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

RC Data Book
TRCS-FC-Z 0211 - 1204_201512_EN HFC R134a
ELCA_Engine ver.3.3.0.3

COOLING
FREE C.

TRCS-FC-Z 0211 - 1204

302-1693 kW

High efficiency chiller, air source with free-cooling

HFC R134a
CENTRIF.
FLOODED
VPF
VSPEED
GREEN CERTIFICATION RELEVANT

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

- ENERGY SAVING
- VERY HIGH EFFICIENCY
- WIDE RANGE
- LOW INRUSH CURRENTS
- EXTREMELY SILENT OPERATION
- INTEGRATED HYDRONIC MODULE

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

INDEX **TRCS-FC-Z 0211 - 1204**

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

Flooded evaporator

Other features

VPF

VSpeed

GREEN Certification relevant

GREEN CERTIFICATION RELEVANT

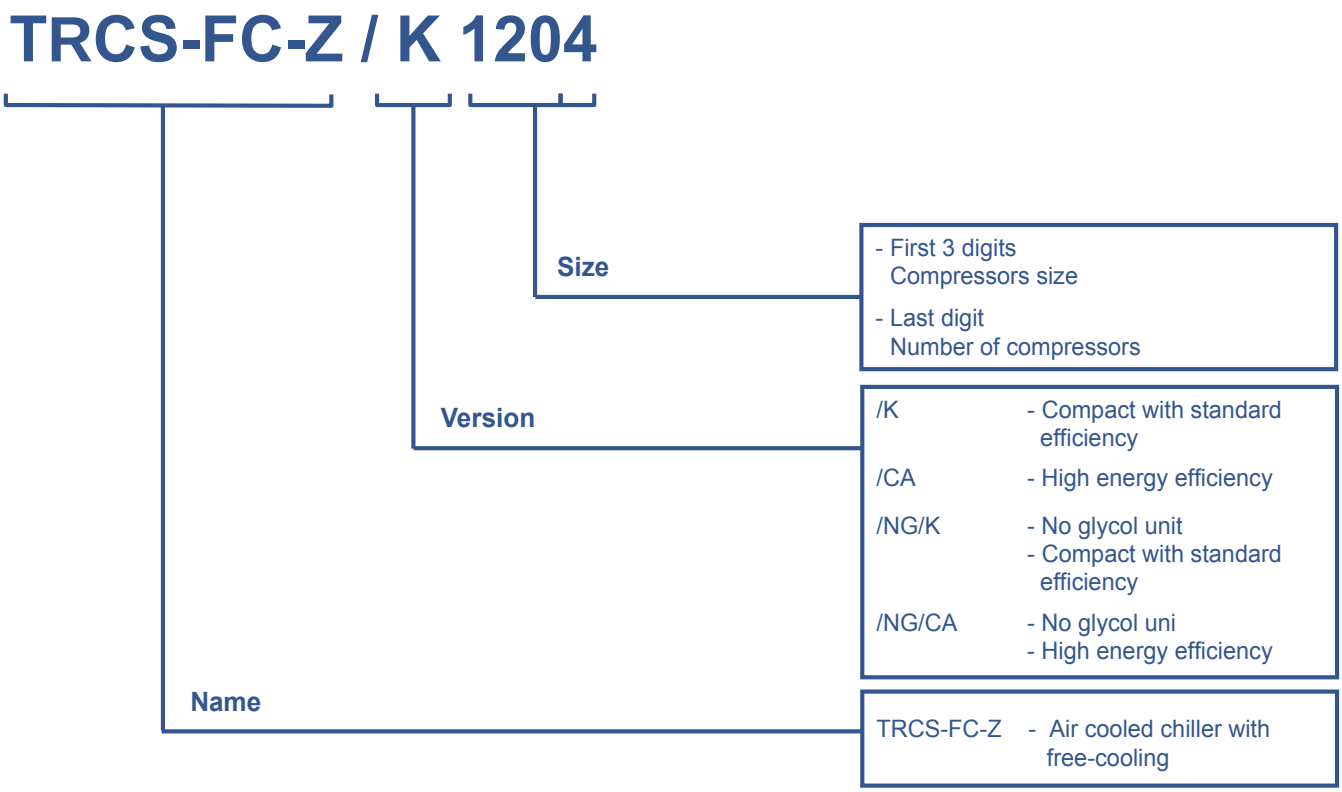
Mitsubishi Electric Hydronics & IT Cooling Systems S.p.A., as a major player in the world HVAC market and a leading manufacturer of energy efficient, sustainable HVAC solutions, recognizes and supports the diffusion of green certification systems, as an effective way to deliver high performance buildings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


TRCS-FC-Z / K 1204
Size
- First 3 digits
Compressors size
- Last digit
Number of compressors
Version
/K - Compact with standard efficiency
/CA - High energy efficiency
/NG/K - No glycol unit
- Compact with standard efficiency
/NG/CA - No glycol uni
- High energy efficiency
Name
TRCS-FC-Z - Air cooled chiller with free-cooling

2.1 PRODUCT PRESENTATION

Outdoor unit for the production of chilled water, equipped with oil-free centrifugal compressors, with R134a, axial EC fans, condensing coil with copper tubes and aluminum fins, shell and tube flooded evaporator and electronic expansion valve. Base and supporting structure and panels are are of galvanized epoxy powder coated steel. The unit is supplied with refrigerant and has been factory tested. On-site installation therefore just involves making connections to the mains power and water supplies.
The rotor speed digital control allows an accurate and efficient thermoregulation in every operating condition. An additional brazed plate heat exchanger constitutes the economizer and improves the refrigerant ciruit efficiency (not present in sizes 0211 and 0452).
These units, fitted with free-cooling coils, are used in IT-cooling, civil and industrial installations when the demand for cooling load persists even during the cold months or when the outdoor temperature is lower than the temperature of the liquid return line. In free cooling mode, the fluid is cooled by outside air, thus lowering the load of the compressors until it is reduced to zero.
The NG configuration complies with applications where it is not allowed or desired the use of ethylene glycol.

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

2.4 VERY HIGH EFFICIENCY
Top-level seasonal efficiency thanks to technlogical solutions at the forefront: magnetic levitation centrifugal compressors, flooded evaporator, EC fans and advanced control algorithms.

2.5 WIDE RANGE
Extended capacity range.

2.6 LOW INRUSH CURRENTS
Reduced breakaway starting currents thanks to the revolutionary centrifugal compressor.

2.7 EXTREMELY SILENT OPERATION
Extremely silent operation in line with the best on the market, and highly reduced vibrations

2.8 INTEGRATED HYDRONIC MODULE
It consists of 2 pumps with 4-pole motor, fixed or variable speed, with high or low head options to satisfy different industrial or IT-cooling applications and demands for comfort.

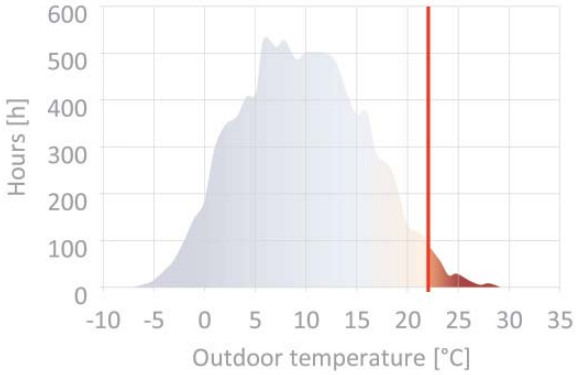
FREE-COOLING CHILLER: OPERATING MODES

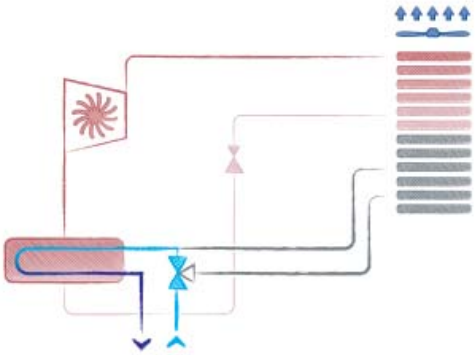
RC's free-cooling chillers are designed to work in three different modes (Total free-cooling, Hybrid cooling, Mechanical cooling), according to the outdoor air conditions and to the operating water temperature.
The free-cooling chilling effect is granted by special finned coils that allow the air to directly exchange heat with the operating water.

As the outdoor air temperature drops 1 degree below the returning water temperature, a valve system redirects the water to the special coils and the benefits of free-cooling begin.
Free-cooling capacity grows with lower air temperature, until it manages to cover the entire cooling demand.

Mechanical Cooling

Conventional Chiller



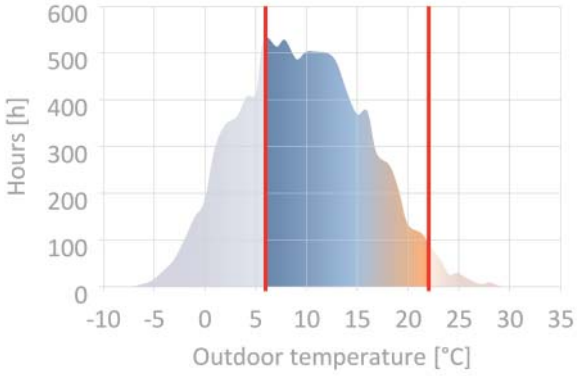


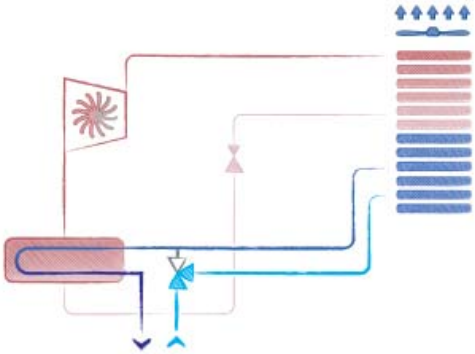
The outdoor air temperature is equal to or higher than the returning water temperature.

Total cooling capacity is provided by the compressors, in the evaporator. The unit works like an ordinary chiller.

Hybrid Cooling

Optimised Source Management



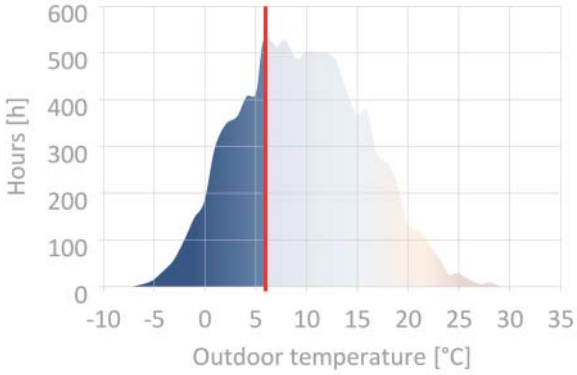


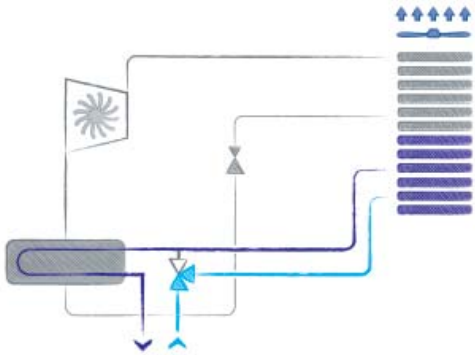
The outdoor air temperature is lower than the returning water temperature but not cold enough to achieve total free-cooling.

Part of the cooling capacity is provided by the outdoor air, in the free-cooling coils, while the rest is provided by the compressors, in the evaporator.

Total Free Cooling

Maximum Energy Saving





The outdoor air temperature is low enough to satisfy the entire cooling demand.

Total cooling capacity is provided by the outdoor air, in the free-cooling coils, while the compressors are off.

NOTE:
Graphics above show the temperature profile of London and consider a unit working with operating water temperature (in/out) 23°C / 18°C.

3.2 High efficiency chiller, air source with free-cooling

Outdoor unit for the production of chilled water featuring oil-free centrifugal compressor, with R134a, axial-flow fans, condensing coil and air-water coil with copper tubes and aluminium fins, shell and tube flooded evaporator and electronic regulation valve. Base and supporting structure and panels are of galvanized epoxy powder coated steel with increased thickness.
Flexible and reliable unit; it easily adapts itself to different thermal load conditions thanks to the precise thermoregulation together with the use of inverter technology.

3.3 Installation note

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

3.4 Structure

Base and frame in galvanized steel. The supporting frame are polyester-painted for the highest resistance to external factors: surfaces´ hue and brightness are preserved.
Pipes and compressors´ box covered with an acoustic layer to reduce global noise emissions.

3.5 Refrigerant circuit

Unit designed with dedicated and independent refrigerant circuits in order to ensure continuous operation, limited pollution, and easy maintenance. In addition to 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
- Compressor's suction motorised valve
- filter on compressor's inlet
- drier filter with replaceable cartridge
- refrigerant line sight glass with humidity indicator
- high and low pressure transducers
- An additional brazed plate heat exchanger constitutes the economizer and improves the refrigerant circuit efficiency (not present in sizes 0211 and 0452).

3.6 Water circuit

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

3.7 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
- water-air heat exchanger

3.8 Anti-freeze heaters and thermal insulation

.

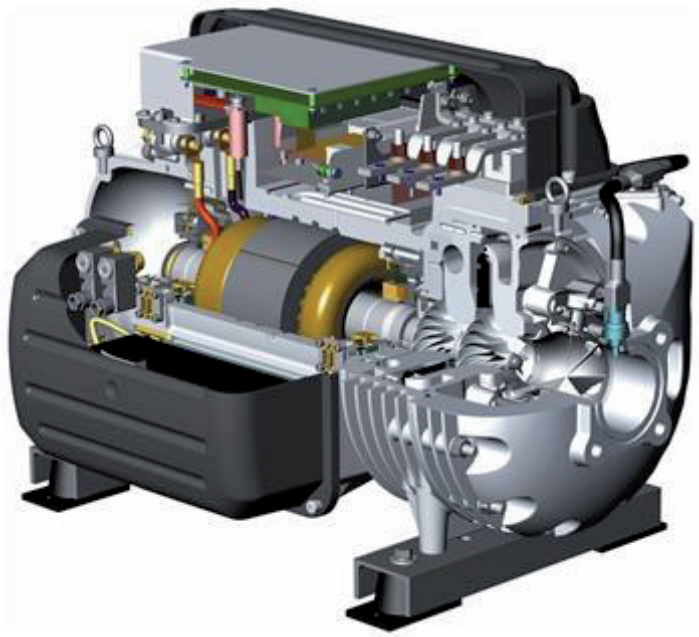
	Tair > -15°C			
	Electrical heaters		Thermal insulation	
	Std FC	NG FC	Std FC	NG FC
Evaporator	No	Yes	9 mm	18 mm
Pipes	No	Yes	9 mm	18 mm
Pumps	No	Yes	9 mm	18 mm
NG heat exchanger	-	Yes	-	18 mm
NG pump	-	No	-	9 mm
NG pipes	-	No	-	9 mm

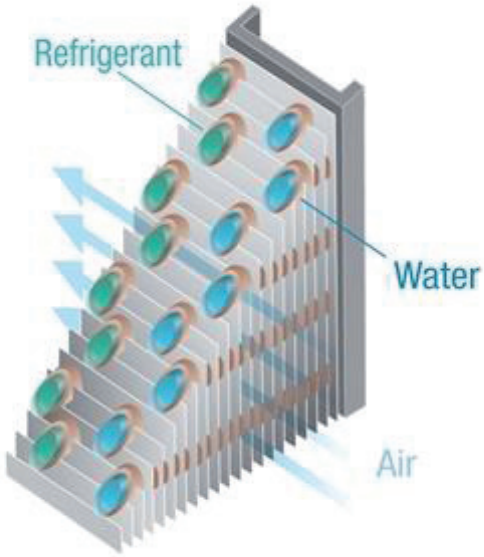
	-15°C > Tair > -25°C			
	Electrical heaters		Thermal insulation	
	Std FC	NG FC	Std FC	NG FC
Evaporator	No	Yes	9 mm	18 mm
Pipes	No	Yes	9 mm	18 mm
Pumps	Yes	Yes	9 mm	18 mm
NG heat exchanger	-	Yes	-	18 mm
NG pump	-	No	-	9 mm
NG pipes	-	No	-	9 mm

NOTE: For this configuration the low temperature kit is required.

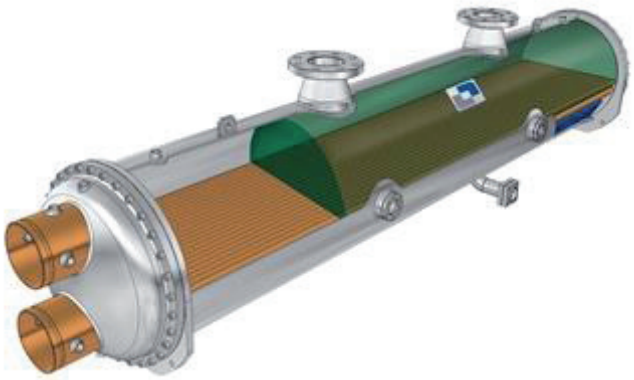
3.9 Compressor

Two stage, variable speed, centrifugal compressor with aluminium impellers, designed requiring no oil for lubrication. Compressor constructed with cast aluminium casing and high-strenght thermoplastic electronics enclosures. Compressor provided with radial and axial magnetic bearings to levitate the shaft thereby eliminating metal to metal contact, and thus eliminating friction and the need for oil. Each bearing position is sensed by position sensors to provide real-time repositioning of the rotor shaft, controlled by the on-board digital electronics. Compressor speed is reduced as condensing temperature and/or heat load reduces, optimizing energy performance through the entire range.
Continuous modulation is possibile thanks to the integrated inverter. Signals from the compressor controller determine the inverter output frequency, voltage and phase, thereby regulating the motor speed. In case of power failure, the compressor is capable of allowing for a normal de-levitation and shutdown. Inlet Guide Vanes is built-in to further trim the compressor capacity in conjuction with the variable-speed control, to optimize compressor performance at low loads.
The compressor is provided with a direct drive, high efficiency, permanent-magnet synchronous motor powered by pulse-width-modulating (PWM) voltage supply. Motor cooling is by liquid refrigerant injection. A non-return valve on the discharge port of the compressor is installed to protect against backflow of refrigerant during coastdown; a thermal protection protects against over-currents while a soft-charge device reduces in-rush starting current under 2 amps.





3.10 Plant side heat exchanger
Shell and tube heat exchanger, fully designed and manufactured by RC, working as flooded type evaporator, with water flowing inside the pipes and refrigerant flowing in the shell side.
The steel shell is insulated with a foamed polyethylene closed-cell mat of 9 mm thikness (Std configuration) or 18 mm (NG configuration) and a thermal condcuctivity of 0,033 W/mK at 0°C to avoid condensation on its surface. The copper tubes are internally and externally grooved to improve heat exchange. A drop´s separator is integrated in the evaporator to protect the compressor against the possibility of liquid´s suction. A differential pressure switch is already fitted in order to monitor the waterflow while the unit is working, avoiding the risk of ice generation. The heat exchanger comply with PED standards, concerning to operating pressure. In NG configuration units, the shell and tube evaporator, the intemediate plate heat exchanger and the water pipes are equipped with electrical heaters, to protect these components from freezing in case of unit's stand by.
Water side connections with grooved coupling with weld end counter-pipe user side.



3.11 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.

3.12 Fan section source side
Axial electronically commutated fans (EC fans), with external rotor, profiled die-cast aluminium blades, housed in aeodynamic hoods complete with guard grille. 6-poles electric motor with built-in thermal protection. The brushless motor, governed by a special controller, continuously adjust fans' speed to minimize energy consumption, electromagnetic noises and current's absorption even during start-up phase.

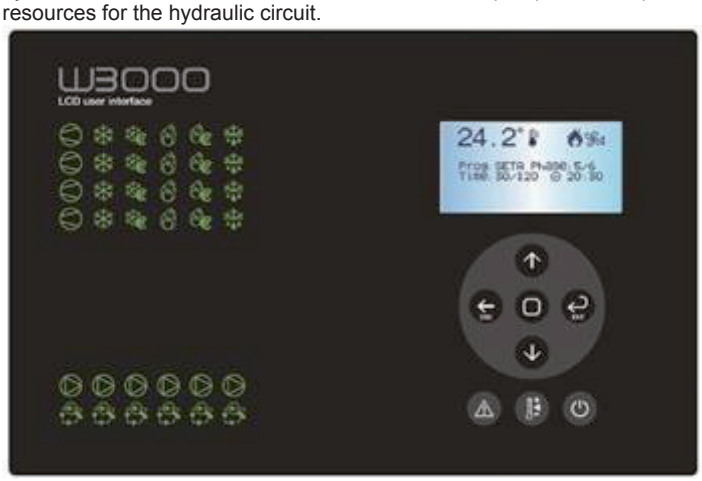
3.13 Electrical and control panel
Electrical and control panel built to EN60204-1 and EC204-1 standards, complete with:
- electronic controller
- control circuit transformer
- general door lock isolator
- power circuit with bar distribution system
- EMC filter and reactor on the compressor's power circuit
- fuses for compressors
- terminals for cumulative alarm block
- remote ON/OFF terminals
- spring-type control circuit terminal board
- auxiliary 4-20mA analogue input
- relays for remote pump(s) activation for plant side and heat source side (only for units without hydronic pumps)
- outdoor air temperature probe
- forced ventilation of compressor enclosure
- Power supply: 400V~ ±10% 3ph 50Hz PE

3.14 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
- Electromagnetic compatibility EN 61000-3-4
- Machine directive 2006/42/EC
- PED directive 97/23/EC
- 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

3.15 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.

3.16 Electronic control W3000 TE
The brand new W3000TE controller offers advanced functions and algorithms. The large format keyboard provides a complete view of the statuses of the unit. The controls and the complete LCD display favour an easy and safe access to the machine setup. These resources allow the assessment and intervention on the unit, by means of 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.



3.16 Touch screen
Touch screen interface

3.17 Versions
/K – Compact with standard efficiency
Key efficiency, compact version.

/CA - High energy efficiency
High energy efficiency units for the minimum investment payback time. High performing heat exchangers and generous heat exchanger's surfaces.

3.18 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.

4.1 OPTIONS

OPTIONS	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
380 **NUMBERED WIRING**			
381 NUMBERED WIRING ON EL. BOARD			ALL
382 PWR WIRINGS ACC.TO UK REQUEST	Facilitate maintainance interventions to the electrical board connections.		ALL
383 NUMBERED WIRINGS+UK REQUESTS			ALL
3300 **COMPRESSOR REPHASING**			
3302 COMPR.POWER FACTOR CORR.0,95	Capacitors on the compressors' power inlet line.	The unit's average cos(phi) increases.	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..20mA analogue 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 activate the Energy Saving set-point.	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

OPTIONS

OPTIONS	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
6190 **TYPE OF VISUAL DISPLAY**			
6195 W3000 TOUCH VISUAL DISPLAY	Colour WVGA 7" display keyboard with adjustable LED backlight (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
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 1+1 RELAY EVAPORATOR PUMPS	Relay for the pump(s) on/off.	It permits the pumps on/off. In case of 2 pumps, one in stand-by to the other, it's possible to balance the operating hours between them.	ALL
3390 **ELECTRIC HEATER ON BOARD**			
3391 ELECTRIC HEATER ON 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
3420 **LIGHTS ON ELECTRIC BOARD**			
3421 LIGHTS ON ELECTRIC BOARD	Electrical board equipped with lights.	Facilitate 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
3432 REFRIG. LEAK DETECTOR+MIGR.	Refrigerant leak detection and migration system. In case the device detects a leakage the unit stops and stores the remaining refrigerant inside the evaporator, waiting for the intervention of a technician.	It promptly detects gas leakages, stops the unit and stores the remaining refrigerant.	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
3450 **ELECTR. COMP. AS IEC 61000-6**			
3451 EMC COMP. FOR RESIDENTIAL APP.	EMC compatibility for residential applications as per EN61000-6-3	Assure units' EMC compatibility as per EN61000-6-3, for residential, commercial and light industrial applications.	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

OPTIONS

OPTIONS	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
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(W/ DISPLAY) 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, display them and send them via RS-485 bus to the BMS for energy metering.	ALL
4500 **FAST RESTART**			
4501 Fast RE-START	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. The fast restart arrangement requires an external 203V AC 300VA UPS power supply, by customer.	ALL
890 **CONDENSING COIL**			
881 Cu/Cu EXTERNAL COIL	Air-refrigerant heat exchanger with copper fins and tubes.	Recommended for applications in corrosive atmospheres	ALL
894 Cu PIPES/PREPAINTED ALL. FINS	Fins made from pre-painted material.	Recommended for applications in medium level pollution atmospheres.	ALL

OPTIONS

OPTIONS	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
895 FIN GUARD SILVER TREATM	Air-refrigerant heat exchanger with epoxidic treatment on coils and fins.	Recommended for marine exposure conditions, with an high level of pollution or other aggressive atmospheres.	ALL
2000 **COIL PROTECTION**			
2001 COIL PROT.GRILLS IN PERALUMAN	Coil protecting grilles	Protects against the intrusion of solid bodies with mediumlarge dimensions.	ALL
2870 **OPERATING RANGE TRCS-FC-Z**			
2871 AIR TEMP. DOWN TO -15°C	Kit to increase the unit's operating range.		ALL
2872 AIR TEMP. DOWN TO -25°C	Kit to increase the unit's operating range.		ALL
1800 **EVAPORATOR WATER FLOW SWITCH**			
1801 EVAPORATOR WATER FLOW SWITCH			ALL
2910 **HYDRAULIC CONNECTIONS**			
2911 FLANGED HYDRAULIC CONNECTIONS			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**			
3183 N.2 PUMPS 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
3240 **PUMP ASSEMBLY WITH VPF SYSTEM**			
3245 N.2 PUMPS 4 POL L.P+VPF	Hydronic group with pre-arrangement for the control of the inverter driven pumps for the plant's primary circuit (see dedicated section). This option includes: control devices to read the signals (4-20mA) coming from pressure transducers placed in the plant and so to manage the pumps and the by-pass valve (0-10V signal), additional pressure transducer in the evaporator [pressure transducers, pumps and by-pass valve to be supplied by others]		ALL

OPTIONS

OPTIONS	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
3246 N.2 PUMPS 4 POL H.P+VPF	Hydronic group with pre-arrangement for the control of the inverter driven pumps for the plant's primary circuit (see dedicated section). This option includes: control devices to read the signals (4-20mA) coming from pressure transducers placed in the plant and so to manage the pumps and the by-pass valve (0-10V signal), additional pressure transducer in the evaporator [pressure transducers, pumps and by-pass valve to be supplied by others]		ALL
VPF CONTROL MANAGER FROM 3000			
3020 VPF.D CONTROL FROM UNIT			ALL
3030 VPF CONTROL FROM MANAGER W3000			ALL
3040 **PUMP ASSEMBLY WITH VPF.D SYST.**			
3045 N.2 PUMPS 4 POL L.P+VPF.D	Hydronic group with pre-arrangement for the control of the inverter driven pumps for the plant's primary circuit (see dedicated section). This option includes: control devices to read the signals (4-20mA) coming from pressure transducers placed in the plant and so to manage the pumps and the by-pass valve (0-10V signal), additional pressure transducer in the evaporator [pressure transducers, pumps and by-pass valve to be supplied by others]		ALL
3046 N.2 PUMPS 4 POL H.P+VPF.D	Hydronic group with pre-arrangement for the control of the inverter driven pumps for the plant's primary circuit (see dedicated section). This option includes: control devices to read the signals (4-20mA) coming from pressure transducers placed in the plant and so to manage the pumps and the by-pass valve (0-10V signal), additional pressure transducer in the evaporator [pressure transducers, pumps and by-pass valve to be supplied by others]		ALL
3230 **PUMP ASSEMBLY WITH 2PS SYSTEM**			
3235 N.2 PUMPS 4 POL LH+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.		ALL
3236 N.2 PUMPS 4 POL LH+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.		ALL

OPTIONS

OPTIONS	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
2020 **ANTI-INTRUSION GRILLS**			
2021 ANTI-INTRUSION GRILLS	Anti-intrusions grills	Avoid the intrusion of solid bodies into the unit's structure.	ALL
2100 **ANTIVIBRATION MOUNTING**			
2101 RUBBER TYPE ANTIVIBR.MOUNTING			ALL
2102 SPRING TYPE ANTIVIBR.MOUNTING			ALL
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			ALL
9967 COIL PROTECTION PACKING			ALL
9979 CONTAINER PACKING			ALL

OPTIONS

OPTIONS NOTES

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 0 position (open).
In some units, the transfer switch requires an enlarged electrical board. With these options, standard unit lengths change as follows:

UNIT SIZE	LENGTH INCREASE WITH RESPECT
0211	-
0251	-
0351	-
0452	+ 250 mm
0552	+ 250 mm
0652	+ 250 mm
0712	+ 250 mm
0803	+ 250 mm
0903	+ 250 mm
0953	+ 250 mm
1003	+ 250 mm
1164	+ 250 mm
1204	+ 250 mm

4501 - Fast restart (UPS excluded)
Time frames shown in Tables 1 and 2 are defined from the power restoration.
The ramp-up time to achieve 100% of cooling capacity (without free-cooling contribution) depends on several factors:
- Number of compressors;
- Power outage duration;
- Cooling capacity required;
- Water and outdoor air temperatures;
- Compressors' operating conditions before the power failure.

For the above-mentioned elements, the data listed in Table 2 are subject to a tolerance.

Table 1 - First compressor start-up time

Standard unit	Unit with fast restart	
	After power outage < 40"	After power outage ≥ 40"
4' 30''	26''	50''

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

No. compr.	Standard unit *	Unit with fast restart *	
		After power outage < 40"	After power outage ≥ 40"
1	16'10"	5'00"	4'20"
2	17'10"	6'30"	5'50"
3	16'00"	8'00"	7'20"
4	16'40"	9'30"	8'50"

* Reference conditions:
Plant (side) cooling exchanger water (in/out) 12°C / 7°C; Source (side) heat exchanger air (in) 35°C.

1801 - Evaporator water flow switch
The accessory is supplied loose.

3183 ; 3184 - Pump assembly
3245 ; 3246 - Pump assembly with VPF system
3045 ; 3046 - Pump assembly with VPF.D system
3235 ; 3236 - Pump assembly with 2PS system
To request this option, please contact RC's sales department. The pump assembly could entail a unit length increase.

4.2 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.

5.1 GENERAL TECHNICAL DATA TRCS-FC-Z /K

[SI System]

TRCS-FC-Z /K			0211	0351	0452	0552	0652	0712	0903	0953	1003	1164
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												
Cooling capacity	(1)	**kW**	**302**	**483**	**594**	**689**	**943**	**980**	**1185**	**1253**	**1421**	**1578**
Compressors power input	(1)	kW	82,0	131	167	171	268	256	296	349	398	424
Total power input	(1)	kW	87,1	141	179	181	285	275	320	373	425	455
EER	(1)	**kW/kW**	**3,47**	**3,43**	**3,33**	**3,81**	**3,31**	**3,56**	**3,70**	**3,36**	**3,35**	**3,47**
Free Cooling (Tae = 10,0°C)												
Power	(1)	**kW**	**77,3**	**127**	**161**	**184**	**245**	**271**	**332**	**327**	**371**	**434**
% Free cooling	(1)	%	26	26	27	27	26	28	28	26	26	28
FREE-COOLING ON 100%												
Cooling capacity	(2)	**kW**	**302**	**483**	**594**	**689**	**943**	**980**	**1185**	**1253**	**1421**	**1578**
Total power input	(2)	kW	5,10	9,60	12,0	10,2	16,8	19,2	24,0	24,0	26,4	31,2
EER	(2)		**59,3**	**50,3**	**49,5**	**67,5**	**56,2**	**51,1**	**49,4**	**52,2**	**53,8**	**50,6**
Total FC temperature	(2)	°C	-1,9	-2,5	-1,9	-1,4	-2,7	-1,4	-1,2	-2,7	-2,5	-1,6
EXCHANGERS												
HEAT EXCHANGER USER SIDE IN REFRIGERATION												
Glycol	(1)	%	30	30	30	30	30	30	30	30	30	30
Water flow	(1)	l/s	16,0	25,6	31,5	36,5	50,0	51,9	62,8	66,4	75,3	83,6
Pressure drop	(1)	kPa	86,0	98,6	89,3	104	104	107	91,8	80,2	103	106
COMPRESSORS												
Compressors nr.		N°	1	1	2	2	2	2	3	3	3	4
Number of capacity		N°	0	0	0	0	0	0	0	0	0	0
No. Circuits		N°	1	1	1	1	1	1	2	2	2	2
Regulation			STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS
Min. capacity step		%	-	-	-	-	-	-	-	-	-	-
Refrigerant			R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a
Refrigerant charge		kg	120	140	260	260	320	320	430	520	520	540
Oil charge		kg	0	0	0	0	0	0	0	0	0	0
FANS												
Quantity		N°	6	8	10	12	14	16	20	20	22	26
Air flow		m³/s	26,00	33,89	42,88	46,38	61,86	70,69	87,85	85,76	96,06	113,52
Fans power input		kW	0,85	1,20	1,20	0,85	1,20	1,20	1,20	1,20	1,20	1,20
NOISE LEVEL												
Noise Pressure	(3)	dB(A)	56	61	62	58	63	63	64	64	65	65
Sound power level in cooling	(4)	dB(A)	88	93	94	91	96	96	97	97	98	98
SIZE AND WEIGHT												
A	(5)	mm	4000	4000	4900	6400	7000	7900	10600	11200	11200	13000
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	3430	3850	5080	5820	6340	6900	9750	10260	10530	12290

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.
- Unavailable

GENERAL TECHNICAL DATA — TRCS-FC-Z /K

[SI System]

TRCS-FC-Z /K			1204
Power supply		V/ph/Hz	400/3/50
PERFORMANCE			
FREE-COOLING OFF			
Cooling capacity	(1)	**kW**	**1649**
Compressors power input	(1)	kW	429
Total power input	(1)	kW	461
EER	(1)	**kW/kW**	**3,58**
Free Cooling (Tae = 10,0°C)			
Power	(1)	**kW**	**450**
% Free cooling	(1)	%	27
FREE-COOLING ON 100%			
Cooling capacity	(2)	**kW**	**1649**
Total power input	(2)	kW	31,2
EER	(2)		**52,9**
Total FC temperature	(2)	°C	-1,8
EXCHANGERS			
HEAT EXCHANGER USER SIDE IN REFRIGERATION			
Glycol	(1)	%	30
Water flow	(1)	l/s	87,3
Pressure drop	(1)	kPa	115
COMPRESSORS			
Compressors nr.		N°	4
Number of capacity		N°	0
No. Circuits		N°	2
Regulation			STEPLESS
Min. capacity step		%	-
Refrigerant			R134a
Refrigerant charge		kg	540
Oil charge		kg	0
FANS			
Quantity		N°	26
Air flow		m³/s	115,56
Fans power input		kW	1,20
NOISE LEVEL			
Noise Pressure	(3)	dB(A)	65
Sound power level in cooling	(4)	dB(A)	98
SIZE AND WEIGHT			
A	(5)	mm	13600
B	(5)	mm	2260
H	(5)	mm	2500
Operating weight	(5)	kg	12350

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.
- Unavailable

GENERAL TECHNICAL DATA

[SI System]

TRCS-FC-Z /CA

TRCS-FC-Z /CA			0211	0251	0351	0452	0552	0712	0803	0903	1003
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
PERFORMANCE											
FREE-COOLING OFF											
Cooling capacity	(1)	**kW**	**310**	**354**	**496**	**616**	**714**	**990**	**1068**	**1209**	**1446**
Compressors power input	(1)	kW	80,3	83,0	126	163	164	251	246	286	390
Total power input	(1)	kW	85,4	89,8	134	173	177	268	267	308	412
EER	(1)	**kW/kW**	**3,63**	**3,94**	**3,69**	**3,56**	**4,03**	**3,69**	**4,00**	**3,92**	**3,51**
Free Cooling (Tae = 10,0°C)											
Power	(1)	**kW**	**88,2**	**102**	**138**	**173**	**212**	**275**	**315**	**352**	**388**
% Free cooling	(1)	%	28	29	28	28	30	28	29	29	27
FREE-COOLING ON 100%											
Cooling capacity	(2)	**kW**	**310**	**354**	**496**	**616**	**714**	**990**	**1068**	**1209**	**1446**
Total power input	(2)	kW	5,10	6,80	8,50	10,2	13,6	17,0	20,4	22,1	22,1
EER	(2)		**60,7**	**52,0**	**58,4**	**60,4**	**52,5**	**58,3**	**52,4**	**54,7**	**65,4**
Total FC temperature	(2)	°C	-0,1	-0,2	-1,0	-0,5	0,4	-0,9	0,2	0,0	-1,6
EXCHANGERS											
HEAT EXCHANGER USER SIDE IN REFRIGERATION											
Glycol	(1)	%	30	30	30	30	30	30	30	30	30
Water flow	(1)	l/s	16,4	18,7	26,3	32,6	37,8	52,5	56,6	64,1	76,6
Pressure drop	(1)	kPa	90,3	96,3	104	95,9	111	109	74,6	95,6	107
COMPRESSORS											
Compressors nr.		N°	1	1	1	2	2	2	3	3	3
Number of capacity		N°	0	0	0	0	0	0	0	0	0
No. Circuits		N°	1	1	1	1	1	1	2	2	2
Regulation			STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS
Min. capacity step		%	-	-	-	-	-	-	-	-	-
Refrigerant			R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a
Refrigerant charge		kg	120	120	140	260	280	320	430	430	520
Oil charge		kg	0	0	0	0	0	0	0	0	0
FANS											
Quantity		N°	6	8	10	12	16	20	24	26	26
Air flow		m³/s	24,42	28,34	36,01	46,38	60,43	72,03	89,24	96,68	96,68
Fans power input		kW	0,85	0,85	0,85	0,85	0,85	0,85	0,85	0,85	0,85
NOISE LEVEL											
Noise Pressure	(3)	dB(A)	56	57	58	58	59	60	61	61	61
Sound power level in cooling	(4)	dB(A)	88	89	90	91	92	93	94	94	94
SIZE AND WEIGHT											
A	(5)	mm	4000	4000	4900	6400	7900	10000	12100	13000	13000
B	(5)	mm	2260	2260	2260	2260	2260	2260	2260	2260	2260
H	(5)	mm	2500	2500	2500	2500	2500	2500	2500	2500	2500
Operating weight	(5)	kg	3660	3790	4380	5720	6770	8870	10530	11370	11730

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.
- Unavailable

GENERAL TECHNICAL DATA — TRCS-FC-Z /NG /K

[SI System]

TRCS-FC-Z /NG /K			0211	0351	0452	0552	0652	0712	0903	0953	1003	1164
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												
Cooling capacity	(1)	**kW**	**310**	**496**	**610**	**708**	**969**	**1007**	**1217**	**1287**	**1460**	**1621**
Compressors power input	(1)	kW	82,5	132	167	172	270	257	298	351	400	426
Total power input	(1)	kW	87,6	142	180	182	287	277	322	375	427	457
EER	(1)	**kW/kW**	**3,54**	**3,50**	**3,40**	**3,89**	**3,38**	**3,64**	**3,78**	**3,43**	**3,42**	**3,55**
Free Cooling (Tae = 10,0°C)												
Power	(1)	**kW**	**71,7**	**118**	**149**	**172**	**228**	**251**	**307**	**304**	**345**	**402**
% Free cooling	(1)	%	23	24	24	24	24	25	25	24	24	25
FREE-COOLING ON 100%												
Cooling capacity	(2)	**kW**	**310**	**496**	**610**	**708**	**969**	**1007**	**1217**	**1287**	**1460**	**1621**
Total power input	(2)	kW	5,10	9,60	12,0	10,2	16,8	19,2	24,0	24,0	26,4	31,2
EER	(2)		**60,9**	**51,6**	**50,8**	**69,4**	**57,7**	**52,4**	**50,7**	**53,6**	**55,3**	**52,0**
Total FC temperature	(2)	°C	-4,9	-5,5	-5,0	-4,5	-5,8	-4,5	-4,3	-5,7	-5,6	-4,7
EXCHANGERS												
HEAT EXCHANGER USER SIDE IN REFRIGERATION												
Glycol	(1)	%	0	0	0	0	0	0	0	0	0	0
Water flow	(1)	l/s	14,9	23,7	29,2	33,9	46,4	48,2	58,2	61,6	69,9	77,6
Pressure drop	(1)	kPa	98,1	128	112	137	135	130	113	110	140	154
COMPRESSORS												
Compressors nr.		N°	1	1	2	2	2	2	3	3	3	4
Number of capacity		N°	0	0	0	0	0	0	0	0	0	0
No. Circuits		N°	1	1	1	1	1	1	2	2	2	2
Regulation			STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS
Min. capacity step		%	-	-	-	-	-	-	-	-	-	-
Refrigerant			R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a
Refrigerant charge		kg	120	140	260	260	320	320	430	520	520	540
Oil charge		kg	0	0	0	0	0	0	0	0	0	0
FANS												
Quantity		N°	6	8	10	12	14	16	20	20	22	26
Air flow		m³/s	26,00	33,89	42,88	46,38	61,86	70,69	87,85	85,76	96,06	113,52
Fans power input		kW	0,85	1,20	1,20	0,85	1,20	1,20	1,20	1,20	1,20	1,20
NOISE LEVEL												
Noise Pressure	(3)	dB(A)	56	61	62	58	63	63	64	64	65	65
Sound power level in cooling	(4)	dB(A)	88	93	94	91	96	96	97	97	98	98
SIZE AND WEIGHT												
A	(5)	mm	4000	4000	4900	6400	7000	7900	10600	11200	11200	13000
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	4120	4620	6100	6990	7610	8280	11700	12320	12640	14750

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.
- Unavailable

GENERAL TECHNICAL DATA TRCS-FC-Z /NG /K

[SI System]

TRCS-FC-Z /NG /K			1204
Power supply		V/ph/Hz	400/3/50
PERFORMANCE			
FREE-COOLING OFF			
Cooling capacity	(1)	**kW**	**1693**
Compressors power input	(1)	kW	432
Total power input	(1)	kW	463
EER	(1)	**kW/kW**	**3,66**
Free Cooling (Tae = 10,0°C)			
Power	(1)	**kW**	**417**
% Free cooling	(1)	%	25
FREE-COOLING ON 100%			
Cooling capacity	(2)	**kW**	**1693**
Total power input	(2)	kW	31,2
EER	(2)		**54,3**
Total FC temperature	(2)	°C	-4,9
EXCHANGERS			
HEAT EXCHANGER USER SIDE IN REFRIGERATION			
Glycol	(1)	%	0
Water flow	(1)	l/s	81,0
Pressure drop	(1)	kPa	169
COMPRESSORS			
Compressors nr.		N°	4
Number of capacity		N°	0
No. Circuits		N°	2
Regulation			STEPLESS
Min. capacity step		%	-
Refrigerant			R134a
Refrigerant charge		kg	540
Oil charge		kg	0
FANS			
Quantity		N°	26
Air flow		m³/s	115,56
Fans power input		kW	1,20
NOISE LEVEL			
Noise Pressure	(3)	dB(A)	65
Sound power level in cooling	(4)	dB(A)	98
SIZE AND WEIGHT			
A	(5)	mm	13600
B	(5)	mm	2260
H	(5)	mm	2500
Operating weight	(5)	kg	14820

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.
- Unavailable

GENERAL TECHNICAL DATA — TRCS-FC-Z /NG /CA

[SI System]

TRCS-FC-Z /NG /CA			0211	0251	0351	0452	0552	0712	0803	0903	1003
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
PERFORMANCE											
FREE-COOLING OFF											
Cooling capacity	(1)	**kW**	**318**	**363**	**509**	**632**	**733**	**1017**	**1097**	**1242**	**1485**
Compressors power input	(1)	kW	80,8	83,5	126	164	164	253	248	288	392
Total power input	(1)	kW	85,9	90,3	135	174	178	270	268	310	414
EER	(1)	**kW/kW**	**3,70**	**4,03**	**3,78**	**3,63**	**4,12**	**3,77**	**4,09**	**4,01**	**3,58**
Free Cooling (Tae = 10,0°C)											
Power	(1)	**kW**	**81,0**	**94,0**	**127**	**159**	**194**	**253**	**288**	**323**	**358**
% Free cooling	(1)	%	25	26	25	25	27	25	26	26	24
FREE-COOLING ON 100%											
Cooling capacity	(2)	**kW**	**318**	**363**	**509**	**632**	**733**	**1017**	**1097**	**1242**	**1485**
Total power input	(2)	kW	5,10	6,80	8,50	10,2	13,6	17,0	20,4	22,1	22,1
EER	(2)		**62,4**	**53,5**	**59,9**	**62,0**	**53,9**	**59,8**	**53,8**	**56,2**	**67,2**
Total FC temperature	(2)	°C	-3,2	-3,2	-4,1	-3,6	-2,7	-4,0	-2,9	-3,1	-4,7
EXCHANGERS											
HEAT EXCHANGER USER SIDE IN REFRIGERATION											
Glycol	(1)	%	0	0	0	0	0	0	0	0	0
Water flow	(1)	l/s	15,2	17,4	24,4	30,3	35,1	48,7	52,5	59,4	71,1
Pressure drop	(1)	kPa	103	120	131	120	147	133	92,2	117	145
COMPRESSORS											
Compressors nr.		N°	1	1	1	2	2	2	3	3	3
Number of capacity		N°	0	0	0	0	0	0	0	0	0
No. Circuits		N°	1	1	1	1	1	1	2	2	2
Regulation			STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS
Min. capacity step		%	-	-	-	-	-	-	-	-	-
Refrigerant			R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a
Refrigerant charge		kg	120	120	140	260	280	320	430	430	520
Oil charge		kg	0	0	0	0	0	0	0	0	0
FANS											
Quantity		N°	6	8	10	12	16	20	24	26	26
Air flow		m³/s	24,42	28,34	36,01	46,38	60,43	72,03	89,24	96,68	96,68
Fans power input		kW	0,85	0,85	0,85	0,85	0,85	0,85	0,85	0,85	0,85
NOISE LEVEL											
Noise Pressure	(3)	dB(A)	56	57	58	58	59	60	61	61	61
Sound power level in cooling	(4)	dB(A)	88	89	90	91	92	93	94	94	94
SIZE AND WEIGHT											
A	(5)	mm	4000	4000	4900	6400	7900	10000	12100	13000	13000
B	(5)	mm	2260	2260	2260	2260	2260	2260	2260	2260	2260
H	(5)	mm	2500	2500	2500	2500	2500	2500	2500	2500	2500
Operating weight	(5)	kg	4400	4550	5260	6870	8130	10650	12640	13650	14080

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.
- Unavailable

GENERAL TECHNICAL DATA

ENERGY EFFICIENCY

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

TRCS-FC-Z /K			0211	0351	0452	0552	0652	0712	0903	0953	1003	1164	1204		
Prated,c	(1)	kW	260,8	414,1	507,2	607,7	800,0	850,9	1045	1069	1212	1361	1435		
SEPR	(1) (2)	-	6,66	6,54	6,39	6,64	6,43	6,58	6,45	6,28	6,32	6,30	6,31		

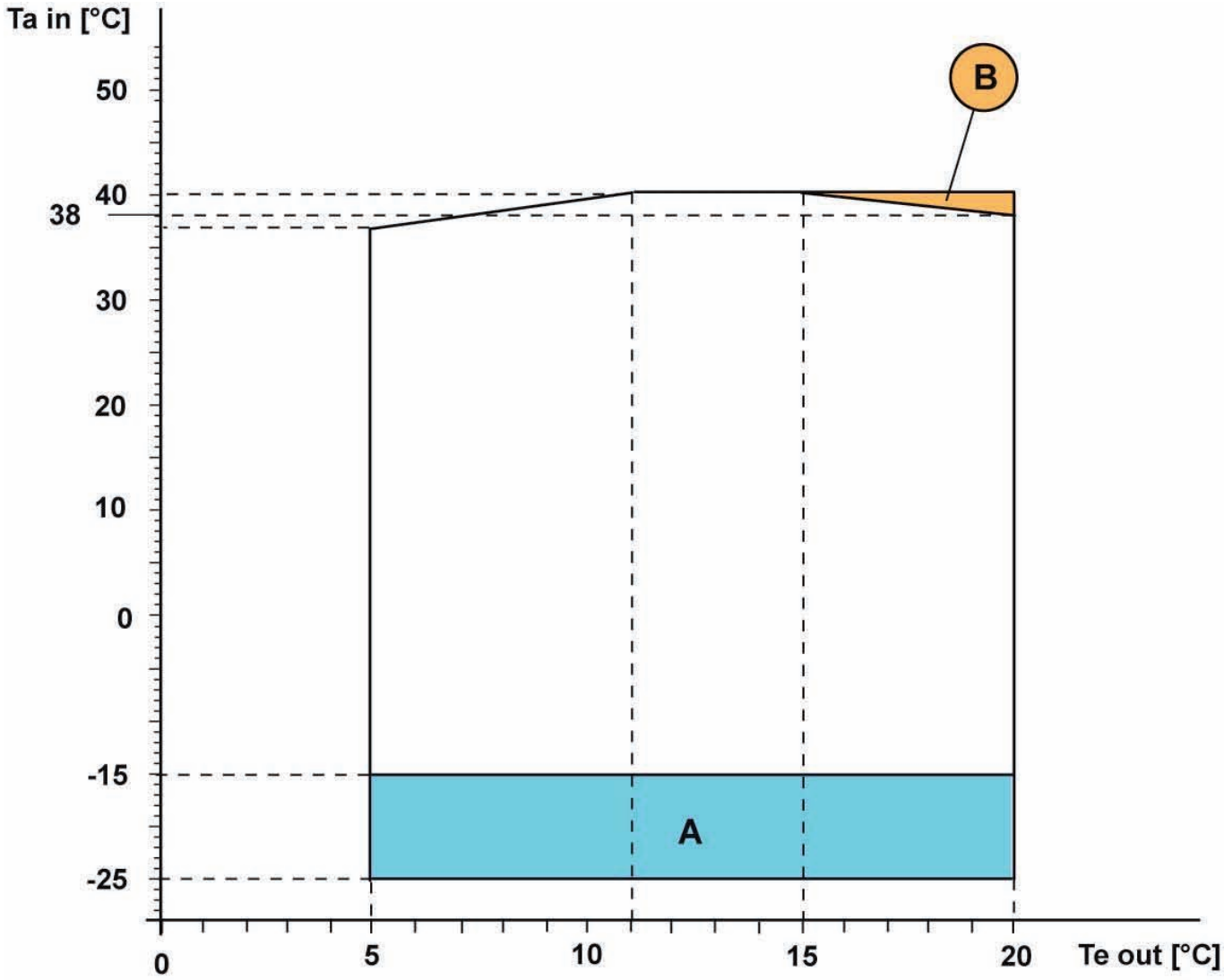
TRCS-FC /CA			0211	0351	0452	0552	0652	0712	0903	0953	1003				
Prated,c	(1)	kW	270,8	319,4	434,1	534,6	650,2	866,7	971,8	1086	1244				
SEPR	(1) (2)	-	6,97	6,90	7,13	6,80	6,88	6,94	6,88	6,88	6,65				

TRCS-FC /NG /K			0211	0351	0452	0552	0652	0712	0903	0953	1003	1164	1204		
Prated,c	(1)	kW	260,3	413,0	506,1	605,9	798,0	849,0	1043	1067	1209	1357	1430		
SEPR	(1) (2)	-	6,20	6,06	5,87	6,14	5,84	6,02	5,95	5,76	5,75	5,64	5,65		

TRCS-FC /NG /CA			0211	0351	0452	0552	0652	0712	0903	0953	1003				
Prated,c	(1)	kW	270,3	318,5	433,0	533,4	648,1	864,7	970,0	1084	1241				
SEPR	(1) (2)	-	6,46	6,21	6,55	6,31	6,17	6,26	6,29	6,24	6,04				

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 Low temperature kit required (option 2872)

B Unit in part load operation

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

6.2 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.

6.3 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		
	ff (m² °CW)	F1	FK1	KE [°C]
VARIOUS	0	1,000	1,000	0,0
VARIOUS	1,80 x 10^{-5}	1,000	1,000	0,0
VARIOUS	4,40 x 10^{-5}	1,000	1,000	0,0
VARIOUS	8,80 x 10^{-5}	0,960	0,990	0,7
VARIOUS	13,20 x 10^{-5}	0,944	0,985	1,0
VARIOUS	17,20 x 10^{-5}	0,930	0,980	1,5

ff: fouling factors
F1: potential correction factors
FK1: compressor power input correction factors
KE: minimum evaporator outlet temperature increase

7.1 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
TRCS-FC-Z /K /0211	400/3/50	21,8	6,39	17,2	70,0	5000
TRCS-FC-Z /K /0351	400/3/50	9,77	9,44	25,8	85,0	5000
TRCS-FC-Z /K /0452	400/3/50	5,84	12,8	35,6	110	5000
TRCS-FC-Z /K /0552	400/3/50	5,04	14,4	39,7	120	5000
TRCS-FC-Z /K /0652	400/3/50	2,69	18,6	51,7	140	5000
TRCS-FC-Z /K /0712	400/3/50	2,57	18,6	51,9	140	5000
TRCS-FC-Z /K /0903	400/3/50	1,51	26,7	73,6	280	5000
TRCS-FC-Z /K /0953	400/3/50	1,18	28,6	79,4	305	5000
TRCS-FC-Z /K /1003	400/3/50	1,18	28,6	79,4	305	5000
TRCS-FC-Z /K /1164	400/3/50	0,98	34,2	94,4	345	5000
TRCS-FC-Z /K /1204	400/3/50	0,98	34,2	94,4	345	5000
TRCS-FC-Z /CA /0211	400/3/50	21,8	6,39	17,2	70,0	5000
TRCS-FC-Z /CA /0251	400/3/50	17,8	7,50	20,3	75,0	5000
TRCS-FC-Z /CA /0351	400/3/50	9,77	9,44	26,4	85,0	5000
TRCS-FC-Z /CA /0452	400/3/50	5,84	12,8	35,6	110	5000
TRCS-FC-Z /CA /0552	400/3/50	5,04	14,4	39,7	120	5000
TRCS-FC-Z /CA /0712	400/3/50	2,57	18,6	52,5	140	5000
TRCS-FC-Z /CA /0803	400/3/50	1,51	26,7	73,6	280	5000
TRCS-FC-Z /CA /0903	400/3/50	1,51	26,7	73,6	280	5000
TRCS-FC-Z /CA /1003	400/3/50	1,18	28,6	79,4	305	5000
TRCS-FC-Z /NG /K /0211	400/3/50	34,3	6,39	17,2	70,0	5000
TRCS-FC-Z /NG /K /0351	400/3/50	17,5	9,44	25,8	85,0	5000
TRCS-FC-Z /NG /K /0452	400/3/50	10,2	12,8	35,6	110	5000
TRCS-FC-Z /NG /K /0552	400/3/50	9,24	14,4	39,7	120	5000
TRCS-FC-Z /NG /K /0652	400/3/50	4,85	18,6	51,7	140	5000
TRCS-FC-Z /NG /K /0712	400/3/50	4,32	18,6	51,7	140	5000
TRCS-FC-Z /NG /K /0903	400/3/50	2,57	26,7	73,6	280	5000
TRCS-FC-Z /NG /K /0953	400/3/50	2,23	28,6	79,4	305	5000
TRCS-FC-Z /NG /K /1003	400/3/50	2,22	28,6	79,4	305	5000
TRCS-FC-Z /NG /K /1164	400/3/50	1,98	34,2	94,4	345	5000
TRCS-FC-Z /NG /K /1204	400/3/50	1,99	34,2	94,4	345	5000
TRCS-FC-Z /NG /CA /0211	400/3/50	34,2	6,39	17,2	70,0	5000
TRCS-FC-Z /NG /CA /0251	400/3/50	30,6	7,50	20,3	75,0	5000
TRCS-FC-Z /NG /CA /0351	400/3/50	17,1	9,44	25,8	85,0	5000
TRCS-FC-Z /NG /CA /0452	400/3/50	10,1	12,8	35,6	110	5000
TRCS-FC-Z /NG /CA /0552	400/3/50	9,22	14,4	39,7	120	5000
TRCS-FC-Z /NG /CA /0712	400/3/50	4,32	18,6	51,7	140	5000
TRCS-FC-Z /NG /CA /0803	400/3/50	2,58	26,7	73,6	280	5000
TRCS-FC-Z /NG /CA /0903	400/3/50	2,56	26,7	73,6	280	5000
TRCS-FC-Z /NG /CA /1003	400/3/50	2,22	28,6	79,4	305	5000

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

8.1 ELECTRICAL DATA TRCS-FC-Z /K

[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]
0211	400/3/50	1	85	135	145	1,95	3	97,0	155	-
0351	400/3/50	1	130	210	231	1,95	3	146	236	-
0452	400/3/50	2	85	135	145	1,95	3	190	303	-
0552	400/3/50	2	85	135	145	1,95	3	193	310	-
0652	400/3/50	2	130	210	231	1,95	3	287	466	-
0712	400/3/50	2	130	210	231	1,95	3	291	473	-
0903	400/3/50	3	2x85+1x130	2x135+1x210	2x145+1x231	1,95	3	339	546	-
0953	400/3/50	3	1x85+2x130	1x135+2x210	1x145+2x231	1,95	3	384	621	-
1003	400/3/50	3	130	210	231	1,95	3	433	703	-
1164	400/3/50	4	2x85+2x130	2x135+2x210	2x145+2x231	1,95	3	481	776	-
1204	400/3/50	4	2x85+2x130	2x135+2x210	2x145+2x231	1,95	3	481	776	-

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

Electrical 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

TRCS-FC-Z /CA

[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]
0211	400/3/50	1	85	135	145	1,95	3	97,0	155	-
0251	400/3/50	1	85	135	145	1,95	3	101	161	-
0351	400/3/50	1	130	210	231	1,95	3	150	243	-
0452	400/3/50	2	85	135	145	1,95	3	193	310	-
0552	400/3/50	2	85	135	145	1,95	3	201	323	-
0712	400/3/50	2	130	210	231	1,95	3	299	486	-
0803	400/3/50	3	85	135	145	1,95	3	302	484	-
0903	400/3/50	3	2x85+1x130	2x135+1x210	2x145+1x231	1,95	3	351	566	-
1003	400/3/50	3	130	210	231	1,95	3	441	716	-

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

Electrical 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

TRCS-FC-Z /NG /K

[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]
0211	400/3/50	1	85	135	145	1,95	3	97,0	155	-
0351	400/3/50	1	130	210	231	1,95	3	146	236	-
0452	400/3/50	2	85	135	145	1,95	3	190	303	-
0552	400/3/50	2	85	135	145	1,95	3	193	310	-
0652	400/3/50	2	130	210	231	1,95	3	287	466	-
0712	400/3/50	2	130	210	231	1,95	3	291	473	-
0903	400/3/50	3	2x85+1x130	2x135+1x210	2x145+1x231	1,95	3	339	546	-
0953	400/3/50	3	1x85+2x130	1x135+2x210	1x145+2x231	1,95	3	384	621	-
1003	400/3/50	3	130	210	231	1,95	3	433	703	-
1164	400/3/50	4	2x85+2x130	2x135+2x210	2x145+2x231	1,95	3	481	776	-
1204	400/3/50	4	2x85+2x130	2x135+2x210	2x145+2x231	1,95	3	481	776	-

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

Electrical 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

TRCS-FC-Z /NG /CA

[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]
0211	400/3/50	1	85	135	145	1,95	3	97,0	155	-
0251	400/3/50	1	85	135	145	1,95	3	101	161	-
0351	400/3/50	1	130	210	231	1,95	3	150	243	-
0452	400/3/50	2	85	135	145	1,95	3	193	310	-
0552	400/3/50	2	85	135	145	1,95	3	201	323	-
0712	400/3/50	2	130	210	231	1,95	3	299	486	-
0803	400/3/50	3	85	135	145	1,95	3	302	484	-
0903	400/3/50	3	2x85+1x130	2x135+1x210	2x145+1x231	1,95	3	351	566	-
1003	400/3/50	3	130	210	231	1,95	3	441	716	-

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

Electrical 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

9.1 FULL LOAD SOUND LEVEL TRCS-FC-Z /K

SOUND POWER									
SIZE	Octave band [Hz]								Total sound level dB(A)
	63	125	250	500	1000	2000	4000	8000	
	Sound power level dB								
0211	86	87	87	84	84	80	75	69	**88**
0351	91	92	92	89	89	85	80	74	**93**
0452	92	93	93	90	90	86	81	75	**94**
0552	89	90	90	87	87	83	78	72	**91**
0652	94	95	95	92	92	88	83	77	**96**
0712	94	95	95	92	92	88	83	77	**96**
0903	95	96	96	93	93	89	84	78	**97**
0953	95	96	96	93	93	89	84	78	**97**
1003	96	97	97	94	94	90	85	79	**98**
1164	96	97	97	94	94	90	85	79	**98**
1204	96	97	97	94	94	90	85	79	**98**

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 PRESSURE LEVEL									
SIZE	Octave band [Hz]								Total sound level dB(A)
	63	125	250	500	1000	2000	4000	8000	
	Sound pressure level dB								
0211	54	55	55	52	52	48	43	37	**56**
0351	59	60	60	57	57	53	48	42	**61**
0452	60	61	61	58	58	54	49	43	**62**
0552	56	57	57	54	54	50	45	39	**58**
0652	61	62	62	59	59	55	50	44	**63**
0712	61	62	62	59	59	55	50	44	**63**
0903	62	63	63	60	60	56	51	45	**64**
0953	62	63	63	60	60	56	51	45	**64**
1003	63	64	64	61	61	57	52	46	**65**
1164	63	64	64	61	61	57	52	46	**65**
1204	63	64	64	61	61	57	52	46	**65**

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 TRCS-FC-Z /CA

SOUND POWER									
SIZE	Octave band [Hz]								Total sound level dB(A)
	63	125	250	500	1000	2000	4000	8000	
	Sound power level dB								
0211	86	87	87	84	84	80	75	69	**88**
0251	87	88	88	85	85	81	76	70	**89**
0351	88	89	89	86	86	82	77	71	**90**
0452	89	90	90	87	87	83	78	72	**91**
0552	90	91	91	88	88	84	79	73	**92**
0712	91	92	92	89	89	85	80	74	**93**
0803	92	93	93	90	90	86	81	75	**94**
0903	92	93	93	90	90	86	81	75	**94**
1003	92	93	93	90	90	86	81	75	**94**

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 PRESSURE LEVEL									
SIZE	Octave band [Hz]								Total sound level dB(A)
	63	125	250	500	1000	2000	4000	8000	
	Sound pressure level dB								
0211	54	55	55	52	52	48	43	37	**56**
0251	55	56	56	53	53	49	44	38	**57**
0351	56	57	57	54	54	50	45	39	**58**
0452	56	57	57	54	54	50	45	39	**58**
0552	57	58	58	55	55	51	46	40	**59**
0712	58	59	59	56	56	52	47	41	**60**
0803	59	60	60	57	57	53	48	42	**61**
0903	59	60	60	57	57	53	48	42	**61**
1003	59	60	60	57	57	53	48	42	**61**

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 TRCS-FC-Z /NG /K

SOUND POWER									
SIZE	Octave band [Hz]								Total sound level dB(A)
	63	125	250	500	1000	2000	4000	8000	
	Sound power level dB								
0211	86	87	87	84	84	80	75	69	**88**
0351	91	92	92	89	89	85	80	74	**93**
0452	92	93	93	90	90	86	81	75	**94**
0552	89	90	90	87	87	83	78	72	**91**
0652	94	95	95	92	92	88	83	77	**96**
0712	94	95	95	92	92	88	83	77	**96**
0903	95	96	96	93	93	89	84	78	**97**
0953	95	96	96	93	93	89	84	78	**97**
1003	96	97	97	94	94	90	85	79	**98**
1164	96	97	97	94	94	90	85	79	**98**
1204	96	97	97	94	94	90	85	79	**98**

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 PRESSURE LEVEL									
SIZE	Octave band [Hz]								Total sound level dB(A)
	63	125	250	500	1000	2000	4000	8000	
	Sound pressure level dB								
0211	54	55	55	52	52	48	43	37	**56**
0351	59	60	60	57	57	53	48	42	**61**
0452	60	61	61	58	58	54	49	43	**62**
0552	56	57	57	54	54	50	45	39	**58**
0652	61	62	62	59	59	55	50	44	**63**
0712	61	62	62	59	59	55	50	44	**63**
0903	62	63	63	60	60	56	51	45	**64**
0953	62	63	63	60	60	56	51	45	**64**
1003	63	64	64	61	61	57	52	46	**65**
1164	63	64	64	61	61	57	52	46	**65**
1204	63	64	64	61	61	57	52	46	**65**

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 TRCS-FC-Z /NG /CA

SOUND POWER									
SIZE	Octave band [Hz]								Total sound level dB(A)
	63	125	250	500	1000	2000	4000	8000	
	Sound power level dB								
0211	86	87	87	84	84	80	75	69	**88**
0251	87	88	88	85	85	81	76	70	**89**
0351	88	89	89	86	86	82	77	71	**90**
0452	89	90	90	87	87	83	78	72	**91**
0552	90	91	91	88	88	84	79	73	**92**
0712	91	92	92	89	89	85	80	74	**93**
0803	92	93	93	90	90	86	81	75	**94**
0903	92	93	93	90	90	86	81	75	**94**
1003	92	93	93	90	90	86	81	75	**94**

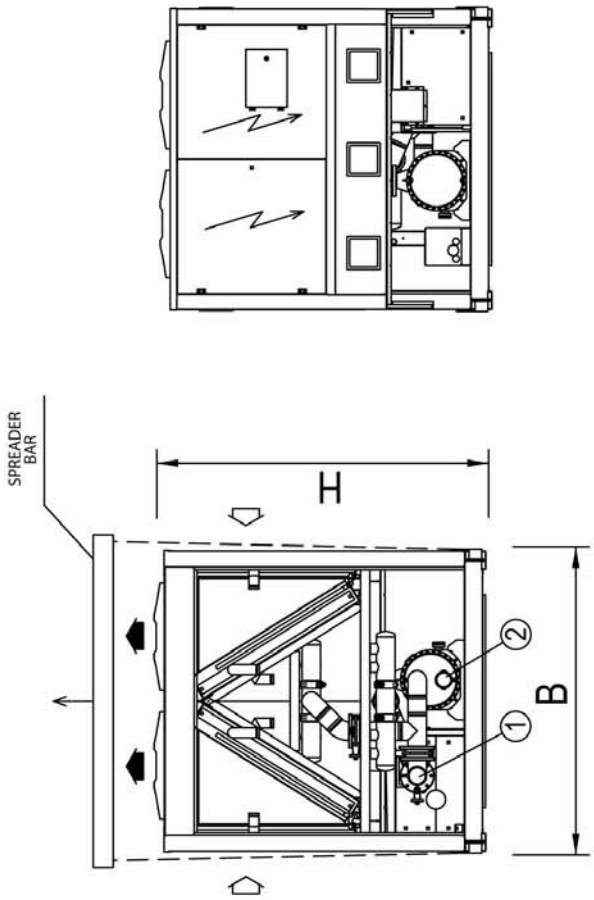
Working conditions

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 PRESSURE LEVEL									
SIZE	Octave band [Hz]								Total sound level dB(A)
	63	125	250	500	1000	2000	4000	8000	
	Sound pressure level dB								
0211	54	55	55	52	52	48	43	37	**56**
0251	55	56	56	53	53	49	44	38	**57**
0351	56	57	57	54	54	50	45	39	**58**
0452	56	57	57	54	54	50	45	39	**58**
0552	57	58	58	55	55	51	46	40	**59**
0712	58	59	59	56	56	52	47	41	**60**
0803	59	60	60	57	57	53	48	42	**61**
0903	59	60	60	57	57	53	48	42	**61**
1003	59	60	60	57	57	53	48	42	**61**

Working conditions

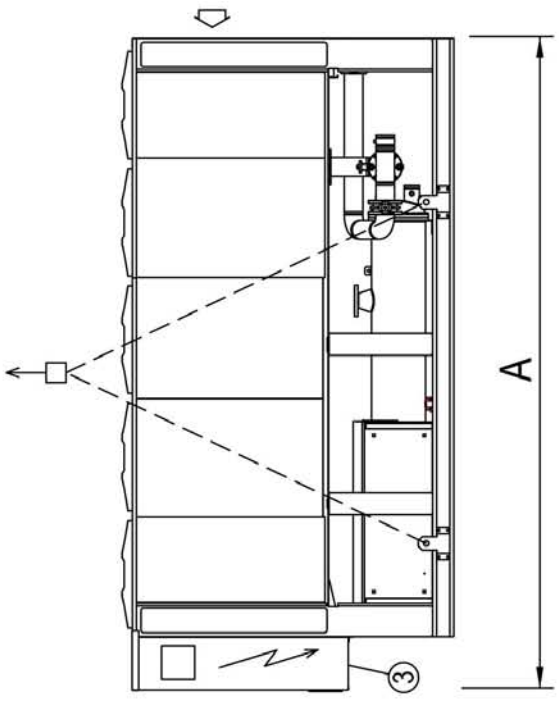
Plant (side) cooling exchanger water (in/out) 15,0°C/10,0°C; Source (side) heat exchanger air (in) 30,0°C; Ethylene glycol 30%.
Average sound pressure level at 10m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.

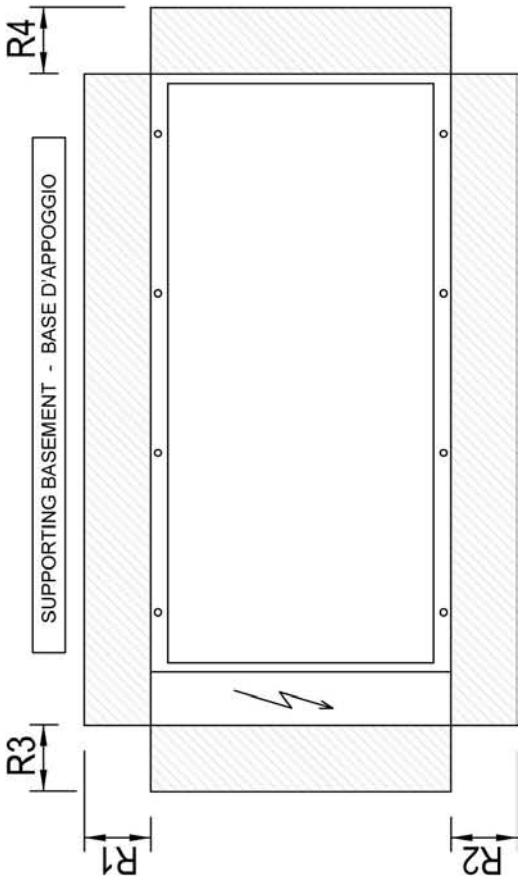


① EVAPORATOR WATER INLET - ENTRATA ACQUA EVAPORATORE

② EVAPORATOR WATER OUTLET - USCITA ACQUA EVAPORATORE

③ POWER INLET - INGRESSO LINEA ELETTRICA





"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."

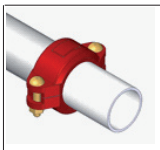
DIMENSIONAL DRAWINGS

TRCS-FC-Z 0211 - 1204

[SI System]

SIZE	DIMENSIONS AND WEIGHTS				CLEARANCE				HEAT EXCHANGER USER SIDE	
	A	B	H	VEIGH	R1	R2	R3	R4	IN/OUT	
	[mm]	[mm]	[mm]	[kg]	[mm]	[mm]	[mm]	[mm]	TYPE	Ø
TRCS-FC-Z /K /0211	4000	2260	2500	3430	2000	2000	1800	2000	H	4"
TRCS-FC-Z /K /0351	4000	2260	2500	3850	2000	2000	1800	2000	H	4"
TRCS-FC-Z /K /0452	4900	2260	2500	5080	2000	2000	1800	2000	H	5"
TRCS-FC-Z /K /0552	6400	2260	2500	5820	2000	2000	1800	2000	H	5"
TRCS-FC-Z /K /0652	7000	2260	2500	6340	2000	2000	1800	2000	H	6"
TRCS-FC-Z /K /0712	7900	2260	2500	6900	2000	2000	1800	2000	H	6"
TRCS-FC-Z /K /0903	10600	2260	2500	9750	2000	2000	1800	2000	H	6"
TRCS-FC-Z /K /0953	11200	2260	2500	10260	2000	2000	1800	2000	H	8"
TRCS-FC-Z /K /1003	11200	2260	2500	10530	2000	2000	1800	2000	H	8"
TRCS-FC-Z /K /1164	13000	2260	2500	12290	2000	2000	1800	2000	H	8"
TRCS-FC-Z /K /1204	13600	2260	2500	12350	2000	2000	1800	2000	H	8"
TRCS-FC-Z /CA /0211	4000	2260	2500	3660	2000	2000	1800	2000	H	4"
TRCS-FC-Z /CA /0251	4000	2260	2500	3790	2000	2000	1800	2000	H	4"
TRCS-FC-Z /CA /0351	4900	2260	2500	4380	2000	2000	1800	2000	H	4"
TRCS-FC-Z /CA /0452	6400	2260	2500	5720	2000	2000	1800	2000	H	5"
TRCS-FC-Z /CA /0552	7900	2260	2500	6770	2000	2000	1800	2000	H	5"
TRCS-FC-Z /CA /0712	10000	2260	2500	8870	2000	2000	1800	2000	H	6"
TRCS-FC-Z /CA /0803	12100	2260	2500	10530	2000	2000	1800	2000	H	6"
TRCS-FC-Z /CA /0903	13000	2260	2500	11370	2000	2000	1800	2000	H	6"
TRCS-FC-Z /CA /1003	13000	2260	2500	11730	2000	2000	1800	2000	H	8"
TRCS-FC-Z /NG /K /0211	4000	2260	2500	4120	2000	2000	1800	2000	H	4"
TRCS-FC-Z /NG /K /0351	4000	2260	2500	4620	2000	2000	1800	2000	H	4"
TRCS-FC-Z /NG /K /0452	4900	2260	2500	6100	2000	2000	1800	2000	H	5"
TRCS-FC-Z /NG /K /0552	6400	2260	2500	6990	2000	2000	1800	2000	H	5"
TRCS-FC-Z /NG /K /0652	7000	2260	2500	7610	2000	2000	1800	2000	H	6"
TRCS-FC-Z /NG /K /0712	7900	2260	2500	8280	2000	2000	1800	2000	H	6"
TRCS-FC-Z /NG /K /0903	10600	2260	2500	11700	2000	2000	1800	2000	H	6"
TRCS-FC-Z /NG /K /0953	11200	2260	2500	12320	2000	2000	1800	2000	H	8"
TRCS-FC-Z /NG /K /1003	11200	2260	2500	12640	2000	2000	1800	2000	H	8"
TRCS-FC-Z /NG /K /1164	13000	2260	2500	14750	2000	2000	1800	2000	H	8"
TRCS-FC-Z /NG /K /1204	13600	2260	2500	14820	2000	2000	1800	2000	H	8"
TRCS-FC-Z /NG /CA /0211	4000	2260	2500	4400	2000	2000	1800	2000	H	4"
TRCS-FC-Z /NG /CA /0251	4000	2260	2500	4550	2000	2000	1800	2000	H	4"
TRCS-FC-Z /NG /CA /0351	4900	2260	2500	5260	2000	2000	1800	2000	H	4"
TRCS-FC-Z /NG /CA /0452	6400	2260	2500	6870	2000	2000	1800	2000	H	5"
TRCS-FC-Z /NG /CA /0552	7900	2260	2500	8130	2000	2000	1800	2000	H	5"
TRCS-FC-Z /NG /CA /0712	10000	2260	2500	10650	2000	2000	1800	2000	H	6"
TRCS-FC-Z /NG /CA /0803	12100	2260	2500	12640	2000	2000	1800	2000	H	6"
TRCS-FC-Z /NG /CA /0903	13000	2260	2500	13650	2000	2000	1800	2000	H	6"
TRCS-FC-Z /NG /CA /1003	13000	2260	2500	14080	2000	2000	1800	2000	H	8"

LEGEND OF PIPE CONNECTIONS



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

UNI ISO 228/1

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

Notes:

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

11.1 HYDRONIC GROUP

11.1 HYDRONIC GROUP
Hydronic group consisting of:
- 2 pumps, 4 pole, low or high head
- differential pressure switch
- discharge valves on exchanger
- pump inlet / oulet valves
- check valve
- purge valve
- drain plug

Each of the components of the hydraulic group has been designed to optimise hydraulic and electrical installation space,
time and costs.
The hydronic group is protected by a special casing ventilating. The second pump operates in stand-by to the first. The relative operating hours of the two pumps are balanced. In case the operating pump breaks down, the reserve pump is automatically enabled. The electrical panel of the unit is protected with fuses and contactors with thermals cut-out.
The choice between in-line and end-suction pumps has been made keeping in consideration the best configuration in terms of dimensions and performances.

11.2 IN-LINE PUMPS SPECIFICATION
Low or high head pump
Centrifugal pumps with in-line suction and delivery flanges, twin version. Pump body in cast iron with elettrophoretic painting (cataphoresis) and impeller in composite material PES/PP 30% GF.
Mechanical seal with components in ceramics or carbon and EPDM elastomers. Three-phase high efficiency electric motor, directly couple, protected to IP55, insulation class F (IEG 85), designed in line with EUP IE3 requirements.

11.3 SINGLE PUMPS SPECIFICATION
low or high head pump
Horizontal cochlea centrifugal pump, normalised to EN 733, axial suction and radial delivery, pump body and impeller in cast iron with elettrophoretic painting (cataphoresis), shaft in stainless steel AISI 304.
Mechanical seal with components in ceramic or carbon and EPDM.Three-phase high efficiency EFF2 electric motor, directly couple, protected to IP55, insulation class F (IEG 85).

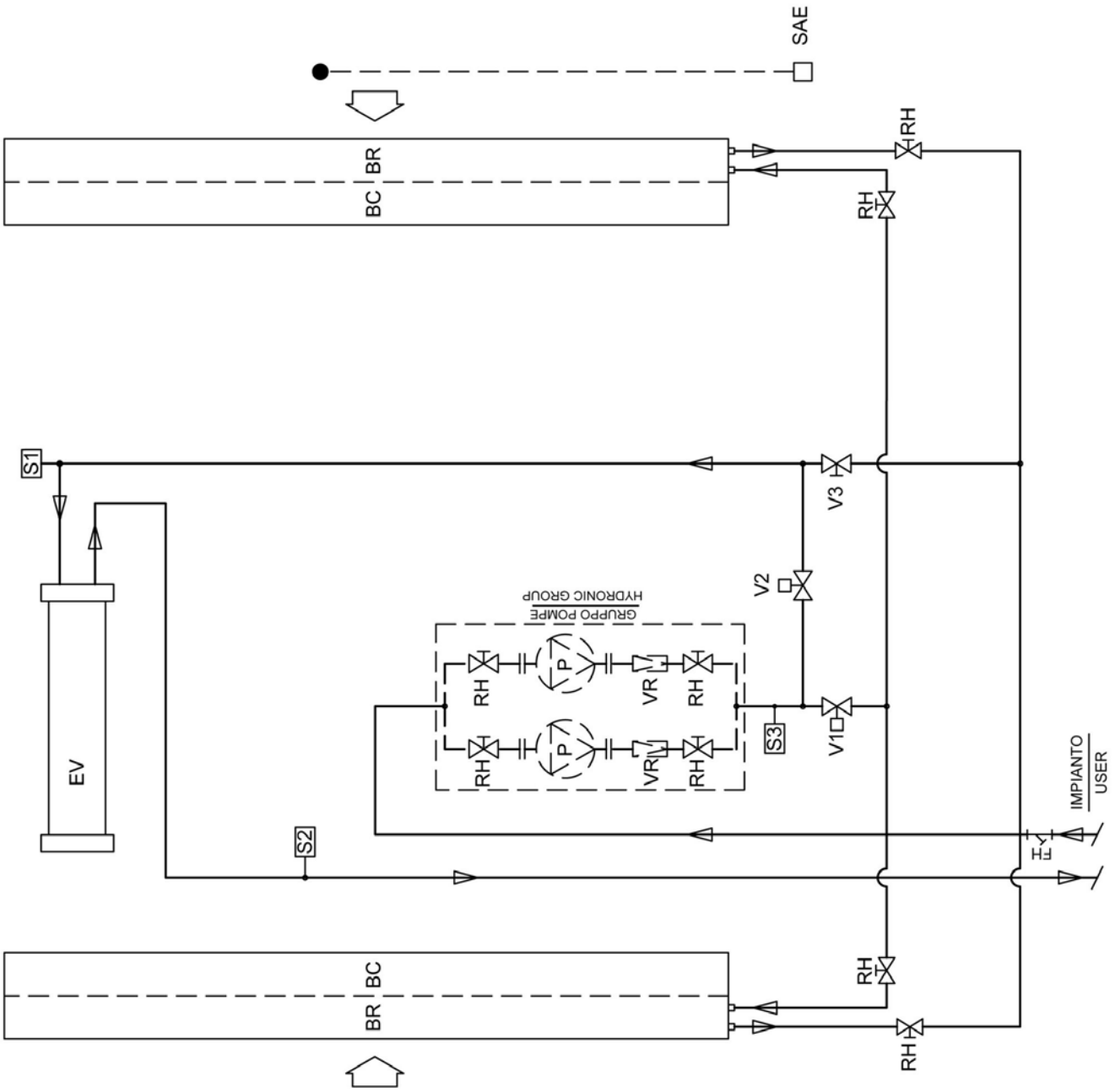
11.4 SPECIAL PUMPS
For pumps with different configurations, please contact our sales department.
The supply does not include the following accessories though these are recommended to ensure correct system operation:
- Flow-out switch
- Pressure gauges upline and downline from the unit
- Flexible joints on piping
- On-off valves
- Outlet control thermometer
- Mains filter.

Possible configuration

PUMPS GROUP	Versions	
	CA	K
2 POMPE 4P (2EV AP)	X	X
2 POMPE 4P (2EV BP)	X	X

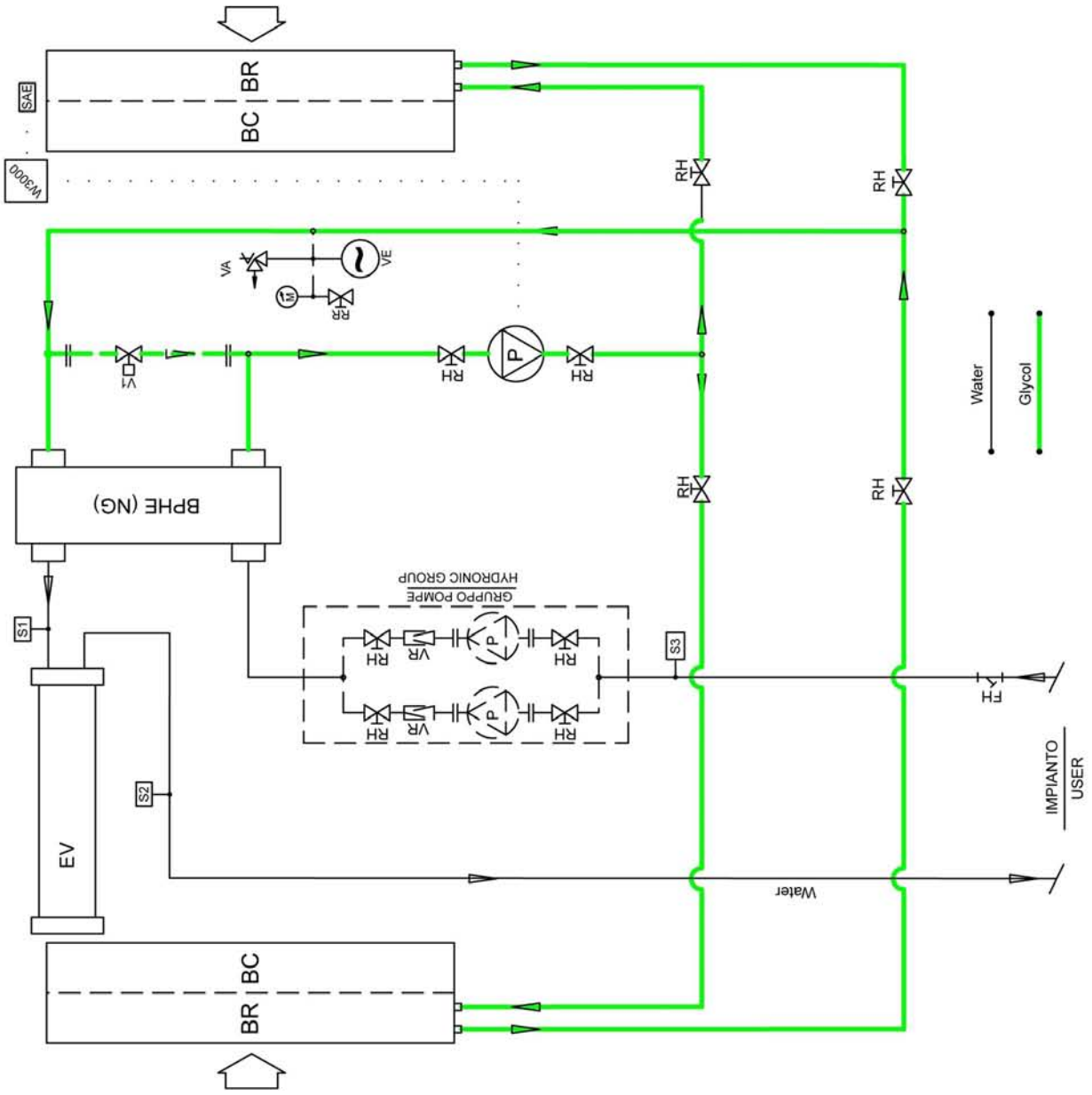
Schema idraulico pompe ORTOGONALI - configurazione STD
Hydraulic diagram END-SUCTION water PUMPS – STD configuration

LEGENDA - LEGEND	
BC	Batteria di condensazione Condenser coil
BR	Batteria ad acqua Water coil
EV	Evaporatore allagato Flooded evaporator
FH	Filtro a Y Y strainer
P	Pompa Pump
RH	Rubinetti di servizio Service valve
S1	Sonda ingresso acqua evaporatore Evaporator inlet water probe
S2	Sonda uscita acqua evaporatore Evaporator outlet water probe
S3	Sonda ritorno impianto Return water probe
SAE	Sonda aria esterna External air probe
V1 / V2	Rubinetti motorizzati Actuated valve
V3	Rubinetto di servizio Service valve
VR	Valvola di non ritorno Check valve



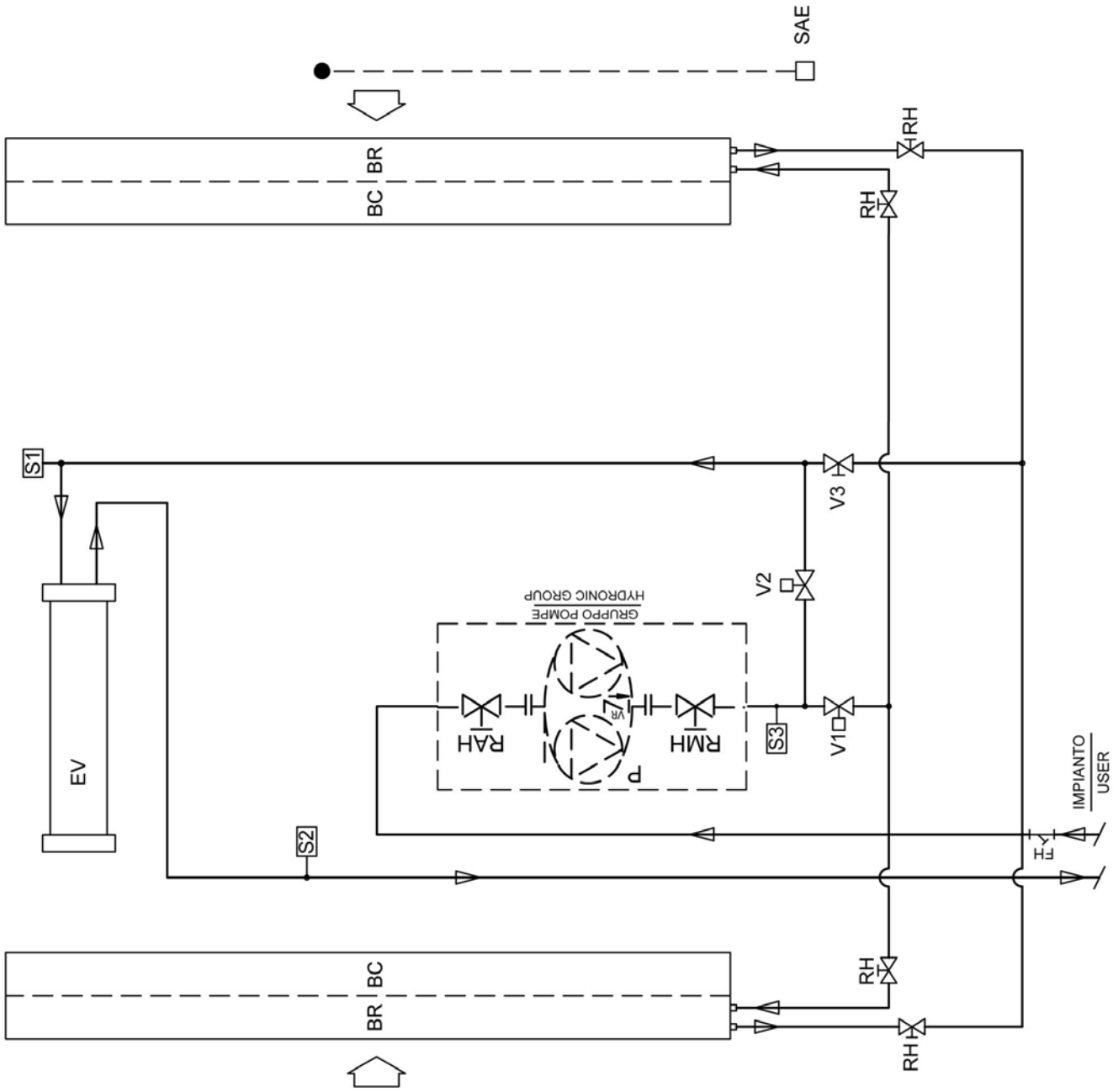
Schema idraulico pompe ORTOGONALI - configurazione NG
Hydraulic diagram END-SUCTION water PUMPS – NG configuration

LEGENDA - LEGEND	
BC	Batteria di condensazione / Condenser coil
BPHE (NG)	Scambiatore a piastre / Plate heat exchanger
BR	Batteria ad acqua / Water coil
EV	Evaporatore allagato / Flooded evaporator
FH	Filtro a Y / Y strainer
M	Manometro / Pressure gauge
P	Pompa / Pump
RH	Rubinetti di servizio / Service valve
RR	Rubinetto di reintegro / Water filling
S1	Sonda ingresso acqua evaporatore Evaporator inlet water probe
S2	Sonda uscita acqua evaporatore Evaporator outlet water probe
S3	Sonda ritorno impianto / Return water probe
SAE	Sonda aria esterna / External air probe
V1	Rubinetto motorizzato / Actuated valve
VA	Valvola di sicurezza High pressure relief valve
VE	Vaso di espansione / Expansion tank
VR	Valvola di non ritorno / Check valve



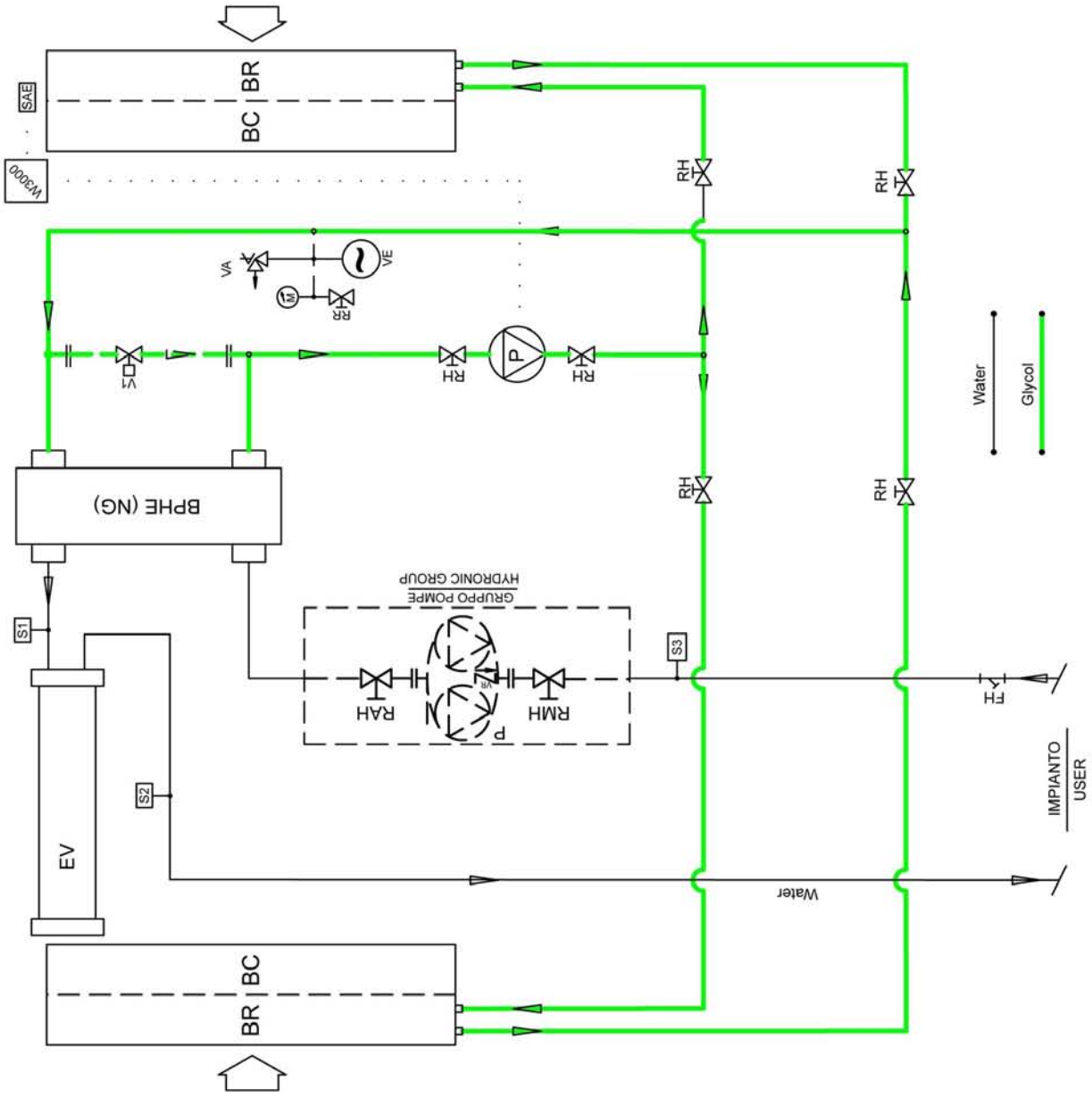
Schema idraulico pompe IN-LINE - configurazione STD
Hydraulic diagram IN-LINE water PUMPS – STD configuration

LEGENDA - LEGEND	
BC	Batteria di condensazione Condenser coil
BR	Batteria ad acqua Water coil
EV	Evaporatore allagato Flooded evaporator
FH	Filtro a Y Y strainer
P	Pompa Pump
RH	Rubinetti di servizio Service valve
S1	Sonda ingresso acqua evaporatore Evaporator inlet water probe
S2	Sonda uscita acqua evaporatore Evaporator outlet water probe
S3	Sonda ritorno impianto Return water probe
SAE	Sonda aria esterna External air probe
V1 / V2	Rubinetti motorizzati Actuated valve
V3	Rubinetto di servizio Service valve
VR	Valvola di non ritorno Check valve
RAH	Rubinetto aspirazione Pump suction valve
RMH	Rubinetto mandata Pump discharge valve



Schema idraulico pompe IN-LINE - configurazione NG
Hydraulic diagram IN-LINE water PUMPS – NG configuration

LEGENDA - LEGEND	
BC	Batteria di condensazione / Condenser coil
BPHE (NG)	Scambiatore a piastre / Plate heat exchanger
BR	Batteria ad acqua / Water coil
EV	Evaporatore allagato / Flooded evaporator
FH	Filtro a Y / Y strainer
M	Manometro / Pressure gauge
P	Pompa / Pump
RH	Rubinetti di servizio / Service valve
RR	Rubinetto di reintegro / Water filling
S1	Sonda ingresso acqua evaporatore Evaporator inlet water probe
S2	Sonda uscita acqua evaporatore Evaporator outlet water probe
S3	Sonda ritorno impianto / Return water probe
SAE	Sonda aria esterna / External air probe
V1	Rubinetto motorizzato / Actuated valve
VA	Valvola di sicurezza High pressure relief valve
VE	Vaso di espansione / Expansion tank
VR	Valvola di non ritorno / Check valve
RAH	Rubinetto aspirazione / Pump suction valve
RMH	Rubinetto mandata / Pump discharge valve



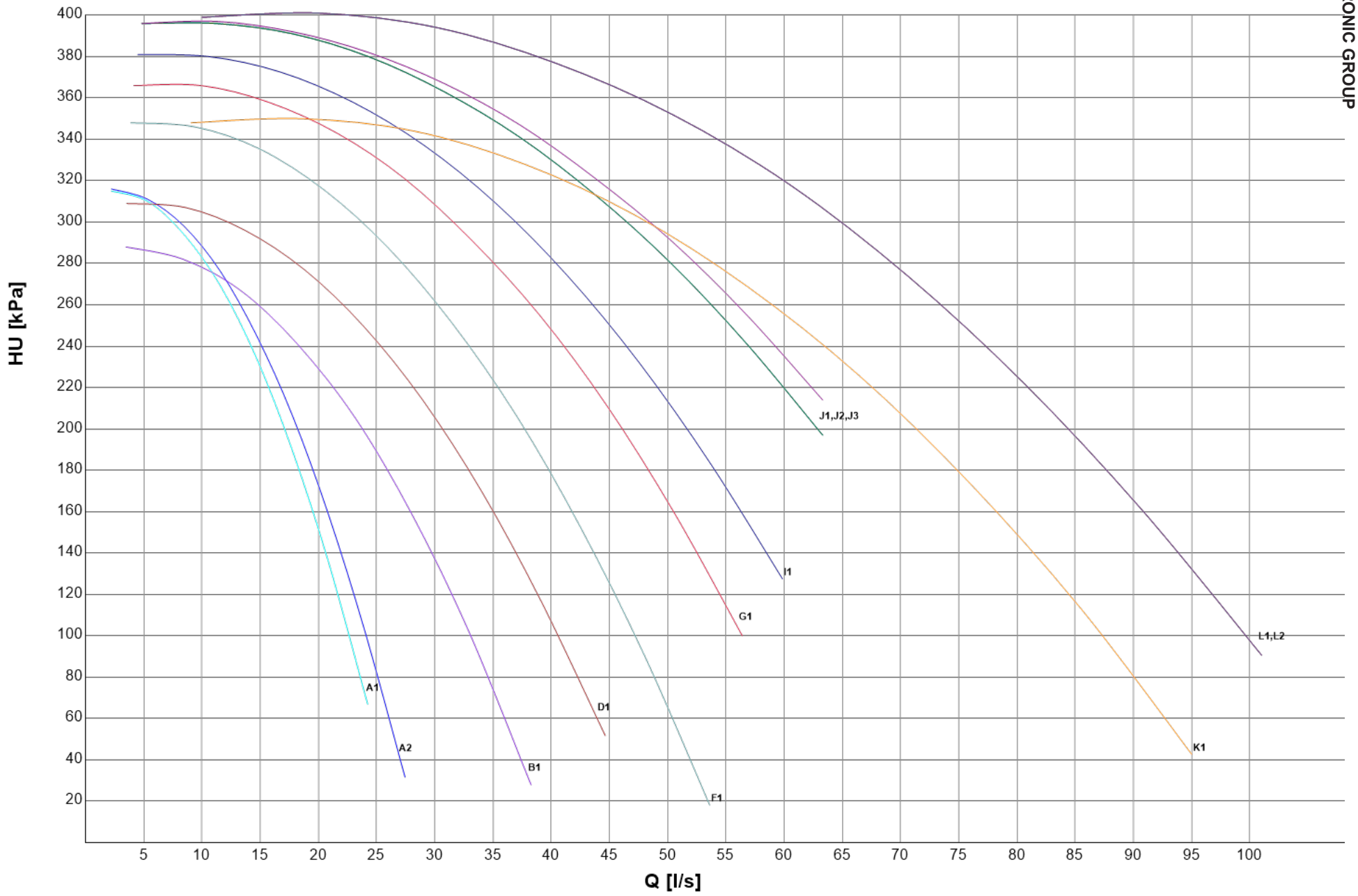
HYDRONIC GROUP

HEAT EXCHANGER USER SIDE - 2 PUMPS 4 POLES (2EV HH)

SIZE		CH		PUMP					CH
		Pfgross	Qfgross	Rif.	Model	N.	F.L.A.	F.L.I.	HU
		[kW] (1)	[l/s] (1)			Pole	[A]	[kW]	[kPa]
0211	CA	318	15,2	A1	TPD 80-340/4	4	21	11,0	227
	K	310	14,9						232
0251	CA	363	17,4	A2					212
0351	CA	509	24,4	B1	TPD 100-330/4	4	29	15,0	194
	K	496	23,7						200
0452	CA	632	30,3	D1	TPD 100-370/4	4	37	18,5	226
	K	610	29,2		TPD 100-330/4	4	29	15,0	189
0552	CA	733	35,1	F1	TPD 100-410/4	4	43	22,0	242
	K	708	33,9		TPD 100-370/4	4	37	18,5	214
0652	K	969	46,4	G1	TPD 100-410/4	4	43	22,0	197
0712	CA	1017	48,7	I1	TPD 125-400/4	4	56	30,0	256
	K	1007	48,2		TPD 100-410/4	4	43	22,0	191
0803	CA	1097	52,5	J1	TPD 125-400/4	4	56	30,0	268
0903	CA	1242	59,4	J2					224
	K	1217	58,2						232
0953	K	1287	61,6	J3					225
1003	CA	1485	71,1	K1	NB 125-315/317	4	58	30,0	202
	K	1460	69,9						208
1164	K	1621	77,6	L1	NB 125-315/336	4	69	37,0	239
1204	K	1693	81,0	L2					220

(1) Values refer to nominal conditions
CH Cooling mode
Pf Cooling capacity unit (Cooling mode)
Pt Heating capacity unit (Heating mode)
Q Plant (side) exchanger water flow
F.L.I. Pump power input
F.L.A. Pump running current
HU Pump residual pressure head (Units with hydronic group without mains filter)

HEAT EXCHANGER USER SIDE - 2 PUMPS 4 POLES (2EV HH)

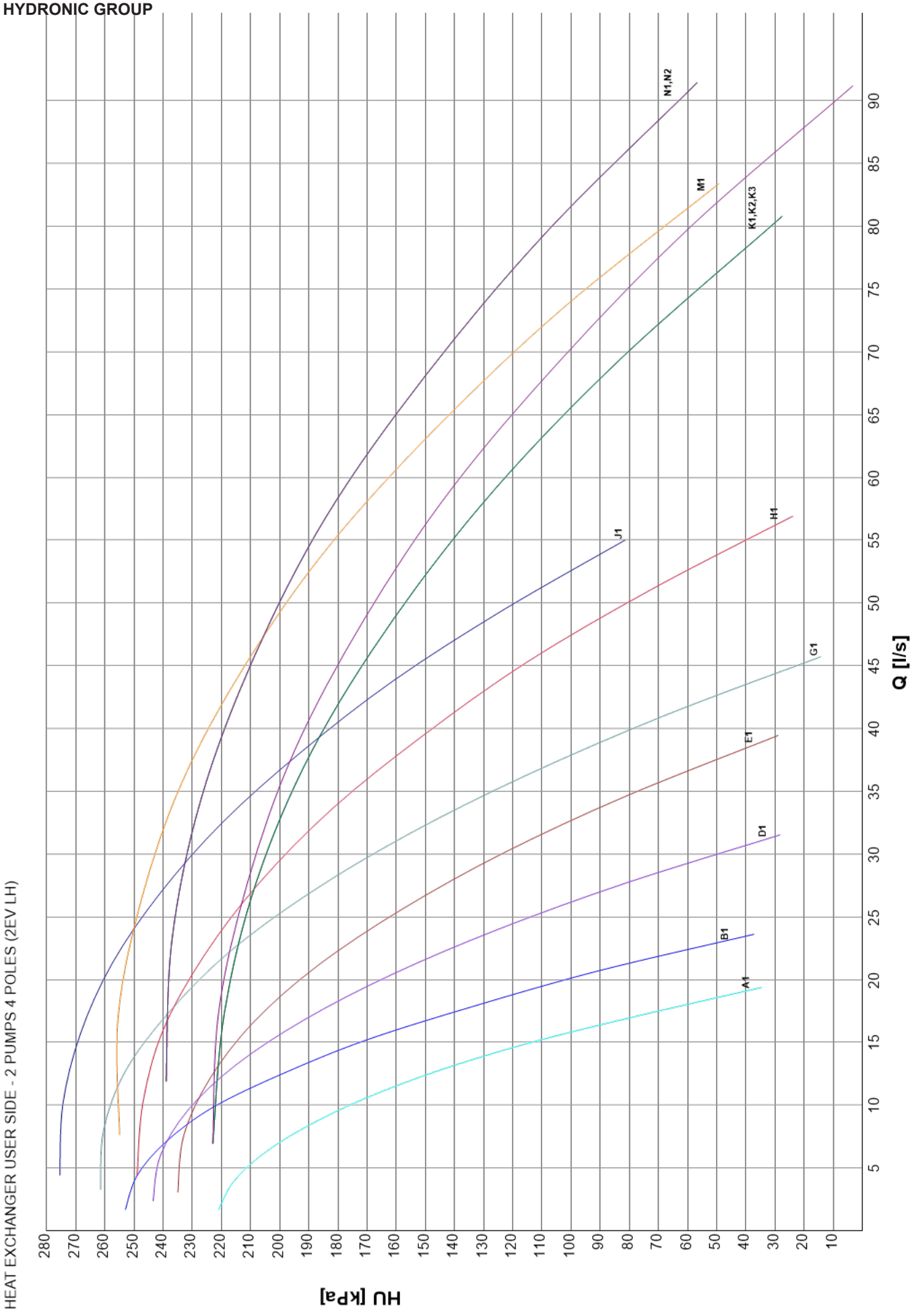


HYDRONIC GROUP

HEAT EXCHANGER USER SIDE - 2 PUMPS 4 POLES (2EV LH)

SIZE		CH		PUMP					CH
		Pfgross	Qfgross	Rif.	Model	N.	F.L.A.	F.L.I.	HU
		[kW] (1)	[l/s] (1)			Pole	[A]	[kW]	[kPa]
0211	CA	318	15,2	A1	TPD 80-240/4	4	11	5,50	109
	K	310	14,9						115
0251	CA	363	17,4	B1	TPD 80-270/4	4	15	7,50	141
0351	CA	509	24,4	D1	TPD 100-250/4	4	21	11,0	136
	K	496	23,7		TPD 80-270/4	4	15	7,50	104
0452	CA	632	30,3	E1	TPD 100-250/4	4	21	11,0	122
	K	610	29,2						131
0552	CA	733	35,1	G1	TPD 100-330/4	4	29	15,0	156
	K	708	33,9		TPD 100-250/4	4	21	11,0	107
0652	K	969	46,4	H1	TPD 125-230/4	4	29	15,0	107
0712	CA	1017	48,7	J1	TPD 125-300/4	4	35	18,5	155
	K	1007	48,2		TPD 125-230/4	4	29	15,0	106
0803	CA	1097	52,5	K1	TPD 150-250/4	4	43	22,0	149
0903	CA	1242	59,4	K2					125
	K	1217	58,2						129
0953	K	1287	61,6	K3					133
1003	CA	1485	71,1	M1	NB 125-315/290	4	43	22,0	123
	K	1460	69,9		TPD 150-250/4	4	43	22,0	102
1164	K	1621	77,6	N1	NB 125-250/269	4	58	30,0	116
1204	K	1693	81,0	N2					103

(1) Values refer to nominal conditions
CH Cooling mode
Pf Cooling capacity unit (Cooling mode)
Pt Heating capacity unit (Heating mode)
Q Plant (side) exchanger water flow
F.L.I. Pump power input
F.L.A. Pump running current
HU Pump residual pressure head (Units with hydronic group without mains filter)


HEAT EXCHANGER USER SIDE - 2 PUMPS 4 POLES (2EV LH)
HU [kPa]
Q [l/s]
N1,N2
M1
K1,K2,K3
J1
H1
G1
E1
D1
B1
A1

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

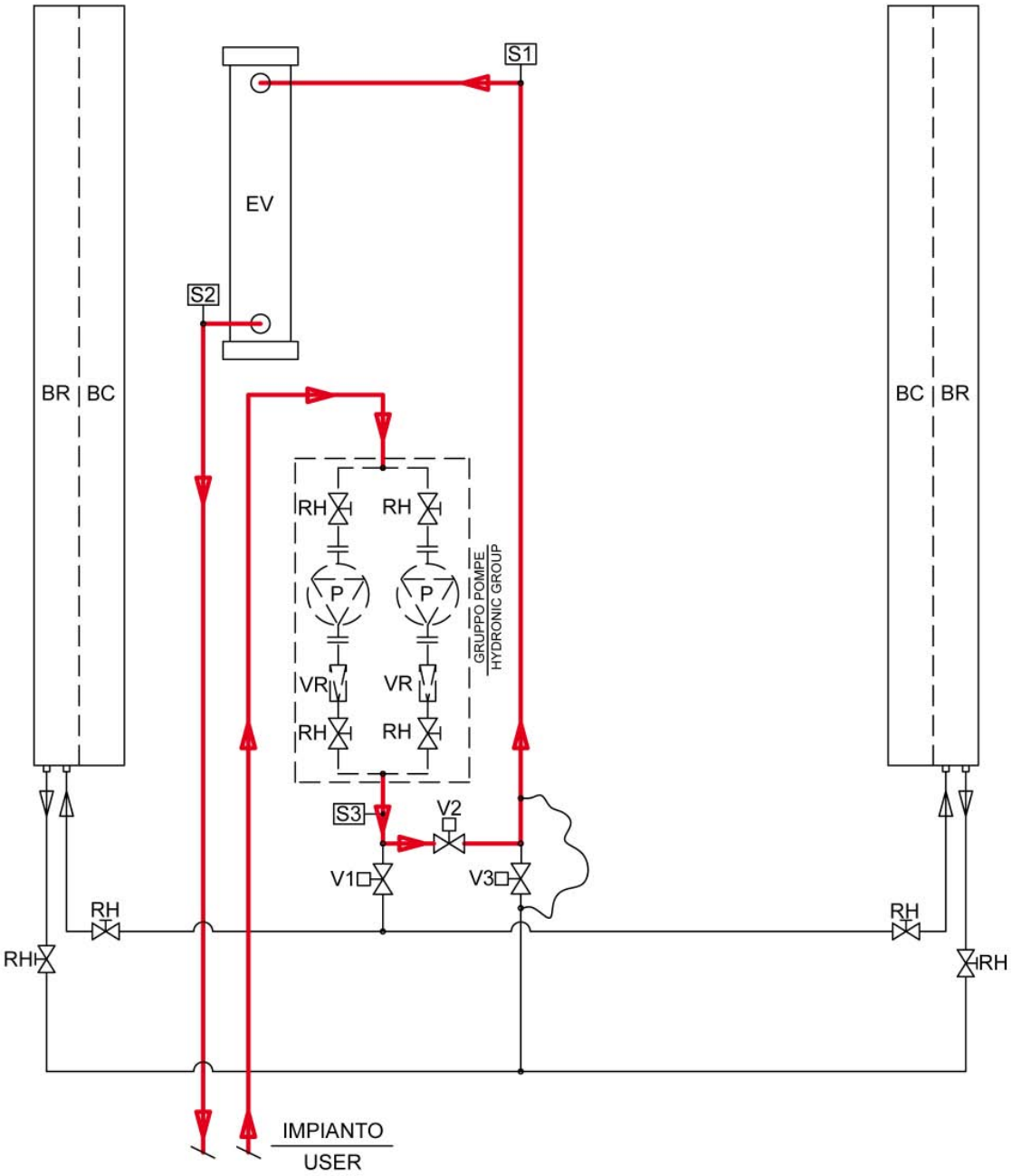


Fig. 1 Hydraulic diagram - standard chiller mode

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

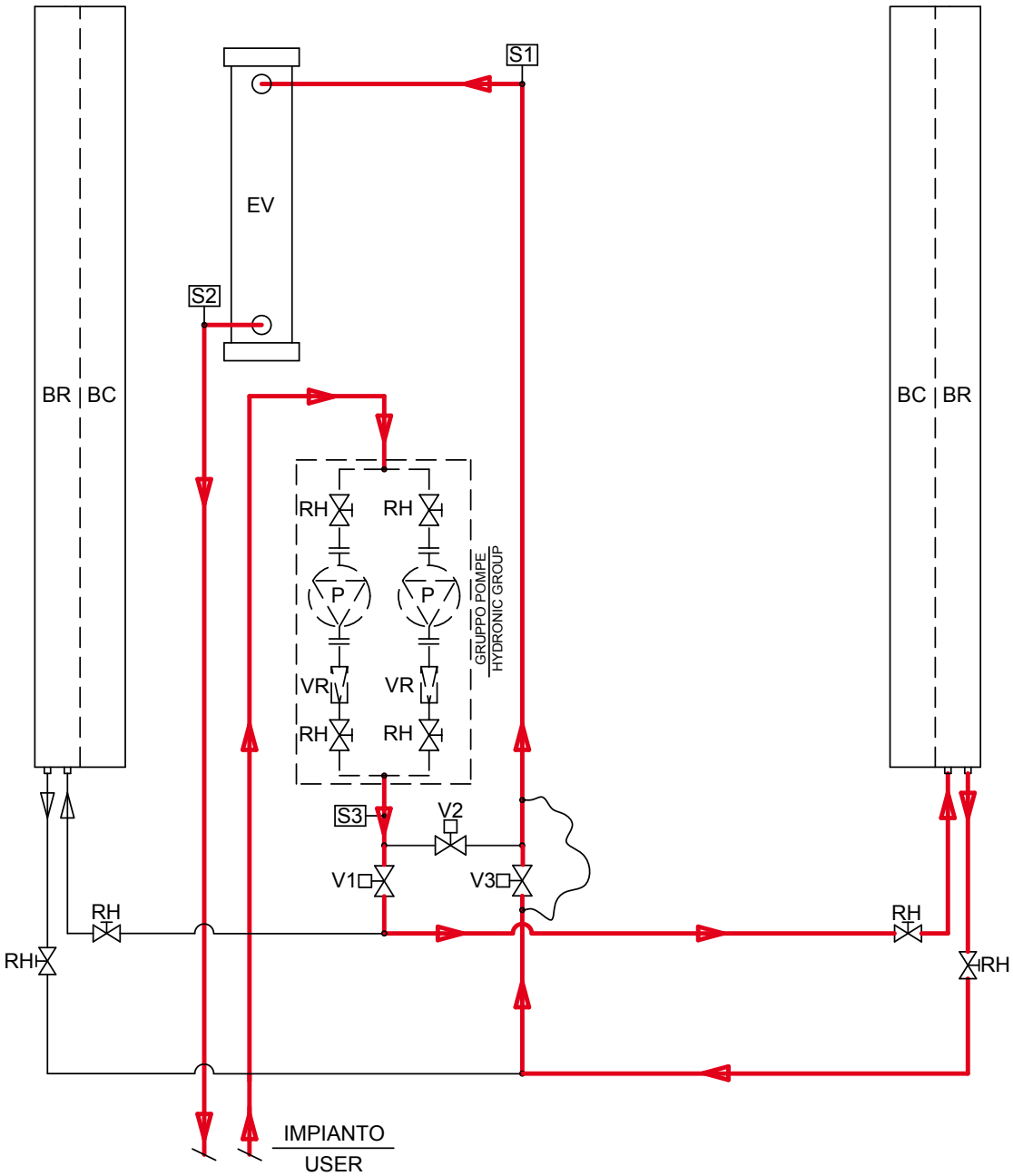


Fig. 2 Hydraulic diagram - free-cooling mode

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.

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. 3 plots the head Hsys required by the system as a function of the flow rate Q according to the chiller operating mode.

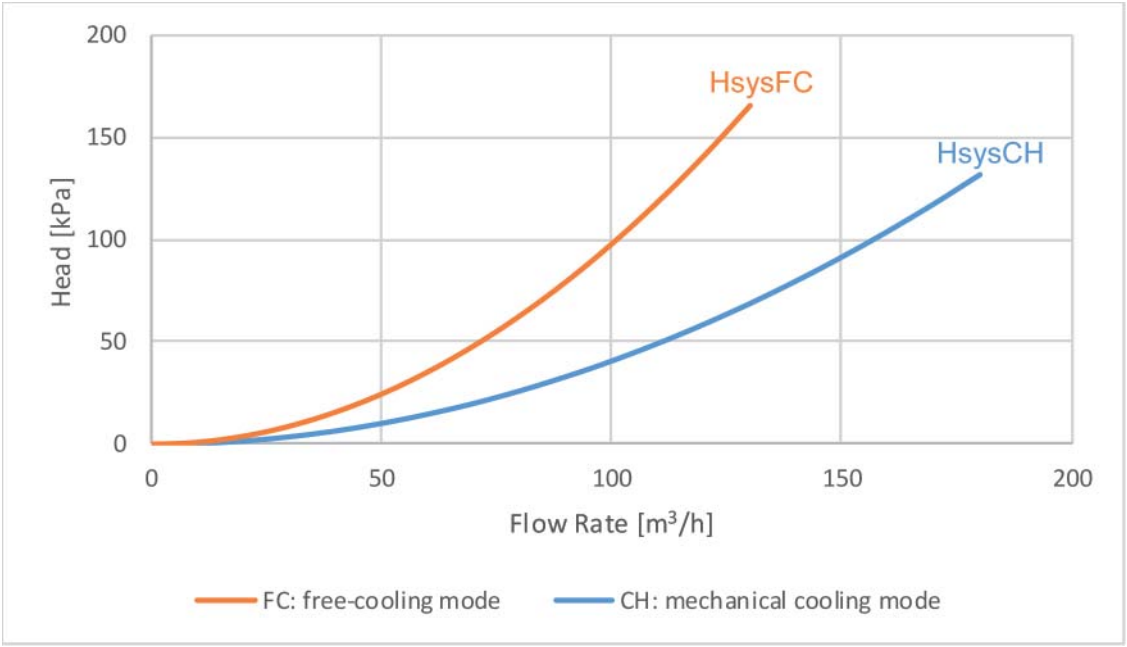


Fig. 3 System resistance curve

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 4

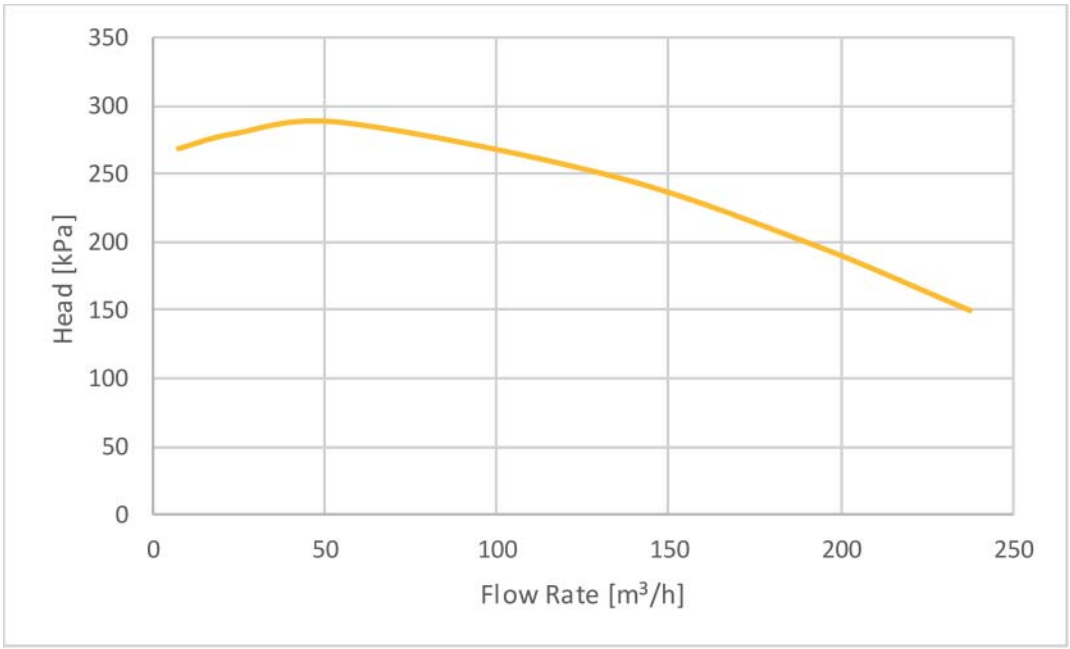


Fig. 4 Performance curve of the pump

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.

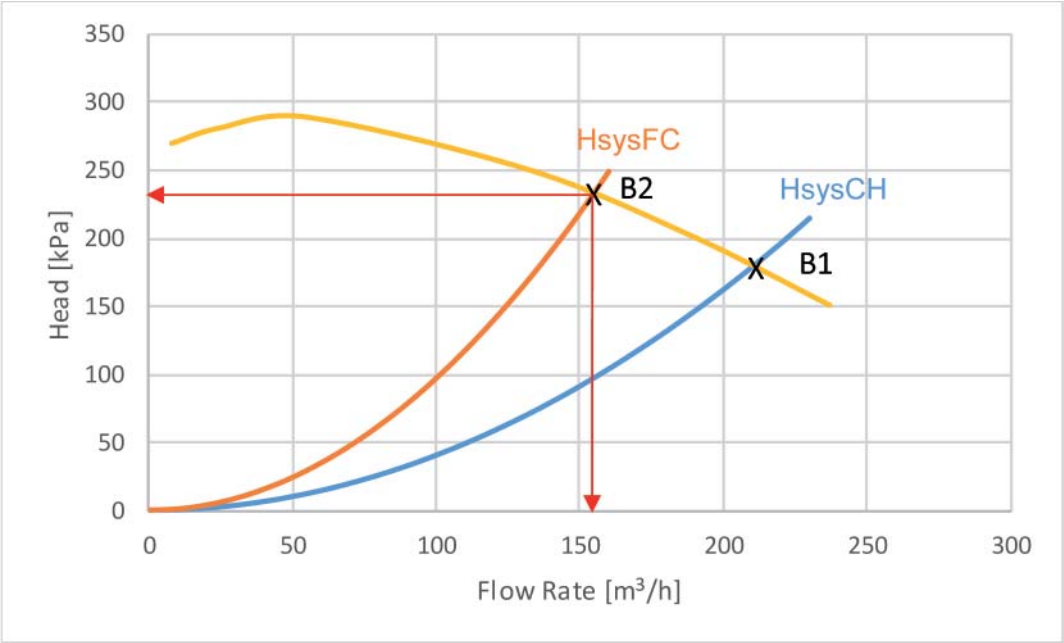


Fig. 5 Performance curves

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.

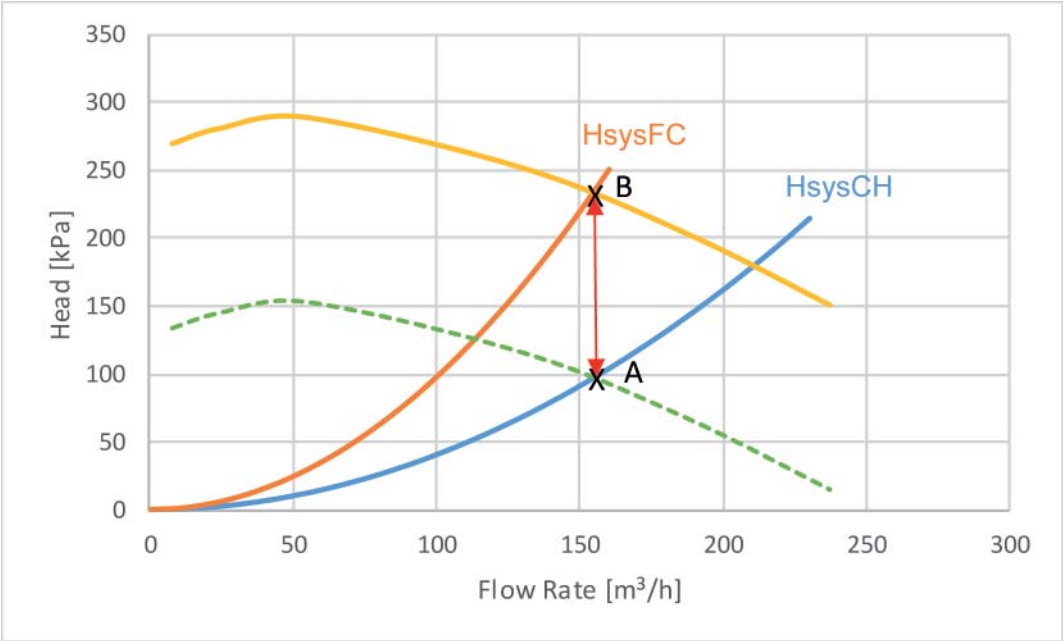


Fig. 6 Pump performance curves at variable speed

2PS (2 pump speed)
In a plant with a free-cooling chiller, 2PS system (opt. codes 4863-4883) 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

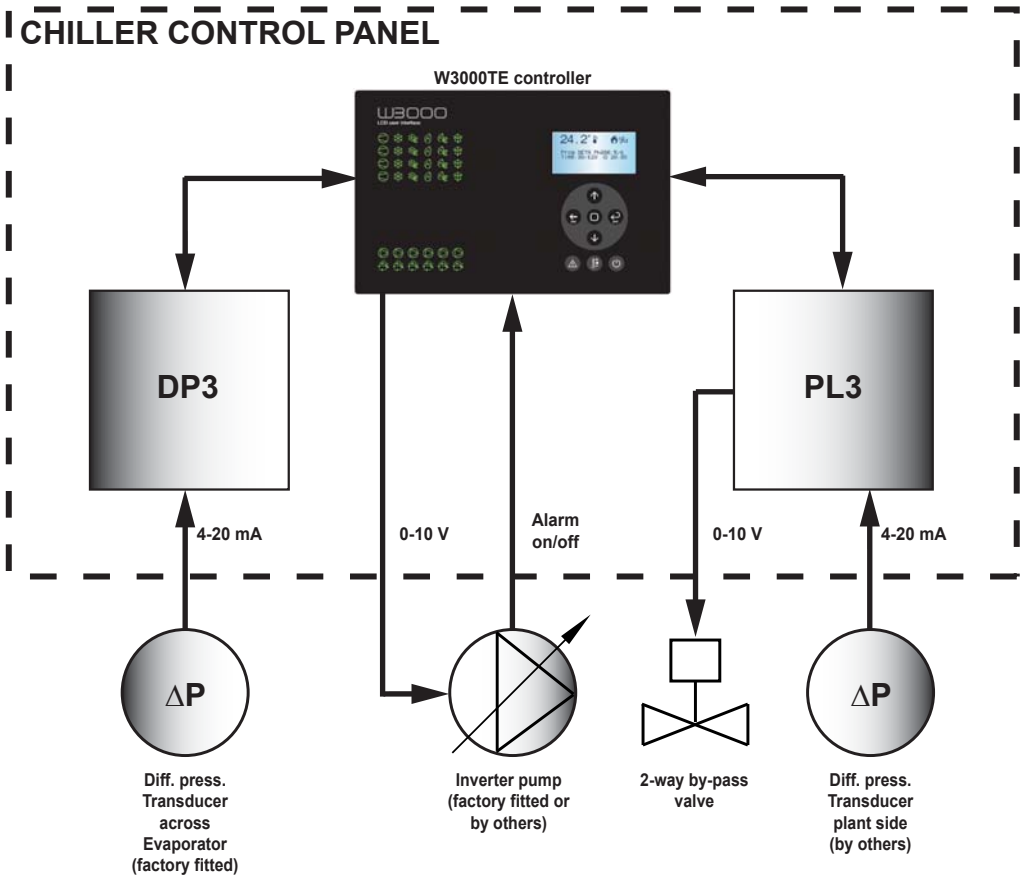
The energy consumption associated with fluid circulation weighs heavily on the total operating costs of a large installation, especially when the units work at part load, and even more, when they are in stand-by. Under these conditions, although the power absorbed by the compressors and fans is reduced, 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 the 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 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 along with the unit):
- 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.

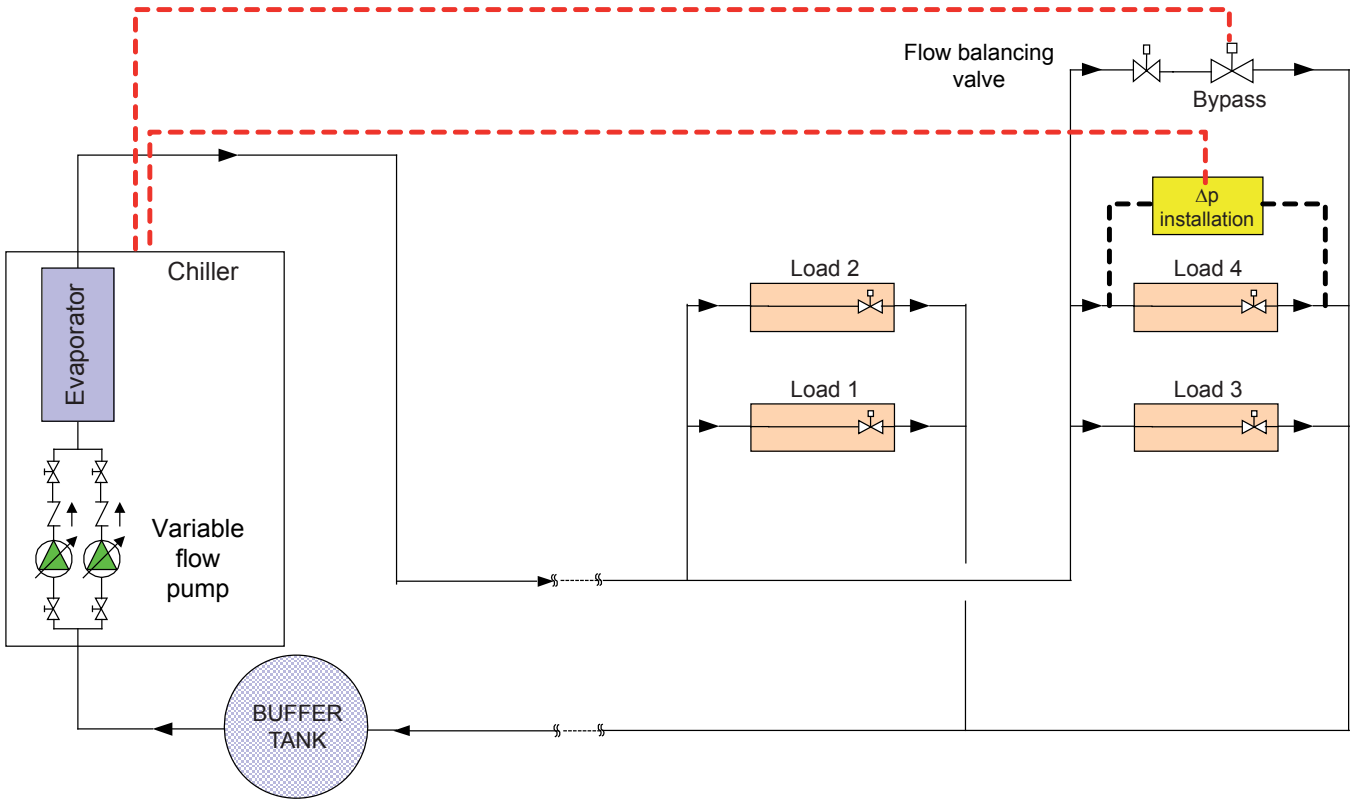


How it works

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.



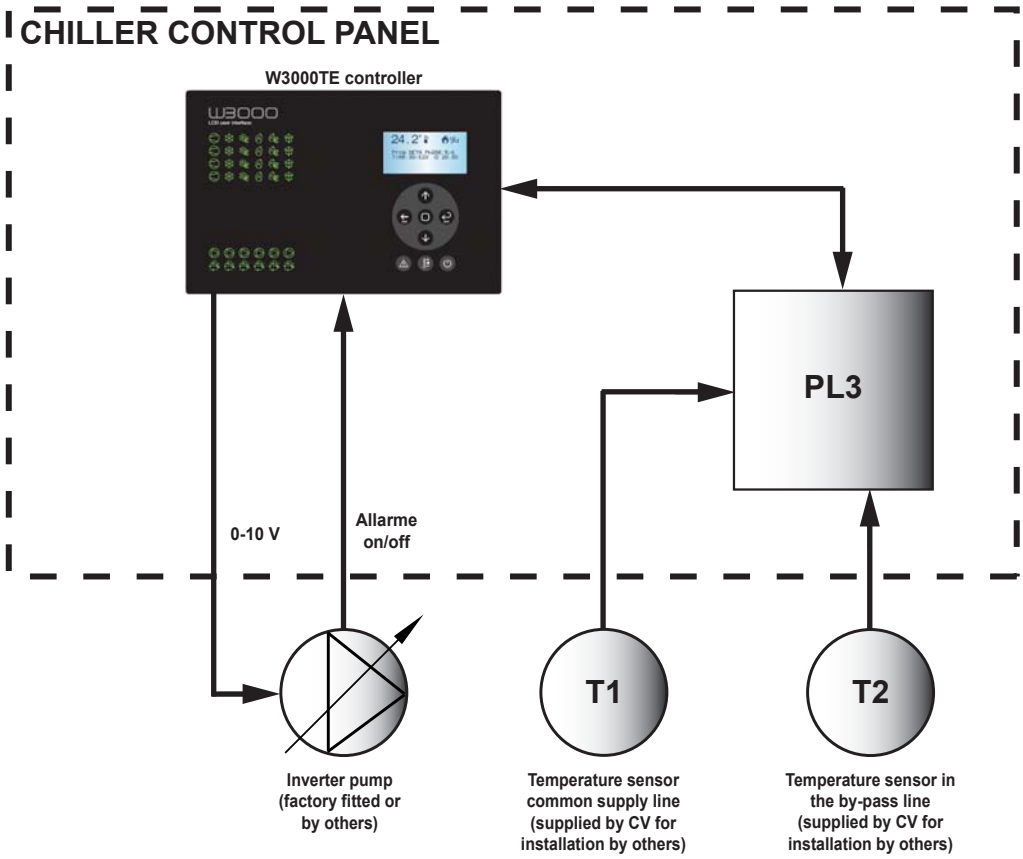
12.3 VPF.D systems for plants designed with both primary circuit and secondary one with variable flow

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.
This 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 along with the unit 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.

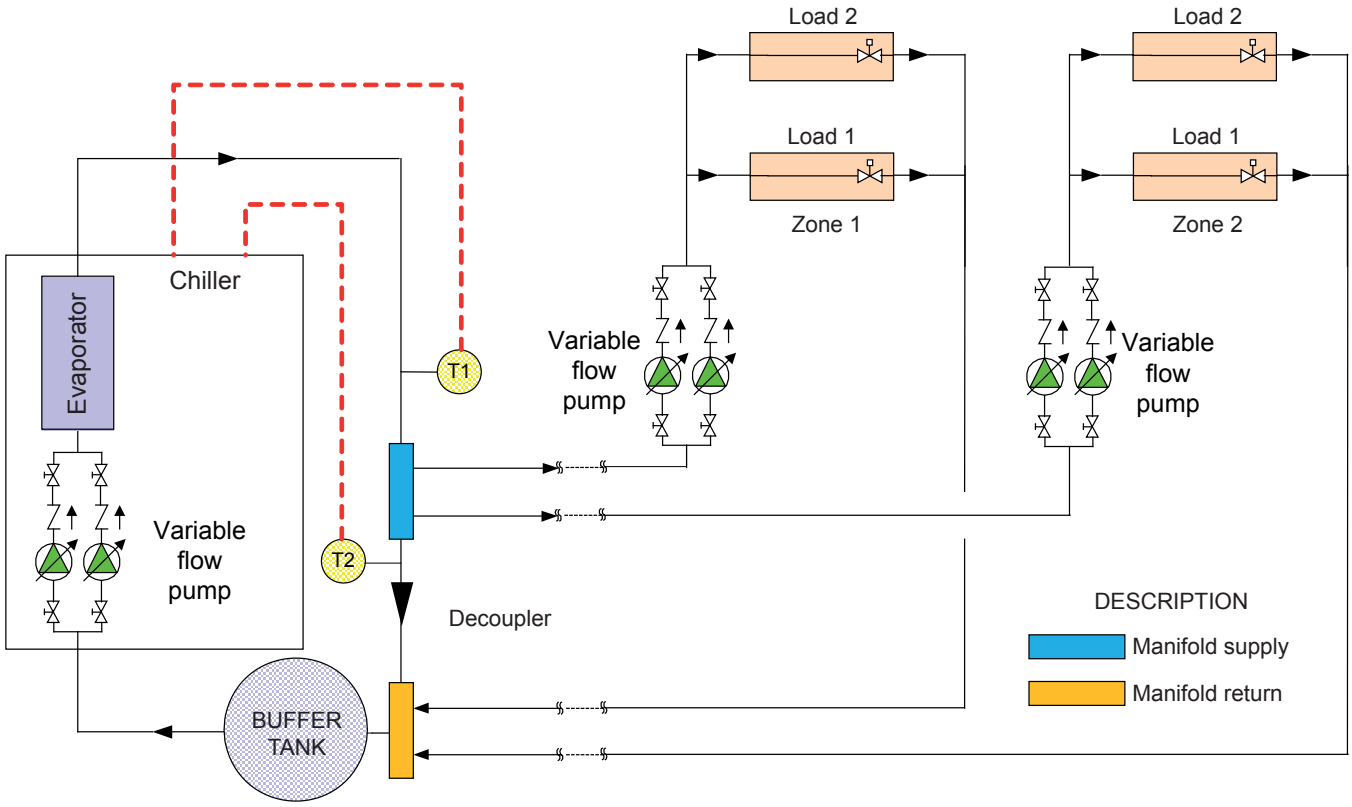


How it works

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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