power supply		V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
PERFORMANCE												
FREE-COOLING OFF (GROSS VALUE)												
Cooling capacity	(1)	**kW**	**332**	**372**	**426**	**476**	**522**	**625**	**656**	**712**	**745**	**787**
Compressors power input	(1)	kW	81,0	90,0	105	119	129	151	171	175	193	215
Total power input	(1)	kW	89,8	98,8	116	130	142	167	186	193	210	232
EER	(1)	**kW/kW**	**3,69**	**3,77**	**3,69**	**3,66**	**3,66**	**3,75**	**3,53**	**3,70**	**3,54**	**3,39**
Free Cooling (Tae = 10,0°C)												
Free cooling capacity	(1)	**kW**	**105**	**114**	**133**	**147**	**169**	**195**	**207**	**223**	**236**	**243**
% Free cooling	(1)	%	32	31	31	31	32	31	31	31	32	31
TOTAL FREE-COOLING (GROSS VALUE)												
Cooling capacity	(2)	**kW**	**332**	**372**	**426**	**476**	**522**	**625**	**656**	**712**	**745**	**787**
Total power input	(2)	kW	9,60	9,60	12,0	12,0	14,4	16,8	16,8	19,2	19,2	19,2
EER	(2)	**kW/kW**	**34,55**	**38,76**	**35,53**	**39,67**	**36,22**	**37,20**	**39,06**	**37,08**	**38,80**	**41,00**
Total free-cooling temperature	(2)	°C	0,6	0,7	0,6	0,6	0,7	0,5	0,9	0,7	0,9	0,6
EXCHANGERS												
HEAT EXCHANGER USER SIDE IN REFRIGERATION												
Glycol	(1)	%	30	30	30	30	30	30	30	30	30	30
Water flow	(1)	l/s	17,57	19,71	22,59	25,22	27,64	33,11	34,77	37,72	39,47	41,70
Pressure drop	(1)	kPa	67,2	84,5	76,1	84,6	61,2	79,0	63,4	74,6	61,0	68,2
REFRIGERANT CIRCUIT												
Compressors nr.		N°	2	2	2	2	2	2	2	2	2	2
Number of capacity steps		N°	0	0	0	0	0	0	0	0	0	0
No. Circuits		N°	2	2	2	2	2	2	2	2	2	2
Regulation			STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS
Min. capacity step		%	25	25	25	25	25	25	25	25	25	25
Refrigerant			R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a
Refrigerant charge		kg	98,0	104	124	137	147	162	167	201	207	219
Oil charge		kg	30,0	30,0	30,0	30,0	44,0	44,0	38,0	38,0	38,0	49,0
FANS												
Quantity		N°	8	8	10	10	12	14	14	16	16	16
Air flow		m³/s	30,10	33,68	38,26	41,46	46,30	55,35	53,57	63,26	61,22	61,22
Fans power input		kW	1,10	1,10	1,10	1,10	1,10	1,10	1,10	1,10	1,10	1,10
NOISE LEVEL												
Sound Pressure	(3)	dB(A)	57	57	57	58	59	58	58	59	59	59
Sound power level in cooling	(4)	dB(A)	89	89	89	90	91	91	91	92	92	92
SIZE AND WEIGHT												
A	(5)	mm	4000	4900	4900	5800	5800	7000	7000	7900	7900	7900
B	(5)	mm	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260
H	(5)	mm	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
Operating weight	(5)	kg	5380	5950	6040	6600	7500	8250	9070	9550	10040	10590

Notes:
1 Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Source (side) heat exchanger air (in) 30,0°C; Ethylene glycol 30%.
2 Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Ethylene glycol 30%.
3 Average sound pressure level at 10m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.
4 Sound power on the basis of measurements made in compliance with ISO 9614.
5 Unit in standard configuration/execution, without optional accessories.
- Not available

GENERAL TECHNICAL DATA FR-FC-Z /SL-T+

[SI System]

FR-FC-Z /SL-T+			3602	3902	4202	4502	4802	5402
Power supply		V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
PERFORMANCE								
FREE-COOLING OFF (GROSS VALUE)								
Cooling capacity	(1)	**kW**	**878**	**938**	**984**	**1097**	**1139**	**1288**
Compressors power input	(1)	kW	223	244	263	274	301	351
Total power input	(1)	kW	245	266	285	301	328	377
EER	(1)	**kW/kW**	**3,59**	**3,52**	**3,46**	**3,65**	**3,48**	**3,41**
Free Cooling (Tae = 10,0°C)								
Free cooling capacity	(1)	**kW**	**280**	**289**	**296**	**346**	**352**	**384**
% Free cooling	(1)	%	32	31	30	32	31	30
TOTAL FREE-COOLING (GROSS VALUE)								
Cooling capacity	(2)	**kW**	**878**	**938**	**984**	**1097**	**1139**	**1288**
Total power input	(2)	kW	24,0	24,0	24,0	28,8	28,8	28,8
EER	(2)	**kW/kW**	**36,58**	**39,10**	**40,99**	**38,09**	**39,55**	**44,72**
Total free-cooling temperature	(2)	°C	0,9	0,5	0,1	0,8	0,5	0,0
EXCHANGERS								
HEAT EXCHANGER USER SIDE IN REFRIGERATION								
Glycol	(1)	%	30	30	30	30	30	30
Water flow	(1)	l/s	46,51	49,71	52,12	58,09	60,32	68,25
Pressure drop	(1)	kPa	69,8	86,2	92,6	83,8	90,4	84,8
REFRIGERANT CIRCUIT								
Compressors nr.		N°	2	2	2	2	2	2
Number of capacity steps		N°	0	0	0	0	0	0
No. Circuits		N°	2	2	2	2	2	2
Regulation			STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS
Min. capacity step		%	25	25	25	25	25	25
Refrigerant			R134a	R134a	R134a	R134a	R134a	R134a
Refrigerant charge		kg	229	253	281	334	339	357
Oil charge		kg	60,0	60,0	60,0	60,0	60,0	60,0
FANS								
Quantity		N°	20	20	20	24	24	24
Air flow		m³/s	73,33	73,33	73,33	88,76	88,76	94,13
Fans power input		kW	1,10	1,10	1,10	1,10	1,10	1,10
NOISE LEVEL								
Sound Pressure	(3)	dB(A)	59	59	59	61	61	62
Sound power level in cooling	(4)	dB(A)	92	92	92	94	94	95
SIZE AND WEIGHT								
A	(5)	mm	10000	10000	10000	11800	11800	13000
B	(5)	mm	2260	2260	2260	2260	2260	2260
H	(5)	mm	2500	2500	2500	2500	2500	2500
Operating weight	(5)	kg	13020	13060	13560	14970	15060	16360

Notes:
1 Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Source (side) heat exchanger air (in) 30,0°C; Ethylene glycol 30%.
2 Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Ethylene glycol 30%.
3 Average sound pressure level at 10m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.
4 Sound power on the basis of measurements made in compliance with ISO 9614.
5 Unit in standard configuration/execution, without optional accessories.
- Not available

GENERAL TECHNICAL DATA FR-FC-Z /NG /T+

[SI System]

FR-FC-Z /NG /T+			1502	1702	1902	2002	2202	2602	2702	3002	3202	3402
Power supply		V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
PERFORMANCE												
FREE-COOLING OFF (GROSS VALUE)												
Cooling capacity	(1)	**kW**	**345**	**383**	**444**	**494**	**545**	**636**	**683**	**714**	**774**	**849**
Compressors power input	(1)	kW	77,5	87,0	99,1	114	122	149	161	176	184	193
Total power input	(1)	kW	89,5	103	115	134	142	173	185	200	212	225
EER	(1)	**kW/kW**	**3,85**	**3,71**	**3,86**	**3,70**	**3,85**	**3,67**	**3,68**	**3,57**	**3,65**	**3,78**
Free Cooling (Tae = 10,0°C)												
Free cooling capacity	(1)	**kW**	**92,5**	**105**	**120**	**134**	**148**	**176**	**188**	**192**	**213**	**229**
% Free cooling	(1)	%	27	27	27	27	27	28	27	27	28	27
TOTAL FREE-COOLING (GROSS VALUE)												
Cooling capacity	(2)	**kW**	**345**	**383**	**444**	**494**	**545**	**636**	**683**	**714**	**774**	**849**
Total power input	(2)	kW	15,0	23,5	21,5	27,5	27,5	35,0	35,0	35,0	43,0	47,0
EER	(2)	**kW/kW**	**22,97**	**16,28**	**20,66**	**17,96**	**19,80**	**18,17**	**19,52**	**20,39**	**17,99**	**18,06**
Total free-cooling temperature	(2)	°C	-1,4	-1,2	-1,3	-1,2	-1,2	-0,8	-0,9	-1,2	-0,9	-1,4
EXCHANGERS												
HEAT EXCHANGER USER SIDE IN REFRIGERATION												
Glycol	(1)	%	0	0	0	0	0	0	0	0	0	0
Water flow	(1)	l/s	16,49	18,31	21,26	23,64	26,06	30,42	32,69	34,16	37,02	40,61
Pressure drop	(1)	kPa	100	123	113	121	117	118	107	116	123	107
REFRIGERANT CIRCUIT												
Compressors nr.		N°	2	2	2	2	2	2	2	2	2	2
Number of capacity steps		N°	0	0	0	0	0	0	0	0	0	0
No. Circuits		N°	2	2	2	2	2	2	2	2	2	2
Regulation			STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS
Min. capacity step		%	25	25	25	25	25	25	25	25	25	25
Refrigerant			R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a
Refrigerant charge		kg	85,0	90,0	108	119	128	141	145	175	180	190
Oil charge		kg	30,0	30,0	30,0	30,0	44,0	44,0	38,0	38,0	38,0	49,0
FANS												
Quantity		N°	6	8	8	10	10	12	12	12	14	16
Air flow		m³/s	35,93	43,27	47,48	54,88	58,82	64,28	67,43	67,43	77,20	90,75
Fans power input		kW	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00
NOISE LEVEL												
Sound Pressure	(3)	dB(A)	67	68	68	68	69	70	69	69	69	69
Sound power level in cooling	(4)	dB(A)	99	100	100	100	101	102	102	102	102	102
SIZE AND WEIGHT												
A	(5)	mm	4000	4000	4900	4900	5800	5800	6400	6400	7000	7900
B	(5)	mm	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260
H	(5)	mm	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
Operating weight	(5)	kg	5270	5470	6020	6250	7520	8000	9020	9060	9420	10300

Notes:
1 Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Source (side) heat exchanger air (in) 30,0°C; Ethylene glycol 0%.
2 Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Ethylene glycol 0%.
3 Average sound pressure level at 10m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.
4 Sound power on the basis of measurements made in compliance with ISO 9614.
5 Unit in standard configuration/execution, without optional accessories.
- Not available

GENERAL TECHNICAL DATA — FR-FC-Z /NG /T+

[SI System]

FR-FC-Z /NG /T+			3602	3902	4202	4502	4802	5402	6002
Power supply		V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
PERFORMANCE									
FREE-COOLING OFF (GROSS VALUE)									
Cooling capacity	(1)	**kW**	**905**	**970**	**1040**	**1123**	**1221**	**1361**	**1450**
Compressors power input	(1)	kW	215	235	247	268	271	325	370
Total power input	(1)	kW	246	267	279	308	319	373	418
EER	(1)	**kW/kW**	**3,67**	**3,63**	**3,73**	**3,65**	**3,82**	**3,65**	**3,47**
Free Cooling (Tae = 10,0°C)									
Free cooling capacity	(1)	**kW**	**246**	**254**	**272**	**298**	**330**	**363**	**386**
% Free cooling	(1)	%	27	26	26	27	27	27	27
TOTAL FREE-COOLING (GROSS VALUE)									
Cooling capacity	(2)	**kW**	**905**	**970**	**1040**	**1123**	**1221**	**1361**	**1450**
Total power input	(2)	kW	47,0	47,0	50,5	62,0	66,5	70,0	70,0
EER	(2)	**kW/kW**	**19,26**	**20,63**	**20,59**	**18,11**	**18,36**	**19,44**	**20,71**
Total free-cooling temperature	(2)	°C	-1,0	-1,6	-1,6	-1,3	-1,4	-1,3	-1,3
EXCHANGERS									
HEAT EXCHANGER USER SIDE IN REFRIGERATION									
Glycol	(1)	%	0	0	0	0	0	0	0
Water flow	(1)	l/s	43,32	46,41	49,77	53,72	58,42	65,12	69,37
Pressure drop	(1)	kPa	114	137	157	131	155	165	187
REFRIGERANT CIRCUIT									
Compressors nr.		N°	2	2	2	2	2	2	2
Number of capacity steps		N°	0	0	0	0	0	0	0
No. Circuits		N°	2	2	2	2	2	2	2
Regulation			STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS
Min. capacity step		%	25	25	25	25	25	25	25
Refrigerant			R134a	R134a	R134a	R134a	R134a	R134a	R134a
Refrigerant charge		kg	199	220	244	290	295	310	330
Oil charge		kg	60,0	60,0	60,0	60,0	60,0	60,0	64,0
FANS									
Quantity		N°	16	16	16	20	24	24	24
Air flow		m³/s	88,23	88,23	92,43	106,08	132,98	128,57	134,86
Fans power input		kW	2,00	2,00	2,00	2,00	2,00	2,00	2,00
NOISE LEVEL									
Sound Pressure	(3)	dB(A)	70	70	70	72	73	73	73
Sound power level in cooling	(4)	dB(A)	103	103	103	105	106	106	106
SIZE AND WEIGHT									
A	(5)	mm	7900	7900	10000	10000	11800	11800	13000
B	(5)	mm	2260	2260	2260	2260	2260	2260	2260
H	(5)	mm	2500	2500	2500	2500	2500	2500	2500
Operating weight	(5)	kg	11280	11370	13070	13570	14490	15760	16680

Notes:
1 Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Source (side) heat exchanger air (in) 30,0°C; Ethylene glycol 0%.
2 Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Ethylene glycol 0%.
3 Average sound pressure level at 10m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.
4 Sound power on the basis of measurements made in compliance with ISO 9614.
5 Unit in standard configuration/execution, without optional accessories.
- Not available

GENERAL TECHNICAL DATA — FR-FC-Z /NG /SL-T+

[SI System]

FR-FC-Z /NG /SL-T+			1502	1702	1902	2002	2202	2602	2702	3002	3202	3402
Power supply		V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
PERFORMANCE												
FREE-COOLING OFF (GROSS VALUE)												
Cooling capacity	(1)	**kW**	**341**	**382**	**438**	**489**	**536**	**642**	**674**	**731**	**765**	**808**
Compressors power input	(1)	kW	81,4	90,4	105	120	130	152	171	176	194	216
Total power input	(1)	kW	90,2	99,2	116	131	143	168	187	193	212	234
EER	(1)	**kW/kW**	**3,78**	**3,85**	**3,77**	**3,74**	**3,74**	**3,82**	**3,61**	**3,78**	**3,61**	**3,46**
Free Cooling (Tae = 10,0°C)												
Free cooling capacity	(1)	**kW**	**89,5**	**97,8**	**114**	**125**	**145**	**166**	**177**	**191**	**203**	**208**
% Free cooling	(1)	%	26	26	26	26	27	26	26	26	26	26
TOTAL FREE-COOLING (GROSS VALUE)												
Cooling capacity	(2)	**kW**	**341**	**382**	**438**	**489**	**536**	**642**	**674**	**731**	**765**	**808**
Total power input	(2)	kW	12,6	13,6	17,5	17,5	21,9	27,8	27,8	30,2	30,2	34,2
EER	(2)	**kW/kW**	**27,03**	**28,10**	**25,02**	**27,94**	**24,46**	**23,09**	**24,24**	**24,22**	**25,33**	**23,64**
Total free-cooling temperature	(2)	°C	-2,0	-1,9	-2,0	-2,1	-2,0	-2,1	-1,7	-2,1	-1,7	-2,0
EXCHANGERS												
HEAT EXCHANGER USER SIDE IN REFRIGERATION												
Glycol	(1)	%	0	0	0	0	0	0	0	0	0	0
Water flow	(1)	l/s	16,30	18,29	20,96	23,40	25,64	30,72	32,25	34,99	36,61	38,69
Pressure drop	(1)	kPa	97,8	123	110	118	113	120	104	122	120	97,0
REFRIGERANT CIRCUIT												
Compressors nr.		N°	2	2	2	2	2	2	2	2	2	2
Number of capacity steps		N°	0	0	0	0	0	0	0	0	0	0
No. Circuits		N°	2	2	2	2	2	2	2	2	2	2
Regulation			STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS
Min. capacity step		%	25	25	25	25	25	25	25	25	25	25
Refrigerant			R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a
Refrigerant charge		kg	98,0	104	124	137	147	162	167	201	207	219
Oil charge		kg	30,0	30,0	30,0	30,0	44,0	44,0	38,0	38,0	38,0	49,0
FANS												
Quantity		N°	8	8	10	10	12	14	14	16	16	16
Air flow		m³/s	30,10	33,68	38,26	41,46	46,30	55,35	53,57	63,26	61,22	61,22
Fans power input		kW	1,10	1,10	1,10	1,10	1,10	1,10	1,10	1,10	1,10	1,10
NOISE LEVEL												
Sound Pressure	(3)	dB(A)	57	57	57	58	59	58	58	59	59	59
Sound power level in cooling	(4)	dB(A)	89	89	89	90	91	91	91	92	92	92
SIZE AND WEIGHT												
A	(5)	mm	4000	4900	4900	5800	5800	7000	7000	7900	7900	7900
B	(5)	mm	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260
H	(5)	mm	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
Operating weight	(5)	kg	5770	6360	6520	7160	8020	8890	9590	10070	10570	11290

Notes:
1 Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Source (side) heat exchanger air (in) 30,0°C; Ethylene glycol 0%.
2 Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Ethylene glycol 0%.
3 Average sound pressure level at 10m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.
4 Sound power on the basis of measurements made in compliance with ISO 9614.
5 Unit in standard configuration/execution, without optional accessories.
- Not available

GENERAL TECHNICAL DATA FR-FC-Z /NG /SL-T+

[SI System]

FR-FC-Z /NG /SL-T+			3602	3902	4202	4502	4802	5402
Power supply		V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
PERFORMANCE								
FREE-COOLING OFF (GROSS VALUE)								
Cooling capacity	(1)	**kW**	**902**	**964**	**1010**	**1126**	**1169**	**1323**
Compressors power input	(1)	kW	224	245	264	276	303	353
Total power input	(1)	kW	246	267	286	302	329	380
EER	(1)	**kW/kW**	**3,67**	**3,61**	**3,54**	**3,73**	**3,55**	**3,48**
Free Cooling (Tae = 10,0°C)								
Free cooling capacity	(1)	**kW**	**240**	**248**	**254**	**296**	**302**	**329**
% Free cooling	(1)	%	27	26	25	26	26	25
TOTAL FREE-COOLING (GROSS VALUE)								
Cooling capacity	(2)	**kW**	**902**	**964**	**1010**	**1126**	**1169**	**1323**
Total power input	(2)	kW	39,0	39,0	42,5	47,3	47,3	50,8
EER	(2)	**kW/kW**	**23,12**	**24,71**	**23,76**	**23,81**	**24,71**	**26,04**
Total free-cooling temperature	(2)	°C	-1,7	-2,2	-2,5	-1,8	-2,1	-2,6
EXCHANGERS								
HEAT EXCHANGER USER SIDE IN REFRIGERATION								
Glycol	(1)	%	0	0	0	0	0	0
Water flow	(1)	l/s	43,15	46,11	48,35	53,89	55,96	63,31
Pressure drop	(1)	kPa	113	135	148	132	142	156
REFRIGERANT CIRCUIT								
Compressors nr.		N°	2	2	2	2	2	2
Number of capacity steps		N°	0	0	0	0	0	0
No. Circuits		N°	2	2	2	2	2	2
Regulation			STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS
Min. capacity step		%	25	25	25	25	25	25
Refrigerant			R134a	R134a	R134a	R134a	R134a	R134a
Refrigerant charge		kg	229	253	281	334	339	357
Oil charge		kg	60,0	60,0	60,0	60,0	60,0	60,0
FANS								
Quantity		N°	20	20	20	24	24	24
Air flow		m³/s	73,33	73,33	73,33	88,76	88,76	94,13
Fans power input		kW	1,10	1,10	1,10	1,10	1,10	1,10
NOISE LEVEL								
Sound Pressure	(3)	dB(A)	59	59	59	61	61	62
Sound power level in cooling	(4)	dB(A)	92	92	92	94	94	95
SIZE AND WEIGHT								
A	(5)	mm	10000	10000	10000	11800	11800	13000
B	(5)	mm	2260	2260	2260	2260	2260	2260
H	(5)	mm	2500	2500	2500	2500	2500	2500
Operating weight	(5)	kg	13810	13850	13970	15590	15680	17220

Notes:
1 Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Source (side) heat exchanger air (in) 30,0°C; Ethylene glycol 0%.
2 Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Ethylene glycol 0%.
3 Average sound pressure level at 10m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.
4 Sound power on the basis of measurements made in compliance with ISO 9614.
5 Unit in standard configuration/execution, without optional accessories.
- Not available

GENERAL TECHNICAL DATA

ENERGY EFFICIENCY

SEASONAL EFFICIENCY IN COOLING (Reg. EU 2016/2281)
Process Refrigeration at high temperature

FR-FC-Z /T+			1502	1702	1902	2002	2202	2602	2702	3002	3202	3402	3602	3902	4202
Prated,c	(1)	kW	292,7	327,5	379,3	422,1	465,9	542,3	584,2	610,4	661,7	726,1	772,8	826,3	886,6
SEPR	(1) (2)	-	5,95	5,68	6,15	5,84	6,12	5,99	5,98	5,93	6,00	6,00	5,91	5,75	5,80
FR-FC-Z /T+			**4502**	**4802**	**5402**	**6002**									
Prated,c	(1)	kW	960,6	1049	1168	1240									
SEPR	(1) (2)	-	5,75	5,92	5,89	5,69									

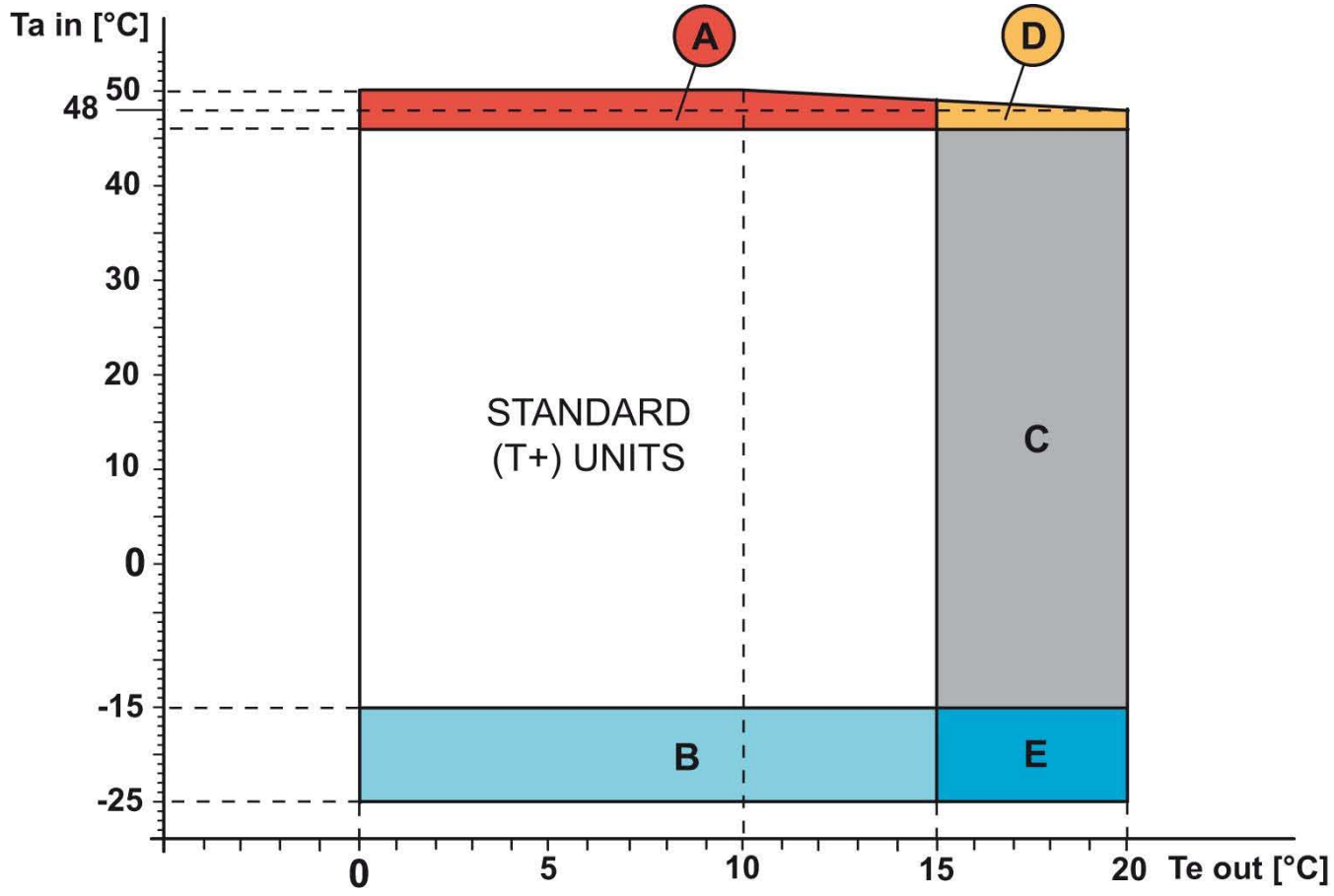
FR-FC-Z /SL-T+			1502	1702	1902	2002	2202	2602	2702	3002	3202	3402	3602	3902	4202
Prated,c	(1)	kW	288,9	326,7	373,1	416,9	457,5	547,2	575,5	625,2	653,7	689,7	769,0	820,1	859,3
SEPR	(1) (2)	-	6,02	5,88	6,26	6,30	6,24	6,26	6,18	6,24	6,28	6,07	6,13	5,97	5,80
FR-FC-Z /SL-T+			**4502**	**4802**	**5402**										
Prated,c	(1)	kW	962,7	1003	1133										
SEPR	(1) (2)	-	6,16	6,07	6,08										

FR-FC-Z /NG /T+			1502	1702	1902	2002	2202	2602	2702	3002	3202	3402	3602	3902	4202
Prated,c	(1)	kW	292,0	326,5	378,2	420,9	464,3	540,8	582,5	608,5	659,4	724,3	770,8	823,8	883,3
SEPR	(1) (2)	-	5,56	5,10	5,64	5,33	5,54	5,38	5,39	5,37	5,53	5,42	5,37	5,26	5,21
FR-FC-Z /NG /T+			**4502**	**4802**	**5402**	**6002**									
Prated,c	(1)	kW	957,6	1045	1163	1235									
SEPR	(1) (2)	-	5,17	5,35	5,27	5,15									

FR-FC-Z /NG /SL-T+			1502	1702	1902	2002	2202	2602	2702	3002	3202	3402	3602	3902	4202
Prated,c	(1)	kW	288,1	325,7	372,1	415,7	456,0	545,6	573,9	623,2	651,4	688,1	766,8	817,5	856,2
SEPR	(1) (2)	-	5,62	5,43	5,75	5,79	5,65	5,64	5,56	5,64	5,66	5,47	5,54	5,43	5,21
FR-FC-Z /NG /SL-T+			**4502**	**4802**	**5402**										
Prated,c	(1)	kW	959,7	999,2	1129										
SEPR	(1) (2)	-	5,52	5,46	5,44										

Notes:

(1) Seasonal energy efficiency of high temperature process cooling [REGULATION (EU) N. 2016/2281]
(2) Seasonal process cooling energy index



Ta in Outdoor air temperature [°C]

Te out Evaporator outlet temperature [°C]

A Kit [0°C < TH_2O < 15°C] / [Tair > 46°C] required (option 1272)

B Kit [0°C < TH_2O < 15°C] / [-25°C < Tair < -15°C] required (option 1273)

C Kit [15°C < TH_2O < 20°C] / [-15°C < Tair < 46°C] required (option 1274)

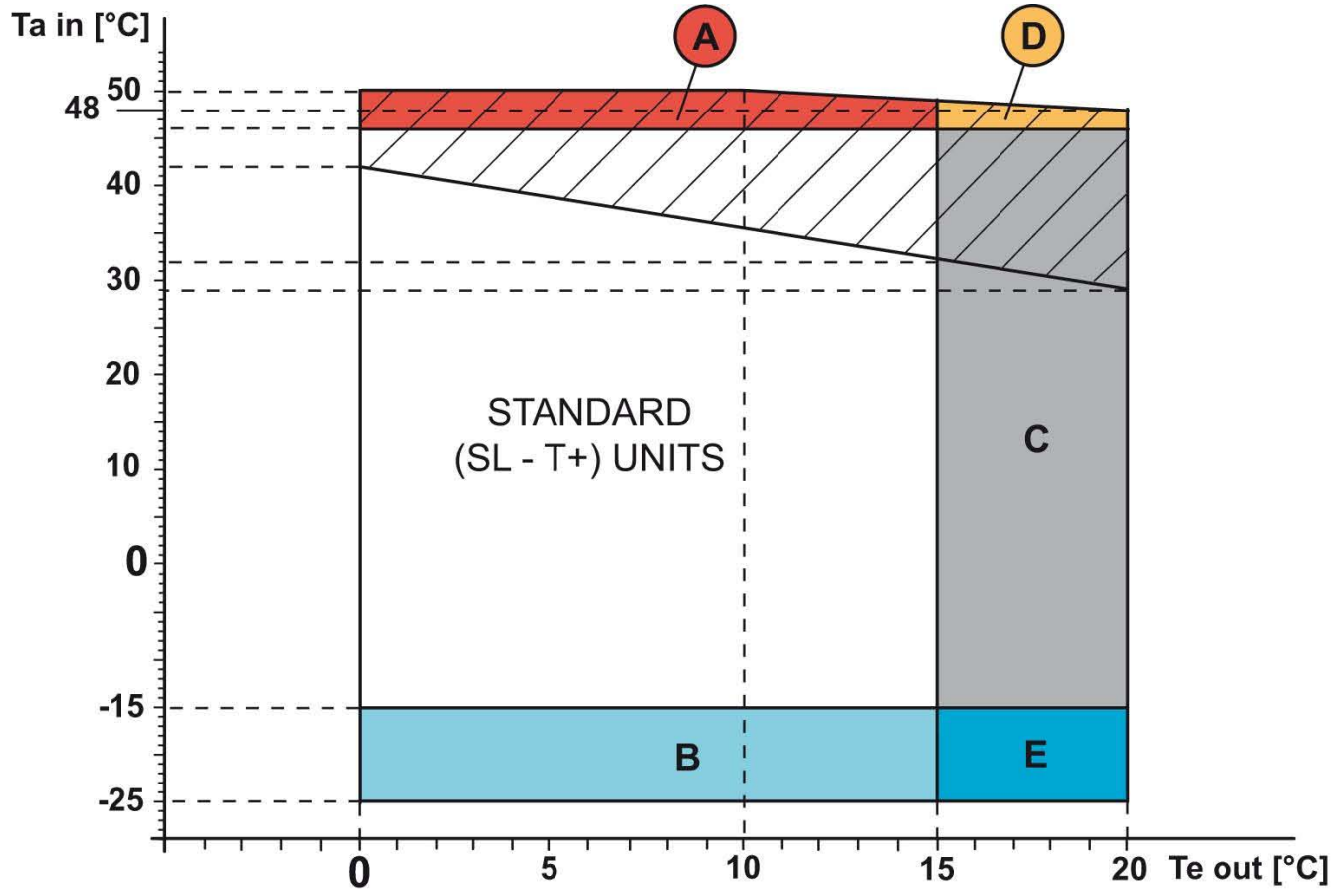
D Kit [15°C < TH_2O < 20°C] / [Tair > 46°C] required (option 1275)

E Kit [15°C < TH_2O < 20°C] / [25°C <Tair < -15°C] required (option 1276)

Unit in not silenced mode

For limits to individual sizes, versions and evaporator Δt [°C] temperature, consult ELCA WORLD SOFTWARE.
Minimum storage temperature: -20°C

SIZE
FR-FC-Z /T+ /1502
FR-FC-Z /T+ /1702
FR-FC-Z /T+ /1902
FR-FC-Z /T+ /2002
FR-FC-Z /T+ /2202
FX-FC-Z /T+ /2602
FR-FC-Z /T+ /2702
FR-FC-Z /T+ /3002
FR-FC-Z /T+ /3202
FR-FC-Z /T+ /3402
FR-FC-Z /T+ /3602
FR-FC-Z /T+ /3902
FR-FC-Z /T+ /4202
FR-FC-Z /T+ /4502
FR-FC-Z /T+ /4802
FR-FC-Z /T+ /5402
FR-FC-Z /T+ /6002
FR-FC-Z /NG /T+ /1502
FR-FC-Z /NG /T+ /1702
FX-FC-Z /NG /T+ /1902
FR-FC-Z /NG /T+ /2002
FR-FC-Z /NG /T+ /2202
FR-FC-Z /NG /T+ /2602
FR-FC-Z /NG /T+ /2702
FR-FC-Z /NG /T+ /3002
FR-FC-Z /NG /T+ /3202
FR-FC-Z /NG /T+ /3402
FR-FC-Z /NG /T+ /3602
FR-FC-Z /NG /T+ /3902
FR-FC-Z /NG /T+ /4202
FR-FC-Z /NG /T+ /4502
FR-FC-Z /NG /T+ /4802
FR-FC-Z /NG /T+ /5402
FR-FC-Z /NG /T+ /6002



Ta in Outdoor air temperature [°C]

Te out Evaporator outlet temperature [°C]

A Kit [0°C < TH_2O < 15°C] / [Tair > 46°C] required (option 1272)

B Kit [0°C < TH_2O < 15°C] / [-25°C < Tair < -15°C] required (option 1273)

C Kit [15°C < TH_2O < 20°C] / [-15°C < Tair < 46°C] required (option 1274)

D Kit [15°C < TH_2O < 20°C] / [Tair > 46°C] required (option 1275)

E Kit [15°C < TH_2O < 20°C] / [25°C <Tair < -15°C] required (option 1276)

Unit in not silenced mode

For limits to individual sizes, versions and evaporator Δt [°C] temperature, consult ELCA WORLD SOFTWARE.
Minimum storage temperature: -20°C

SIZE
FR-FC-Z /SL-T+ /1502
FR-FC-Y /SL-T+ /1702
FX-FC-Z /SL-T+ /1902
FR-FC-Z /SL-T+ /2002
FR-FC-Z /SL-T+ /2202
FR-FC-Z /SL-T+ /2602
FR-FC-Z /SL-T+ /2702
FR-FC-Z /SL-T+ /3002
FR-FC-Z /SL-T+ /3202
FR-FC-Z /SL-T+ /3402
FR-FC-Z /SL-T+ /3602
FR-FC-Z /SL-T+ /3902
FR-FC-Z /SL-T+ /4202
FR-FC-Z /SL-T+ /4502
FR-FC-Z /SL-T+ /4802
FR-FC-Z /SL-T+ /5402
FR-FC-Z /NG /SL-T+ /1502
FR-FC-Z /NG /SL-T+ /1702
FR-FC-Z /NG /SL-T+ /1902
FR-FC-Z /NG /SL-T+ /2002
FR-FC-Z /NG /SL-T+ /2202
FR-FC-Z /NG /SL-T+ /2602
FR-FC-Z /NG /SL-T+ /2702
FR-FC-Z /NG /SL-T+ /3002
FR-FC-Z /NG /SL-T+ /3202
FR-FC-Z /NG /SL-T+ /3402
FR-FC-Z /NG /SL-T+ /3602
FR-FC-Z /NG /SL-T+ /3902
FR-FC-Z /NG /SL-T+ /4202
FR-FC-Z /NG /SL-T+ /4502
FR-FC-Z /NG /SL-T+ /4802
FR-FC-Z /NG /SL-T+ /5402

5.2 ETHYLENE GLYCOL MIXTURE

Ethylene glycol and water mixture, used as a heat-conveying fluid, cause a variation in unit performance. For correct data, use the factors indicated in the following tabel.

	Freezing point (°C)							
	0	-5	-10	-15	-20	-25	-30	-35
	Ethylene glycol percentage by weight							
	0%	12%	20%	30%	35%	40%	45%	50%
cPf	1	0,985	0,98	0,974	0,97	0,965	0,964	0,96
cQ	1	1,02	1,04	1,075	1,11	1,14	1,17	1,2
cdp	1	1,07	1,11	1,18	1,22	1,24	1,27	1,3

cPf: cooling power correction factor
cQ: flow correction factor
cdp: pressure drop correction factor

For data concerning other kind of anti-freeze solutions (e,g, propylene glycol) please contact our Sale Department.

5.3 FOULING FACTORS

Performances are based on clean condition of tubes (fouling factor = 1). For different fouling values, performance should be adjusted using the correction factors shown in the following table.

SERIES	FOULING FACTORS	EVAPORATOR			CONDENSER/RECOVERY			DESUPERHEATER
	ff (m^2 °CW)	F1	FK1	KE [°C]	F2	FK2	KC [°C]	R3
VARIOUS	0	1,000	1,000	0,0	1,000	1,000	0,0	1,000
VARIOUS	$1{,}80 \times 10^{-5}$	1,000	1,000	0,0	1,000	1,000	0,0	1,000
VARIOUS	$4{,}40 \times 10^{-5}$	1,000	1,000	0,0	0,990	1,030	1,0	0,990
VARIOUS	$8{,}80 \times 10^{-5}$	0,960	0,990	0,7	0,980	1,040	1,5	0,980
VARIOUS	$13{,}20 \times 10^{-5}$	0,944	0,985	1,0	0,964	1,050	2,3	0,964
VARIOUS	$17{,}20 \times 10^{-5}$	0,930	0,980	1,5	0,950	1,060	3,0	0,950

ff: fouling factors
F1 - F2: potential correction factors
FK1 - FK2: compressor power input correction factors
R3: capacity correction factors
KE: minimum evaporator outlet temperature increase
KC: maximum condenser outlet temperature decrease

6.1 HYDRAULIC DATA

[SI System]

Water flow and pressure drop

Water flow in the plant (side) exchanger is given by:
Q=P/(4,186 x Dt)
Q: water flow (l/s)
Dt: difference between inlet and outlet water temp. (°C)
P: heat exchanger capacity (kW)

Pressure drop is given by:
Dp= K x (3,6 x Q)^2/1000
Q: water flow (l/s)
Dp: pressure drop (kPa)
K: unit size ratio

SIZE	Power supply V/ph/Hz	HEAT EXCHANGER USER SIDE				
		K	Q min l/s	Q max l/s	C.A.S. l	C.a. min l
FR-FC-Z /T+ /1502	400/3/50	14,1	10,56	26,67	91,0	1090
FR-FC-Z /T+ /1702	400/3/50	14,1	10,56	26,67	91,0	1220
FR-FC-Z /T+ /1902	400/3/50	9,67	13,33	31,94	85,0	1410
FX-FC-Z /T+ /2002	400/3/50	8,62	13,33	31,94	85,0	1570
FR-FC-Z /T+ /2202	400/3/50	5,19	15,83	44,44	133	1740
FR-FC-Z /T+ /2602	400/3/50	4,67	15,83	46,94	124	2020
FR-FC-Z /T+ /2702	400/3/50	3,40	17,50	50,28	230	2170
FR-FC-Z /T+ /3002	400/3/50	3,40	17,50	50,28	230	2270
FR-FC-Z /T+ /3202	400/3/50	2,54	19,17	54,44	220	2460
FR-FC-Z /T+ /3402	400/3/50	2,54	19,17	54,44	220	2700
FR-FC-Z /T+ /3602	400/3/50	2,29	19,17	56,11	210	2870
FR-FC-Z /T+ /3902	400/3/50	2,46	19,17	58,33	209	3070
FR-FC-Z /T+ /4202	400/3/50	2,21	19,17	58,33	209	3290
FR-FC-Z /T+ /4502	400/3/50	1,61	25,00	66,94	269	3570
FR-FC-Z /T+ /4802	400/3/50	1,61	25,00	66,94	269	3910
FR-FC-Z /T+ /5402	400/3/50	1,18	31,11	100,83	310	4340
FR-FC-Z /T+ /6002	400/3/50	1,18	31,11	100,83	310	4620
FR-FC-Z /SL-T+ /1502	400/3/50	14,1	10,56	26,67	91,0	1090
FR-FC-Z /SL-T+ /1702	400/3/50	14,1	10,56	26,67	91,0	1220
FR-FC-Z /SL-T+ /1902	400/3/50	9,67	13,33	31,94	85,0	1410
FR-FC-Z /SL-T+ /2002	400/3/50	8,62	13,33	31,94	85,0	1570
FR-FC-Z /SL-T+ /2202	400/3/50	5,19	15,83	44,44	133	1740
FR-FC-Z /SL-T+ /2602	400/3/50	4,67	15,83	46,94	124	2020
FR-FC-Z /SL-T+ /2702	400/3/50	3,40	17,50	50,28	230	2170
FR-FC-Z /SL-T+ /3002	400/3/50	3,40	17,50	50,28	230	2270
FR-FC-Z /SL-T+ /3202	400/3/50	2,54	19,17	54,44	220	2460
FR-FC-Z /SL-T+ /3402	400/3/50	2,54	19,17	54,44	220	2700
FR-FC-Z /SL-T+ /3602	400/3/50	2,09	19,17	56,11	210	2870
FR-FC-Z /SL-T+ /3902	400/3/50	2,26	19,17	58,33	209	3070
FR-FC-Z /SL-T+ /4202	400/3/50	2,21	19,17	58,33	209	3290
FR-FC-Z /SL-T+ /4502	400/3/50	1,61	25,00	66,94	269	3570
FR-FC-Z /SL-T+ /4802	400/3/50	1,61	25,00	66,94	269	3910
FR-FC-Z /SL-T+ /5402	400/3/50	1,18	31,11	100,83	310	4340
FR-FC-Z /NG /T+ /1502	400/3/50	28,4	10,56	26,67	91,0	1090
FR-FC-Z /NG /T+ /1702	400/3/50	28,4	10,56	26,67	91,0	1220
FR-FC-Z /NG /T+ /1902	400/3/50	19,3	13,33	31,94	85,0	1410
FR-FC-Z /NG /T+ /2002	400/3/50	16,7	13,33	31,94	85,0	1570
FR-FC-Z /NG /T+ /2202	400/3/50	13,3	15,83	44,44	133	1740
FR-FC-Z /NG /T+ /2602	400/3/50	9,80	15,83	46,94	124	2020
FR-FC-Z /NG /T+ /2702	400/3/50	7,70	17,50	50,28	230	2170
FR-FC-Z /NG /T+ /3002	400/3/50	7,70	17,50	50,28	230	2270
FR-FC-Z /NG /T+ /3202	400/3/50	6,90	19,17	54,44	220	2460

Q min: minimum water flow admitted to the heat exchanger
Q max: maximum water flow admitted to the heat exchanger
C.a. min: minimum water content admitted in the plant
C.A.S.: Exchanger water content

HYDRAULIC DATA

[SI System]

SIZE	Power supply V/ph/Hz	HEAT EXCHANGER USER SIDE				
		K	Q min l/s	Q max l/s	C.A.S. l	C.a. min l
FR-FC-Z /NG /T+ /3402	400/3/50	5,00	19,17	54,44	220	2700
FR-FC-Z /NG /T+ /3602	400/3/50	4,70	19,17	56,11	210	2870
FR-FC-Y /NG /T+ /3902	400/3/50	4,90	19,17	58,33	209	3070
FR-FC-Z /NG /T+ /4202	400/3/50	4,90	19,17	58,33	209	3290
FR-FC-Z /NG /T+ /4502	400/3/50	3,50	25,00	66,94	269	3570
FR-FC-Z /NG /T+ /4802	400/3/50	3,50	25,00	66,94	269	3910
FR-FC-Z /NG /T+ /5402	400/3/50	3,00	31,11	100,83	310	4340
FR-FC-Z /NG /T+ /6002	400/3/50	3,00	31,11	100,83	310	4620
FR-FC-Z /NG /SL-T+ /1502	400/3/50	28,4	10,56	26,67	91,0	1090
FR-FC-Z /NG /SL-T+ /1702	400/3/50	28,4	10,56	26,67	91,0	1220
FR-FC-Z /NG /SL-T+ /1902	400/3/50	19,3	13,33	31,94	85,0	1410
FR-FC-Z /NG /SL-T+ /2002	400/3/50	16,7	13,33	31,94	85,0	1570
FR-FC-Z /NG /SL-T+ /2202	400/3/50	13,3	15,83	44,44	133	1740
FR-FC-Z /NG /SL-T+ /2602	400/3/50	9,80	15,83	46,94	124	2020
FR-FC-Z /NG /SL-T+ /2702	400/3/50	7,70	17,50	50,28	230	2170
FR-FC-Z /NG /SL-T+ /3002	400/3/50	7,70	17,50	50,28	230	2270
FR-FC-Z /NG /SL-T+ /3202	400/3/50	6,90	19,17	54,44	220	2460
FR-FC-Z /NG /SL-T+ /3402	400/3/50	5,00	19,17	54,44	220	2700
FR-FC-Z /NG /SL-T+ /3602	400/3/50	4,70	19,17	56,11	210	2870
FR-FC-Z /NG /SL-T+ /3902	400/3/50	4,90	19,17	58,33	209	3070
FR-FC-Z /NG /SL-T+ /4202	400/3/50	4,90	19,17	58,33	209	3290
FR-FC-Z /NG /SL-T+ /4502	400/3/50	3,50	25,00	66,94	269	3570
FR-FC-Z /NG /SL-T+ /4802	400/3/50	3,50	25,00	66,94	269	3910
FR-FC-Z /NG /SL-T+ /5402	400/3/50	3,00	31,11	100,83	310	4340

Q min: minimum water flow admitted to the heat exchanger
Q max: maximum water flow admitted to the heat exchanger
C.a. min: minimum water content admitted in the plant
C.A.S.: Exchanger water content

7.1 ELECTRICAL DATA FR-FC-Z /T+

[SI System]

SIZE	Power supply V/ph/Hz	Maximum values								
		Compressor				Fans (1)		Total (1)(2)		
		n	F.L.I. [kW]	F.L.A. [A]	L.R.A. [A]	F.L.I. [kW]	F.L.A. [A]	F.L.I. [kW]	F.L.A. [A]	S.A. [A]
1502	400/3/50	2	2 x 51.7	2 x 91.7	2 x 267	2,00	4	116	234	356
1702	400/3/50	2	2 x 64.3	2 x 105	2 x 290	2,00	4	145	241	389
1902	400/3/50	2	2 x 70.2	2 x 115	2 x 350	2,00	4	157	262	463
2002	400/3/50	2	2 x 82.1	2 x 132	2 x 423	2,00	4	185	303	545
2202	400/3/50	2	2 x 85.4	2 x 137	2 x 246	2,00	4	192	314	379
2602	400/3/50	2	2 x 101	2 x 165	2 x 300	2,00	4	226	377	451
2702	400/3/50	2	2 x 112	2 x 184	2 x 360	2,00	4	248	414	536
3002	400/3/50	2	112 +127	184 + 208	360 + 404	2,00	4	264	439	539
3202	400/3/50	2	2 x 127	2 x 208	2 x 404	2,00	4	284	471	590
3402	400/3/50	2	127 + 145	208 + 235	404 + 436	2,00	4	306	506	627
3602	400/3/50	2	2 x 145	2 x 235	2 x 436	2,00	4	324	533	660
3902	400/3/50	2	145 + 171	235 + 272	436 + 465	2,00	4	350	572	666
4202	400/3/50	2	2 x 171	2 x 272	2 x 465	2,00	4	375	609	695
4502	400/3/50	2	171 + 191	272 + 310	465 + 586	2,00	4	404	663	760
4802	400/3/50	2	2 x 191	2 x 310	2 x 586	2,00	4	433	716	896
5402	400/3/50	2	2 x 217	2 x 351	2 x 650	2,00	4	485	800	964
6002	400/3/50	2	2 x 243	2 x 392	2 x 805	2,00	4	537	882	1173

F.L.I.: Full load power
F.L.A.: Full load current
L.R.A.: Locked rotor amperes for single compressor
S.A.: Inrush current

(1) Values calculated referring to the version with the maximum number of fans working at the max absorbed current
(1)(2) Safety values to be considered when cabling the unit for power supply and line-protections

Data valid for standard units without any additional option.

Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Source (side) heat exchanger air (in) 30,0°C; Ethylene glycol 30%.

Voltage tolerance: 10%
Maximum voltage unbalance: 3%

Give the typical operating conditions of units designed for outdoor installation, which can be associated (according to reference document IEC 60721) to the following classes:
- climatic conditions class 4K4H: air temperature range from -20 up to 55°C (*), relative humidity range from 4 up to 100%, with possible precipitations, at air pressure from 70 and 106 kPa and a maximum solar radiation of 1120 W/m2
- special climatic conditions negligible
- biological conditions class 4B1 and 4C2: locations in a generic urban area
- mechanically active substances class 4S2: locations in areas with sand or dust representative of urban areas
- mechanical conditions class 4M1: locations protected from significant vibrations or shocks

The required protection level for safe operation, according to reference document IEC 60529, is IP43XW (protection against access, to the most critical unit's parts, of external devices with diameter larger than 1 mm and rain).
The unit can be considered IP44XW protected, i.e. protected against access of external devices (with diameter larger than 1 mm) and water in general.

(*) for the unit's operating limits, see "selection limits" section

ELECTRICAL DATA

FR-FC-Z /SL-T+

[SI System]

SIZE	Power supply V/ph/Hz	Maximum values								
		Compressor				Fans (1)		Total (1)(2)		
		n	F.L.I. [kW]	F.L.A. [A]	L.R.A. [A]	F.L.I. [kW]	F.L.A. [A]	F.L.I. [kW]	F.L.A. [A]	S.A. [A]
1502	400/3/50	2	2 x 51.7	2 x 91.7	2 x 267	2,00	4	120	241	364
1702	400/3/50	2	2 x 64.3	2 x 105	2 x 290	2,00	4	145	241	389
1902	400/3/50	2	2 x 70.2	2 x 115	2 x 350	2,00	4	161	269	470
2002	400/3/50	2	2 x 82.1	2 x 132	2 x 423	2,00	4	185	303	545
2202	400/3/50	2	2 x 85.4	2 x 137	2 x 246	2,00	4	196	321	387
2602	400/3/50	2	2 x 101	2 x 165	2 x 300	2,00	4	230	384	458
2702	400/3/50	2	2 x 112	2 x 184	2 x 360	2,00	4	252	422	543
3002	400/3/50	2	112 +127	184 + 208	360 + 404	2,00	4	272	454	554
3202	400/3/50	2	2 x 127	2 x 208	2 x 404	2,00	4	288	479	598
3402	400/3/50	2	127 + 145	208 + 235	404 + 436	2,00	4	306	506	627
3602	400/3/50	2	2 x 145	2 x 235	2 x 436	2,00	4	332	549	675
3902	400/3/50	2	145 + 171	235 + 272	436 + 465	2,00	4	358	587	681
4202	400/3/50	2	2 x 171	2 x 272	2 x 465	2,00	4	383	624	710
4502	400/3/50	2	171 + 191	272 + 310	465 + 586	2,00	4	412	678	775
4802	400/3/50	2	2 x 191	2 x 310	2 x 586	2,00	4	433	716	896
5402	400/3/50	2	2 x 217	2 x 351	2 x 650	2,00	4	485	800	964

F.L.I.: Full load power
F.L.A.: Full load current
L.R.A.: Locked rotor amperes for single compressor
S.A.: Inrush current

(1) Values calculated referring to the version with the maximum number of fans working at the max absorbed current
(1)(2) Safety values to be considered when cabling the unit for power supply and line-protections

Data valid for standard units without any additional option.

Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Source (side) heat exchanger air (in) 30,0°C; Ethylene glycol 30%.

Voltage tolerance: 10%
Maximum voltage unbalance: 3%

Give the typical operating conditions of units designed for outdoor installation, which can be associated (according to reference document IEC 60721) to the following classes:
- climatic conditions class 4K4H: air temperature range from -20 up to 55°C (*), relative humidity range from 4 up to 100%, with possible precipitations, at air pressure from 70 and 106 kPa and a maximum solar radiation of 1120 W/m2
- special climatic conditions negligible
- biological conditions class 4B1 and 4C2: locations in a generic urban area
- mechanically active substances class 4S2: locations in areas with sand or dust representative of urban areas
- mechanical conditions class 4M1: locations protected from significant vibrations or shocks

The required protection level for safe operation, according to reference document IEC 60529, is IP43XW (protection against access, to the most critical unit's parts, of external devices with diameter larger than 1 mm and rain).
The unit can be considered IP44XW protected, i.e. protected against access of external devices (with diameter larger than 1 mm) and water in general.

(*) for the unit’s operating limits, see “selection limits” section

ELECTRICAL DATA

FR-FC-Z /NG /T+

[SI System]

SIZE	Power supply V/ph/Hz	Maximum values								
		Compressor				Fans (1)		Total (1)(2)		
		n	F.L.I. [kW]	F.L.A. [A]	L.R.A. [A]	F.L.I. [kW]	F.L.A. [A]	F.L.I. [kW]	F.L.A. [A]	S.A. [A]
1502	400/3/50	2	2 x 51.7	2 x 91.7	2 x 267	2,00	4	116	234	356
1702	400/3/50	2	2 x 64.3	2 x 105	2 x 290	2,00	4	145	241	389
1902	400/3/50	2	2 x 70.2	2 x 115	2 x 350	2,00	4	157	262	463
2002	400/3/50	2	2 x 82.1	2 x 132	2 x 423	2,00	4	185	303	545
2202	400/3/50	2	2 x 85.4	2 x 137	2 x 246	2,00	4	192	314	379
2602	400/3/50	2	2 x 101	2 x 165	2 x 300	2,00	4	226	377	451
2702	400/3/50	2	2 x 112	2 x 184	2 x 360	2,00	4	248	414	536
3002	400/3/50	2	112 +127	184 + 208	360 + 404	2,00	4	264	439	539
3202	400/3/50	2	2 x 127	2 x 208	2 x 404	2,00	4	284	471	590
3402	400/3/50	2	127 + 145	208 + 235	404 + 436	2,00	4	306	506	627
3602	400/3/50	2	2 x 145	2 x 235	2 x 436	2,00	4	324	533	660
3902	400/3/50	2	145 + 171	235 + 272	436 + 465	2,00	4	350	572	666
4202	400/3/50	2	2 x 171	2 x 272	2 x 465	2,00	4	375	609	695
4502	400/3/50	2	171 + 191	272 + 310	465 + 586	2,00	4	404	663	760
4802	400/3/50	2	2 x 191	2 x 310	2 x 586	2,00	4	433	716	896
5402	400/3/50	2	2 x 217	2 x 351	2 x 650	2,00	4	485	800	964
6002	400/3/50	2	2 x 243	2 x 392	2 x 805	2,00	4	537	882	1173

F.L.I.: Full load power
F.L.A.: Full load current
L.R.A.: Locked rotor amperes for single compressor
S.A.: Inrush current

(1) Values calculated referring to the version with the maximum number of fans working at the max absorbed current
(1)(2) Safety values to be considered when cabling the unit for power supply and line-protections

Data valid for standard units without any additional option.

Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Source (side) heat exchanger air (in) 30,0°C; Ethylene glycol 30%.

Voltage tolerance: 10%
Maximum voltage unbalance: 3%

Give the typical operating conditions of units designed for outdoor installation, which can be associated (according to reference document IEC 60721) to the following classes:
- climatic conditions class 4K4H: air temperature range from -20 up to 55°C (*), relative humidity range from 4 up to 100%, with possible precipitations, at air pressure from 70 and 106 kPa and a maximum solar radiation of 1120 W/m2
- special climatic conditions negligible
- biological conditions class 4B1 and 4C2: locations in a generic urban area
- mechanically active substances class 4S2: locations in areas with sand or dust representative of urban areas
- mechanical conditions class 4M1: locations protected from significant vibrations or shocks

The required protection level for safe operation, according to reference document IEC 60529, is IP43XW (protection against access, to the most critical unit's parts, of external devices with diameter larger than 1 mm and rain).
The unit can be considered IP44XW protected, i.e. protected against access of external devices (with diameter larger than 1 mm) and water in general.

(*) for the unit's operating limits, see "selection limits" section

ELECTRICAL DATA

FR-FC-Z /NG /SL-T+

[SI System]

SIZE	Power supply V/ph/Hz	Maximum values								
		Compressor				Fans (1)		Total (1)(2)		
		n	F.L.I. [kW]	F.L.A. [A]	L.R.A. [A]	F.L.I. [kW]	F.L.A. [A]	F.L.I. [kW]	F.L.A. [A]	S.A. [A]
1502	400/3/50	2	2 x 51.7	2 x 91.7	2 x 267	2,00	4	120	241	364
1702	400/3/50	2	2 x 64.3	2 x 105	2 x 290	2,00	4	145	241	389
1902	400/3/50	2	2 x 70.2	2 x 115	2 x 350	2,00	4	161	269	470
2002	400/3/50	2	2 x 82.1	2 x 132	2 x 423	2,00	4	185	303	545
2202	400/3/50	2	2 x 85.4	2 x 137	2 x 246	2,00	4	196	321	387
2602	400/3/50	2	2 x 101	2 x 165	2 x 300	2,00	4	230	384	458
2702	400/3/50	2	2 x 112	2 x 184	2 x 360	2,00	4	252	422	543
3002	400/3/50	2	112 +127	184 + 208	360 + 404	2,00	4	272	454	554
3202	400/3/50	2	2 x 127	2 x 208	2 x 404	2,00	4	288	479	598
3402	400/3/50	2	127 + 145	208 + 235	404 + 436	2,00	4	306	506	627
3602	400/3/50	2	2 x 145	2 x 235	2 x 436	2,00	4	332	549	675
3902	400/3/50	2	145 + 171	235 + 272	436 + 465	2,00	4	358	587	681
4202	400/3/50	2	2 x 171	2 x 272	2 x 465	2,00	4	383	624	710
4502	400/3/50	2	171 + 191	272 + 310	465 + 586	2,00	4	412	678	775
4802	400/3/50	2	2 x 191	2 x 310	2 x 586	2,00	4	433	716	896
5402	400/3/50	2	2 x 217	2 x 351	2 x 650	2,00	4	485	800	964

F.L.I.: Full load power
F.L.A.: Full load current
L.R.A.: Locked rotor amperes for single compressor
S.A.: Inrush current

(1) Values calculated referring to the version with the maximum number of fans working at the max absorbed current
(1)(2) Safety values to be considered when cabling the unit for power supply and line-protections

Data valid for standard units without any additional option.

Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Source (side) heat exchanger air (in) 30,0°C; Ethylene glycol 30%.

Voltage tolerance: 10%
Maximum voltage unbalance: 3%

Give the typical operating conditions of units designed for outdoor installation, which can be associated (according to reference document IEC 60721) to the following classes:
- climatic conditions class 4K4H: air temperature range from -20 up to 55°C (*), relative humidity range from 4 up to 100%, with possible precipitations, at air pressure from 70 and 106 kPa and a maximum solar radiation of 1120 W/m2
- special climatic conditions negligible
- biological conditions class 4B1 and 4C2: locations in a generic urban area
- mechanically active substances class 4S2: locations in areas with sand or dust representative of urban areas
- mechanical conditions class 4M1: locations protected from significant vibrations or shocks

The required protection level for safe operation, according to reference document IEC 60529, is IP43XW (protection against access, to the most critical unit's parts, of external devices with diameter larger than 1 mm and rain).
The unit can be considered IP44XW protected, i.e. protected against access of external devices (with diameter larger than 1 mm) and water in general.

(*) for the unit's operating limits, see "selection limits" section

8.1 FULL LOAD SOUND LEVEL FR-FC-Z /T+

SOUND POWER									
SIZE	Octave band [Hz]								Total sound level dB(A)
	63	125	250	500	1000	2000	4000	8000	
	Sound power level dB								
1502	91	96	98	96	95	89	83	73	**99**
1702	92	97	99	97	96	90	84	74	**100**
1902	92	97	99	97	96	90	84	74	**100**
2002	92	97	99	97	96	90	84	74	**100**
2202	93	98	100	98	97	91	85	75	**101**
2602	94	99	101	99	98	92	86	76	**102**
2702	94	99	101	99	98	92	86	76	**102**
3002	94	99	101	99	98	92	86	76	**102**
3202	94	99	101	99	98	92	86	76	**102**
3402	94	99	101	99	98	92	86	76	**102**
3602	95	100	102	100	99	93	87	77	**103**
3902	95	100	102	100	99	93	87	77	**103**
4202	95	100	102	100	99	93	87	77	**103**
4502	97	102	104	102	101	95	89	79	**105**
4802	98	103	105	103	102	96	90	80	**106**
5402	98	103	105	103	102	96	90	80	**106**
6002	98	103	105	103	102	96	90	80	**106**

Working conditions

Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Source (side) heat exchanger air (in) 30,0°C; Ethylene glycol 30%.
Sound power in compliance with ISO 3744 for non-certified units.
Such certification refers specifically to the sound Power Level in dB(A). This is therefore the only acoustic data to be considered as binding.
Sound power on the basis of measurements made in compliance with ISO 9614.

SOUND PRESSURE LEVEL									
SIZE	Octave band [Hz]								Total sound level dB(A)
	63	125	250	500	1000	2000	4000	8000	
	Sound pressure level dB								
1502	59	64	66	64	63	57	51	41	**67**
1702	60	65	67	65	64	58	52	42	**68**
1902	60	65	67	65	64	58	52	42	**68**
2002	60	65	67	65	64	58	52	42	**68**
2202	61	66	68	66	65	59	53	43	**69**
2602	62	67	69	67	66	60	54	44	**70**
2702	61	66	68	66	65	59	53	43	**69**
3002	61	66	68	66	65	59	53	43	**69**
3202	61	66	68	66	65	59	53	43	**69**
3402	61	66	68	66	65	59	53	43	**69**
3602	62	67	69	67	66	60	54	44	**70**
3902	62	67	69	67	66	60	54	44	**70**
4202	62	67	69	67	66	60	54	44	**70**
4502	64	69	71	69	68	62	56	46	**72**
4802	65	70	72	70	69	63	57	47	**73**
5402	65	70	72	70	69	63	57	47	**73**
6002	65	70	72	70	69	63	57	47	**73**

Working conditions

Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Source (side) heat exchanger air (in) 30,0°C; Ethylene glycol 30%.
Average sound pressure level at 10m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.

FULL LOAD SOUND LEVEL FR-FC-Z /SL-T+

SOUND POWER									
SIZE	Octave band [Hz]								Total sound level dB(A)
	63	125	250	500	1000	2000	4000	8000	
	Sound power level dB								
1502	81	79	82	86	87	78	66	59	**89**
1702	81	79	82	86	87	78	66	59	**89**
1902	81	79	82	86	87	78	66	59	**89**
2002	82	80	83	87	88	79	67	60	**90**
2202	84	83	86	88	89	77	67	59	**91**
2602	84	83	86	88	89	77	67	59	**91**
2702	84	83	86	88	89	77	67	59	**91**
3002	85	84	87	89	90	78	68	60	**92**
3202	85	84	87	89	90	78	68	60	**92**
3402	85	84	87	89	90	78	68	60	**92**
3602	85	84	87	89	90	78	68	60	**92**
3902	85	84	87	89	90	78	68	60	**92**
4202	85	84	87	89	90	78	68	60	**92**
4502	87	86	89	92	92	79	69	61	**94**
4802	87	86	89	92	92	79	69	61	**94**
5402	88	87	90	93	93	80	70	62	**95**

Working conditions

Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Source (side) heat exchanger air (in) 30,0°C; Ethylene glycol 30%.

Sound power in compliance with ISO 3744 for non-certified units.

Such certification refers specifically to the sound Power Level in dB(A). This is therefore the only acoustic data to be considered as binding.

Sound power on the basis of measurements made in compliance with ISO 9614.

SOUND PRESSURE LEVEL									
SIZE	Octave band [Hz]								Total sound level dB(A)
	63	125	250	500	1000	2000	4000	8000	
	Sound pressure level dB								
1502	49	47	50	54	55	46	34	27	**57**
1702	49	47	50	54	55	46	34	27	**57**
1902	49	47	50	54	55	46	34	27	**57**
2002	50	48	51	55	56	47	35	28	**58**
2202	52	51	54	56	57	45	35	27	**59**
2602	51	50	53	55	56	44	34	26	**58**
2702	51	50	53	55	56	44	34	26	**58**
3002	52	51	54	56	57	45	35	27	**59**
3202	52	51	54	56	57	45	35	27	**59**
3402	52	51	54	56	57	45	35	27	**59**
3602	52	51	54	56	57	45	35	27	**59**
3902	52	51	54	56	57	45	35	27	**59**
4202	52	51	54	56	57	45	35	27	**59**
4502	54	53	56	59	59	46	36	28	**61**
4802	54	53	56	59	59	46	36	28	**61**
5402	55	54	57	60	60	47	37	29	**62**

Working conditions

Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Source (side) heat exchanger air (in) 30,0°C; Ethylene glycol 30%.

Average sound pressure level at 10m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.

FULL LOAD SOUND LEVEL

FR-FC-Z /NG /T+

SOUND POWER									
SIZE	Octave band [Hz]								Total sound level dB(A)
	63	125	250	500	1000	2000	4000	8000	
	Sound power level dB								
1502	91	96	98	96	95	89	83	73	**99**
1702	92	97	99	97	96	90	84	74	**100**
1902	92	97	99	97	96	90	84	74	**100**
2002	92	97	99	97	96	90	84	74	**100**
2202	93	98	100	98	97	91	85	75	**101**
2602	94	99	101	99	98	92	86	76	**102**
2702	94	99	101	99	98	92	86	76	**102**
3002	94	99	101	99	98	92	86	76	**102**
3202	94	99	101	99	98	92	86	76	**102**
3402	94	99	101	99	98	92	86	76	**102**
3602	95	100	102	100	99	93	87	77	**103**
3902	95	100	102	100	99	93	87	77	**103**
4202	95	100	102	100	99	93	87	77	**103**
4502	97	102	104	102	101	95	89	79	**105**
4802	98	103	105	103	102	96	90	80	**106**
5402	98	103	105	103	102	96	90	80	**106**
6002	98	103	105	103	102	96	90	80	**106**

Working conditions

Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Source (side) heat exchanger air (in) 30,0°C; Ethylene glycol 30%.

Sound power in compliance with ISO 3744 for non-certified units.

Such certification refers specifically to the sound Power Level in dB(A). This is therefore the only acoustic data to be considered as binding.

Sound power on the basis of measurements made in compliance with ISO 9614.

SOUND PRESSURE LEVEL									
SIZE	Octave band [Hz]								Total sound level dB(A)
	63	125	250	500	1000	2000	4000	8000	
	Sound pressure level dB								
1502	59	64	66	64	63	57	51	41	**67**
1702	60	65	67	65	64	58	52	42	**68**
1902	60	65	67	65	64	58	52	42	**68**
2002	60	65	67	65	64	58	52	42	**68**
2202	61	66	68	66	65	59	53	43	**69**
2602	62	67	69	67	66	60	54	44	**70**
2702	61	66	68	66	65	59	53	43	**69**
3002	61	66	68	66	65	59	53	43	**69**
3202	61	66	68	66	65	59	53	43	**69**
3402	61	66	68	66	65	59	53	43	**69**
3602	62	67	69	67	66	60	54	44	**70**
3902	62	67	69	67	66	60	54	44	**70**
4202	62	67	69	67	66	60	54	44	**70**
4502	64	69	71	69	68	62	56	46	**72**
4802	65	70	72	70	69	63	57	47	**73**
5402	65	70	72	70	69	63	57	47	**73**
6002	65	70	72	70	69	63	57	47	**73**

Working conditions

Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Source (side) heat exchanger air (in) 30,0°C; Ethylene glycol 30%.

Average sound pressure level at 10m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.

FULL LOAD SOUND LEVEL FR-FC-Z /NG /SL-T+

SOUND POWER									
SIZE	Octave band [Hz]								Total sound level dB(A)
	63	125	250	500	1000	2000	4000	8000	
	Sound power level dB								
1502	81	79	82	86	87	78	66	59	**89**
1702	81	79	82	86	87	78	66	59	**89**
1902	81	79	82	86	87	78	66	59	**89**
2002	82	80	83	87	88	79	67	60	**90**
2202	84	83	86	88	89	77	67	59	**91**
2602	84	83	86	88	89	77	67	59	**91**
2702	84	83	86	88	89	77	67	59	**91**
3002	85	84	87	89	90	78	68	60	**92**
3202	85	84	87	89	90	78	68	60	**92**
3402	85	84	87	89	90	78	68	60	**92**
3602	85	84	87	89	90	78	68	60	**92**
3902	85	84	87	89	90	78	68	60	**92**
4202	85	84	87	89	90	78	68	60	**92**
4502	87	86	89	92	92	79	69	61	**94**
4802	87	86	89	92	92	79	69	61	**94**
5402	88	87	90	93	93	80	70	62	**95**

Working conditions

Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Source (side) heat exchanger air (in) 30,0°C; Ethylene glycol 30%.

Sound power in compliance with ISO 3744 for non-certified units.

Such certification refers specifically to the sound Power Level in dB(A). This is therefore the only acoustic data to be considered as binding.

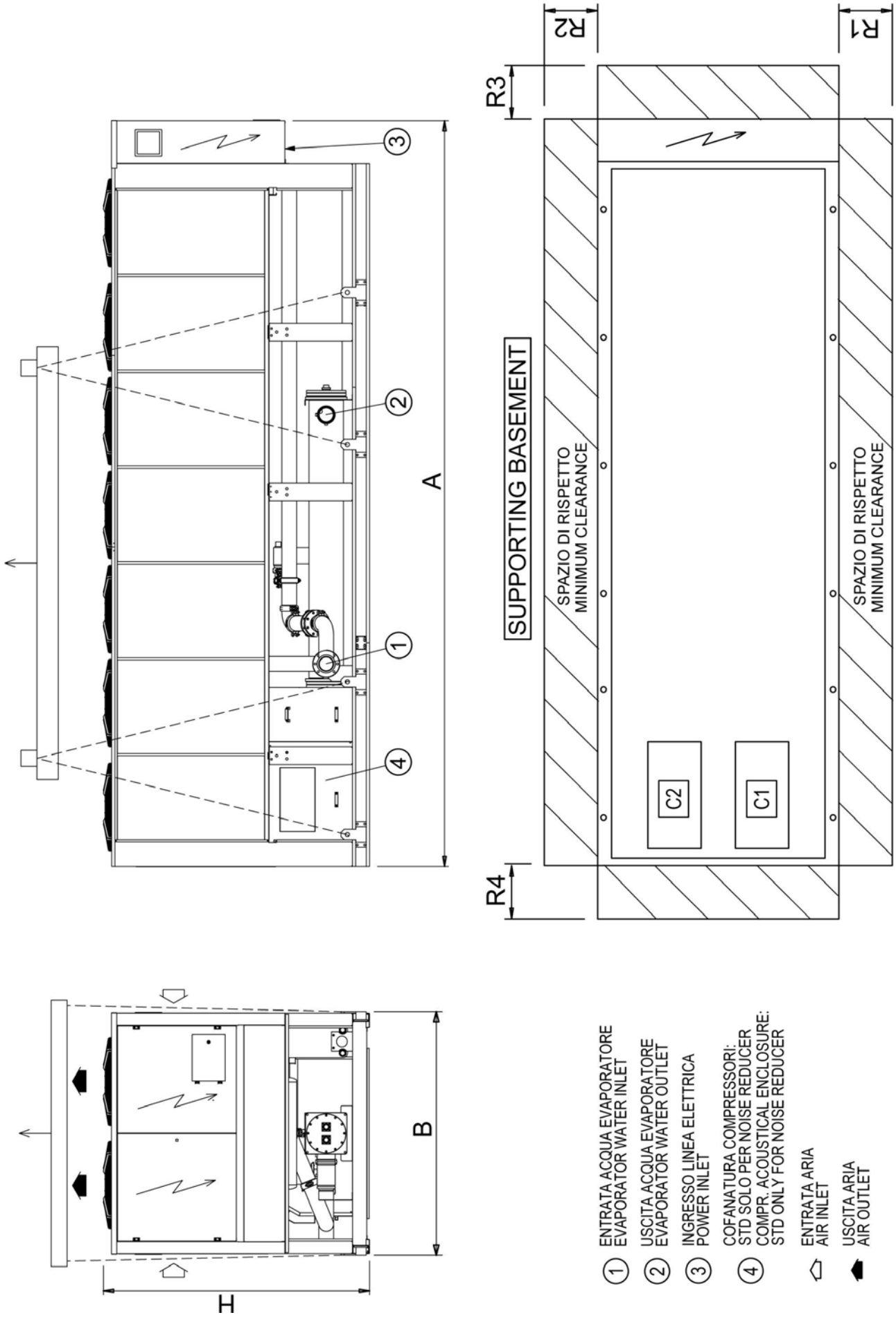
Sound power on the basis of measurements made in compliance with ISO 9614.

SOUND PRESSURE LEVEL									
SIZE	Octave band [Hz]								Total sound level dB(A)
	63	125	250	500	1000	2000	4000	8000	
	Sound pressure level dB								
1502	49	47	50	54	55	46	34	27	**57**
1702	49	47	50	54	55	46	34	27	**57**
1902	49	47	50	54	55	46	34	27	**57**
2002	50	48	51	55	56	47	35	28	**58**
2202	52	51	54	56	57	45	35	27	**59**
2602	51	50	53	55	56	44	34	26	**58**
2702	51	50	53	55	56	44	34	26	**58**
3002	52	51	54	56	57	45	35	27	**59**
3202	52	51	54	56	57	45	35	27	**59**
3402	52	51	54	56	57	45	35	27	**59**
3602	52	51	54	56	57	45	35	27	**59**
3902	52	51	54	56	57	45	35	27	**59**
4202	52	51	54	56	57	45	35	27	**59**
4502	54	53	56	59	59	46	36	28	**61**
4802	54	53	56	59	59	46	36	28	**61**
5402	55	54	57	60	60	47	37	29	**62**

Working conditions

Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Source (side) heat exchanger air (in) 30,0°C; Ethylene glycol 30%.

Average sound pressure level at 10m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.



REMARKS:
For installation purposes, please refer to the documentation sent after the purchase-contract. This technical data should be considered as indicative. RC may modify them at any moment.
Data valid for standard units without any additional option.

DIMENSIONAL DRAWINGS

FR-FC-Z 1502 - 6002

[SI System]

SIZE	DIMENSIONS AND WEIGHTS				CLEARANCE				HEAT EXCHANGER USER SIDE	
	A	B	H	WEIGHT	R1	R2	R3	R4	IN/OUT	
	[mm]	[mm]	[mm]	[kg]	[mm]	[mm]	[mm]	[mm]	TYPE	Ø
FR-FC-Z /T+ /1502	4000	2260	2500	4880	2000	2000	1800	1500	H	4"
FR-FC-Z /T+ /1702	4000	2260	2500	4990	2000	2000	1800	1500	H	4"
FR-FC-Z /T+ /1902	4900	2260	2500	5520	2000	2000	1800	1500	H	4"
FR-FC-Z /T+ /2002	4900	2260	2500	5700	2000	2000	1800	1500	H	5"
FR-FC-Z /T+ /2202	5800	2260	2500	7000	2000	2000	1800	1500	H	5"
FR-FC-Z /T+ /2602	5800	2260	2500	7410	2000	2000	1800	1500	H	5"
FR-FC-Z /T+ /2702	6400	2260	2500	8270	2000	2000	1800	1500	H	6"
FR-FC-Z /T+ /3002	6400	2260	2500	8310	2000	2000	1800	1500	H	6"
FR-FC-Z /T+ /3202	7000	2260	2500	8750	2000	2000	1800	1500	H	6"
FR-FC-Z /T+ /3402	7900	2260	2500	9600	2000	2000	1800	1500	H	6"
FR-FC-Z /T+ /3602	7900	2260	2500	10470	2000	2000	1800	1500	H	6"
FR-FC-Z /T+ /3902	7900	2260	2500	10570	2000	2000	1800	1500	H	6"
FR-FC-Z /T+ /4202	10000	2260	2500	12680	2000	2000	1800	1500	H	8"
FR-FC-Z /T+ /4502	10000	2260	2500	13180	2000	2000	1800	1500	H	8"
FR-FC-Z /T+ /4802	11800	2260	2500	13710	2000	2000	1800	1500	H	8"
FR-FC-Z /T+ /5402	11800	2260	2500	14930	2000	2000	1800	1500	H	8"
FR-FC-Z /T+ /6002	13000	2260	2500	15810	2000	2000	1800	1500	H	8"
FR-FC-Z /SL-T+ /1502	4000	2260	2500	5380	2000	2000	1800	1500	H	4"
FR-FC-Z /SL-T+ /1702	4900	2260	2500	5950	2000	2000	1800	1500	H	4"
FR-FC-Z /SL-T+ /1902	4900	2260	2500	6040	2000	2000	1800	1500	H	4"
FR-FC-Z /SL-T+ /2002	5800	2260	2500	6600	2000	2000	1800	1500	H	5"
FR-FC-Z /SL-T+ /2202	5800	2260	2500	7500	2000	2000	1800	1500	H	5"
FR-FC-Z /SL-T+ /2602	7000	2260	2500	8250	2000	2000	1800	1500	H	5"
FR-FC-Z /SL-T+ /2702	7000	2260	2500	9070	2000	2000	1800	1500	H	6"
FR-FC-Z /SL-T+ /3002	7900	2260	2500	9550	2000	2000	1800	1500	H	6"
FR-FC-Z /SL-T+ /3202	7900	2260	2500	10040	2000	2000	1800	1500	H	6"
FR-FC-Z /SL-T+ /3402	7900	2260	2500	10590	2000	2000	1800	1500	H	6"
FR-FC-Z /SL-T+ /3602	10000	2260	2500	13020	2000	2000	1800	1500	H	6"
FR-FC-Z /SL-T+ /3902	10000	2260	2500	13060	2000	2000	1800	1500	H	6"
FR-FC-Z /SL-T+ /4202	10000	2260	2500	13560	2000	2000	1800	1500	H	8"
FR-FC-Z /SL-T+ /4502	11800	2260	2500	14970	2000	2000	1800	1500	H	8"
FR-FC-Z /SL-T+ /4802	11800	2260	2500	15060	2000	2000	1800	1500	H	8"
FR-FC-Z /SL-T+ /5402	13000	2260	2500	16360	2000	2000	1800	1500	H	8"
FR-FC-Z /NG /T+ /1502	4000	2260	2500	5270	2000	2000	1800	1500	H	4"
FR-FC-Z /NG /T+ /1702	4000	2260	2500	5470	2000	2000	1800	1500	H	4"
FR-FC-Z /NG /T+ /1902	4900	2260	2500	6020	2000	2000	1800	1500	H	4"
FR-FC-Z /NG /T+ /2002	4900	2260	2500	6250	2000	2000	1800	1500	H	5"
FR-FC-Z /NG /T+ /2202	5800	2260	2500	7520	2000	2000	1800	1500	H	5"
FR-FC-Z /NG /T+ /2602	5800	2260	2500	8000	2000	2000	1800	1500	H	5"
FR-FC-Z /NG /T+ /2702	6400	2260	2500	9020	2000	2000	1800	1500	H	6"
FR-FC-Z /NG /T+ /3002	6400	2260	2500	9060	2000	2000	1800	1500	H	6"
FR-FC-Z /NG /T+ /3202	7000	2260	2500	9420	2000	2000	1800	1500	H	6"
FR-FC-Z /NG /T+ /3402	7900	2260	2500	10300	2000	2000	1800	1500	H	6"
FR-FC-Z /NG /T+ /3602	7900	2260	2500	11280	2000	2000	1800	1500	H	6"
FR-FC-Z /NG /T+ /3902	7900	2260	2500	11370	2000	2000	1800	1500	H	6"
FR-FC-Z /NG /T+ /4202	10000	2260	2500	13070	2000	2000	1800	1500	H	6"
FR-FC-Z /NG /T+ /4502	10000	2260	2500	13570	2000	2000	1800	1500	H	6"
FR-FC-Z /NG /T+ /4802	11800	2260	2500	14490	2000	2000	1800	1500	H	6"
FR-FC-Z /NG /T+ /5402	11800	2260	2500	15760	2000	2000	1800	1500	H	6"
FR-FC-Z /NG /T+ /6002	13000	2260	2500	16680	2000	2000	1800	1500	H	6"
FR-FC-Z /NG /SL-T+ /1502	4000	2260	2500	5770	2000	2000	1800	1500	H	4"
FR-FC-Z /NG /SL-T+ /1702	4900	2260	2500	6360	2000	2000	1800	1500	H	4"

DIMENSIONAL DRAWINGS

FR-FC-Z 1502 - 6002

[SI System]

SIZE	DIMENSIONS AND WEIGHTS				CLEARANCE				HEAT EXCHANGER USER SIDE	
	A	B	H	WEIGHT	R1	R2	R3	R4	IN/OUT	
	[mm]	[mm]	[mm]	[kg]	[mm]	[mm]	[mm]	[mm]	TYPE	Ø
FR-FC-Z /NG /SL-T+ /1902	4900	2260	2500	6520	2000	2000	1800	1500	H	4"
FR-FC-Z /NG /SL-T+ /2002	5800	2260	2500	7160	2000	2000	1800	1500	H	5"
FR-FC-Z /NG /SL-T+ /2202	5800	2260	2500	8020	2000	2000	1800	1500	H	5"
FR-FC-Z /NG /SL-T+ /2602	7000	2260	2500	8890	2000	2000	1800	1500	H	5"
FR-FC-Z /NG /SL-T+ /2702	7000	2260	2500	9590	2000	2000	1800	1500	H	6"
FR-FC-Z /NG /SL-T+ /3002	7900	2260	2500	10070	2000	2000	1800	1500	H	6"
FR-FC-Z /NG /SL-T+ /3202	7900	2260	2500	10570	2000	2000	1800	1500	H	6"
FR-FC-Z /NG /SL-T+ /3402	7900	2260	2500	11290	2000	2000	1800	1500	H	6"
FR-FC-Z /NG /SL-T+ /3602	10000	2260	2500	13810	2000	2000	1800	1500	H	6"
FR-FC-Z /NG /SL-T+ /3902	10000	2260	2500	13850	2000	2000	1800	1500	H	6"
FR-FC-Z /NG /SL-T+ /4202	10000	2260	2500	13970	2000	2000	1800	1500	H	6"
FR-FC-Z /NG /SL-T+ /4502	11800	2260	2500	15590	2000	2000	1800	1500	H	6"
FX-FC-Z /NG /SL-T+ /4802	11800	2260	2500	15680	2000	2000	1800	1500	H	6"
FR-FC-Z /NG /SL-T+ /5402	13000	2260	2500	17220	2000	2000	1800	1500	H	6"

DIMENSIONAL DRAWINGS

LEGEND OF PIPE CONNECTIONS

TYPE = H
Grooved coupling with weld end counter-pipe user side

NOMINAL PIPE SIZE	PIPE OUTSIDE DIAMETER
ø inches	ø mm
¾	26,7
1	33,7
1 ¼	42,4
1 ½	48,3
2	60,3
2 ½	76,1
3	88,9
3 ½	101,6

NOMINAL PIPE SIZE	PIPE OUTSIDE DIAMETER
ø inches	ø mm
4	114,3
4 ½	127,0
5	139,7
6	168,3
8	219,1
10	273,0
12	323,9
14	355,6

UNI ISO 228/13
Pipe threads where pressure-tight joints are not made on the threads - Designation, dimensions and tolerances
Used terminology:
G: Pipe threads where pressure-tight joints are not made on the threads
A: Close tolerance class for external pipe threads where pressure-tight joints are not made on the threads
B: Wider tolerance class for external pipe threads where pressure-tight joints are not made on the threads
Internal threads: G letter followed by thread mark (only tolerance class)
External threads: G letter followed by thread mark and by A letter for A class external threads or by B letter for B class external threads.

UNI EN 10226-1
Pipe threads where pressure-tight joints are made on the threads - Designation, dimensions and tolerances
Used terminology:
Rp: Internal cylindrical threads where pressure-tight joints are made on the threads
Rc: Internal conical threads where pressure-tight joints are made on the threads
R: External conical threads where pressure-tight joints are made on the threads
Internal cylindrical threads: R letter followed by p letter
Internal conical threads: R letter followed by c letter
External conical threads: R letter

DESIGNATION	DESCRIPTION
UNI EN 10226-1 - Rp 1 1/2	Internal cylindrical threads where pressure-tight joints are made on the threads, defined by standard UNI ISO 7/1 Conventional ø 1 1/2”
UNI EN 10226-1 - Rp 2 1/2	Internal cylindrical threads where pressure-tight joints are made on the threads, defined by standard UNI ISO 7/1 Conventional ø 2 1/2”
UNI EN 10226-1 - Rp 3	Internal cylindrical threads where pressure-tight joints are made on the threads, defined by standard UNI ISO 7/1 Conventional ø 3”
UNI EN 10226-1 - R 3	External conical threads where pressure-tight joints are made on the threads, defined by standard UNI ISO 7/1 Conventional ø 3”
UNI ISO 228/1 - G 4 B	Internal cylindrical threads where pressure-tight joints are not made on the threads, defined by standard UNI ISO 228/1 Tolerance class B for external thread Conventional ø 4”
DN 80 PN 16	Flange Nominal Diameter: 80 mm Nominal Pressure: 16 bar

NOTE:
Conventional diameter value [in inches] identifies short thread designation, based upon the relative standard.
All relative values are defined by standards.
As example, here below some values:

	UNI EN 10226-1	UNI ISO 228/1
Conventional ø	1”	1”
Pitch	2.309 mm	2.309 mm
External ø	33.249 mm	33.249 mm
Core ø	30.291 mm	30.291 mm
Thread height	1.479 mm	1.479 mm

FIXED SPEED CENTRIFUGAL PUMPS SELECTION IN FC UNITS

Free-cooling units take advantage of low external air temperatures to cool a fluid without the aid of compressors, obtaining in this way a significant saving of energy costs.
Depending on their operation mode (mechanical cooling, total free-cooling or mixing mode), total hydraulic pressure drops Δp can vary considerably from standard to free-cooling mode. Indeed, the presence of free-cooling air-water coils affect the head loss in the water circuit increasing the amount of pressure drops.

Mechanical cooling
The unit operates as a traditional chiller, the carrier fluid is chilled by the evaporating refrigerant in the user side heat exchanger using the work of the compressors. The water coil is completely off. Unit pressure drop ΔpCH is given by the sum of the evaporator and hydraulic circuit pressure drops.

BC	Condenser coil
BR	Water coil
EV	Evaporator
P	Pump

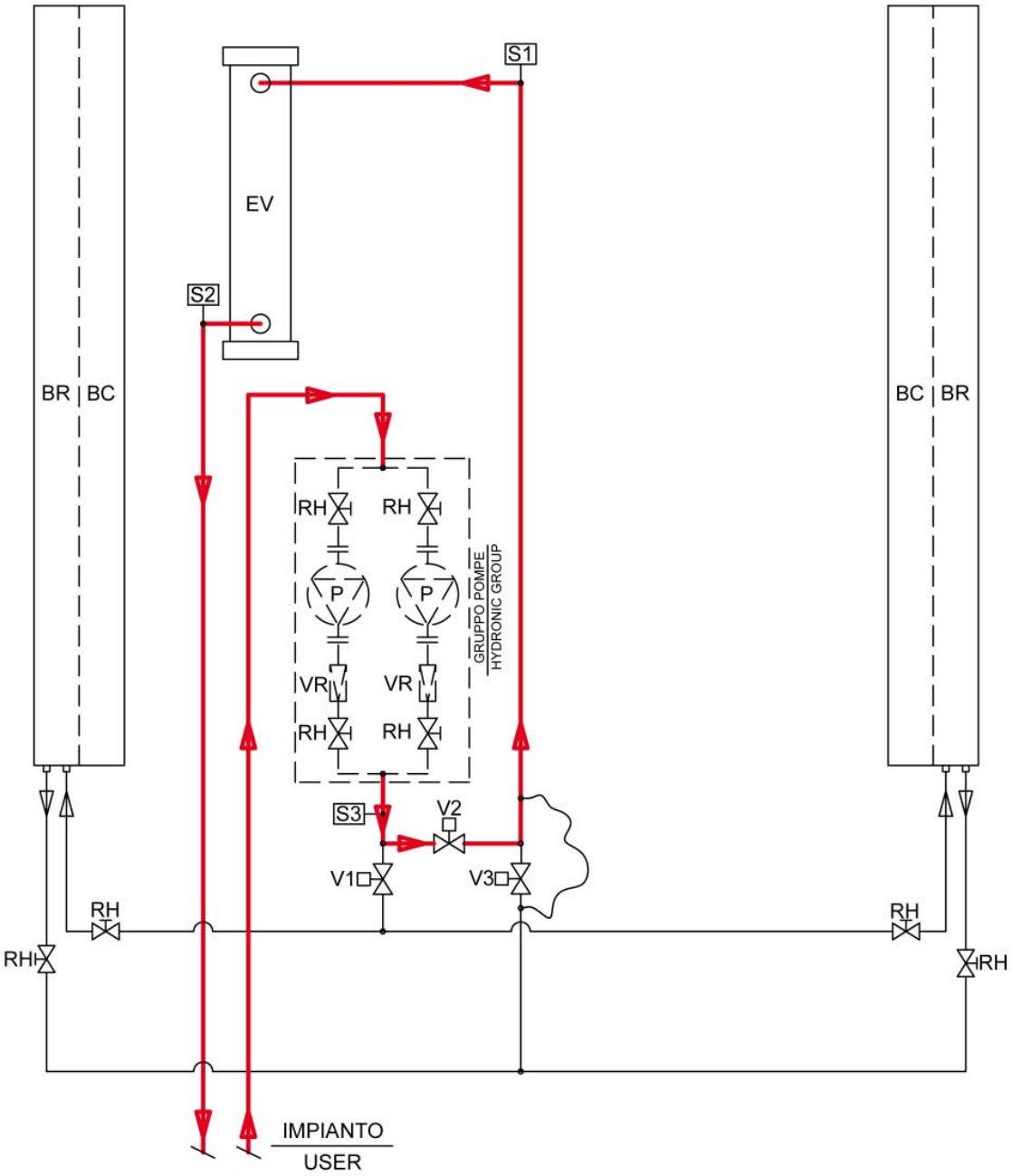


Fig. 1 Hydraulic diagram - standard chiller mode

Free-cooling
As the outdoor air temperature drops 1 degree below the returning water temperature, a valve system redirects the water to special finned coils that allow the air to directly exchange heat with the operating mixture. The fluid is cooled when passing through the coil and heat is rejected to the atmosphere.

BC	Condenser coil
BR	Water coil
EV	Evaporator
P	Pump

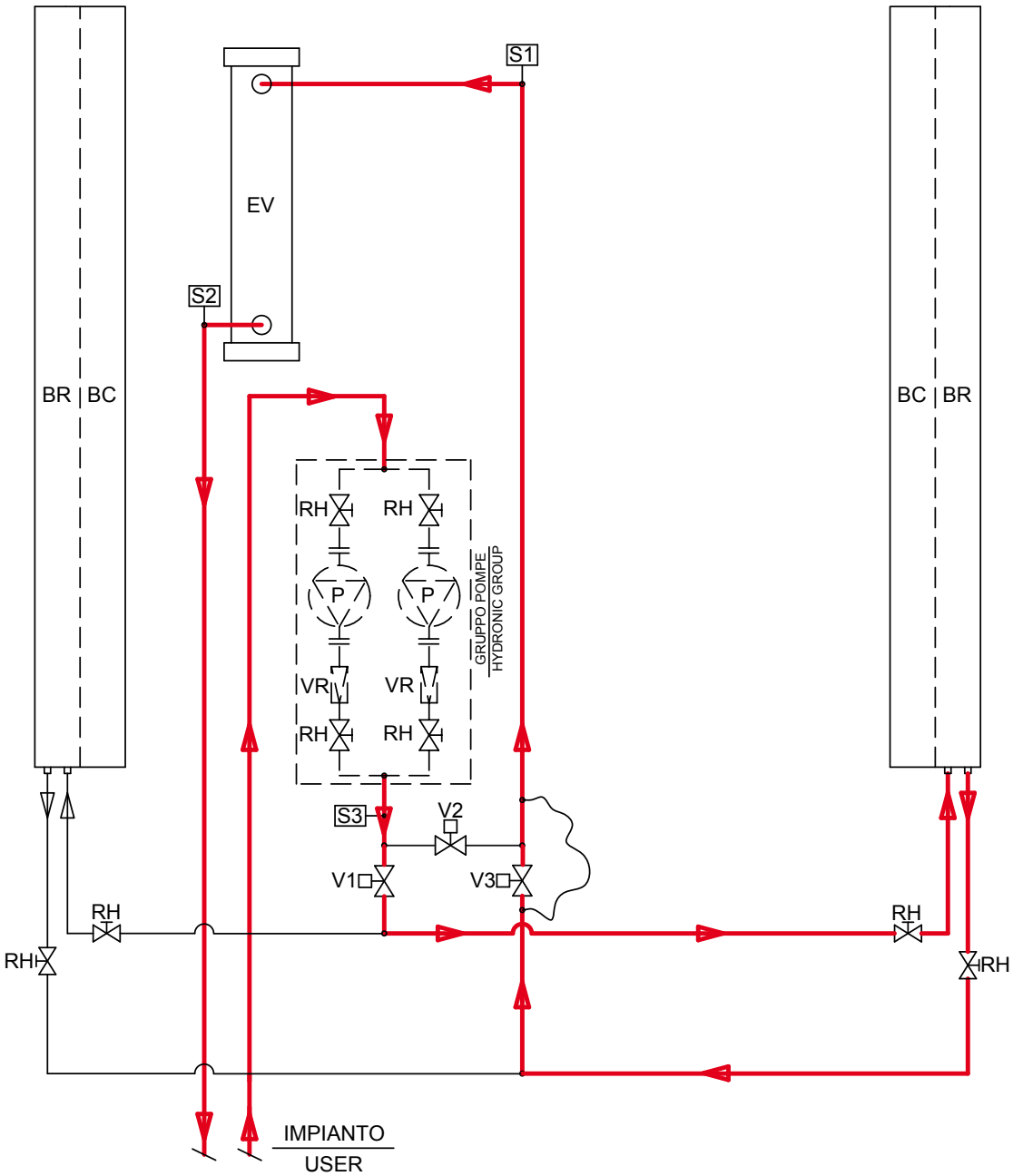


Fig. 2 Hydraulic diagram - free-cooling mode

Unit pressure drops in free cooling mode ΔpFC includes the evaporator, free-cooling hydraulic circuit and the air/water exchangers pressure drops.

Free-cooling [NG]
In case of NG (no glycol) units, hydraulic pressure drops Δp are constant thanks to an intermediate heat exchanger that isolates the free-cooling circuit from the primary circuit.

BC	Condenser coil
BR	Water coil
EV	Evaporator
P	Pump

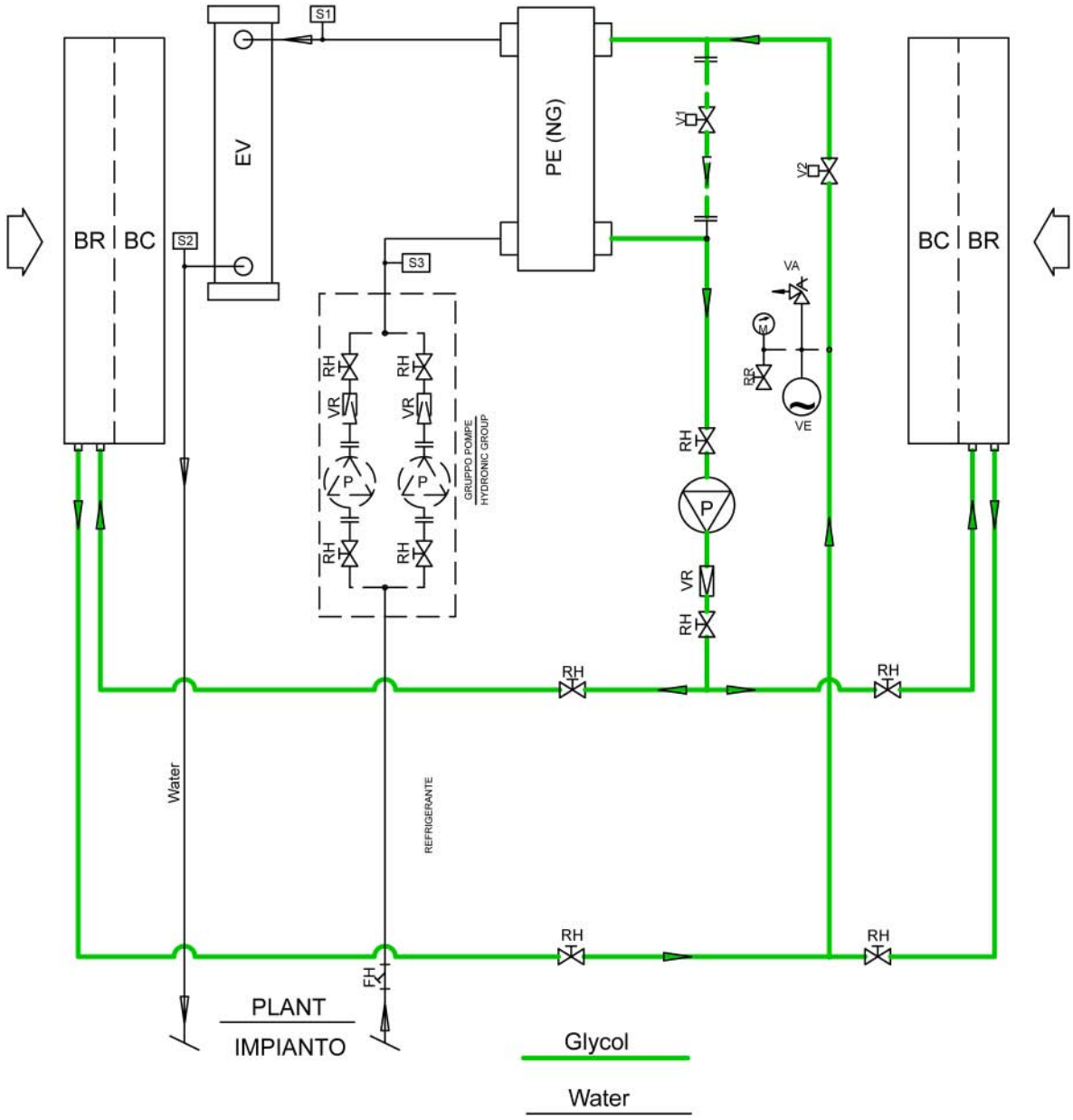


Fig. 3 Hydraulic diagram - NG configuration

Characteristic curves
The two operating modes are clearly shown in the system characteristic curve that describes the total amount of pressure drops of the installation. Fig. 4 plots the head Hsys required by the system as a function of the flow rate Q according to the chiller operating mode.

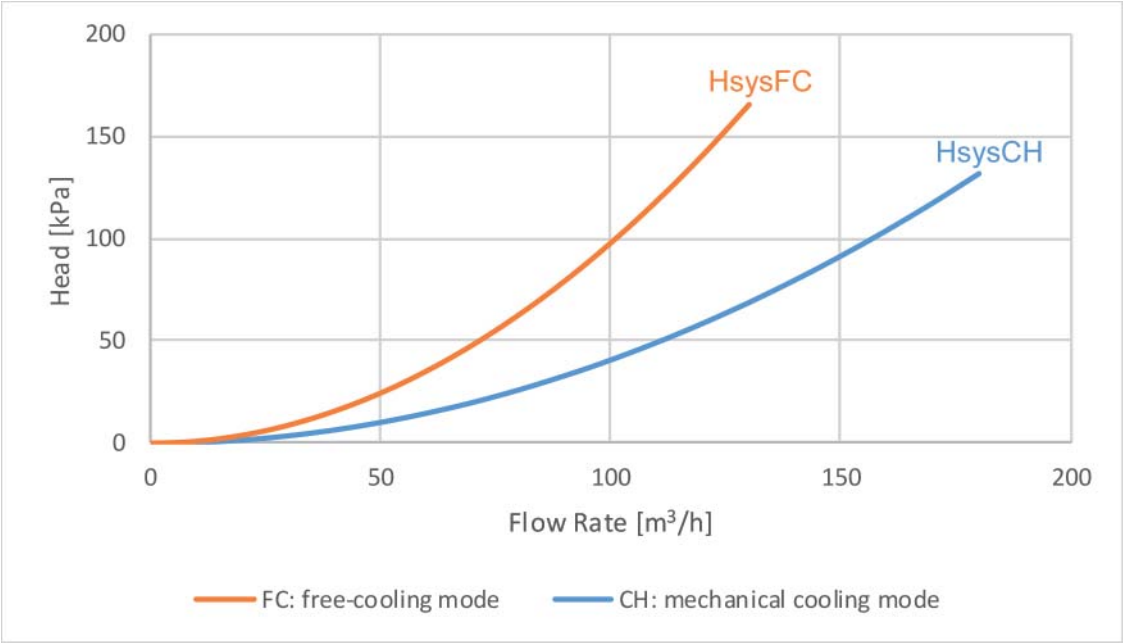


Fig. 4 System resistance curve

On the other hand, centrifugal pumps deliver a variable flow rate Q (increasing with decreasing head) when operating at constant speed. They are therefore able to accommodate changes depending on the system curve. Fig 5

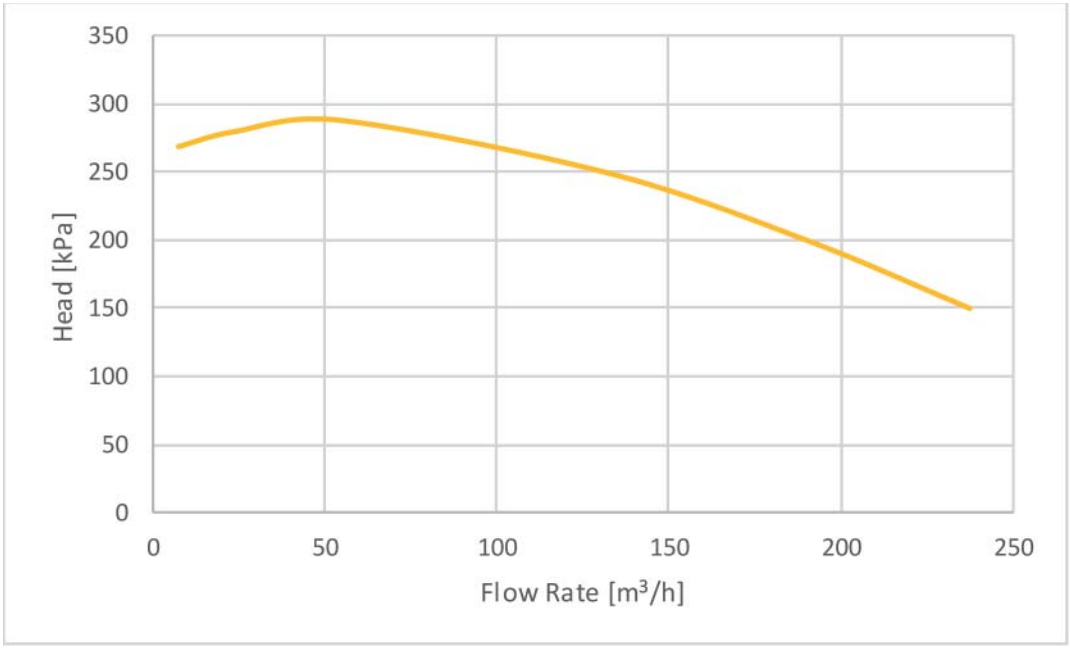


Fig. 5 Performance curve of the pump

The operating point of a centrifugal pump, also called its duty point, is given by the intersection of the pump performance curve with the system characteristic curve. The flow rate Q and the developed head H are both determined by the intersection. When the system curve changes, the pump's operating point changes too.

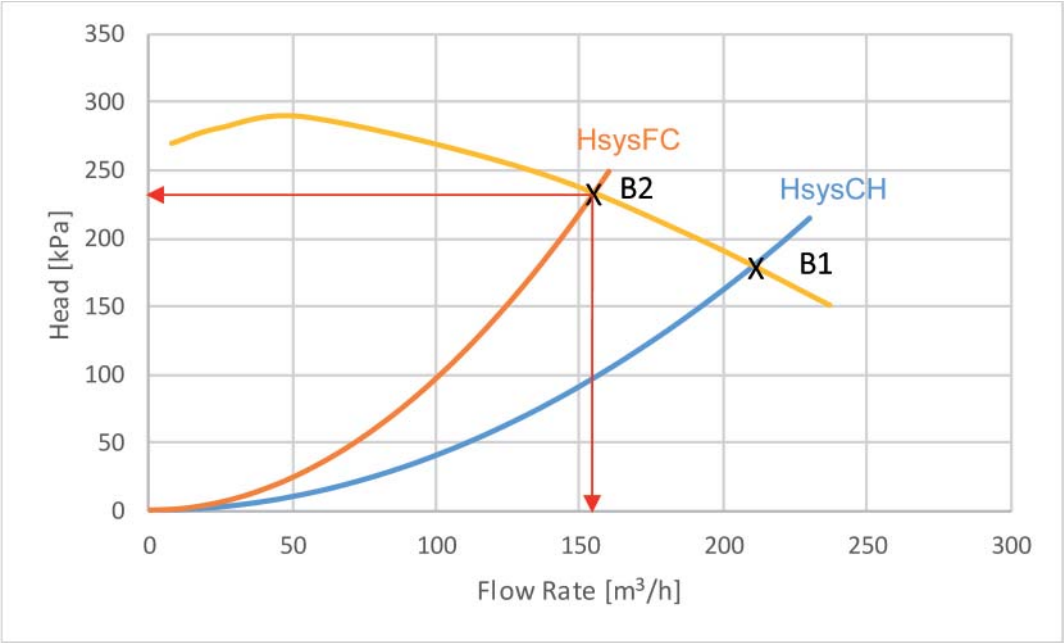


Fig. 6 Performance curves

By increasing the system resistance by changing the unit mode from standard to free-cooling, the original system curve HsysCH becomes steeper and transforms into HsysFC. If the speed of the pump is constant, the operating point B1 moves to B2 on the pump characteristic curve, in other words, at a lower flow rate. The new operating point is given by the balance between the required system head and the one provided by the pump. Water flow decreases compared to the nominal one, consequently medium ΔT increases.

Pumps selection
Pump capacity starting from one operating point rather than the other one entails different obstructions, power consumption and operational problems. In both cases an increasing/decreasing water flow is expected compared with the nominal value, shifting from one functioning mode to the other.

Hydronic kit selection is realized considering mechanical cooling operating mode, which provide the following advantages:

- Pump size is smaller (lower required head) and power consumption is lower. As FC units are a typical solution for technological systems or industrial processes which operate continuously throughout the year, a lower hydronic kit power consumption means huge energy savings.

- Pump size capacity based on the higher pressure drop, in FC mode, this means that when the unit works as a standard chiller, the characteristic curve is lower and the new duty point has a larger water flow than the nominal one with the risk of working off its curve. Pumps operating at the right-hand end of the pump curve leads to instabilities in the flow, furthermore the likelihood of cavitation increases and power absorption is higher.

- Reduced dimensions, which means a more ergonomic workplace during unit maintenance, when pumps are provided on board, and a reduced amount of space and installation costs when installed separately.

In both cases, the capacity of the hydronic kit accordingly to one of the unit's operation mode, one of the two working points won't correspond to the nominal water flow, as moving the characteristic curve implies a pressure head change. To prevent this from happening, an inverter controlled pump or the RC 2PS system can be used to have a constant carrier fluid flow thanks to the pump speed variation.

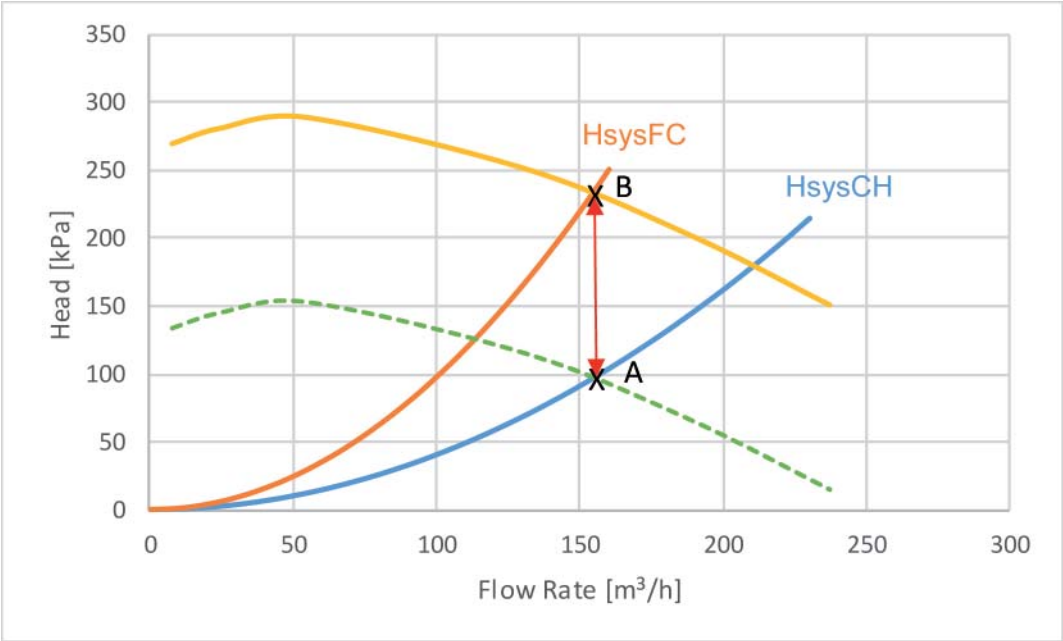


Fig. 7 Pump performance curves at variable speed

2PS (2 pump speed)
In a plant with a free-cooling chiller, 2PS system keeps the primary circuit water flow constant as a function of the unit operating mode. Thanks to a 0-10V signal, inverter pumps can work at two fixed rotational speeds accordingly to the unit's pressure drops.
The two values are set by the technical assistance centre during the chiller commissioning through the corresponding parameter configuration interface.

12.1 VARIABLE FLOW HYDRAULIC GROUP (optional)

12.2 VPF systems for plants designed with a single variable flow hydraulic circuit

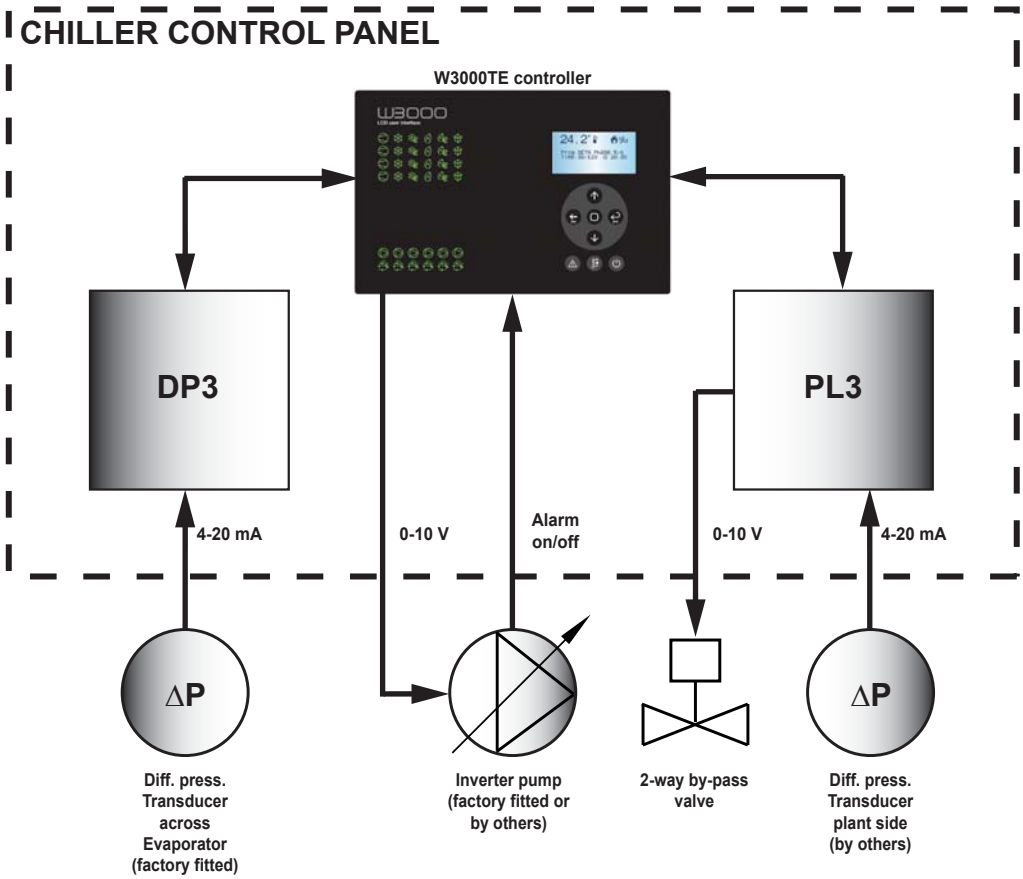
The energy consumption associated with fluid circulation weighs heavily on the total operating costs of a large installation, especially when the units work at part load, and even more, when they are in stand-by. Under these conditions, although the power absorbed by the compressors and fans is reduced, the power consumed for water circulation remains high. The system power consumption can be reduced using pumps with continuous flow control by inverter. Energy savings are considerable and immediately evident, to the extent that a Δx reduction of the flow of water to be delivered to the system, amounts to a proportional reduction of $(\Delta x)^3$ in the power absorbed. In the most advanced systems these ones become the pumps for the entire hydraulic circuit, and this eliminates the need to detach the primary circuit, dedicated to the circulation of the water on the units side, from the secondary one, dedicated to water circulation throughout the entire system. In traditional systems it was the only choice possible and imposed mostly by the need for the chiller to work with constant water flow through the evaporator. Now designers can work without worrying about this limit, as RC units are designed to work with
the maximum efficiency even with variable flow through the evaporator, managing the resources independently, in order to keep the outlet water temperature constantly at the set-point entered by the user. This simplifies the design and realization of variable flow systems and offers advantages in terms of both reductions in consumption and hydraulic circuit sizing. The integration of pumps + inverters built-in the unit permits significant savings in space, circuit components, and system start-up times.

The VPF (Variable Primary Flow system) is the RC solution that allows to have the variable water flow on the user side (evaporator) in the plants with primary circuit only.

The VPF kit includes the following devices:
- control device (called DP3 in the herebelow scheme), mounted on the electrical panel, and pressure differential transducer (with 4-20 mA signal), mounted on the heat exchanger user side
- control device (called PL3 in the herebelow scheme), positioned inside the elettrical panel
- pumps with inverter and dedicated signals for the communication with the controller of the unit (W3000TE)

To these ones it's mandatory to add (not supplied by RC):
- pressure transducer on plant side, with the dedicated signal 4-20 mA for the communication with the PL3 device (this transducer must be installed on the longest (worst) leg of the installation)
- 2 way by-pass valve, with a dedicated 0-10V signal for the communication with the PL3 device

When the plant includes more units connected together with a management system (Manager 3000), it's mandatory to order also the option 3030 "VPF control from Manager 3000", in order to have the installation of the PL3 device inside the Manager itself and not in the electrical panel of each unit.

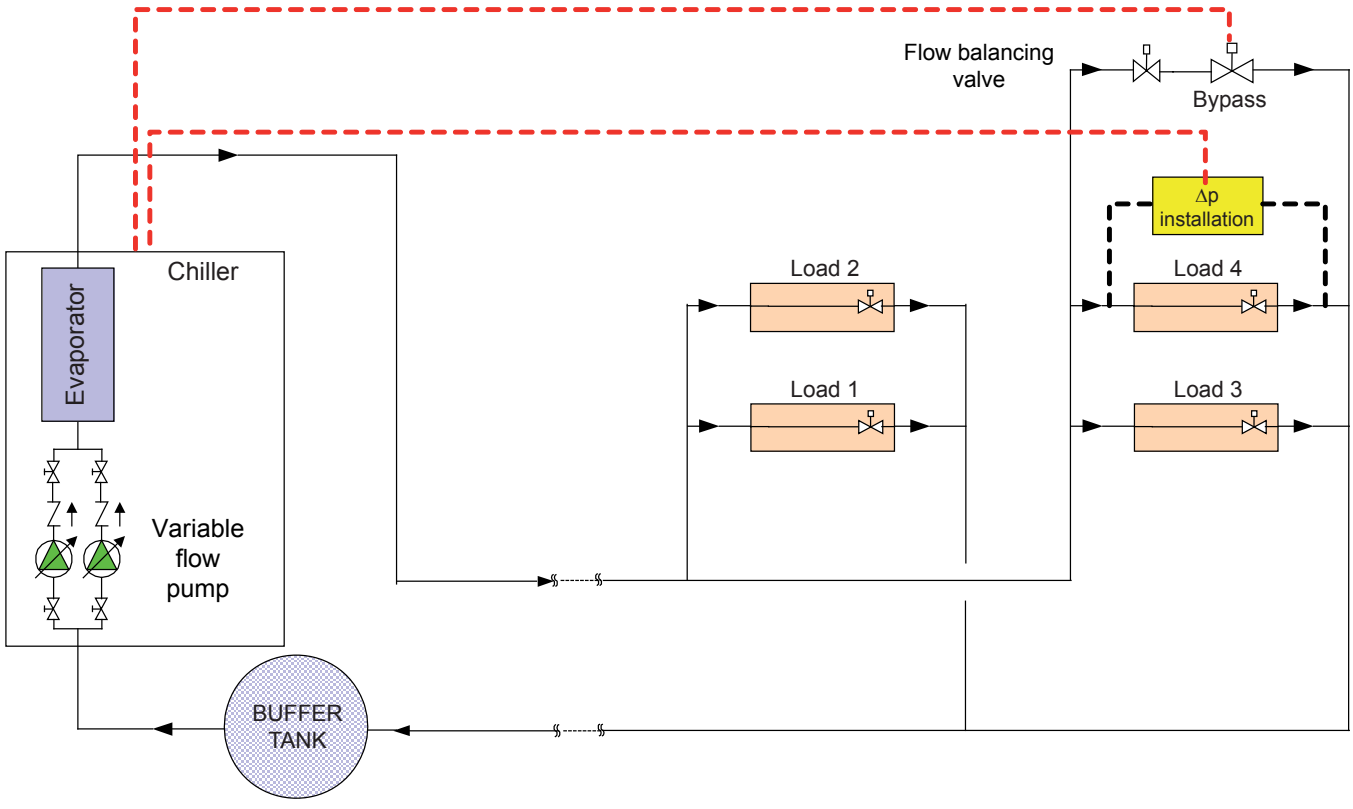


How it works

The VPF option measures the differential pressure across the installation in order to keep it between a minimum and a maximum value programmed in the PL3 device. As long as the measured value remains inside this range, the output signal to the pumps remains the same. On the other side when the measured value is bigger than the maximum programmed, the signal to the pumps is decreased, and in case the measured value results smaller than the minimum programmed, the signal to the pumps is increased. In any case the change of signal is performed through step by step adjustments and monitoring constantly the effects in order to avoid rough changes and guaranteeing the return of the measured value inside the programmed range as much quickly as possible.

In case the differential pressure requires a water flow smaller than the minimum necessary for the heat exchanger, the DP3 device communicates with the controller in the meantime that the PL3 send to the by-pass valve the signal to open gradually in order to protect the chiller.

When the plant includes more units, the working logic remains the same. The PL3 device, installed in the Manager, collects the information from the pressure transducer mounted in the plant (in common for all the units) and communicates with the by-pass valve (this one too in common for all the units), while the differential transducer mounted on each evaporator, the related DP3 device and the management of the pumps+inverters are duty of the W3000 of each unit.



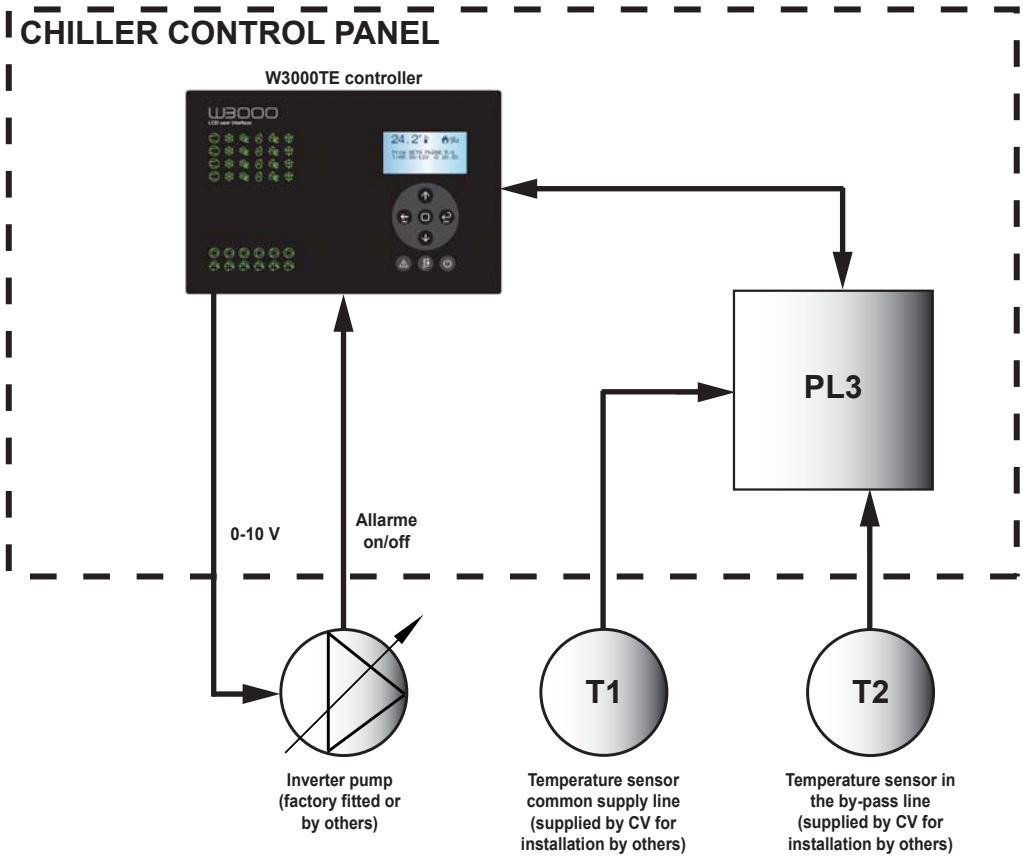
12.3 VPF.D systems for plants designed with both primary circuit and secondary one with variable flow

Also in those cases when it's not possible to design a single circuit with variable flow or when it's necessary to maintain decoupled the primary circuit (dedicated to the chillers) and the secondary one (dedicated to the plant users), it's possible to have the management of the pumps and inverters directly from the unit.
The energy savings are lower than the solution with a unique VPF system, but still important especially when the units are in stand-by, as in this case it's possible to reduce down to 50% the water flow.
These systems can be easily adopted in retrofit application, where the chiller is supposed to be replaced but the plant isn't.
The RC solution guarantees also the water flow balancing between primary and secondary circuit, in order to avoid the flow inversion in the decoupling pipe.

The VPF.D system (Variable Primary Flow with Decoupler) is the option that allows to have variable water flow on the user side exchanger (evaporator) in plants with both primary and secondary circuits and additional pumps on the user side.

The VPF.D option includes:
- control device (PL3 in the herebelow scheme), mounted in the electrical panel
- 2 temperature probes, provided by RC but installed by the client in the plant, one for the delivery line and one for the by-pass line
- pumps with inverters and related signals for the communication with the controller W3000TE

When the plant includes more units connected together with a management system (Manager 3000), it's mandatory to order also the option 3030 "VPF control from Manager 3000", in order to have the installation of the PL3 device inside the Manager itself and not in the electrical panel of each unit.

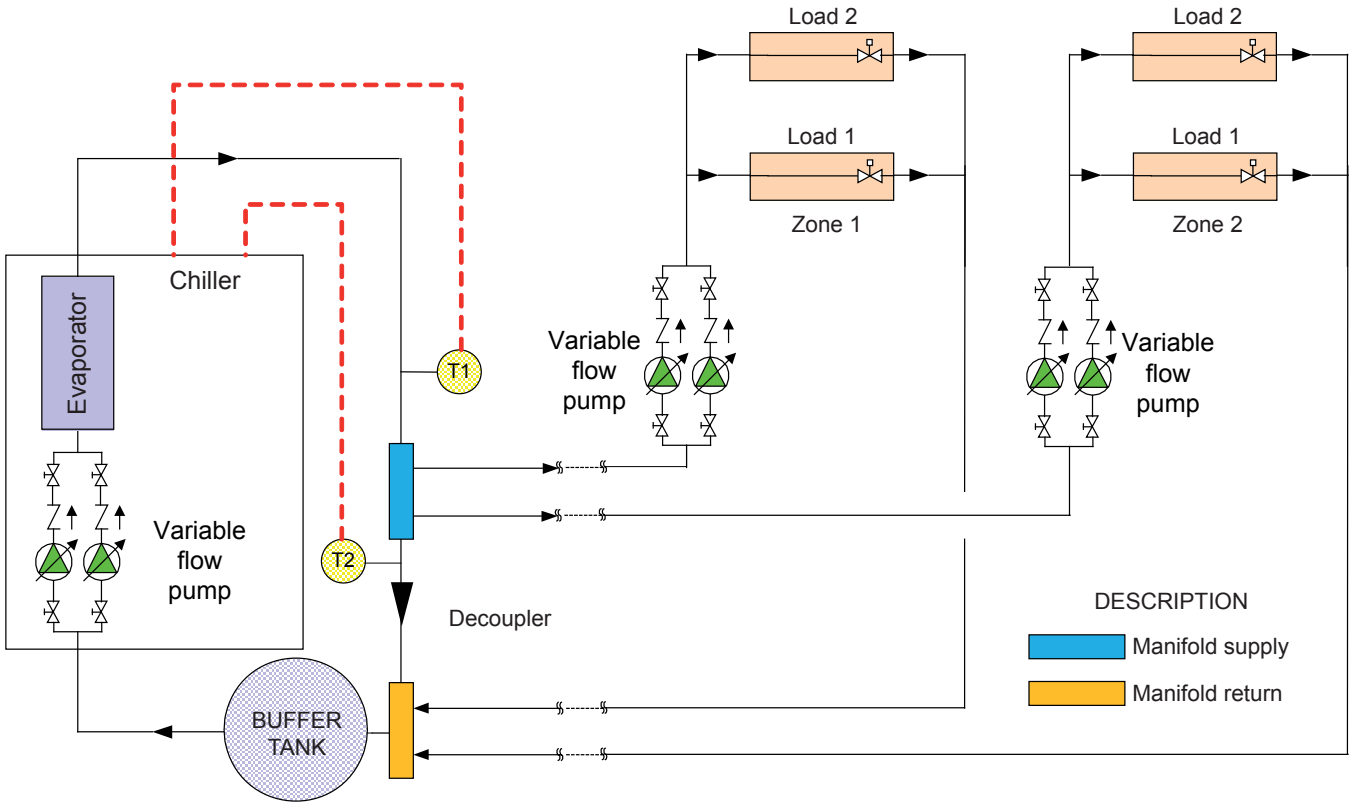


How it works

The VPF. D measures, thorugh the two probes installed, the temperatures T1 and T2 (on the delivery and by-pass lines), keeping T2=T1 as control target.
As long as T1=T2, the water flow in the primary circuit is equal or higher than in the secondary one. When T2>T1, the water flow in the primary circuit becomes lower than the flow in the secondary circuit, leading to recirculation of warm water coming back from the installation and mixing with the cold supply water.

In order to rebalance this situation the speed of the pumps is being increased gradually in order to let the temperature T1 be again equal to T2.
The target of the VPF.D is then to keep constant the ΔT in the primary circuit. The secondary circuit remains completely independent and so has to be managed and controlled by the customer side.
The minimum water flow through the user side exchanger is guaranteed by a fixed setting for the minimum speed of the pumps (inside the service menu of the unit controller).

When the plant includes more units, the working logic remains the same. The PL3 device, installed in the Manager, collect the information about temperatures T1 and T2, while the W3000 of each unit takes care of the speed of the pumps, according to the signal sent from the Manager. The Manager itself takes care also that the pumps of each chiller work at the same speed and that, when an additional unit is switched on, the speed of the already running pumps is automatically aligned



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