Technical Bulletin

BT16A004GB-04

SPINchiller³ FREE-COOLING

FREE-COOLING high efficiency air-cooled liquid chiller
for outdoor installation

WSAT-XSC3 FC 90.4-240.4 RANGE

Nominal cooling capacity from 260 kW to 675 kW

- FREE-COOLING mixing section on source exchanger
- R-410A multiscroll technology
- Two independent refrigeration circuits
- Diffusers for thermodynamic recovery fans

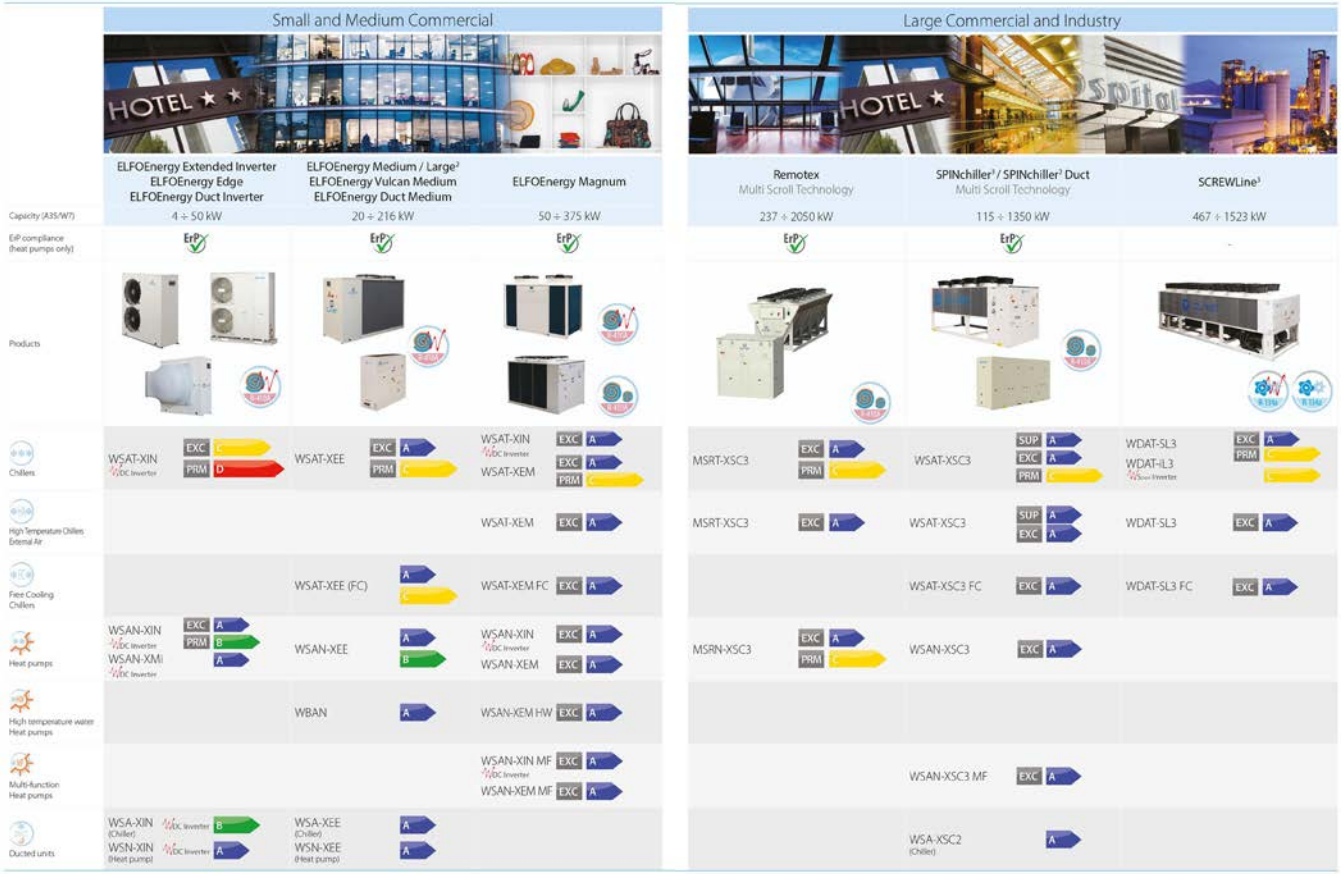
EXCELLENCE version

- Up to 45°C outdoor air temperature / Perferct for LEED

Clivet hydronic system

Designed to provide high energy efficiency and sustainability of the investment, the wide range of Clivet liquid chillers and heat pumps for high efficiency air conditioning of Residential and Commercial spaces and for Industrial applications it is available with air or water source.

HYDRONIC System - Air Source



Specialization

Every intended use has specific requirements which determine the overall efficiency. For this, the Clivet hydronic system always offers the best solution in every project.

- Modular range with over 8000 kW of overall capacity
- Capacity control with Screw and modular Scroll technology
- Multifunction versions
- Outdoor or indoor (ductable type) installation

Centrality of the Air Renewal

From the Air Renewal depends the comfort in the spaces. Since it often represents the main building energetic load, it also determines the running costs of the entire system.

ZEPHIR3
Packaged Primary Air supply system with thermodynamic energy recovery.

- Simplifies the system, reduces the heating and cooling generators
- Purifies the air with standard electronic filters
- Increases the energy efficiency and it also allows a savings of 40% on the running costs
- From –40°C to +50°C of outdoor air temperature

Terminal and AHU complete system

The hydronic terminal units are very diffused for their versatility and reliability. The Clivet range includes many versions that simplify the application in differents type of installation and building.

ELFOSpace
High energy efficiency hydronic terminal units

AQX
Air-conditioning unit

- Cased and uncased terminal units, from 1 to 90 kW
- Horizontal and vertical installation
- Energy-saving DC fans
- Modular air conditioning units up to 160.000 m³/h
- EUROVENT certification

SPINchiller³: modular scroll technology for every application

SPINchiller³ is the new generation of Clivet liquid chillers and heat pump with modular scroll technology. Thanks to its high seasonal efficiency and range versatility, it represents the ideal solution for different types of installation.

WSAT-XSC3

Air cooled water chiller

- EXCELLENCE high efficiency version and PREMIUM compact version
- Operating with 52°C of outdoor air temperature
- Total / partial recovery of the condensing heat
- Eurovent certification

Dedicated series separately documentated

WSAT-XSC3 FREE-COOLING

Air cooled water chiller with FREE-COOLING

- Direct FREE-COOLING
- Indirect FREE-COOLING (No-Glycol)

WSAN-XSC3

Air coole heat pump

- EXCELLENCE high efficiency version
- Eurovent certification

Dedicated series separately documentated

WSAN-XSC3 Multifunction

Air cooled heat/cool heat pump with simultaneous operating

- EXCELLENCE high efficiency version
- 4-pipe system
- 2-pipe system and total condensing heat recovery

Dedicated series separately documentated

Cost or reliability?

The dilemma of modern system engineering applications

Air-conditioning systems in trade centres influence both the starting investment and monthly management costs, for the whole of their working lives. This theme is even more relevant in residential applications with centralised systems. Furthermore, maximum working flexibility requirements should be added to that, in serving different users while avoiding wasting energy and thus, money. Finally, there are several industrial applications which require hot or chilled water as service fluid, process fluid or vector fluid for operator comfort and for conserving goods and enabling cycles to function correctly. Furthermore, in all these cases, the working reliability of the system is decisive.



High efficiency hydronic systems

The high efficiency hydronic systems are extremely versatile, reliable and widespread

Despite their apparently low costs, split, multi-split and VRF direct expansion systems have a lot of limits in these applications. For example, they require a separate system for primary air treatment. The pipes that contain the refrigerant cross the served rooms and therefore they are subject to restrictions and use limitations. They cannot operate in the FREE-COOLING mode, the high efficiency and convenient mode that allows energy savings.

The hydronic systems are certainly more complete and versatile. They make it possible to adopt various types of terminals in the served environment, from fan coil units exposed or integrated in the furnishings, up to radiant or induction systems. They are also irreplaceable in the service and process industrial applications.

The main component performances, like air-cooled liquid chillers and hydronic heat pumps, are checked and certificated by appropriate certification programs, as Eurovent.

Clivet technological evolution

Clivet chillers reduce consumption and are compact and reliable

With over twenty years of technological evolution, Clivet liquid chillers and heat pumps represent the state of the art in air-conditioning of residential, trade and industrial environments.

Their success is based on high energy efficiency, compactness and management maintenance simplicity, with wide versatility in the choice of the most suitable model for the specific use.

Perfect for LEED certification

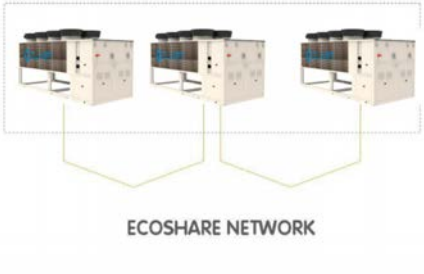
The whole EXCELLENCE range satisfies both requirements 2 (Minimum Energy Performance) and 3 (Fundamental Refrigerant Management) of Energy and Atmosphere section. They also meet Credit 4 parameters (Enhanced Refrigerant Management) allowing 2 points acquisition.

Clivet is committed in promoting the green building principles and has become a member of GBC Italia. This organization collaborates with USGBC, the U.S. nonprofit organization that promotes worldwide the LEED system of indipendent certification.

The advantages of the modular solution

In the event of particularly large buildings requiring high capacities, it is advisable to use several units. The ECOSHARE technology developed by Clivet allows to coordinate up to 7 units in local network, in parallel with modular logic, with the following advantages:

- greater efficiency, because the compressors are sequentially activated exploiting at most their point of operating with the lowest consumption, and the pumping units are activated only when necessary;
- greater flexibility, thanks to capability of the automatic control to follow the load;
- increased reliability, since the malfunction of one unit does not compromise the capacity supply of the other units.



Remote system management

The unit is standard equipped with:

- potential-free contact for remote on/off control;
- potential-free contacts for the compressor status display;
- setting from user interface: Off / local On / serial On;
- potential-free contact to remote a general alarm.

Thanks to the different communication protocols available, the unit is able to exchange information with the main supervisory systems using serial connections.

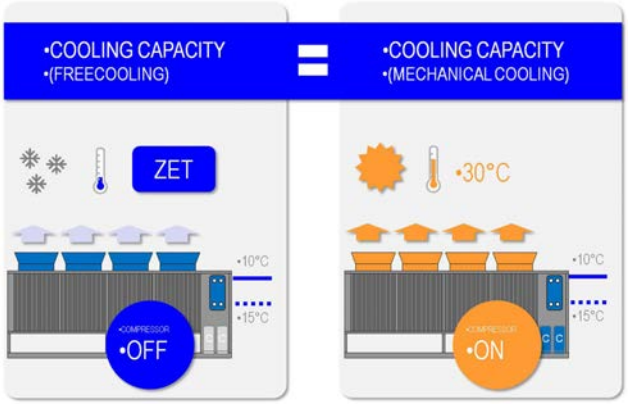
FREE-COOLING always convenient

For industrial or civil applications where cooling capacity required is stable in any outdoor condition and it is not effected by outdoor temperature, using solutions that exploit low outdoor temperatures for supplying cooling capacity for free is strongly suggested.

The new SPINchiller[3] FREE-COOLING series is the answer to that, and thanks to large exchanging surfaces with an antifreeze solution drives to notable annual energy consumption savings, up to 40% in harsh climate.

Not only great winter performances thanks to FREE-COOLING but also all SPINchiller[3] benefits and especially very high efficiency at high outdoor temperature conditions.

During one operative year of FREE-COOLING units 70% of the time compressors are running and providing a quite important cooling capacity amount.



It is mandatory to provide a good efficiency even when FREE-COOLING is OFF, in these conditions SPINchiller[3] drives to an high saving thanks to a full load efficiency up to 3,3.

Available with two configurations:

- direct FREE-COOLING (FCD): for systems with glycol;
- glycol free FREE-COOLING (FCI): for systems without glycol.

10% of savings with an higher set point

For industrial applications, water supply could be different than 7°C. With FREE-COOLING units the advantages in terms of efficiency increasing water temperature set-point by few degrees is even more noticeable, driving to annual energy savings higher than 8% with a set point of 10°C for example, concrete economical value for this kind of applications.

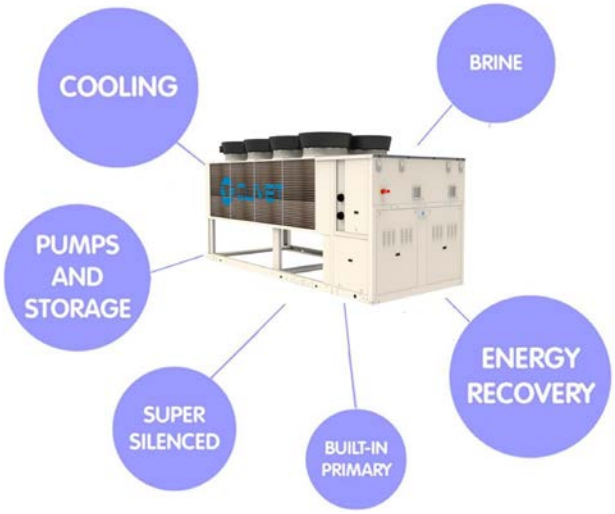
SPINchiller³

Provides all Clivet technological developments for their medium capacity hydronic systems

High efficiency Scroll compressors, high performance heat exchangers, electronic control fans, fully automatic operation: these are only some of the technologies available with SPINchiller³, in a range of models that are ideal for high capacity air conditioning systems in commercial, residential and industrial buildings.

The EXCELLENCE version stands out for its extremely high energy efficiency under both part and full load conditions.

SPINchiller³ can also be supplied in many configurations equipped with the main components installed built-in.



Advantages

High efficiency all year round

SPINchiller³ reduces yearly energy consumption thanks to its high part-load efficiency i.e., by far the most frequent condition throughout the system's life-cycle. This way, even the value of the served building increases. The main components are manufactured on an industrial scale, with maximum manufacturing reliability and can be easily found as spare parts.

To further increase energy efficiency in a system with several SPINchiller³ units operating on the same equipment, there is the innovative ECOSHARE feature, which automatically distributes the load and activates the necessary pumps.

4.5
ESEER
Seasonal
Efficiency

System simplification

All of the features are provided by Clivet already assembled and tested built-in, differently then other manufacturers who make numerous additional components available to be installed on site.

Compact and versatile

Suitable for any type of terminals, from fan coils to radiant systems and chilled beams, SPINchiller³ is also available in Super-silenced configuration. Energy recovery for producing hot water free of charge, FREE-COOLING. Seasonal energy efficiency is further increased with the DST operating logic, which maintains a constant return temperature.

5.4
DST
Seasonal
Efficiency

Borderless multiscroll technology

With SPINchiller³ the modular scroll compressor technology reaches the best levels of performance and versatility ever, guaranteeing competitiveness in more and more demanding applications. The top class seasonal efficiency rewards SPINchiller³ in comparison to any other air cooled chiller technology. A comparison with three SPINchiller³ competitors such as:

- air cooled liquid chillers with magnetic bearing centrifugal compressors;
- air cooled liquid chillers with modulating capacity screw compressors;
- air cooled liquid chillers with inverter screw compressors;

shows that SPINchiller³ is the best solution, considering its seasonal efficiency similar to the inverter screw chillers and a capital cost lower than that of centrifugal compressor chillers, even considering the capital investment pay back, that for analized technologies are always above acceptable values normally considered for system investment equal to 3 years.

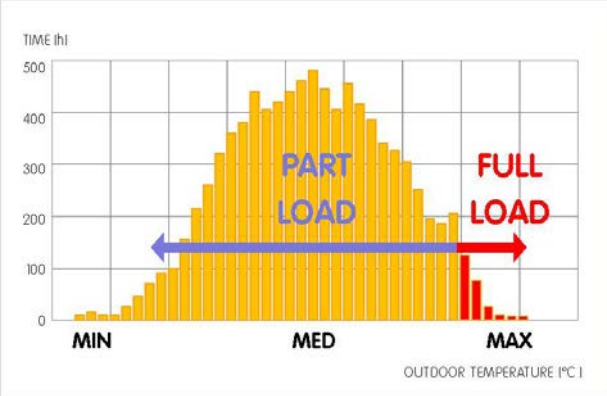
Comfort and energy saving in one solution

Maximum efficiency is necessary with a part load

The system is required to generate maximum capacity only for a short amount of time.

Therefore, it is essential to have the maximum efficiency under part-load conditions.

This is the only way to actually reduce overall yearly consumptions.



Part load efficiency determines the seasonal efficiency

Seasonal efficiency is conventionally represented by ESEER parameters according to Eurovent and IPLV parameters according to ARI. Both give great importance to part load operation, since it is the predominant condition.

SYSTEM LOAD	WEIGHT (ESEER) *	WEIGHT (IPLV) *
100%	3%	1%
75%	33%	42%
50%	41%	45%
25%	23%	12%

* EUROVENT (ESEER) supply times reference and ARI (IPLV) reference for seasonal efficiency calculations.

SPINchiller technology enhances part-load efficiency

SPINchiller[3] uses high efficiency Scroll compressors.

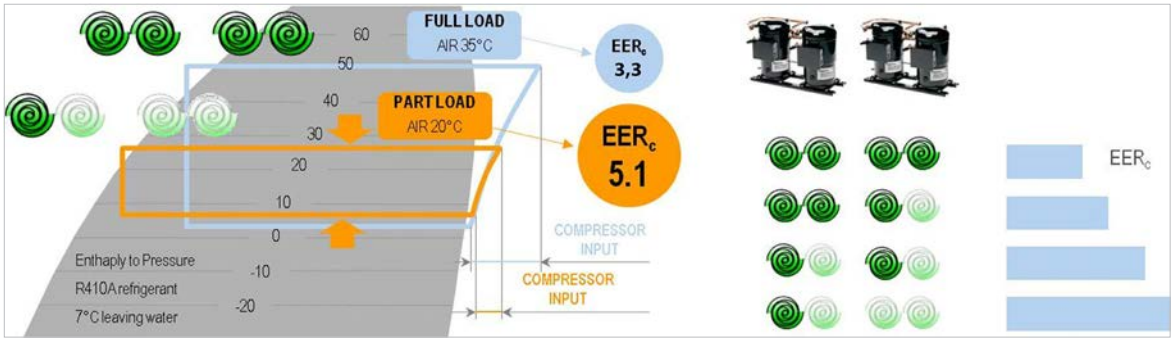
The advantages are:

- compressors manufactured in large ranges on an industrial scale with strict quality control inspections and maximum manufacturing reliability thanks to the high production volumes;
- every refrigeration circuit uses two Scroll compressors, depending on the different sizes of the unit. When two compressors are used, their sizes are different in order to obtain more control steps. This way, only the necessary energy is supplied.

Doubled efficiency

The heat exchange surface is sized for full capacity operation. Under part load condition, some compressors are automatically deactivated. Under this condition, in fact, the compressors in operation make use of a much larger surface.

This entails a reduced condensation temperature and an increased evaporation temperature. This way, the compressor capacity consumption is reduced with respect to the yield thereby increasing the overall efficiency of the unit.

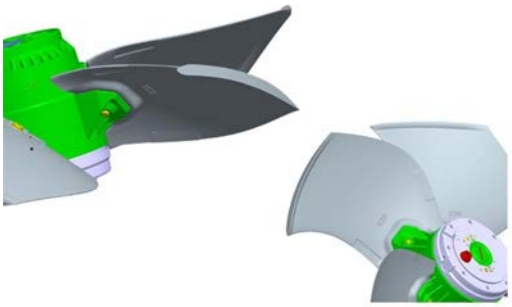


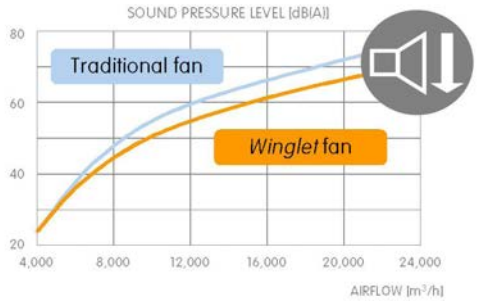
EERc =Energy efficiency referred to compressors

Efficient and silent ventilation technology

Advanced aerofoil fans

The external axial fans are equipped with the innovative Winglet airfoil-vane with integrated baffle, able to increase the aerodynamic efficiency. It results in a consumption reduction of the 10% and a medium sound emission lower of 6 dB than the traditional fans.



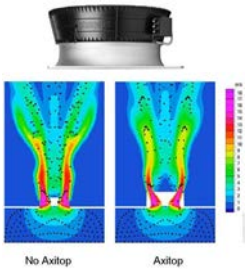


Diffusers for fans

Also the innovative air handling system on the external exchangers is the result of the Clivet design evolution.

The new AxiTop diffuser creates an ideal air distribution: it aerodynamically decelerates the flow and transforms a big part of its dynamic energy in static pressure, obtaining:

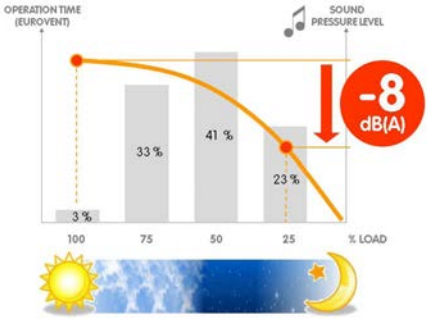
- –3 dB of sound reduction;
- reduction of 3% of the absorbed energy.



Energy efficiency improved by Axitop

Fans at variable speed for minimal noise emission

All SPINchiller³ units are equipped with electronic condensation control. It automatically reduces the fan speed when the heat load is reduced. Since the fans are the unit's main noise source, the benefits are evident especially during the night hours, when the load is reduced but sensitivity to noise is enhanced. All this translates into a sound pressure reduced down to 8 dB(A) compared to full load operation in 90% of operating time of the unit.



EXCELLENCE version: maximum efficiency

Apart from the high seasonal efficiency, the standard EXCELLENCE SC version stands out for its extremely high energy efficiency ratio (EER) during full-load cooling, which exceeds the value 3.1 and places it in Eurovent Energy Efficiency class A.

This is all possible thanks to Scroll modular technology, high efficiency heat exchangers, to the speed electronic control of the phase cutting fans and to Axitop diffusers and to an electronic control device supplied as standard.

This allows for:

- energy efficiencies equal to or higher than most units on the market equipped with screw compressors, even when inverter driven;
- efficient use even in a large number of industrial and process applications;
- upgrade of the building's energy class and, therefore, increased value;
- maximum savings on running and maintenance costs.

EXCELLENCE

EER 3,3

Available in two high efficiency acoustic configurations, it represents the optimum combination of efficiency and low noise:

- the EXCELLENCE SC version is standard and besides offering a high efficiency at full load and excellent performance in FREE-COOLING operation keeps reduced dimensions;
- the EXCELLENCE EN version not only confirms but also improves the SC performance and reduces noise emissions, thanks to the use of heat exchangers with generous dimensions and reduced fan rotation speed.

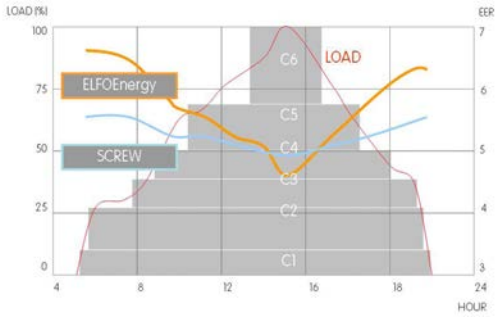
Both configurations offer soundproofed panels as standard, which constitute a heated compartment for the main component protection also from cold temperatures, including pumping units (if requested).

Superior flexibility and reliability

Efficient precision

Sequential activation of SPINchiller[3] compressors allow:

- adapting to the load required for use, thereby ensuring added comfort;
- reducing the number of compressor start-ups, i.e., the main cause of wear;
- increasing the unit's useful life;
- reducing repair times and costs, thanks to the modular components, their reduced dimensions and reduced cost compared to semi-hermetic compressors.

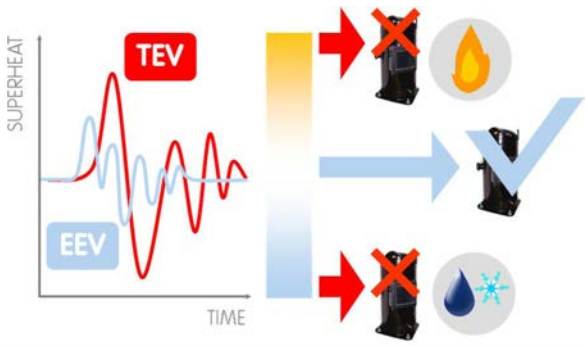


THE NUMBER OF START-UPS DECREASES THEREFORE THE LIFE CYCLE INCREASES

Stable and reliable operation

The electronic expansion valve (EEV) adapts rapidly and precisely to the actual load required for usage, allowing stable and reliable adjustment in comparison with mechanical thermostatic valves (TEV). This results also in a further increase in efficiency and longer compressor life.

The overheating control allows preventing phenomena that are hazardous to the compressors, such as overtemperature and return fluids, thereby increasing even more efficiency and durability.



Simplified maintenance

Besides being efficient, SPINchiller[3] improves the system maintenance.

In fact, the malfunction of a compressor does not compromise overall operation.

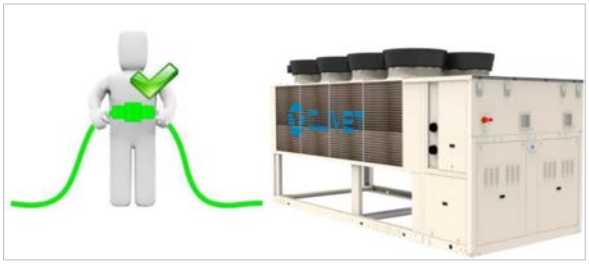
Furthermore, Scroll compressors are very compact, easy to find and easy to handle in case of replacement.

Controlled power supply

Proper power supply ensures optimal unit operation and protects its many electrical components.

The phase monitor, standard supplied:

- controls the presence and the exact sequence of the phases;
- checks any voltage anomalies (-10%);
- automatically restarts the unit as soon as the proper power supply is restored.



Multifunction monitor, where limit values and the service schedule of Clivet's Technical Support can be modified.

The automatic control device coordinates resources ensuring maximum efficiency

Operating completely automatic

The microprocessor control automatically manages operation according to the maximum efficiency criterion and includes many safety and alarm management functions.

It also includes advanced functions, such as daily and weekly programming and automatic maximum power consumption limitation (demand limit).

Energy measuring

Monitoring energy consumption and instant power employed is the starting point to improve the system's energy management and efficiency. With the optional energy meter, the user displays all the information related to the unit's electrical parameters on the interface built-in the unit or via the serial connection.

Moreover, the integration with the Demand Limit function supplied as standard allows to act on consumption levels by limiting them if they exceed the expected limit.

Seasonal energy efficiency is further increased with the DST operating logic

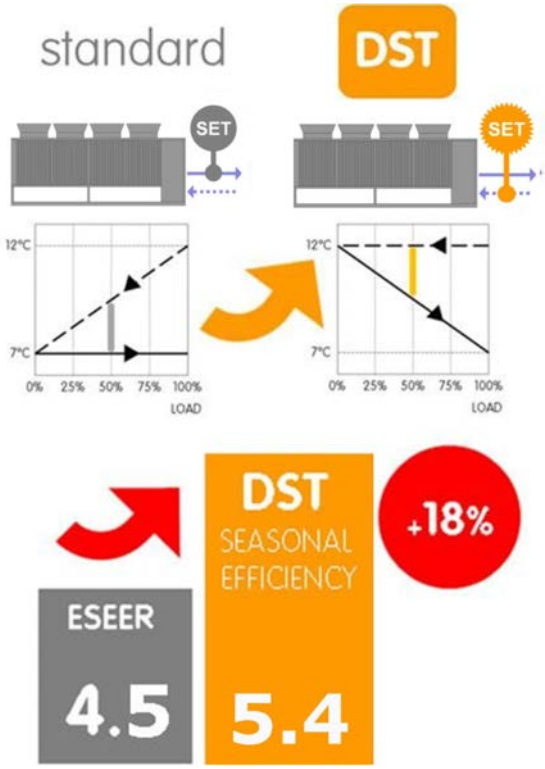
SPINchiller[3] is equipped with standard DST control (Dynamic Supply Temperature) control logic, which can be activated by the user.

Unlike the traditional control logic that aims at maintaining the water supply temperature constant, the DST logic aims at keeping constant the water return temperature, modifying the supply temperature dynamically according to the load. This way, evaporation temperature increases during part-load cooling, thereby increasing seasonal energy efficiency.

The DST control allows a considerable consumption and operation costs reduction, especially in civil applications, upon verification of the air treatment system's dehumidification capacity during cooling at part load.

The DST control allows considerable consumption and operation costs reduction, especially in civil applications, upon verification of the air treatment system's dehumidification capacity during part-load cooling. The DST control is particularly interesting when combined with active thermodynamic fresh air systems. The direct expansion circuit allows them to operate the outdoor air treatment independently from SPINchiller[2], which can vary the system water supply temperature, thereby optimising energy efficiency in the yearly cycle.

The DST control logic is as an alternative to the control logic at variable flow-rate.



Example

The following diagram represents the various operating temperatures in the production of chilled water under various load conditions for a typical civil system consisting of:

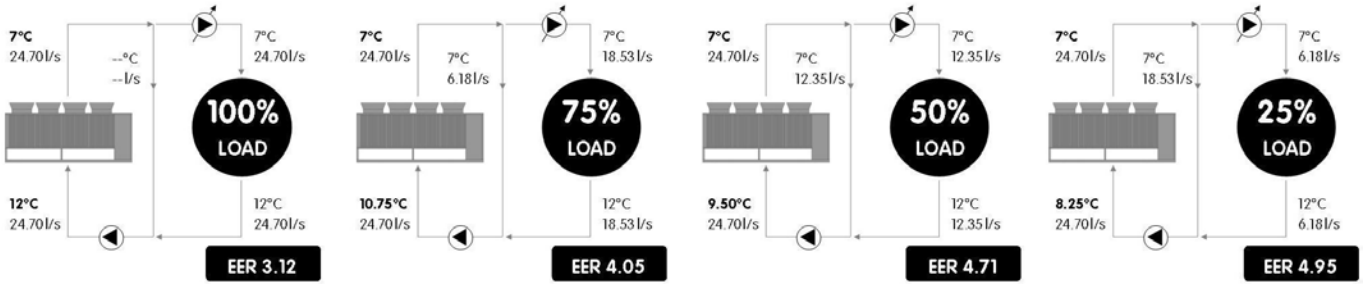
- primary circuit with constant water flow rate;
- secondary circuit with variable water flow-rate according to the load (linear variability for simplicity).

The traditional control logic keeps the water supply temperature to room terminals and outdoor air treatment units constant, in order for the latter to carry out the dehumidification.

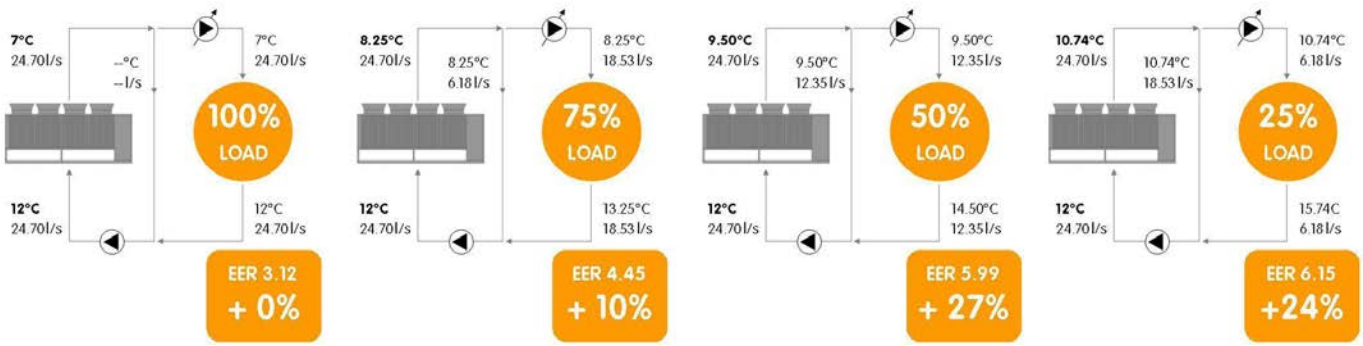
The DST control logic, on the other hand, allows increasing the system water supply temperature during part-load operation, thereby increasing seasonal energy efficiency for SPINchiller[3].

The DST application must be verified during the design stage according to specific system constraints.

Traditional control logic (system water flow rate temperature = constant)



DST control logic (system water return temperature = constant)



SPINchiller³ technology industrialised the system

SPINchiller³ can be supplied equipped with components that are often provided separately. This allows reducing:

- design times: all accessories are made to ensure the best overall efficiency;
- installation costs: the accessories already mechanically connected, electrically wired and individually tested are ready to be put to operate immediately;
- overall dimensions: system components are integrated with the unit, thereby reducing the technical area and increasing the area available for other uses.

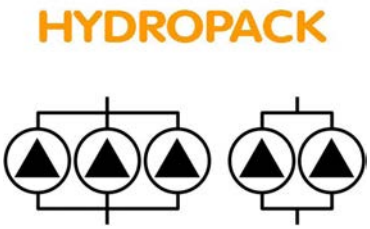
Built-in inertial accumulation available

In most SPINchiller³ systems it can be installed without inertial accumulation on the system. In fact, the unit quickly adapts to the load due to modular compressors, electronic thermostatic valve and low water content plate heat exchangers. However, in the event of hydraulic distribution networks with reduced dimensions, it is important to provide the system with a hydraulic flywheel. In such cases, inertial accumulation is available built-in, equipped with insulating coating and all the necessary safety devices. This allows eliminating installation times and costs and freeing space inside the building.

The built-in pumps are versatile, ready-for-use and reliable

The various solutions available are:

- HYDROPACK, the modular solution with two or three parallel pumps. Automatically reduces the water flow rate when in critical conditions, thereby preventing jams due to overloading, requiring the subsequent intervention of specialised technical personnel;
- it is very useful during start-ups, when restarting after operating breaks (e.g. at the weekend) or after a long period of inactivity;
- Inverter driven HYDROPACK allows water flow-rate-head calibration.



Variable flow-rate advantages

Pumping energy for moving the water has an heavy impact on seasonal efficiency. The variable flow control is available for all units and drives to energy savings during partial load.

Pump energy consumption is proportional with cubic rotation speed. Evident the advantage when reducing flow-rate of 40% comparing to nominal conditions: energy saving is of 75% on pump energy consumption.

The control logic I based on keeping stable the water temperature entering and leaving difference, guaranteeing at the same time the best efficiency and a working envelope within an acceptable range for the heat exchanger (pressure losses).

The control logic applies to both flow-rate and compressor regulation thanks to steps. Proportional-Integral-Derivative guarantees a precise and stable operation.

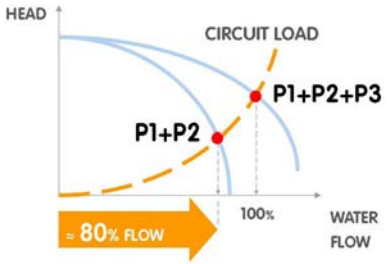
The possibility of independent pump management in case of failure is embedded in the unit keeping operative the system.

The exceptional HydroPack operation continuity

Due to its modularity, HYDROPACK maintains good water flow in the system even in the event of one of the pumps being temporarily unavailable.

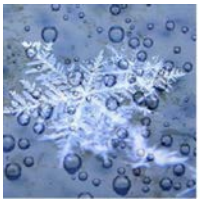
In fact, with a deactivated pump, the residual flow is:

- about 80% of the rated flow (3 pump configuration);
- about 60% of the rated flow (2 pump configuration).



Even for low water temperature

The unit is also perfectly adapted for use in process cooling where the low temperature version (Brine) together with the addition of glycol to the thermo-vector liquid produces chilled water down to –8 °C.



Further considerations on the installation

The vast operating field of SPINchiller³ allows it to adapt to most system applications. In some cases, special duty conditions may exceed the unit operating field. Simple devices on the system allow proper operation and meeting any requirement. Here are two examples.

Water flow rate values outside the limits

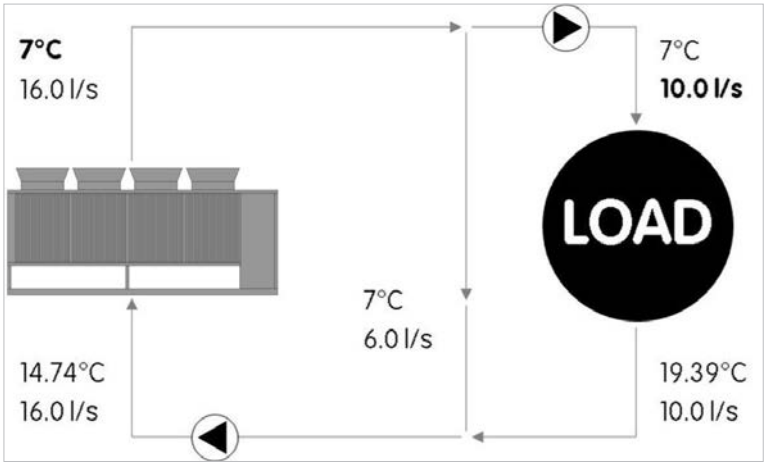
SPINchiller³ operates with constant water flow rate to the evaporator, between a minimum and maximum value indicated in the technical documents.

Flow rate values below the limit may cause unwanted formation of ice, incrustations, reduced control precision, and the unit to stop following the intervention of built-in safety devices.

Flow values above the limit may cause high pressure drops, high pumping costs, and reduced control precision, and erosion damages to the exchangers.

In this example, the required flow-rate is lower than the maximum value allowed to the evaporator, while the operating temperatures fall within the functional field of the unit.

A properly sized bypass piping resolves the problem.



Example referred to WSAT-XSC3 FC 180.4 SC EXCELLENCE version.
Appropriate water flow rate for the correct unit operation.

Temperature values outside the limits

SPINchiller³ operates with the system supply temperatures indicated in the technical documentation.

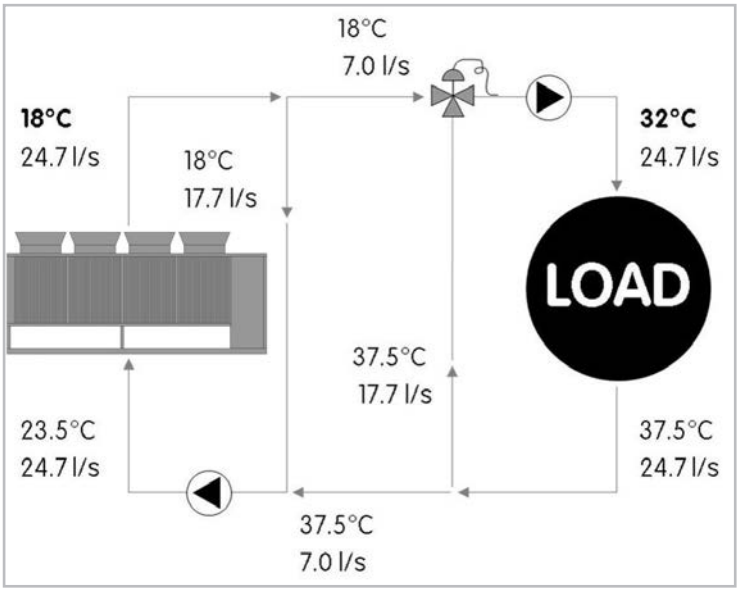
Temperature limits below the limit may cause unwanted formation of ice and the unit to stop following the intervention of built-in safety devices.

Temperature values under the limit may cause malfunctions and damages to the compressors, reduced control precision, and the unit to stop following the intervention of built-in safety devices.

In this example, the required temperature exceeds the maximum value allowed to the evaporator, while the water flow rate falls within the functional field of the unit.

A properly sized bypass piping and mixing system resolve the problem.

Should both the water flow rate and the operating temperature exceed the values intended for the chiller, all you have to do is combine the two cases described above.



Example referred to WSAT-XSC3 FC 180.4 SC EXCELLENCE version.
Appropriate supply water temperature for the correct unit operation. Nominal water flow rate.

Evaporator thermal gradient

SPINchiller³ nominal capacities refer to an evaporator thermal gradient equal to 5 °C. A different thermal gradient may be used in full load operation, provided that both the operating flow and temperatures fall within the limits. As an indication, this corresponds to a minimum thermal gradient of approximately 3 °C and a maximum of 10 °C (the exact values must be determined based on the allowed flows and temperatures).

Standard unit technical specifications - FCD configuration

Compressor

High efficiency hermetic orbiting scroll compressor complete with oil charge, motor over-temperature and over-current devices and protection against excessive gas discharge temperature with oil heater, which starts automatically, keeps the oil from being diluted by the refrigerant when the compressor stops. Compressors, fitted on rubber antivibration mounts to prevent transmission of noise and vibration, are connected in TANDEM on a single refrigerating circuit with biphasic oil equalisation, it allows to reach high efficiency at partial load. Uniform compression process with reduced number of moving parts which ensure very low levels of noise and vibration.

Structure

Structure and base made entirely of sturdy sheet steel, thickness of 30/10 or 40/10, with the surface treatment in Zinc–Magnesium painted, for the parts in view, with polyester powder RAL 9001 that guarantees excellent mechanical characteristics and high corrosion strength over time.

Panelling

External pre-painted zinc-magnesium paneling, thickness 10/10, with the surface treatment in Zinc–Magnesium painted with polyester powder RAL 9001 that ensures superior resistance to corrosion for outdoor installation and eliminates the need for periodical painting. The panels can be easily removed to fully access internal components and are lined with sound-proof material on the inside to contain the unit's sound levels.

Internal exchanger (evaporator)

Direct expansion heat exchanger, brazed AISI 316 stainless steel plates, in pack without seals using copper as the brazing material, with low refrigerant charge and large exchange surface, complete with:

- external thermal insulation no-condensation, thickness 9,5 mm, in extruded elastomer foam with closed cells;
- differential pressure switch, water side;
- antifreeze heater to protect the water side exchanger, preventing the formation of frost if the water temperature falls below a set value.

Maximum operating pressure exchanger: 10 bar on the water side and 45 bar on the refrigerant side.

External exchanger (condenser)

Finned exchanger, made from copper pipes arranged in staggered rows and mechanically expanded for better adherence to the collar of the fins. The exchangers are planned, designed and produced directly by CLIVET. The fins are made of aluminium with a special corrugated surface, set a suitable distance apart to ensure maximum heat exchange efficiency.

A proper liquid supply of the expansion valve is ensured by the subcooling circuit. Each finned heat exchanger is directly cooled by the air flow of its specific fans.

Fan

Axial fans with high performance and low-noise, balanced statically and dynamically, with blades in aluminum sheet coated in PP and sickle profile terminating with "Winglets", Wall ring in sheet steel pre-galvanised, directly coupled to the three-phase electric motor with external rotor and IP54 protection and class F insulation. Fans are located in aerodynamically shaped structures, equipped with accident prevention steel guards.

Diffusers for external section fans - Axitop

Axitop diffusers, to be installed on the outdoor section fans, to recover dynamic energy, resulting in increased efficiency and minimal sound emission. It creates an ideal air distribution: it aerodynamically decelerates the flow and transforms a big part of its dynamic energy in static pressure. The Axitop diffuser installation is provided by the Customer.

Device for consumption reduction of the external section at variable speed (phase-cutting)

Automatic device for reducing of the outdoor section consumption with variable speed fans. The speed of the fan motors is continuously adjusted according to the condensing pressure to ensure the right working of the unit at low outside temperatures.

Refrigeration circuit

Two independent refrigeration circuits, copper made and factory-assembled, welded with continuity metallic solution, completed with:

- replaceable antiacid dehydrator filter with solid cartridge;
- liquid flow and moisture indicator;
- electronic expansion valve;
- no-return valve;
- 4-way reversing valve;
- high pressure safety pressure switch;
- high pressure safety valve;
- low pressure safety valve;
- cutoff valve on liquid line;
- cutoff valve on compressor supply;

Thermal insulated of suction line with insulation material in highly flexible closed-cell elastomer based on EPDM rubber. Refrigeration circuit pressure tested to check leaks and supplied complete of refrigerant charge.

Configurations

B - Low water temperature

SC - Acoustic configuration with compressor soundproofing

EN - Super-silenced acoustic configuration

Electrical panel

Fully constructed and wired in accordance with EN 60204 . The Capacity Section includes:

- main door lock isolator switch;
- isolating transformer for auxiliary circuit power supply (230V/24V);
- compressor circuit breakers;
- fan overload circuit breakers;
- compressor control contactor;
- terminals main power (400V / 3Ph / 50Hz).

The control section includes:

- interface terminal with graphic display;
- display of the set values, the error codes and the parameter index;
- ON/OFF and alarm reset buttons;
- proportional-integral-derivative water temperature control;
- daily, weekly programmer of temperature set-point and unit on/off;
- unit switching on management by local or remote (serial);
- antifreeze protection water side;
- compressor overload protection and timer;
- pre-alarm function for water antifreeze and high refrigerant gas pressure;
- self-diagnosis system with immediate display of the fault code;
- automatic rotation control for compressor starts;
- compressor operating hour display;
- remote ON/OFF control;
- relay for remote cumulative fault signal;
- input for demand limit (absorbed power limit according to an external signal 0÷10V or 4÷20mA);
- potential-free contacts for compressor status;
- digital input for double set-point enabling;
- multifunction phase monitor;
- electrical panel ventilation.

All device functions can be repeated with a normal portable PC connected to the unit with an Ethernet cable and equipped with an internet navigation browser. All electrical cables are colored and numbered in accordance with the wiring diagram.

Hydraulic circuit

Exclusive direct FREE-COOLING components:

- 3-way valve or two 2-way valves (depending on models) with on/off control.

Accessories - Hydraulic circuit

- HYDROPACK
- Inverter driven HYDROPACK
- Storage tank (FCD configuration only)
- Steel mesh mechanical strainer (accessory separately provided). Note: To be located at the exchanger inlet. We disclaim any liability and make the guarantee void, if an appropriate mechanical filter is not provided inside the system.

Accessories

- Finned coil protection grill
- Anti-hail protection grilles
- Copper / aluminium condenser coil with acrylic lining
- Copper / aluminium condenser coil with Aluminium Energy Guard DCC treatment
- High and low pressure gauges
- Cutoff valve on compressor supply and return
- Device for consumption reduction of the external section ECOBREEZE fans
- Device for fan consumption reduction of the external section at variable speed (phase-cutting) (optional in the EN config.)
- Power factor correction capacitors (cosfi > 0.9)
- Serial communication module for Modbus supervisor
- Serial communication module for LonWorks supervisor
- Serial communication module for BACnet-IP supervisor
- ECOSHARE function for the automatic management of a group of units
- Disposal for inrush current reduction (SOFT STARTER)
- Energy meter
- Set-point compensation with 0-10 V signal
- Set-point compensation with outdoor air temperature probe
- Variable flow-rate control
- Electrical panel antifreeze protection
- Remote control via microprocessor control (separately supplied accessory)
- Mains power supply (separately supplied accessory)
- Spring antivibration mounts (separately supplied accessory)
- Couple of manually operated shut-off valves (separately supplied accessory)

On request are available:

- refrigerant leak detector

Test

Unit subjected to factory-tested in specific steps and test pressure of the piping of the refrigerant circuit (with nitrogen and hydrogen), before shipping them. After the approval, the moisture contents present in all circuits are analyzed, in order to ensure the respect of the limits set by the manufacturers of the different components.

Unit technical specifications for FCI configuration

Technical specifications as FCD configuration except for:

Hydraulic circuit

- Pumping unit complete with non-return valves, safety valves, antifreeze heaters, shut-off valves and drainage and thermoformed insulated casing.

Intermediate exchanger

Brazed AISI 316 heat exchanger stainless steel plates for parts in contact with fluid (AISI 304 for the other parts), in pack without seals using copper as the brazing material, complete with:

- external thermal insulation no-condensation, thickness 9,5 mm, in extruded elastomer foam with closed cells;
- antifreeze heater to protect the water side exchanger, preventing the formation of frost if the water temperature falls below a set value.

Maximum operating pressure exchanger: 10 bar.

Unit equipment with outdoor air low temperatures

<table>
<tr><th colspan="2">Minimum outdoor air temperature</th><th>Operating unit</th><th>Unit in stand-by
(fed unit)</th><th>Unit in storage [5]
(unit not fed)</th></tr>
<tr><td>+11°C</td><td>1</td><td rowspan="4">√ standard unit
√ electrical panel antifreeze protection
√ glycol in an appropriate percentage</td><td rowspan="2">√ standard unit</td><td rowspan="3">√ standard unit</td></tr>
<tr><td>+2°C</td><td>2</td></tr>
<tr><td>-7°C</td><td>3</td></tr>
<tr><td>-10°C</td><td>4</td></tr>
<tr><td>Between –10°C and –18°C</td><td></td><td rowspan="3">√ water empty unit or with an appropriate glycol percentage
√ electrical panel anti-freeze protection</td></tr>
<tr><td>Between –18°C and –25°C</td><td></td><td>√ electrical panel antifreeze protection
√ glycol in an appropriate percentage
Not suitable:
X high and low pressure gauges (MHP)</td><td>√ standard unit [6]
Not suitable:
X electrical panel anti-freeze protection
X energy meter (CONTA2)
X high and low pressure gauges (MHP)</td></tr>
<tr><td>Between –25°C and –39°C</td><td></td><td>√ electrical panel antifreeze protection
√ glycol in an appropriate percentage
Not suitable:
X ECOBREEZE fans (optional for SC conf., standard for EN conf.)
X high and low pressure gauges (MHP)</td><td>NOT POSSIBLE</td></tr>
</table>

Data referred to the following conditions:
internal exchanger water = 12/7°C
1. Part load unit and air speed equal to 1 m/s.
2. Part load unit and air speed equal to 0.5 m/s.
3. Part load unit and outdoor air temperature at rest.
4. Unit at full load and outdoor air temperature at rest.

([5]) Unit without water or containing water with an appropriate quantity of glycol.
At the unit start-up the water temperature or water with glycol must be inside the operating range indicated in the "Operating range" graph.
To know the water freezing temperature on varying the glycol percentage refer to the specific 'Correction factors for glycol use' table.

Air conditions which are at rest are defined as the absence of air flowing towards the unit. Weak winds can induce air to flow through the exchanger and air-levels which can cause a reduction in the operating range. In the presence of predominant winds it is necessary to use suitable windbreak barriers.

The unit, with an outdoor air temperature on average lower than -10°C, can remain stored for a maximum of 1 month.

Minimum system water content

For a proper functioning of the unit a minimum water content has to the provided to the system, using the formula:
Minimum water content [l] = 7 x kWf (air conditioning application)
= 14 x kWf (application with low outdoor temperature or low loads required))

kWf = Nominal cooling capacity unit

Volume calculated does not consider internal heat exchanger (evaporator) water content.

Unit configuration

WSAT-XSC3 FC	200 . 4	FCD	EXC	SC	AXIX	-	-
(1)	(2) (3)	(4)	(5)	(6)	(7)	(8)	(9)

(1) Range
WSAT = Air-cooled liquid chilled with scroll compressor
XSC3 FC = SPINchiller³ FREE-COOLING range

(2) Size
200 = Nominal compressor capacity (HP)

(3) Compressors
4 = Compressor quantity

(4) FREE-COOLING configuration
FCD = Direct FREE-COOLING
FCI = No-glycol FREE-COOLING

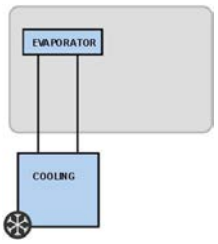
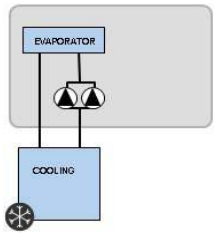
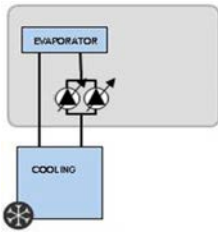
(5) Energy efficiency
EXC = EXCELLENCE version: high energy efficiency

(6) Acoustic configuration
SC = Acoustic configuration with compressor soudproofing
EN = Super-silenced acoustic configuration

(7) Fan diffusers
AXIX = Diffuser for high efficiency fan (standard - separately supplied)
NAXI = Diffuser not required

(8) Low evaporator water temperature configuration
(-) Low water temperature: not required (standard)
B = Low water temperature, down to –8°C (Brine)

(9) Pumping unit user side
(-) Not required
2PM = Hydropack user side with no. 2 of pumps
3PM = Hydropack user side with no. 3 of pumps
2PMV = Hydropack user side with no. 2 of inverter pumps
3PMV = Hydropack user side with no. 3 of inverter pumps

Functionalities	Hydronic units		
2-PIPE SYSTEM Chilled water production for installation	**1.1** Standard unit 	**1.2** Standard unit with HYDROPACK 	**1.3** Standard unit with inverter driven HYDROPACK 

Accessories separately supplied		
• **RCMRX** - Remote control via microprocessor remote control	• **PSX** - Mains power supply unit	• **AMMX** - Spring antivibration mounts

FCD / FCI CONFIGURATION

Acoustic configuration: compressor soundproofing (SC)

General technical data - Performance

Size			90.4	100.4	110.4	120.4	140.4	160.4	180.4	200.4	220.4	240.4
Cooling												
Cooling capacity	1	[kW]	261	284	314	347	397	447	496	565	607	656
Compressor power input	1	[kW]	73,7	81,4	91,3	105	115	132	159	166	189	212
Total power input	2	[kW]	83,5	91,3	101	115	128	145	173	182	206	229
EER	1	-	3,13	3,11	3,11	3,01	3,11	3,09	2,87	3,10	2,95	2,86
Water flow-rate (User Side)	1	[l/s]	12,5	13,6	15,0	16,6	19,0	21,4	23,7	27,0	29,0	31,4
Total pressure drop user side - FCD	1	[kPa]	90,0	93,9	88,3	86,7	103,0	87,4	92,4	98,4	100,0	111,0
Total pressure drop user side - FCI	1	[kPa]	87,3	90,7	84,4	82,1	96,6	80,0	83,5	93,1	94,3	104,0
Cooling capacity (EN14511:2013)	3	[kW]	260	282	312	345	395	445	493	562	604	653
Total power input (EN14511:2013)	3	[kW]	85,0	93,0	103	117	130	147	176	185	209	232
EER (EN 14511:2013)	3	-	3,05	3,03	3,04	2,95	3,03	3,03	2,81	3,03	2,89	2,81
SEER	5	-	4,64	4,65	4,62	4,56	4,66	4,65	4,59	4,64	4,62	4,56
SEPR - FCD	6		7,24	7,17	7,15	6,88	7,16	6,61	6,99	7,12	6,81	6,64
SEPR - FCI	6		6,98	6,91	6,89	6,63	6,90	6,37	6,74	6,86	6,57	6,40
Cooling capacity (AHRI 550/590)	4	[kW]	260	282	313	345	395	445	494	563	605	653
Total power input (AHRI 550/590)	4	[kW]	83,3	91,0	100,9	114,8	127,6	144,4	172,5	181,7	205,0	228,5
COP_R	4	-	3,12	3,10	3,10	3,01	3,10	3,08	2,86	3,10	2,95	2,86
IPLV	4	-	4,81	4,88	4,86	4,85	4,89	5,08	5,03	4,91	4,95	4,94

1. Data referred to the following conditions: internal exchanger water = 12/7 °C. Entering external exchanger air temperature 35°C. Evaporator fouling factor = 0.44 x 10^(-4) m2 K/W.
2. The Total Power Input value does not take into account the part related to the pumps and required to overcome the pressure drops for the circulation of the solution inside the exchangers.
3. Data compliant to Standard EN 14511:2013 referred to the following conditions: - Internal exchanger water temperature = 12/7°C - Entering external exchanger air temperature = 35°C.
4. Data compliant to Standard AHRI 550/590 referred to the following conditions: internal exchanger water temperature = 6,7 °C. Water flow-rate 0,043 l/s per kW. Entering external exchanger air temperature 35°C. Evaporator fouling factor = 0.18 x 10^(-4) m^2 K/W.
5. Data calculated according to the EN 14825:2016 Regulation
6. Data calculated according to the EU 2016/2281 Regulation

Acoustic configuration: super-silenced (EN)

General technical data - Performance

Size			90.4	100.4	110.4	120.4	140.4	160.4	180.4	200.4	220.4	240.4
Cooling												
Cooling capacity	1	[kW]	266	287	316	354	404	455	502	566	623	675
Compressor power input	1	[kW]	71,9	79,2	89,2	102	114	129	156	160	180	200
Total power input	2	[kW]	81,3	88,7	99	111	125	141	168	174	194	214
EER	1	-	3,27	3,23	3,20	3,18	3,22	3,23	2,99	3,26	3,20	3,16
Water flow-rate (User Side)	1	[l/s]	12,7	13,7	15,1	16,9	19,3	21,8	24,0	27,0	29,7	32,3
Total pressure drop user side - FCD	1	[kPa]	93,3	95,8	89,4	91,2	106,0	90,7	99,7	99,7	106,0	118,0
Total pressure drop user side - FCI	1	[kPa]	90,4	92,5	85,5	86,3	99,7	82,9	93,2	94,2	99,7	110,0
Cooling capacity (EN14511:2013)	3	[kW]	264	285	314	352	401	453	499	563	619	672
Total power input (EN14511:2013)	3	[kW]	82,9	90,5	100	113	128	143	170	177	198	217
EER (EN 14511:2013)	3	-	3,19	3,15	3,13	3,11	3,13	3,16	2,93	3,18	3,13	3,09
SEER	5	-	4,61	4,62	4,58	4,55	4,62	4,59	4,55	4,59	4,58	4,55
SEPR - FCD	6		8,16	7,83	8,08	7,98	8,03	7,92	7,99	8,15	7,81	7,92
SEPR - FCI	6		7,34	7,04	7,26	7,17	7,22	7,12	7,18	7,33	7,02	7,12
Cooling capacity (AHRI 550/590)	4	[kW]	264	285	314	352	401	452	498	562	619	671
Total power input (AHRI 550/590)	4	[kW]	81,0	88,4	98	111	125	141	167	173	194	213
COP_R	4	-	3,26	3,22	3,19	3,17	3,21	3,22	2,98	3,25	3,20	3,15
IPLV	4	-	4,86	4,95	4,99	4,86	4,94	4,87	5,05	4,92	4,96	4,98

1. Data referred to the following conditions: internal exchanger water = 12/7 °C. Entering external exchanger air temperature 35°C. Evaporator fouling factor = 0.44 x 10^(-4) m2 K/W.
2. The Total Power Input value does not take into account the part related to the pumps and required to overcome the pressure drops for the circulation of the solution inside the exchangers.
3. Data compliant to Standard EN 14511:2013 referred to the following conditions: - Internal exchanger water temperature = 12/7°C - Entering external exchanger air temperature = 35°C.
4. Data compliant to Standard AHRI 550/590 referred to the following conditions: internal exchanger water temperature = 6,7 °C. Water flow-rate 0,043 l/s per kW. Entering external exchanger air temperature 35°C. Evaporator fouling factor = 0.18 x 10^(-4) m^2 K/W.
5. Data calculated according to the EN 14825:2016 Regulation
6. Data calculated according to the EU 2016/2281 Regulation

FCD / FCI CONFIGURATION

Acoustic configuration: compressor soundproofing (SC)

General technical data - Construction

Size			90.4	100.4	110.4	120.4	140.4	160.4	180.4	200.4	220.4	240.4
Compressor												
Type of compressors		-	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll
No. of compressors		Nr	4	4	4	4	4	4	4	4	4	4
Rated power (C1)		[HP]	45	50	55	60	70	80	90	100	100	120
Rated power (C2)		[HP]	45	50	55	60	70	80	90	100	120	120
Std Capacity control steps		-	6	6	6	4	6	4	6	6	6	4
Oil charge (C1)		[l]	10	11	13	13	13	13	13	13	13	13
Oil charge (C2)		[l]	10	11	13	13	13	13	13	13	13	13
Refrigerant charge (C1)	1	[kg]	32	32	32	33	43	44	45	54	55	58
Refrigerant charge (C2)	1	[kg]	31	31	31	32	42	43	43	53	54	56
Refrigeration circuits		-	2	2	2	2	2	2	2	2	2	2
Internal exchanger												
Type of internal exchanger	2	-	PHE	PHE	PHE	PHE	PHE	PHE	PHE	PHE	PHE	PHE
Water content		[l]	20	22	24	29	32	37	42	49	58	62
System water content	3	l	937	1196	1502	1819	1840	2367	1801	2359	2436	3483
External Section Fans												
Type of fans	4	-	AX	AX	AX	AX	AX	AX	AX	AX	AX	AX
Number of fans		Nr	6	6	6	6	8	8	8	10	10	10
Type of motor	5	-	AC/P	AC/P	AC/P	AC/P	AC/P	AC/P	AC/P	AC/P	AC/P	AC/P
Standard airflow		[l/s]	32912	32912	32912	32912	43882	43882	43882	54853	54853	54853
Connections												
Water fittings		-	4"	4"	4"	4"	4"	4"	4"	5"	5"	5"
Power supply												
Standard power supply		V	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
Electrical data												
FLA Total		A	205,2	216,5	233,3	262,1	299,3	328,3	379,7	416,9	457,1	497,3
FLI Total		kW	117,7	128,6	138,2	155,8	180,7	201,9	227,5	252,4	275,8	299,2
M.I.C. - Value	6	A	455,6	466,9	483,7	512,5	619,2	648,2	649,4	686,6	726,8	767,0
M.I.C. - with soft start accessory	6	A	317,8	329,1	345,9	374,7	447,2	476,2	649,4	686,6	726,8	767,0

1. Indicative values for standard units with possible +/-10% variation. The actual data are indicated on the unit label
2. PHE = plate exchanger
3. Recommended system water content that does not consider the internal exchanger water content (evaporator). With outdoor air low temperature applications or low medium requested loads, the minimum installation water volume is obtained doubling the indicated value.
4. AX = axial fan
5. AC/P = asynchronous three-phase external rotor motor with phase cutting speed automatic control
   Unbalance between phase max 2 % Voltage variation: max +/- 10%
   Electrical data refer to standard units; according to the installed accessories, the data can suffer some variations.
6. M.I.C.=Maximum unit starting current.
   The M.I.C. value is obtained adding the max. compressor starting current of the highest size to the power input at max. admissible conditions (F.L.A.) of the remaining electric components.

Sound levels

Size	Sound power level (dB)								Sound pressure level	Sound power level
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
90.4	93	90	90	88	88	85	71	62	71	92
100.4	93	90	90	88	88	85	71	62	72	92
110.4	93	90	90	88	88	85	71	62	72	92
120.4	93	90	90	88	88	85	71	62	72	92
140.4	94	91	91	89	89	86	72	63	72	92
160.4	95	92	92	90	90	87	73	64	73	93
180.4	101	97	96	93	89	84	78	72	74	95
200.4	101	97	96	93	89	84	78	72	74	95
220.4	102	98	97	94	90	85	79	73	74	95
240.4	102	98	97	94	90	85	79	73	74	95

The sound levels refer to standard unit with Axitop (no accessories) at full load, in test nominal conditions. The sound pressure level refers to 1 m. from the standard unit outer surface operating in open field.
Measures are according to UNI EN ISO 9614-2 regulations, with respect to the EUROVENT 8/1 certification, which provides for a tolerance of 3 dB(A) on the sound power level, which is the only acoustic data to be considered binding.
If unit is set without Axitop, the sound power level presents an increase up to 3 dB(A).

Data referred to the following conditions.
- internal exchanger water = 12/7 °C
- ambient temperature = 35 °C

FCD / FCI CONFIGURATION

Acoustic configuration: super-silenced (EN)

General technical data - Construction

Size			90.4	100.4	110.4	120.4	140.4	160.4	180.4	200.4	220.4	240.4
Compressor												
Type of compressors		-	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll
No. of compressors		Nr	4	4	4	4	4	4	4	4	4	4
Rated power (C1)		[HP]	45	50	55	60	70	80	90	100	100	120
Rated power (C2)		[HP]	45	50	55	60	70	80	90	100	120	120
Std Capacity control steps		-	6	6	6	4	6	4	6	6	6	4
Oil charge (C1)		[l]	10	11	13	13	13	13	13	13	13	13
Oil charge (C2)		[l]	10	11	13	13	13	13	13	13	13	13
Refrigerant charge (C1)	1	[kg]	40	41	41	41	52	52	53	64	65	68
Refrigerant charge (C2)	1	[kg]	39	40	40	40	51	51	52	62	63	65
Refrigeration circuits		-	2	2	2	2	2	2	2	2	2	2
Internal exchanger												
Type of internal exchanger	2	-	PHE	PHE	PHE	PHE	PHE	PHE	PHE	PHE	PHE	PHE
Water content		[l]	20	22	24	29	32	37	42	49	58	62
System water content	3	l	937	1196	1502	1819	1840	2367	1801	2359	2436	3483
External Section Fans												
Type of fans	4	-	AX	AX	AX	AX	AX	AX	AX	AX	AX	AX
Number of fans		Nr	8	8	8	8	10	10	10	12	12	12
Type of motor	5	-	EC	EC	EC	EC	EC	EC	EC	EC	EC	EC
Standard airflow		[l/s]	34200	34200	34200	34200	34200	42750	42750	42750	51300	42750
Connections												
Water fittings		-	4"	4"	4"	4"	4"	4"	4"	5"	5"	5"
Power supply												
Standard power supply		V	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
Electrical data												
FLA Total		A	205,2	216,5	233,3	262,1	299,3	328,3	379,7	416,9	457,1	497,3
FLI Total		kW	117,7	128,6	138,2	155,8	180,7	201,9	227,5	252,4	275,8	299,2
M.I.C. - Value	6	A	455,6	466,9	483,7	512,5	619,2	648,2	649,4	686,6	726,8	767,0
M.I.C. - with soft start accessory	6	A	317,8	329,1	345,9	374,7	447,2	476,2	649,4	686,6	726,8	767,0

1. Indicative values for standard units with possible +/-10% variation. The actual data are indicated on the unit label
2. PHE = plate exchanger
3. Recommended system water content that does not consider the internal exchanger water content (evaporator). With outdoor air low temperature applications or low medium requested loads, the minimum installation water volume is obtained doubling the indicated value.
4. AX = axial fan
5. EC = electronic permanent-magnet switching motor without brushes with speed automatic control
   Unbalance between phase max 2 % Voltage variation: max +/- 10%
   Electrical data refer to standard units; according to the installed accessories, the data can suffer some variations.
6. M.I.C.=Maximum unit starting current.
   The M.I.C. value is obtained adding the max. compressor starting current of the highest size to the power input at max. admissible conditions (F.L.A.) of the remaining electric components.

Sound levels

Size	Sound power level (dB)								Sound pressure level	Sound power level
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
90.4	88	85	84	83	83	80	66	57	66	87
100.4	88	85	84	83	83	80	66	57	66	87
110.4	88	85	84	83	83	80	66	57	66	87
120.4	89	86	85	84	84	81	67	58	67	87
140.4	90	87	86	85	85	82	68	59	67	88
160.4	90	87	86	85	85	82	68	59	68	89
180.4	97	93	92	89	85	80	74	68	70	91
200.4	98	94	93	90	86	81	75	69	70	92
220.4	98	94	93	90	86	81	75	69	70	92
240.4	99	95	94	91	87	82	76	70	71	92

The sound levels refer to standard unit with Axitop (no accessories) at full load, in test nominal conditions. The sound pressure level refers to 1 m. from the standard unit outer surface operating in open field.
Measures are according to UNI EN ISO 9614-2 regulations, with respect to the EUROVENT 8/1 certification, which provides for a tolerance of 3 dB(A) on the sound power level, which is the only acoustic data to be considered binding.
If unit is set without Axitop, the sound power level presents an increase up to 3 dB(A).

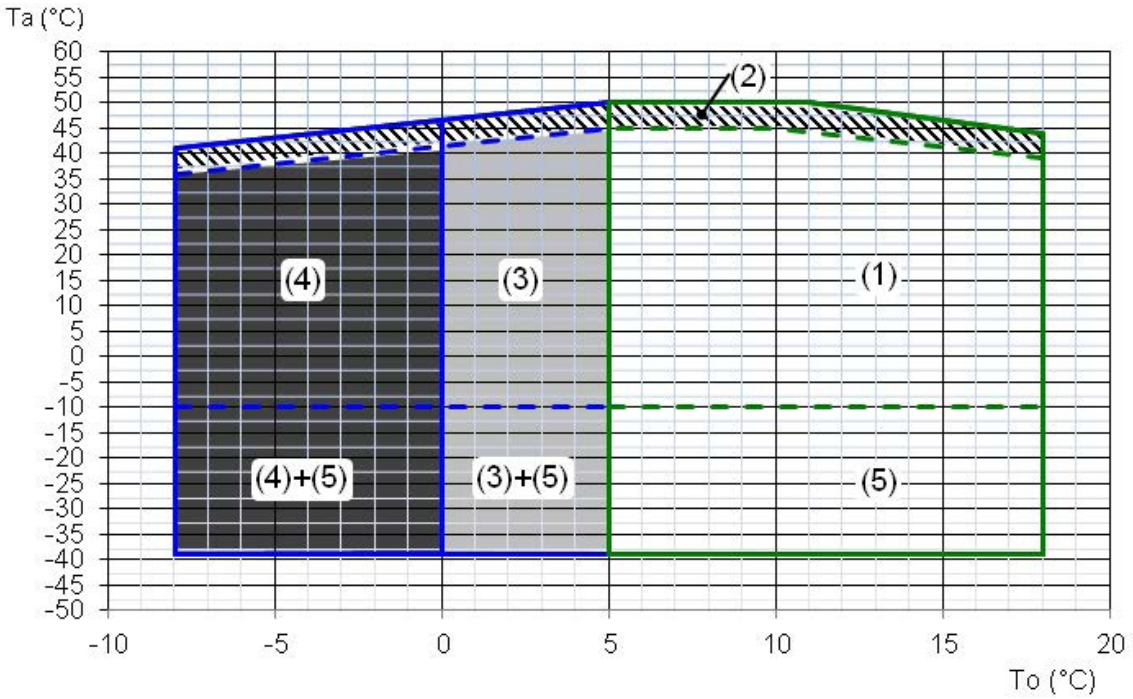
Data referred to the following conditions.
- internal exchanger water = 12/7 °C
- ambient temperature = 35 °C

The indicated sound levels are only valid within the operating field of the standard unit at full load as indicated in the 'Operating range - cooling' graph in the "Super-silenced EN" configuration. With outdoor air temperatures the unit operates at full load automatically increasing the airflow and taking the same sound levels of the "Soundproofed Compressors SC" configuration.

Operating range - Cooling

FCD / FCI CONFIGURATION

Acoustic configuration: compressor soundproofing (SC) / super-silenced (EN)



Ta (°C) = entering external exchanger air temperature (D.B.)
To (°C) = leaving internal exchanger water temperature

1. Standard unit operating range
2. Unit operating range with automatic partialisation of the compressor capacity
3. Unit operating range in 'B - Low water temperature' configuration (40% ethylene glycol)
4. Extended of operating range (extremely low water temperature option available on request)
5. Unit operating range as "Unit equipment with outdoor air low temperatures" table

Admissible water flow-rates

Minimum (Qmin) and maximum (Qmax) admissible water flow for the unit to operate correctly.

EXCELLENCE SC / EN		90.4	100.4	110.4	120.4	140.4	160.4	180.4	200.4	220.4	240.4
Qmin	[l/s]	6,7	7,4	8,0	9,3	10,1	11,5	12,8	14,3	15,8	16,4
Qmax	[l/s]	18,3	20,0	21,8	25,1	27,5	31,2	34,5	38,6	42,4	44,0

Correction factors for ethylene glycol use

% ethylene glycol by weight		5%	10%	15%	20%	25%	30%	35%	40%	50%	60%
Freezing temperature	°C	-2,0	-3,9	-6,5	-8,9	-11,8	-15,6	-19,0	-23,4	-33,0	-39,0
Safety temperature	°C	3,0	1,0	-1,0	-4,0	-6,0	-10,0	-14,0	-19,0	-30,0	-36,0
Cooling Capacity Factor	Nr	0,997	0,994	0,990	0,986	0,981	0,976	0,970	0,964	0,950	0,942
Compressor power input Factor	Nr	1,000	1,001	1,001	1,001	1,001	1,002	1,002	1,002	1,003	1,003
Internal exchanger glycol solution flow factor	Nr	1,003	1,010	1,020	1,033	1,050	1,072	1,095	1,124	1,184	1,221
Pressure drop Factor	Nr	0,989	0,983	0,979	0,980	0,984	0,993	1,004	1,020	1,049	1,073

The correction factors shown refer to water and ethylene glycol mixes used to prevent the formation of frost on the exchangers in the hydraulic circuit during inactivity in winter.

Correction factors for propylene glycol use

% propylene glycol by weight		10%	20%	30%	40%	50%
Freezing temperature	°C	-1,3	-7,1	-12,7	-21,1	-33,5
Safety temperature	°C	3,7	-2,1	-7,7	-16,1	-28,5
Cooling Capacity Factor	Nr	0,985	0,964	0,932	0,889	0,846
Compressor power input Factor	Nr	0,993	0,983	0,969	0,948	0,929
Internal exchanger glycol solution flow factor	Nr	1,017	1,032	1,056	1,092	1,139
Pressure drop Factor	Nr	1,120	1,272	1,496	1,792	2,128

The correction factors shown refer to water and propylene glycol mixes used to prevent the formation of frost on the exchangers in the hydraulic circuit during inactivity in winter.

Fouling Correction Factors

	Internal exchanger	
m2 K / W	F1	FK1
0.44 x 10 (-4)	1,0	1,0
0.88 x 10 (-4)	0,97	0,99
1.76 x 10 (-4)	0,94	0,98

F1 = Cooling capacity correction factors
FK1 = Compressor power input correction factor

Overload and control device calibrations

			open	closed	value
High pressure safety pressure switch		[kPa]	4050	3300	-
Antifreeze protection		[°C]	3	5.5	-
High pressure safety valve		[kPa]	-	-	4500
Low pressure safety valve		[kPa]	-	-	2950
Max no. of compressor starts per hour		[n°]	-	-	10
High compressor discharge temperature safety thermostat		[°C]	-	-	140

Exchanger operating range

	Internal exchanger		
	DPr		DPw
PED (CE)	4500	4500	1000

DPr = Maximum operating pressure on refrigerant side in kPa
DPw = Maximum operating pressure on water side in kPa

FCD / FCI CONFIGURATION

Acoustic configuration: compressor soundproofing (SC)

Cooling performance (continued)

Size	To (°C)	Entering external exchanger air temperature (°C)											
		25		30		35		40		45		50	
		kWf	kWe	kWf	kWe	kWf	kWe	kWf	kWe	kWf	kWe	kWf	kWe
90.4	5	276	60.3	262	66.1	245	72.8	226	79.9	213	87.9	70.9	28.9
	6	284	60.9	269	66.7	251	73.4	234	80.5	219	89.2	73.1	29.3
	7	293	61.7	277	67.2	261	73.7	242	81.2	231	90.6	77.0	29.8
	10	322	63.9	306	69.5	286	76.0	265	83.1	253	92.0	84.5	30.2
	15	367	66.8	346	73.1	323	79.7	300	86.8	182	48.2	-	-
	18	398	69.3	375	75.6	350	82.1	326	89.6	-	-	-	-
100.4	5	299	66.5	285	72.8	267	79.9	247	87.9	231	97.7	142	64.2
	6	308	67.0	293	73.4	275	80.5	254	88.5	239	98.5	147	64.6
	7	319	67.9	301	74.0	284	81.4	265	89.6	248	99.6	153	65.4
	10	351	70.3	333	76.8	312	83.9	289	91.8	275	102	169	66.8
	15	399	74.1	378	80.7	353	88.1	328	96.1	215	59.0	-	-
	18	433	77.0	410	83.7	382	91.2	356	99.5	-	-	-	-
110.4	5	334	74.8	315	81.8	295	89.5	275	98.3	257	108	145	63.4
	6	344	75.6	326	82.7	305	90.4	282	99.0	268	109	151	64.1
	7	353	76.4	335	83.5	314	91.3	294	100	280	111	158	64.8
	10	391	79.3	369	86.6	345	94.4	319	103	304	113	171	66.0
	15	444	83.6	418	91.0	390	99.0	363	108	218	59.1	-	-
	18	481	87.0	453	94.3	422	102	395	111	-	-	-	-
120.4	5	367	86.1	348	94.2	327	103	302	113	284	121	209	95.3
	6	377	86.9	358	95.1	336	104	313	114	292	122	214	95.8
	7	391	88.1	371	96.3	347	105	326	116	307	123	225	97.1
	10	430	91.2	407	99.6	380	109	352	119	334	126	247	99.2
	15	489	96.3	465	105	430	114	403	125	286	83.4	-	-
	18	535	101	504	110	469	119	437	129	-	-	-	-
140.4	5	418	94.5	398	103	374	113	347	123	327	137	182	80.1
	6	429	95.4	409	104	384	114	359	125	335	138	187	80.6
	7	445	96.8	423	106	397	115	373	126	352	140	196	81.8
	10	488	101	463	109	435	119	403	130	385	143	215	84.1
	15	554	106	525	115	491	125	457	136	276	75.2	-	-
	18	606	111	568	120	531	130	495	140	-	-	-	-
160.4	5	469	109	444	118	418	129	390	141	366	155	185	81.2
	6	483	110	460	120	433	131	401	142	380	156	192	82.0
	7	499	112	473	121	447	132	417	144	392	158	198	82.8
	10	548	116	521	126	489	137	453	148	435	163	220	85.5
	15	622	124	589	134	552	144	513	156	290	73.2	-	-
	18	675	129	638	139	596	149	557	161	-	-	-	-
180.4	5	523	129	497	142	465	156	432	172	403	184	266	129
	6	543	130	515	143	481	157	443	173	417	186	276	131
	7	556	132	528	144	496	159	458	174	430	188	285	132
	10	614	136	580	149	541	163	499	179	475	192	317	135
	15	694	143	655	156	609	171	569	187	446	147	-	-
	18	751	149	711	162	658	176	613	192	-	-	-	-
200.4	5	594	137	567	149	532	163	492	179	455	198	266	129
	6	610	138	583	150	546	164	509	180	469	199	274	130
	7	631	140	603	152	565	166	522	182	486	201	284	131
	10	687	145	648	157	607	171	565	187	529	206	309	134
	15	786	154	739	166	695	181	647	195	380	108	-	-
	18	845	160	799	172	747	186	694	201	-	-	-	-
220.4	5	640	155	610	169	573	186	533	204	495	219	369	179
	6	660	156	629	171	589	187	547	206	509	220	380	180
	7	680	158	646	173	607	189	559	207	520	222	388	181
	10	719	162	681	176	643	193	596	213	557	226	417	184
	15	784	168	746	183	703	200	662	221	488	159	-	-
	18	841	173	802	189	752	205	699	227	-	-	-	-

kWf = Cooling capacity in kW. The data do not consider the part related to the pumps, required to overcome the pressure drop for the solution circulation inside the exchangers
kWe = Compressor power input in kW
To (°C) = Leaving internal exchanger water temperature (°C) - Performances in function of the inlet/outlet water temperature differential = 5°C

FCD / FCI CONFIGURATION

Acoustic configuration: compressor soundproofing (SC)

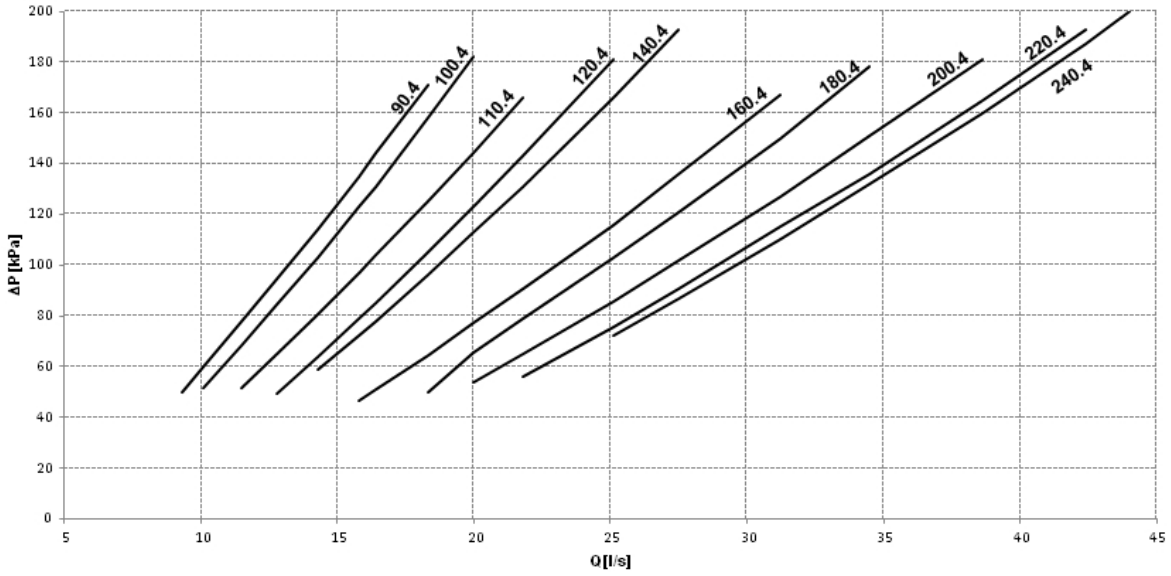
Cooling performance

Size	To (°C)	Entering external exchanger air temperature (°C)											
		25		30		35		40		45		50	
		kWf	kWe	kWf	kWe	kWf	kWe	kWf	kWe	kWf	kWe	kWf	kWe
240.4	5	704	174	670	190	626	209	576	230	535	245	389	193
	6	724	176	688	192	642	211	595	232	552	247	400	195
	7	743	177	705	194	656	212	606	233	561	248	406	195
	10	779	180	736	197	687	216	639	239	592	253	429	198
	15	854	187	808	204	761	224	704	245	499	165	-	-
	18	920	194	875	211	813	230	753	251	-	-	-	-

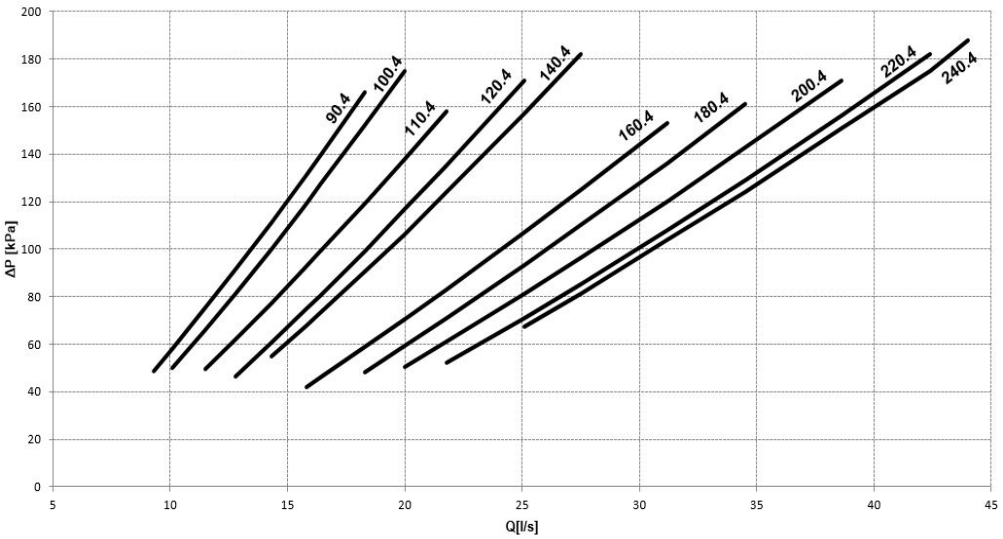
kWf = Cooling capacity in kW. The data do not consider the part related to the pumps, required to overcome the pressure drop for the solution circulation inside the exchangers
kWe = Compressor power input in kW
To (°C) = Leaving internal exchanger water temperature (°C) - Performances in function of the inlet/outlet water temperature differential = 5°C

Pressure drop of the whole unit hydraulic circuit

FCD - Direct FREE-COOLING



FCI - No-glycol FREE-COOLING



Q = water flow-rate [l/s]
DP = pressure drop water side [kPa]

To the overall (valves, pipes, internal exchangers) pressure drops must be added the pressure drops of the steel mesh mechanical filter (not supplied) that must be placed on the water input line. It is a device compulsory for the correct unit operation and it must be selected and installed by the Customer. It is forbidden the use of filters with the mesh pitch higher than 1,0 mm. Filters with higher mesh pitch can cause a bad unit operation and also its serious damaging.

FCD / FCI CONFIGURATION

Acoustic configuration: super-silenced (EN)

Cooling performance (continued)

Size	To (°C)	Entering external exchanger air temperature (°C)											
		25		30		35		40		45		50	
		kWf	kWe	kWf	kWe	kWf	kWe	kWf	kWe	kWf	kWe	kWf	kWe
90.4	5	284	58.8	268	64.6	251	70.5	232	77.0	214	87.2	74.7	27.2
	6	292	59.4	276	65.0	259	71.4	239	78.1	220	88.5	76.9	27.6
	7	302	60.1	286	65.7	266	71.9	247	79.1	232	89.8	81.1	28.0
	10	331	62.2	312	67.9	292	74.7	271	81.2	255	91.2	89.0	28.4
	15	378	65.8	354	71.9	330	78.0	308	85.0	183	47.8	-	-
	18	409	68.3	382	74.5	355	81.0	336	87.6	-	-	-	-
100.4	5	306	64.7	289	70.8	270	77.6	250	85.1	231	96.4	149	60.1
	6	314	65.3	298	71.5	280	78.5	259	86.0	238	97.1	154	60.6
	7	325	66.2	308	72.4	287	79.2	267	87.0	248	98.2	160	61.2
	10	357	68.6	337	74.9	316	82.2	291	89.5	275	100	177	62.6
	15	407	72.9	383	79.3	357	86.3	333	94.3	214	58.2	-	-
	18	440	76.0	414	82.5	388	90.0	363	97.5	-	-	-	-
110.4	5	337	73.0	318	79.8	296	87.2	274	95.3	254	107	150	59.3
	6	346	73.7	326	80.6	306	88.2	283	96.4	264	108	156	59.9
	7	358	74.7	337	81.6	316	89.2	293	97.4	277	109	163	60.6
	10	391	77.5	368	84.4	342	92.0	318	100	301	111	177	61.7
	15	445	82.5	417	89.4	388	96.9	365	105	216	58.2	-	-
	18	480	85.7	449	92.8	423	101	397	109	-	-	-	-
120.4	5	374	83.0	353	90.8	332	99.6	307	109	287	122	151	59.9
	6	387	84.1	366	91.9	341	101	315	110	294	122	155	60.2
	7	398	84.9	375	92.9	354	102	328	111	310	124	163	61.0
	10	439	88.5	413	96.4	384	105	356	115	339	127	178	62.4
	15	496	94.1	465	102	433	111	406	120	226	56.9	-	-
	18	536	98.3	501	106	467	115	443	125	-	-	-	-
140.4	5	430	93.7	407	102	381	112	355	122	328	138	192	76.6
	6	445	95.1	422	104	394	113	365	123	336	138	196	77.1
	7	457	96.1	432	105	404	114	379	125	354	140	207	78.2
	10	503	100	475	109	443	118	412	129	387	144	226	80.4
	15	568	107	535	115	499	125	467	135	277	75.6	-	-
	18	613	111	577	120	539	129	508	140	-	-	-	-
160.4	5	485	107	460	116	430	126	401	137	369	153	196	76.3
	6	498	108	472	117	444	128	412	139	383	155	203	77.1
	7	515	109	488	119	455	129	426	140	396	156	210	77.8
	10	563	114	532	123	497	134	462	145	439	161	233	80.3
	15	640	122	603	131	562	141	527	153	293	72.3	-	-
	18	690	127	649	137	606	147	573	159	-	-	-	-
180.4	5	542	127	512	139	475	153	440	168	421	181	282	125
	6	557	128	524	141	490	155	452	170	435	182	292	127
	7	576	130	540	143	502	156	469	172	450	184	302	128
	10	626	135	592	147	549	161	508	176	495	189	336	131
	15	709	143	663	155	615	169	578	184	463	144	-	-
	18	762	148	712	161	662	175	631	190	-	-	-	-
200.4	5	604	131	573	143	534	157	496	172	452	192	277	119
	6	623	134	590	146	551	159	509	173	466	194	285	120
	7	639	135	607	147	566	160	524	176	483	196	296	121
	10	694	140	657	152	612	165	566	180	525	200	322	124
	15	790	149	742	161	692	174	645	188	405	113	-	-
	18	844	155	799	168	746	180	694	194	-	-	-	-
220.4	5	668	147	632	161	591	177	544	193	504	217	284	118
	6	688	149	650	163	606	178	561	195	518	218	292	119
	7	705	150	668	165	623	180	574	197	529	219	298	120
	10	745	154	699	168	649	183	598	200	570	222	321	121
	15	811	160	766	174	715	190	669	208	409	117	-	-
	18	872	166	820	180	770	197	718	213	-	-	-	-

kWf = Cooling capacity in kW. The data do not consider the part related to the pumps, required to overcome the pressure drop for the solution circulation inside the exchangers
kWe = Compressor power input in kW
To (°C) = Leaving internal exchanger water temperature (°C) - Performances in function of the inlet/outlet water temperature differential = 5°C

FCD / FCI CONFIGURATION

Acoustic configuration: super-silenced (EN)

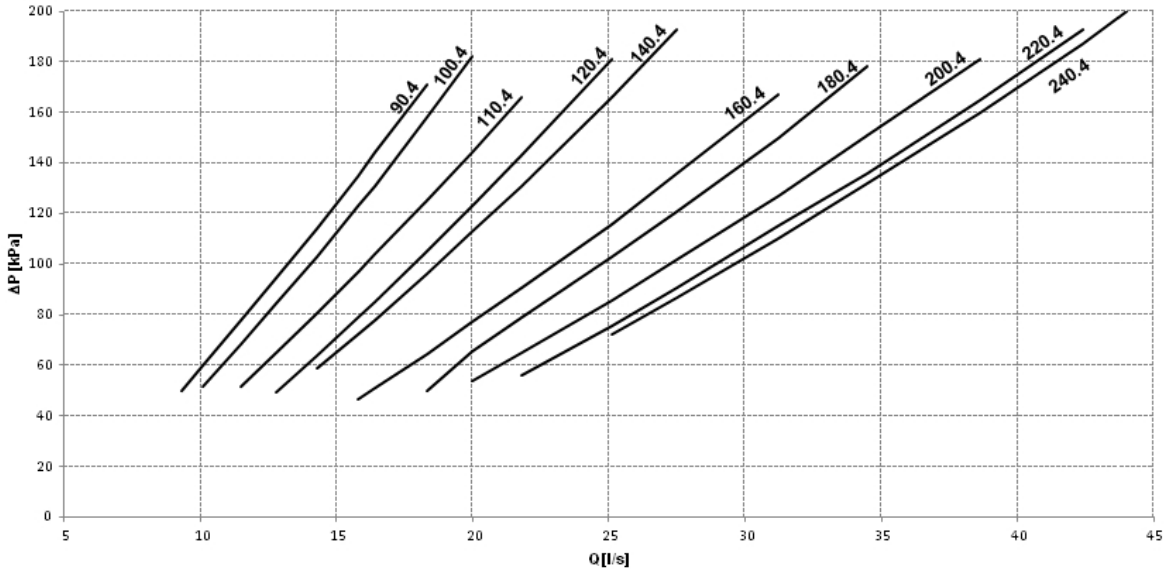
Cooling performance

Size	To (°C)	Entering external exchanger air temperature (°C)											
		25		30		35		40		45		50	
		kWf	kWe	kWf	kWe	kWf	kWe	kWf	kWe	kWf	kWe	kWf	kWe
240.4	5	736	163	694	179	647	197	594	216	569	232	421	180
	6	755	165	711	181	663	199	610	218	585	234	434	181
	7	774	167	730	183	675	200	621	219	594	235	440	182
	10	813	170	761	186	705	203	648	222	624	238	464	184
	15	885	177	830	193	776	211	728	231	527	156	-	-
	18	952	184	891	200	826	217	782	237	-	-	-	-

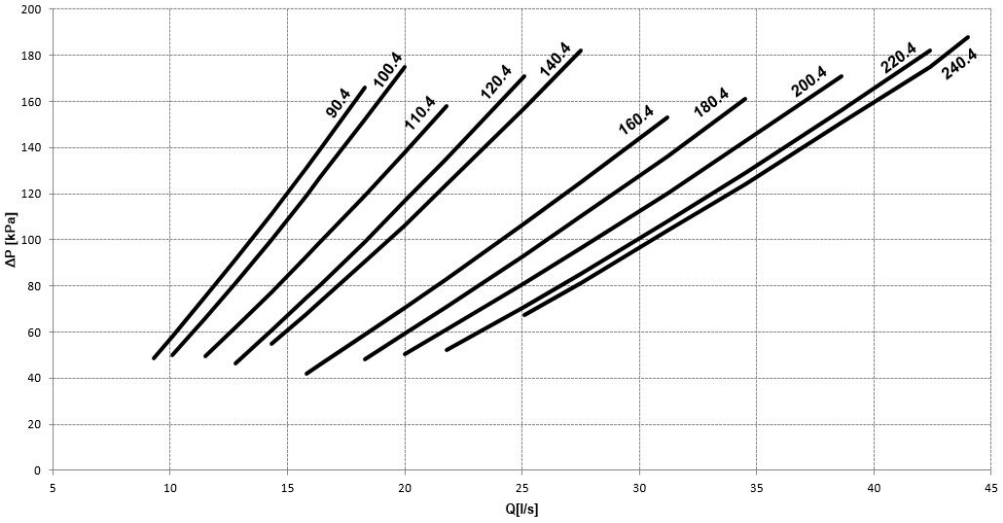
kWf = Cooling capacity in kW. The data do not consider the part related to the pumps, required to overcome the pressure drop for the solution circulation inside the exchangers
kWe = Compressor power input in kW
To (°C) = Leaving internal exchanger water temperature (°C) - Performances in function of the inlet/outlet water temperature differential = 5°C

Pressure drop of the whole unit hydraulic circuit

FCD - Direct FREE-COOLING



FCI - No-glycol FREE-COOLING



Q = water flow-rate [l/s]
DP = pressure drop water side [kPa]

To the overall (valves, pipes, internal exchangers) pressure drops must be added the pressure drops of the steel mesh mechanical filter (not supplied) that must be placed on the water input line. It is a device compulsory for the correct unit operation and it must be selected and installed by the Customer. It is forbidden the use of filters with the mesh pitch higher than 1,0 mm. Filters with higher mesh pitch can cause a bad unit operation and also its serious damaging.

Configurations

Consult the "Option compatibility" section.

B - Low water temperature (Brine)

Configuration also known as "Brine". Enables an "unfreezable" solution to be cooled (for example, water and ethylene glycol in suitable quantities) up to a temperature of between +4°C and –8°C. It includes:

- suitable exchangers with extra-thick closed-cell insulation;
- electronic expansion valve, functional calibration and safety devices suitable for particular uses.

During the selection phase it is necessary to indicate the required operating type, the unit will be optimised on the basis of this: - Unit with single operating set-point (only at low temperature) - Unit with double operating set-point.

The unit in this configuration has a different operation range, indicated in the operating range section.

In low temperature operation, some staging steps could not be available.

The glycol concentration must be chosen based on the minimum temperature the water can reach. The presence of glycol influences pressure drops on the water side and the unit's output as indicated in the table reporting the "correction factors for use with glycol".

FCD - Direct FREE-COOLING

Configurtion that allows for considerable savings on the system's running costs in applications that require chilled water also during the cold season, such as industrial processes, data centres, telecommunications, technological applications and shopping centres. When the outdoor air temperature is lower than the temperature of the system's return water, the FREE-COOLING system recovers cold from the external environment and reduces the operation of the compressors until they stop completely. The higher the temperature of the chilled water in the system (e.g. 10-15°C instead of 7-12°C), the greater the operating range of the FREE-COOLING system and, therefore, the higher the energy savings.

Use of anti-freeze solutions

The FREE-COOLING configuration is particularly indicated in buildings where, at least in certain periods of the year, the temperature of the outdoor air also reaches very low values. For this reason the liquid must be protected from the risk of freezing, typically using the addition of a suitable anti-freeze substance such as ethylene glycol. The percentage of glycol in the solution depends on the minimum temperature value foreseen in the installation zone, and is in any case within the fundamental parameters of the plan for the system.

Management logic

There are three main operating modes, which basically differ in terms of position of the three-way switching valve and the number of active compressors.

(A) Summer

In the summer season, with outdoor air temperatures which are greater than the return temperature of the liquid in the system, the three-way valve is switched in such a way as to exclude the FREE-COOLING coils. The cooling of the liquid is referred to the direct expansion circuit, with the intervention of the compressors as in a traditional chiller.

(B) Intermediate season

In the winter season, or rather with the outdoor air temperature at a little below the return water temperature of the system, when the unit identifies that the temperature conditions are favourable:

- switches the position of the tree-way valve, forcing the solution to transit through the FRE-COOLING coils before reaching the evaporator;
- brings the fans to maximum speed to make the most of the cooling of the solution carried out by the outdoor air
- conducts a first cooling of the solution in a 'natural way and free of charge';
- provides any missing capacity via the cooling circuit using compressors with partial operation (power input proportional to the partialisation level).

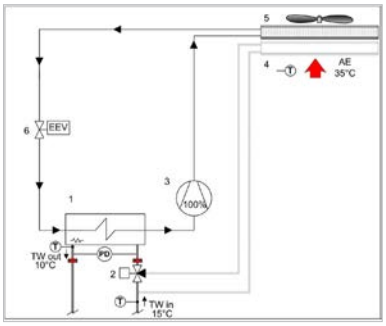
If the outdoor air temperature should increase, the microprocessor automatically converts the operating mode to the summer mode, guaranteeing the conditions requested by the user at all times.

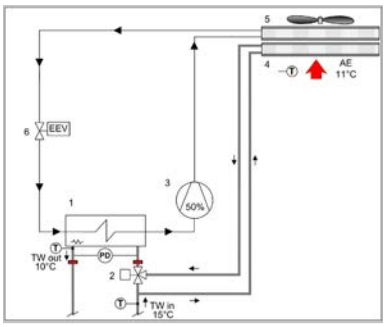
(C) Winter

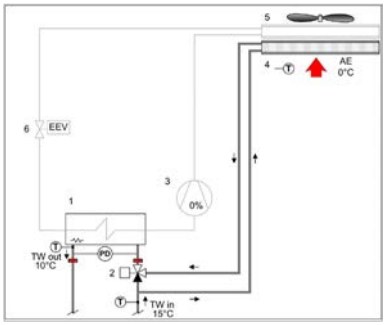
In the winter season, with the outdoor air temperature below the return water temperature of the system, the unit identifies that the temperature conditions are favourable for operating in FREE-COOLING mode:

- the 3-way valve is switched like in the previous case, forcing the solution to transit through the FREE-COOLING coils before reaching the evaporator;
- the outdoor air temperature brings the solution at the outlet of the FREE-COOLING coils already at the temperature required by the utility;
- the microprocessor control completely deactivates all the compressors which supply all the requested cooling capacity at no cost, in contrast to traditional chillers.

The difference between the outdoor air temperature and that requested for use could also be such as to lower the temperature of the solution at the output of the FREE-COOLING coils to below the set-point requested for use. This is a condition which does not prejudice the safety of the unit thanks to the presence of anti-freeze in the solution. The microprocessor modulates fan speed up to the point where they are switched off. If, with all the fans switched, off the temperature continues to decrease, the three-way valve positions itself automatically in the summer operational mode, thus enabling the requested set-point to be maintained.







1 - Internal exchanger
2 -Three-way valve for FREE-COOLING
3 -Compressors
4 - External exchanger
5 -External fan
6 -Expansion electronic valve
T - Temperature probe
TW in chilled water inlet
TW out chilled water outlet
AE - Outdoor air
PD - Differential pressure switch

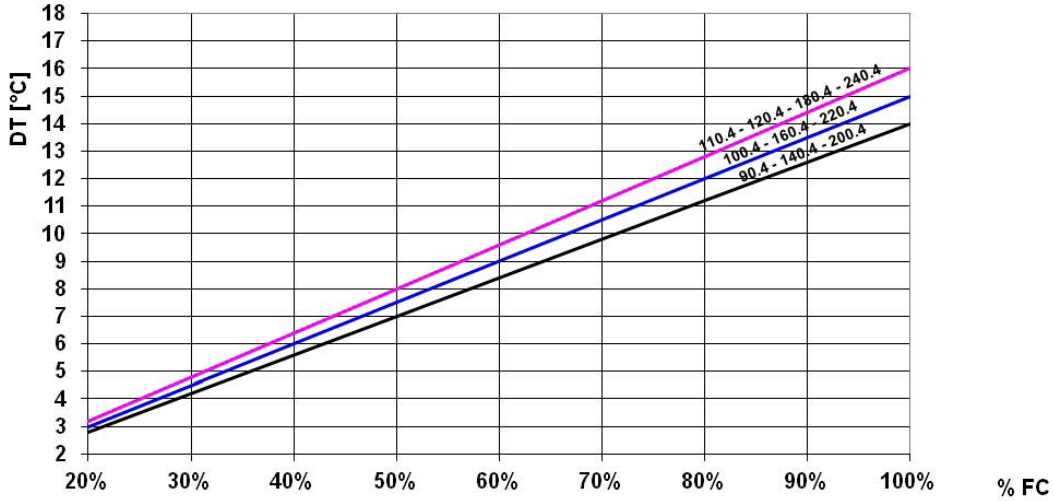
Check availability and compatibility of 'FCD - Direct FREE-COOLING' with the other accessories in the "Option compatibility" table.

Determination of chiller performance with direct FREE-COOLING in conditions of FC = ON

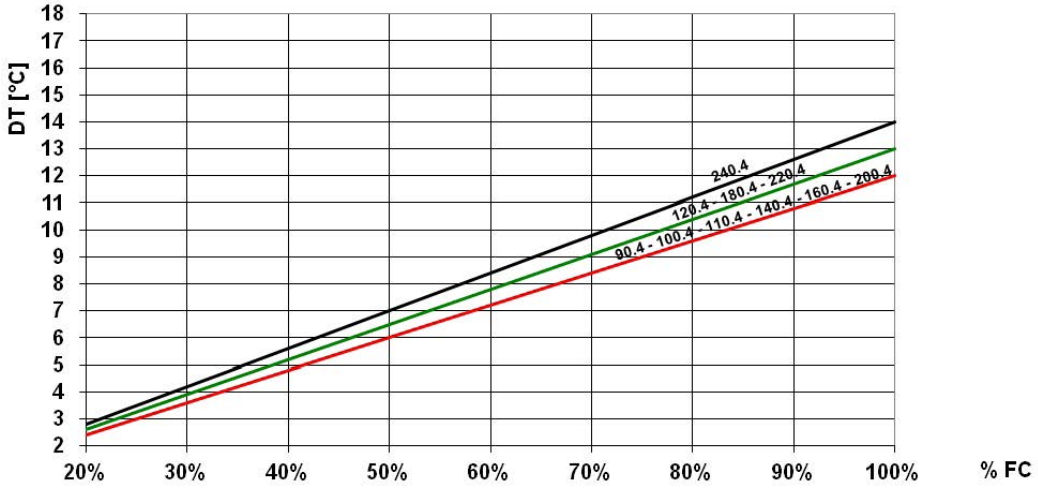
Size			90.4	100.4	110.4	120.4	140.4	160.4	180.4	200.4	220.4	240.4
SC	FREE-COOLING (1) nominal capacity	kW	299	325	361	397	452	509	566	632	664	718
	Air temperature with FREE-COOLING at 100% (1)	°C	1,2	0,4	-0,5	-1,4	1,3	0,2	-0,9	0,8	0,3	-0,6
EN	FREE-COOLING (1) nominal capacity	kW	305	329	359	403	464	519	578	641	683	742
	Air temperature with FREE-COOLING at 100% (1)	°C	3,5	3,2	2,8	2,1	3,4	2,6	1,8	2,7	2,2	1,5

(1) Data refer to the following conditions:
- water temperature: 15°C inlet / 10°C outlet
- glycol percentage 30%

Determination of the direct FREE-COOLING percentage - SC configuration



Determination of the direct FREE-COOLING percentage - EN configuration



KEY
DT [°C] = Temperature difference between the system return water and the outdoor air

% FC = FREE-COOLING percentage (in relation to the rated FREE-COOLING capacity)

Example: Determine the performances with outdoor air = +2°C for the following unit: WSAT-XSC3 90.4 FCD EXC SC (EXCELLENCE version, direct FREE-COOLING configuration), with water 15/10 °C / 30% glycol.

Reference: WSAT-XSC3 90.4 FCD EXC SC: FREE-COOLING nominal capacity = 299 kW (from table with water 15/10 °C / 30% glycol/ outdoor air temperature 1,2°C).

Calculation: Difference between the installation return water and the outdoor air = 15°C - 2°C = 13°C.

The graph shows that: FREE-COOLING percentage = 93%: direct FREE-COOLING capacity at +2°C outdoors = 299 x 93% = 278 kW.

FCI - No-glycol FREE-COOLING

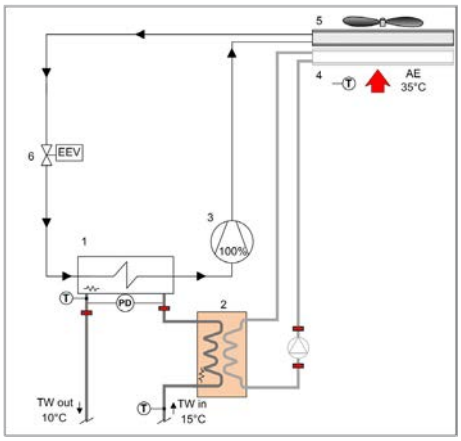
Configurtion that allows for considerable savings on the system's running costs in applications that require chilled water also during the cold season, such as industrial processes, data centres, telecommunications, technological applications and shopping centres. Does not require the addition of an antifreeze substance in the hydraulic circuit used. Therefore, it is particularly suitable for large-sized systems and wherever laws and regulations limit the use of antifreeze substances inside buildings. Moreover, it does not affect the performance of terminal units and the system's pumping units. When the outdoor air temperature is lower than the temperature of the system's return water, the FREE-COOLING system recovers cold from the external environment and reduces the operation of the compressors until they stop completely. The higher the temperature of the chilled water in the system (e.g. 10-15°C instead of 7-12°C), the greater the operating range of the FREE-COOLING system and, therefore, the higher the energy savings.

Management logic

There are three main operating modes, which basically differ in terms of activation of the FREE-COOLING circuit electric pump and the number of active compressors:

(A) Summer

In the summer season, with outdoor air temperatures which are greater than the return temperature of the liquid in the system, the electric pump is off and the fluid circulation by the FREE-COOLING coils is not present. The cooling of the liquid is referred to the direct expansion circuit, with the intervention of the compressors as in a traditional chiller.

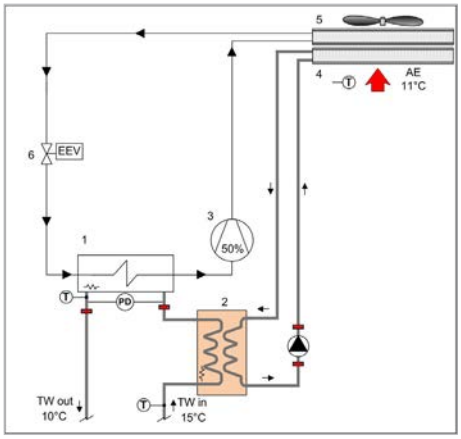


(B) Intermediate season

In the winter season, or rather with the outdoor air temperature at a little below the return water temperature of the system, when the unit identifies that the temperature conditions are favourable:

- activates the electric pump of the FREE-COOLING circuit by creating an exchange of energy between the liquid in the system and the FREE-COOLING circuit before reaching the evaporator;
- brings the fans to maximum speed to make the most of the cooling of the solution carried out by the outdoor air;
- conducts a first cooling of the solution in a 'natural way and free of charge';
- provides any missing capacity via the cooling circuit using compressors with partial operation (power input proportional to the partialisation level);

If the outdoor air temperature should increase, the microprocessor automatically converts the operating mode to the summer mode, guaranteeing the conditions requested by the user at all times.

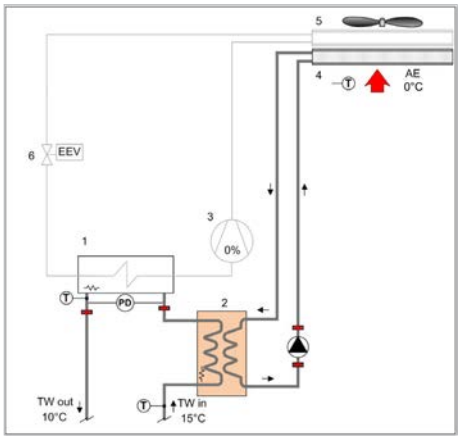


(C) Winter

In the winter season, with the outdoor air temperature below the return water temperature of the system, the unit identifies that the temperature conditions are favourable for operating in FREE-COOLING mode:

- as in the previous scenario, it activates the electric pump on the FREE-COOLING circuit by creating an exchange of energy between the liquid in the system and the FREE-COOLING circuit before reaching the evaporator;
- acts on the speed of the fans until it turns them off in order to reach the temperature required on the system's supply line;
- the microprocessor control turns off all the compressors by releasing all the desired cooling capacity AT ZERO COST, unlike traditional chillers;

If the temperature keeps dropping with all the fans off, the electric pump turns off, which allows the desired set point value to be maintained.



1 - Internal exchanger
2 -Water-water intermediate exchanger
3 -Compressors
4 - External exchanger
5 -External fan
6 -Expansion electronic valve
T - Temperature probe
PD - Differential pressure switch
TW in chilled water inlet
TW out chilled water outlet
AE Outdoor air
PD - Differential pressure switch

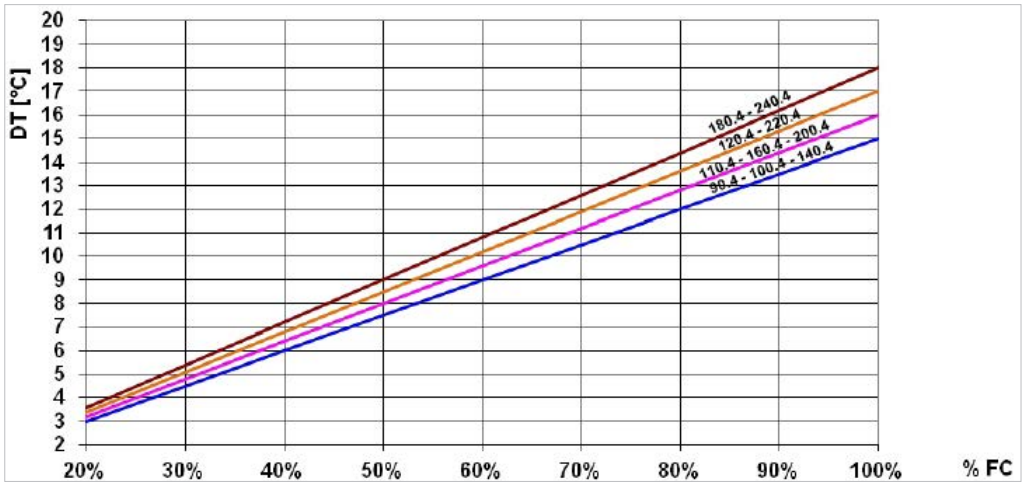
Check availability and compatibility of 'FCI - No-glycol FREE-COOLING' with the other accessories in the "Option compatibility" table

Determination of chiller performance with no-glycol FREE-COOLING in conditions of FC = ON

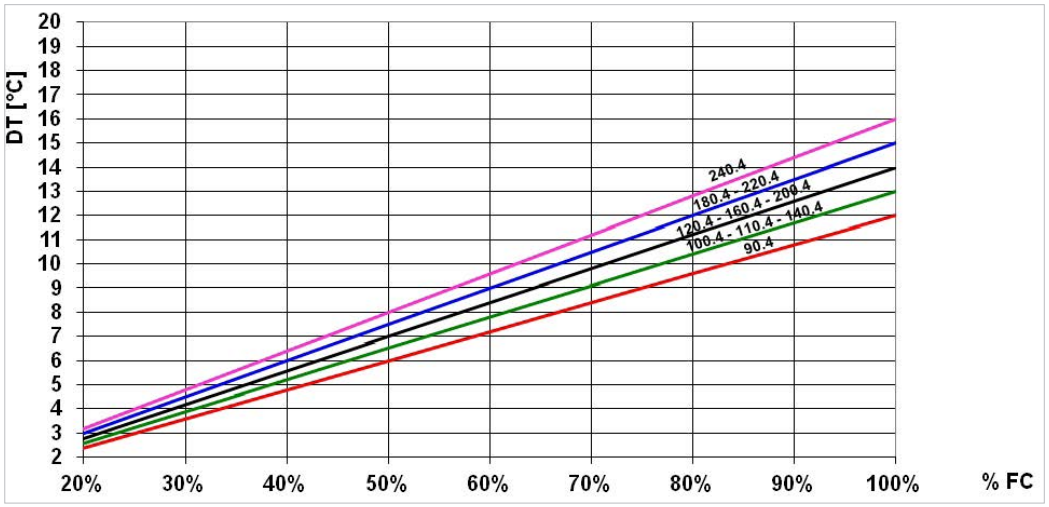
Size			90.4	100.4	110.4	120.4	140.4	160.4	180.4	200.4	220.4	240.4
SC	FREE-COOLING (1) nominal capacity	kW	306	333	369	407	463	521	580	648	681	736
	Air temperature with FREE-COOLING at 100% (1)	°C	0,5	-0,3	-1,3	-2,4	-0,2	-1,4	-2,7	-1,2	-1,7	-2,7
EN	FREE-COOLING (1) nominal capacity	kW	312	337	368	413	475	532	592	657	699	761
	Air temperature with FREE-COOLING at 100% (1)	°C	2,8	2,4	1,7	0,8	1,7	0,8	-0,1	0,7	0,1	-0,7

(1) Data refer to the following conditions:
- water temperature: 15°C inlet / 10°C outlet
- % of glycol in the system: 10%;
- % of glycol in the unit internal closed circuit: 30%.

Determination of the no-glycol FREE-COOLING percentage - SC configuration



Determination of the no-glycol FREE-COOLING percentage - EN configuration



KEY
DT [°C] = Temperature difference between the system return water and the outdoor air

% FC = FREE-COOLING percentage (in relation to the rated FREE-COOLING capacity)

Example: Determine the performances with outdoor air = +2°C for the following unit: WSAT-XSC3 90.4 FCI EXC SC (EXCELLENCE version, No-glycol FREE-COOLING configuration), with water at 15/10 °C / 0% of glycol in the system.

Reference: WSAT-XSC3 90.4 FCI EXC SC: FREE-COOLING nominal capacity = 306 kW (from table with water 15/10 °C / outdoor air temperature 0,5°C).

Calculation: Difference between the installation return water and the outdoor air = 15°C - 2°C = 13°C.

The graph shows that: FREE-COOLING percentage = 86% : FREE-COOLING capacity at +2°C outdoors = 306 x 86% = 263 kW.

WOGLY - Unit supplied without glycol solution

The standard unit is supplied with antifreeze solution in the FREE-COOLING separated circuit. With WOGLY option the unit is supplied without antifreeze solution with the advantage of a reduction of shipping weight of 10% as well as a saving on the initial investment.

The antifreeze solution supply and charge are provided by the Customer. Refer to the Installation and Operating manual for the charging procedures.

For the water + glycol solution content, refer to the ' Quantity of glycol in the no-glycol FREE-COOLING' table.

Option valid in combination with 'FCI - no-glycol FREE-COOLING'.

Quantity of glycol in the no-glycol FREE-COOLING

Size			90.4	100.4	110.4	120.4	140.4	160.4	180.4	200.4	220.4	240.4
SC	Water solution total volume + glycol	l	218	220	224	232	286	292	298	358	364	370
	30% ethylene glycol											
	Freezing temperature	°C	-15,4									
	Ethylene glycol volume	l	65	66	67	70	86	88	89	107	109	111
	Glycol solution total weight	kg	226	228	232	240	296	303	309	371	377	383
	40% ethylene glycol											
	Freezing temperature	°C	-23,4									
	Ethylene glycol volume	l	87	88	90	93	114	117	119	143	146	148
	Glycol solution total weight	kg	229	231	235	243	300	306	312	375	382	388
	50% ethylene glycol											
	Freezing temperature	°C	-33,0									
	Ethylene glycol volume	l	109	110	112	116	143	146	149	179	182	185
	Glycol solution total weight	kg	231	233	238	246	303	310	316	380	386	392
	60% ethylene glycol											
	Freezing temperature	°C	-39,0									
	Ethylene glycol volume	l	131	132	134	139	172	175	179	215	218	222
	Glycol solution total weight	kg	234	236	240	249	307	313	320	384	390	397

Size			90.4	100.4	110.4	120.4	140.4	160.4	180.4	200.4	220.4	240.4
EN	Water solution total volume + glycol	l	262	270	273	278	358	364	370	398	401	414
	30% ethylene glycol											
	Freezing temperature	°C	-15,4									
	Ethylene glycol volume	l	79	81	82	83	107	109	111	119	120	124
	Glycol solution total weight	kg	271	280	283	288	371	377	383	412	416	429
	40% ethylene glycol											
	Freezing temperature	°C	-23,4									
	Ethylene glycol volume	l	105	108	109	111	143	146	148	159	160	166
	Glycol solution total weight	kg	275	283	286	291	375	382	388	417	420	434
	50% ethylene glycol											
	Freezing temperature	°C	-33,0									
	Ethylene glycol volume	l	131	135	137	139	179	182	185	199	201	207
	Glycol solution total weight	kg	278	286	289	295	380	386	392	422	425	439
	60% ethylene glycol											
	Freezing temperature	°C	-39,0									
	Ethylene glycol volume	l	157	162	164	167	215	218	222	239	241	248
	Glycol solution total weight	kg	281	290	293	298	384	390	397	427	430	444

HydroPack

2PM/3PM - Hydronic assembly user side with 2/3 ON/OFF pumps

Option supplied on the unit. Pumping unit consisting of two or three parallel electric pumps with a self-adaptive modular activation logic.

It enables the automatic reduction of the liquid flow rate in critical conditions, avoiding blocks due to overloading and consequential intervention work by specialised technical personnel.

Centrifugal electric pump with impeller made with AISI 304 steel and AISI 304 stainless steel body or grey cast iron (depending on models).

Mechanical seal using ceramic, carbon and EPDM elastomer components.

Three-phase electric motor with IP55-protection. Complete with thermoformed insulated casing, quick connections with insulated casing,non return valve, safety valve, pressure gauges, system load safety pressure switch, stainless steel antifreeze immersion heaters located at the return and supply point.

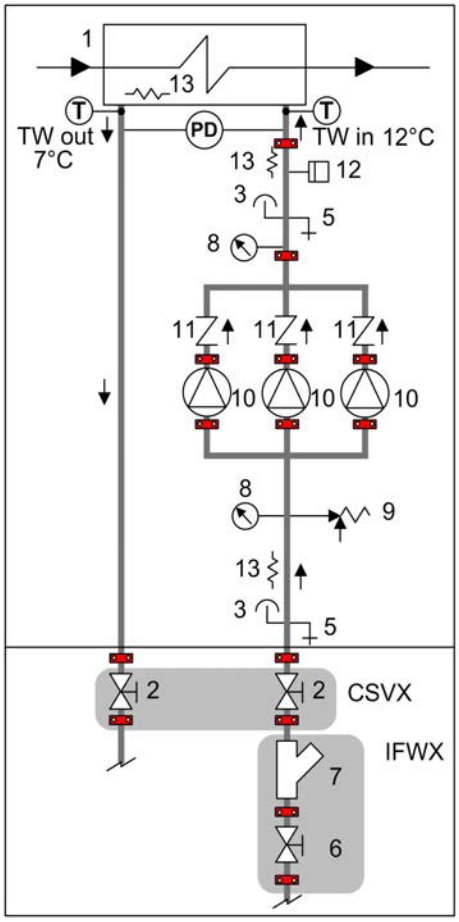
The various models which are available can be differentiated by the system available pressure.

The 2PM / 3PM option is supplied with a kit made up of 2 quick blind connections, for the removal of one pump in case of maintenance.

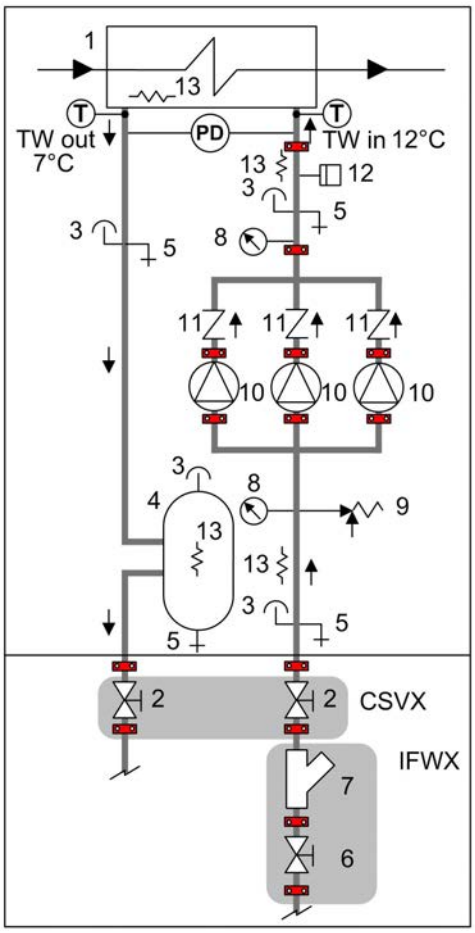
Check the option compatibility table for combinations with storage tank.

Provided with hydraulic interceptions to the outside of the unit (option 'CSVX - A pair of manually operated shut-off valves') to facilitate any major maintenance operations.

HYDROPACK



HYDROPACK WITH STORAGE TANK



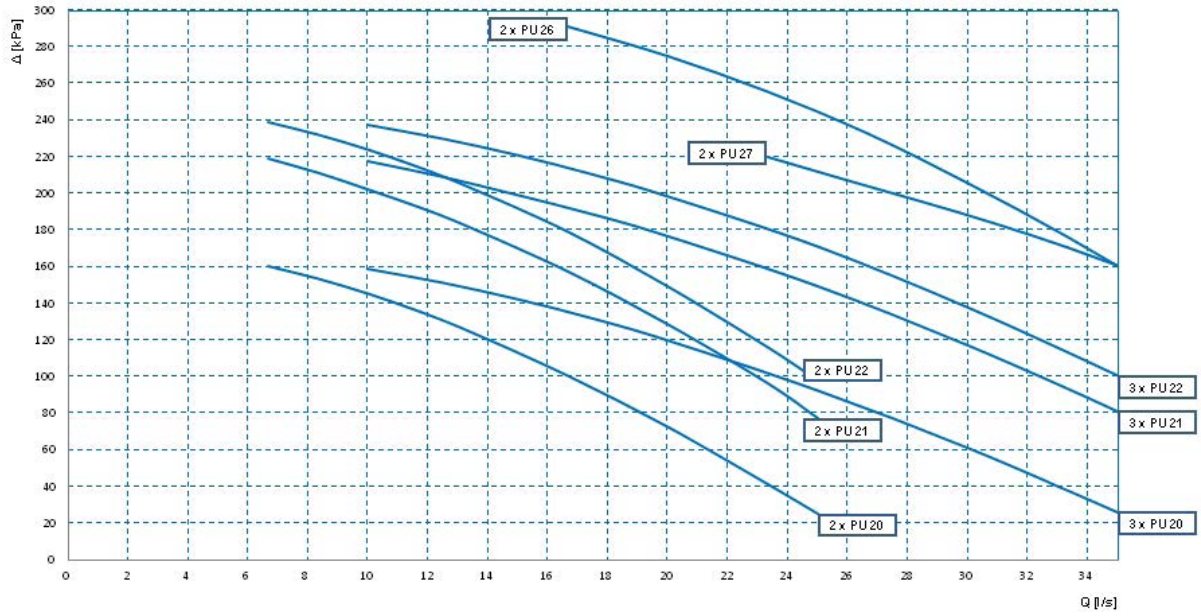
Illustrative diagram referred to unit size 240.4 with Hydropack with no. 3 of pumps

1 - Internal exchanger
2 - Cutoff valve
3 - Purge valve
4 - Storage tank with antifreeze heater
5 - Draw off cock
6 - Cutoff valve with quick joints
7 - Steel mesh strainer water side
8 - Manometer
9 - Safety valve (6 Bar)
10 - Packaged electric pump with high efficiency impeller
11 - Non return valve
12 - System safety pressure switch (prevents the pumps from operating if no water is present)
13 - Antifreeze heater
T - Temperature probe
PD - Differential pressure switch
TW in chilled water inlet
TW out chilled water outlet
IFWX - Steel mesh strainer water side
CSVX - Couple of manual shut-off valves

The grey area indicates further optional components.

2PM/3PM option performances (HydroPack)

Head



Q[l/s]= water flow rate
Δ [kPa] = pump head
PU2* = 2-pole pump

Caution: to obtain the available pressure values, you need to subtract the following from the head values represented in these diagrams:

- pressure drop of the whole unit internal hydraulic circuit;
- IFVX accessory –Steel mesh filter on the water side (where applicable).

Hydropack electrical data

PUMP	Rated power [kW]	Nominal power [A]
2×PU20	2×1.8	2×3.4
2×PU21	2×2.9	2×4.8
2×PU22	2×3.3	2×5.6
2×PU26	2×5.5	2×10.4

PUMP	Rated power [kW]	Nominal power [A]
2×PU27	2×5.5	2×10.4
3×PU20	3×1.8	3×3.4
3×PU21	3×2.9	3×4.8
3×PU22	3×3.3	3×5.6

2PMV/3PMV - Hydronic assembly user side with 2/3 inverter pumps

Option supplied on the unit. Pumping unit consisting of parallel electric pumps and controlled by inverter to adapt to the different application conditions.

It enables the automatic reduction of the liquid flow rate in critical conditions, avoiding blocks due to overloading and consequential intervention work by specialised technical personnel.

Through the inverter calibration, standard supplied, it is possible to adapt the pump flow-rate/head to the installation feature.

Centrifugal electric pump with impeller made with AISI 304 steel and AISI 304 stainless steel body or grey cast iron (depending on models).

Mechanical seal using ceramic, carbon and EPDM elastomer components.

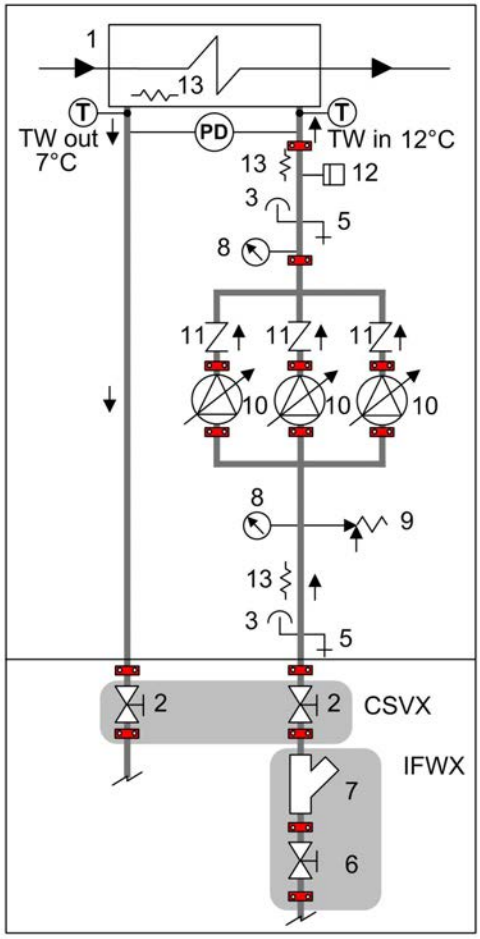
Three-phase electric motor with IP55-protection. Complete with thermoformed insulated casing, quick connections with insulated casing,non return valve, safety valve, pressure gauges, system load safety pressure switch, stainless steel antifreeze immersion heaters located at the return and supply point.

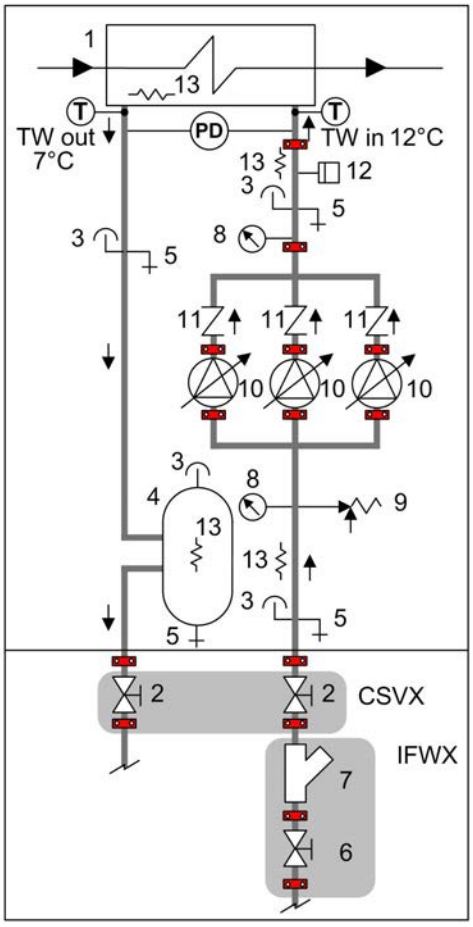
In combination with the "IVFDT" - Variable flow-rate control option, it allows the water flow rate variation to the installation in part load operation to obtain the maximum unit efficiency and lower pumping unit consumption.

The 2PMV / 3PMV option is supplied with a kit made up of 2 quick blind connections, for the removal of one pump in case of maintenance.

Check the option compatibility table for combinations with storage tank.

Provided with hydraulic interceptions to the outside of the unit (option 'CSVX - A pair of manually operated shut-off valves') to facilitate any major maintenance operations.

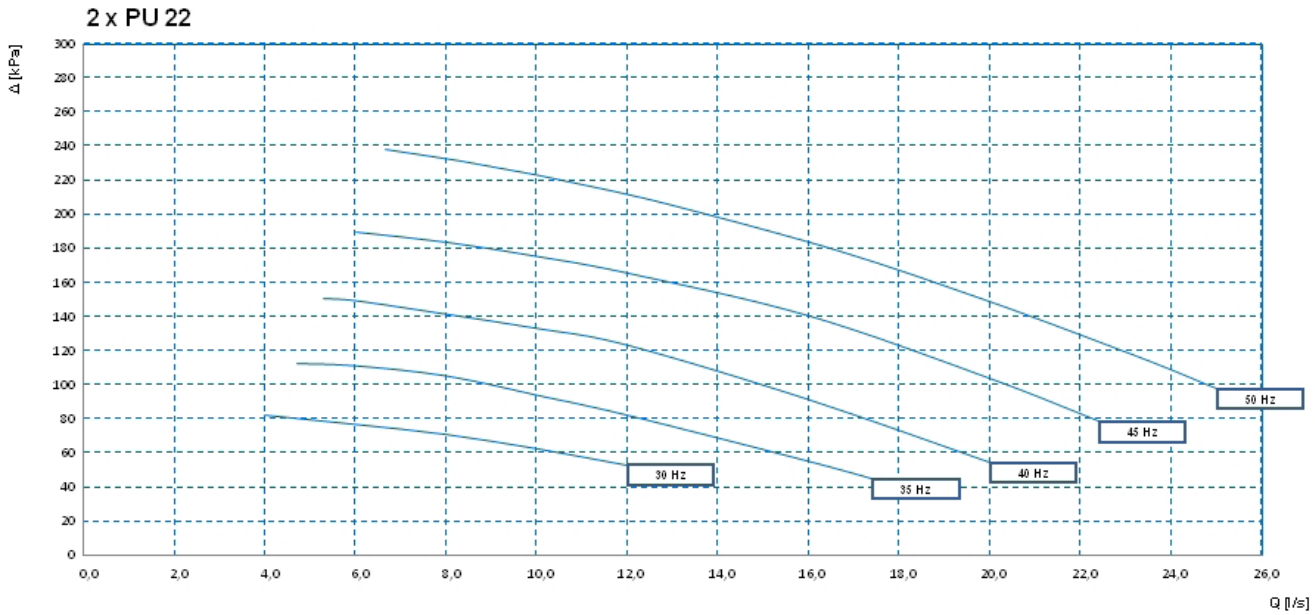




1 - Internal exchanger
2 - Cutoff valve
3 - Purge valve
4- Storage tank
5 - Draw off cock
6 - Cutoff valve with quick joints
7 - Steel mesh strainer water side
8 - Manometer
9 - Safety valve (6 Bar)
10 - Packaged electric pump with high efficiency impeller activated by inverter
11 - Non return valve
12 - System safety pressure switch (prevents the pumps from operating if no water is present)
13 - Antifreeze heater
T - Temperature probe
PD - Differential pressure switch
TW in chilled water inlet
TW out chilled water outlet
IFWX - Steel mesh strainer water side
CSVX - Couple of manual shut-off valves
The grey area indicates further optional components.

2PMV option performances

Head

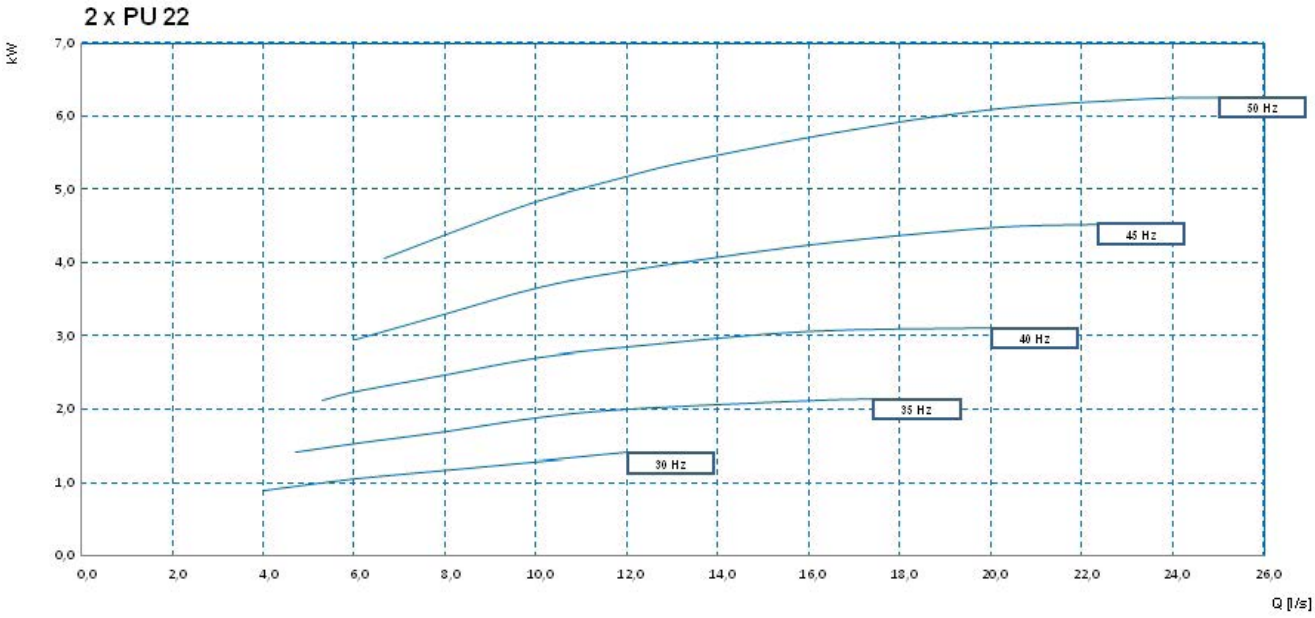


Q[l/s]= water flow rate
Δ [kPa] = pump head

Caution: to obtain the available pressure values, you need to subtract the following from the head values represented in these diagrams:

- pressure drop of the whole unit internal hydraulic circuit;
- IFVX accessory –Steel mesh filter on the water side (where applicable).

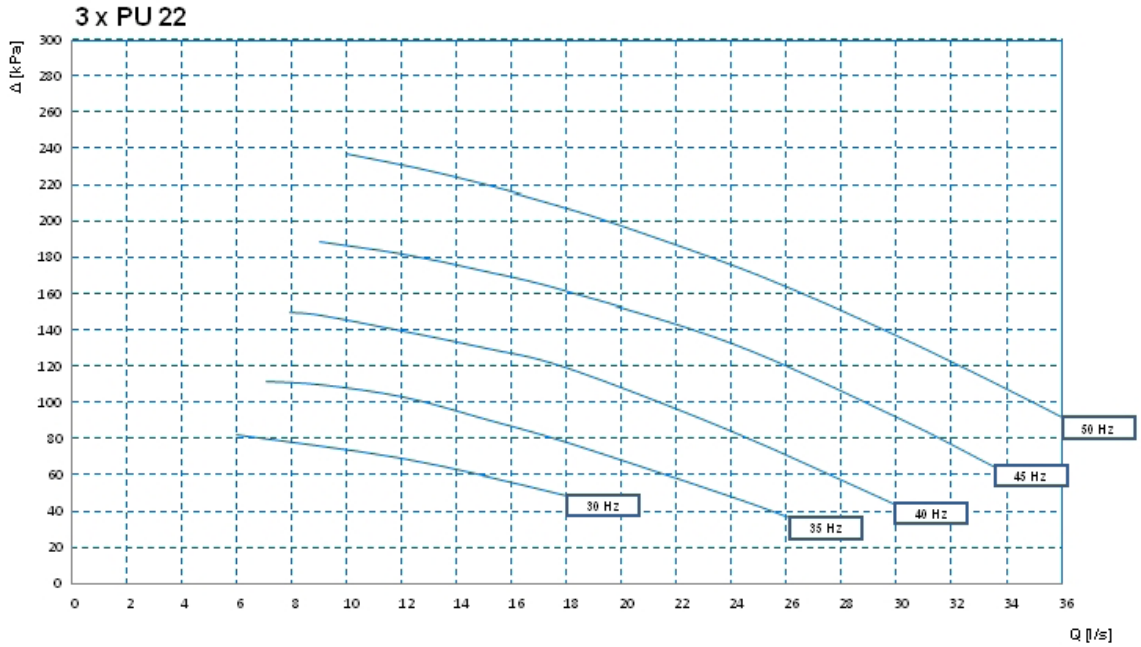
Power input



Q[l/s]= water flow rate
kW = power input

3PMV option performances

Head

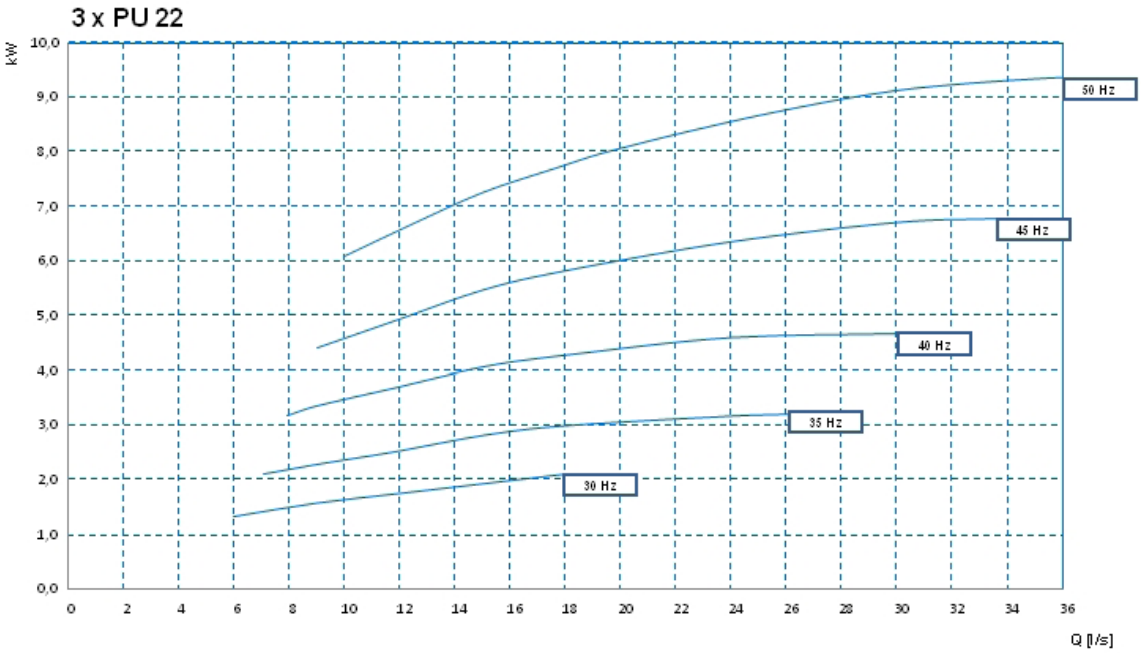


Q[l/s]= water flow rate
Δ [kPa] = pump head

Caution: to obtain the available pressure values, you need to subtract the following from the head values represented in these diagrams:

- pressure drop of the whole unit internal hydraulic circuit;
- IFVX accessory –Steel mesh filter on the water side (where applicable).

Power input

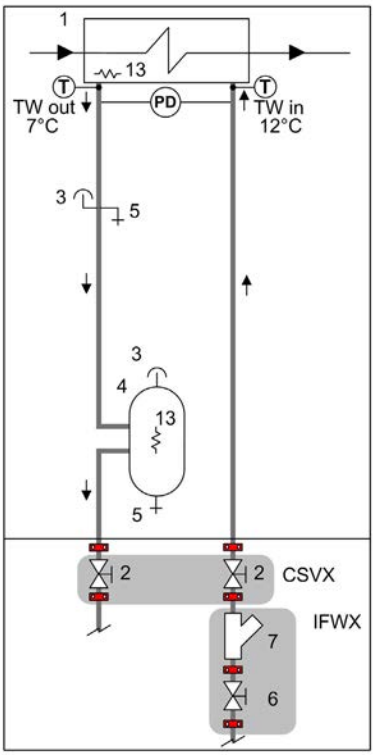


Q[l/s]= water flow rate
kW = power input

Accessories - Hydronic assembly

A550/A700/A900 - 550 / 700 / 900 l. storage tank (only FCD configuration)

Option supplied built-in the unit. Steel storage tank complete with double layer covering with closed-cell insulation, stainless steel anti-freeze immersion resistance, bleed valve, draw off cock, quick connections with insulated casing. The various available models can be differentiated by capacity.



1 - Internal exchanger
2 - Cutoff valve
3 - Purge valve
4 - Storage tank with antifreeze heater
5 - Draw off cock
6 - Cutoff valve with quick joints
7 - Steel mesh strainer water side
13 - Antifreeze heater

T - Temperature probe
PD - Differential pressure switch

TW in chilled water inlet
TW out chilled water outlet

IFWX = Steel mesh strainer water side
CSVX = Couple of manual shut-off valves

The grey area indicates further optional components.

Provided with hydraulic interceptions to the outside of the unit (option 'CSVX - A pair of manually operated shut-off valves') to facilitate any major maintenance operations.

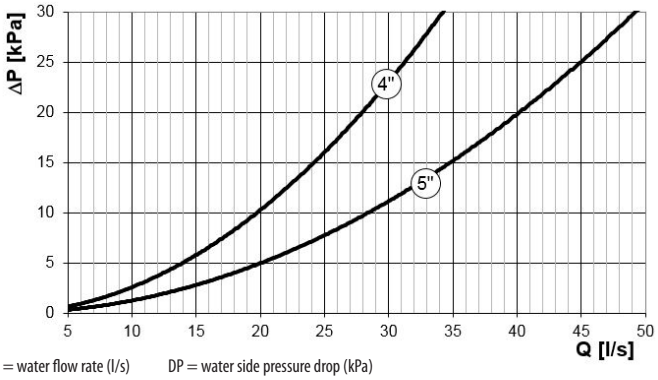
The water outlet user side with "Storage tank" option is positioned in correspondence of the storage tank itself. The outlet position will be defined when ordering. The water inlet user side remains in the same position of the standard unit.

IFWX - Steel mesh strainer water side

The device stops the exchanger from being clogged by any impurities which are in the hydraulic circuit. The mechanical steel mesh strainer must be placed on the water input line. It can be easily dismantled for periodical maintenance and cleaning. It also includes:

- cast-iron shut-off butterfly valve with quick connections and activation lever with a mechanical calibration lock;
- quick connections with insulated casing.

STEEL MESH FILTER PRESSURE DROP



Q = water flow rate (l/s) DP = water side pressure drop (kPa)

STEEL MESH FILTER FEATURES

EXCELLENCE		
Diameter	4"	5"
Degree of filtration	1,6 mm	

Pressure drop referred to a clean filter.

IInstallation is the responsibility of the Client, externally to the unit.

Check for the presence of the required hydraulic shut-off valves in the system, in order to undertake periodical maintenance.

Separately supplied accessory

Accessories

PGFC- Finned coil protection grill

Grilles made in drawn of electro-welded steel and coated to protect the external coil from accidental contact with people and things.

The protection grill has a height equal to the whole unit. Therefore, all areas under the coils are protected.

This accessory also protects the rear area of the unit opposite to the electric panel.

Ideal for installation in places where persons can pass from, such as car parks, terraces, etc.

Accessories supplied and installed built-in the unit.

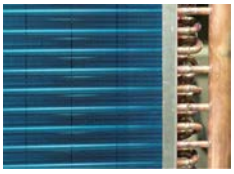
PGCCH - Anti-hail protection grilles

Grilles made in drawn of electro-welded steel and coated suitable to protect the external coil from hail damage.

Accessories supplied and installed built-in the unit.

CCCA - Copper / aluminium condenser coil with acrylic lining

Condensing coils with copper pipes and aluminum fins with acrylic lacquering. Can be used in settings with moderately aggressive low saline concentrations and other chemical agents. The acrylic coating is used as the most economical and effective method particularly in protecting aluminum surfaces exposed to the corrosive influence of the humid and salty air in regions with marine climates.



Attention!

- Cooling capacity variation -2.7%

- Variation in compressor power input +4.2%

- Operating range reduction -2.1°C

Option available only on special request

CCCA1 - Copper / aluminium condenser coil with Aluminium Energy Guard DCC treatment

Condensing coils with copper pipes and aluminum fins with Aluminium Energy Guard DCC treatment. Complete treatment which offers an optimal thermal exchange and guarantees and protects the finned coil exchangers from corrosion over time and UV rays. Can be used in settings with very aggressive saline concentrations and other chemical agents in the air thus maintaining the performance of the coils over time and with negligible pressure drop.

Option available only on special request

MHP - High and low pressure gauges

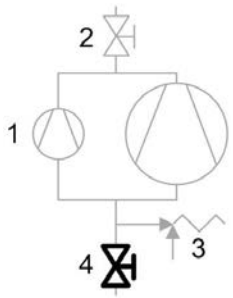
It includes two liquid pressure gauges for the analog measurement of refrigerant pressures on suction and discharge lines of the compressors with pressure sockets installed in the unit in an easily accessible location.

Device supplied and installed built-in the unit.

SDV - Cutoff valve on compressor supply and return

An option which integrates the supply cutoff valve, which is supplied as standard. The presence of the cock at the intake as well enables the compressors to be isolated and substituted without discharging the refrigerant from within the refrigeration circuit. This means that the extraordinary maintenance activities are facilitated.

The device is installed built-in the unit.



1. Compressors
2. Cutoff valve
3. Safety valve
4. SDV option

RE-20 / RE-25 / RE-30 / RE-35 / RE-39 - Electrical panel anti-freeze protection

It includes self-regulating electric heaters with thermost which are able to protect the electrical panel against condensation and frost guaranteeing its correctly functions down to -39°C. This accessory operates even when the unit is switched off provided that the power supply is maintained active and the unit continues to be electrically connected.

Device installed and wired built-in the unit.

This accessory operates even when the unit is switched off provided that the power supply is maintained active and the unit continues to be connected.

This accessory does not lead to substantial variations in the electrical data for the unit which has been declared in the Electrical Data section.

PFCP - Power-factor correction capacitors (cosfi > 0.9)

Component is necessary to lower the phase difference between current and voltage in the electromagnetic components of the unit (e.g. asynchronous motors). The component allows to put the cosfi power factor to values on average higher than 0.9, reducing the network reactive power.

Device installed and wired built-in the unit.

ECS - ECOSHARE function for the automatic management of a group of units

Device allows automatic management of units that operate on the same hydraulic circuit, by creating a local communication network. There are three control modes that can be set via a parameter during the units stat-up.

Two control modes distribute the heat load on the available units by following the distribution logic to benefit of efficiency levels at part load and one shift the supply water set-point temperature on the group of units. Moreover:

Mode 0 - shift the water set-point temperature and keeps all the pumps active;

Mode 1 - distribute the heat load and keeps all the pumps active;

Mode 2 - distribute the heat load and activates only the pumps of the unit required to operate.

The device allows for rotation based on the criterion of minimum wear and management of units in stand-by. In case of failure of one unit the load is distributed in the other units. The units can be of various sizes but of the same type: all reversible heat pumps, or all air-cooled liquid chiller.The set of units is controlled by a Master unit.

The local network can be extended up to 7 units (1 Master and 6 Slave).

The unit supplied with this device can also be equipped at the same time with the RCMRX option and one of the CMSC11 / CMSC9 / CMSC10 options.

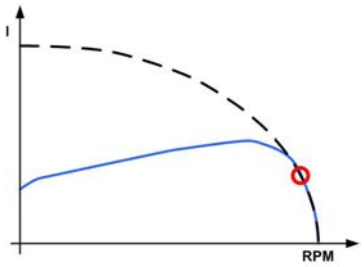
SFSTR – Disposal for inrush current reduction (SOFT STARTER)

Electronic device which automatically starts up the compressors gradually, reducing the starting current for the unit by around 40% in comparison with the nominal value. This results in the reduction of the starting torque of the ON/OFF compressor, it is more protected from mechanical stresses leading to an increased life of the component. The noise is also reduced.

Device installed and wired built-in the unit.

In sizes 180.4, 200.4, 220.4 and 240.4 the larger size compressor is standard equipped with device for progressive start-up, defined part-winding. For these units the soft-starter bene fits are guaranteed on lower size compressors, maintaining unchanged the M.I.C. (max. inrush current) of the standard unit.

The compressors with 60 HP of nominal capacity need the standard device for the progressive start-up defined part-winding.



–– Absorbed current without SFSTR option
– Absorbed current without SFSTR option

CMSC11 - Serial communication module for BACnet supervisor

Module allows the serial connection of the supervision system, using BACnet/IP as the communication protocol. It enables access to the complete list of operational variables, commands and alarms. Using this accessory every unit can dialogue with the main supervision systems.

Device installed and wired built-in the unit.

The configuration and management activities for the BACnet networks are the responsibility of the client.

The total length of each serial line do not exceed 1000 meters and the line must be connected in bus typology (in/out).

CMSC9 - Serial communication module for Modbus supervisor

Module allows the serial connection of the supervision system, using Modbus as the communication protocol. It enables access to the complete list of operational variables, commands and alarms. Using this accessory every unit can dialogue with the main supervision systems.

Device installed and wired built-in the unit.

The total length of each serial line do not exceed 1000 meters and the line must be connected in bus typology (in/out).

CMSC10 - Serial communication module for LonWorks supervisor

Module allows the serial connection of the supervision system which uses the LonWorks communication protocol. It enables access to a list of operating variables, commands and alarms which comply with the Echelon® standard.

Device installed and wired built-in the unit.

The configuration and management activities for the LonWorks networks are the responsibility of the client.

LonWorks technology uses the LonTalk® protocol for communicating between the network nodes. Contact the service supplier for further information.

The total length of each serial line do not exceed 1000 meters and the line must be connected in bus typology (in/out).

CREFB - Device for consumption reduction of the external section ECOBREEZE fans

An option which regards the external helical fans, as an alternative to the phase-cut device. It provides for an IP54 brushless electronically commutated electrical motor and incorporated thermal protection. Supplied with variable speed control.

Standard in EN version.

CREFP - Device for fan consumption reduction of the external section at variable speed (phase-cutting)

An option which regards the external helical fans, as an alternative to the phase-cut device. It provides for an IP54 three-phase electrical motor with an external rotor and incorporated thermal protection. Supplied with variable speed control.

Device installed and wired built-in the unit.

Standard in SC version.

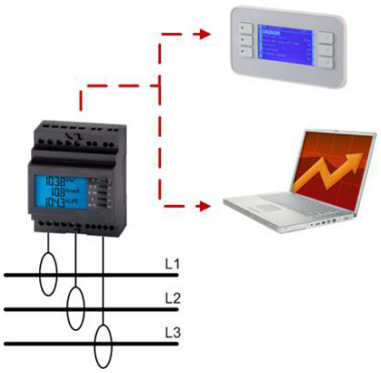
Option available for sizes from 90.4 to 180.4 in EXC version, EN acoustic configuration.

CONTA2 - Energy meter

Allows to display and record the unit's main electrical parameters. The data can be displayed on the device display or via the supervisor through the specific protocol variables. The device has a serial port with Modbus protocol for connection to the supervisory system. It is possible to control:

- voltage (V),
- absorbed current (A),
- frequency (Hz), - cosfi,
- power input (KW),
- absorbed energy (KWh),
- harmonic components (%).

Device installed and wired built-in the unit.



On the device is present a serial port with Modbus protocol for the connection to the supervision system.

SCP4 - Set-point compensation with 0-10 V signal

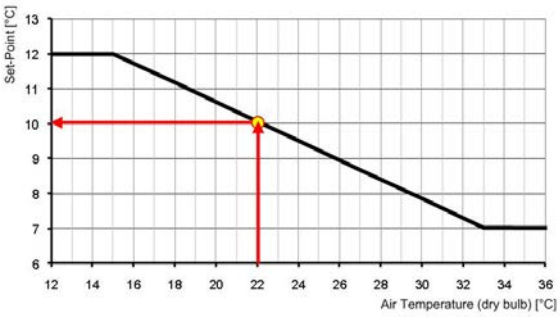
Device allows the changing of the preset set point by means to an external 0÷10 V signal. The interruption of the signal the set-point is at the nominal set value. The limit values can be changed within wide values.

Device installed and wired built-in the unit.

SPC2 - Set-point compensation with outdoor air temperature probe

Device allows the automatic regulation of the preset set-point depending of the outside temperature air measured by the unit probe. This device allows to get the sliding supply water temperature, which varies depending on external conditions, enabling energy savings throughout the entire system.

The device is installed and wired built-in the unit.



IVFDT - Inverter driven variable flow-rate user side control depending on the temperature differential

Option allows water flow-rate modulation to the unit during partial load conditions, maintaining stable the temperature difference between inlet and outlet to the heat exchanger.

The option is available only when the unit thermoregulation is set on the return temperature.

Designed for systems with primary circuit variable flow-rate systems decoupled from secondary circuit. With no building load the unit switches off the compressors while concerning pumps is possible to select:

- active pumps with minimum flow-rate, monitoring secondary circuit temperature variations;
- pump switching off, periodically activating them (settable time) leading secondary circuit temperatures on primary circuit;
- pump switching off and waiting for the user signal for activation (free potential).

Device installed and wired built-in the unit, available only with inverter driven pumps.

This option is available only with inverter driven HYDROPACK selected (2PMV / 3PMV).

The water flow control is active only with thermoregulation on the return temperature.

RPRPDI - Refrigerant leak detector with pump down function in the casing

Leak detector device built-in installed and placed inside the compressor box.

It detects leaks of the internal refrigeration circuit and automatically enables the “pump-down” function, storing the refrigerant inside the finned coil exchanger. During pump-down, cooling capacity is not produced by the unit. At the end of the operation the unit is switched off and a dedicated alarm signal is available directly inside the electrical panel.

The device respects BREEAM regulations.

Accessories separately supplied

CSVX - Couple of manually opeated shut-off valves

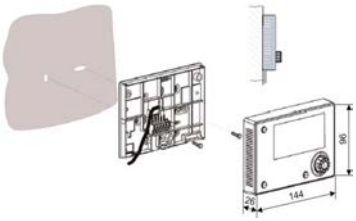
Kit composed of no. 2 cast-iron shut-off butterfly valves, it includes: fast fittings and activation lever with a mechanical calibration lock and no. 2 of Victaulic type quick connection with insulated casing to isolate the hydraulic circuit at the inlet and outlet.

Installation is the responsibility of the Client, externally to the unit.

RCMRX - Remote control via microprocessor control

Option allows to have full control over all the unit functions from a remote position by serial line.

It can be easily installed on the wall and has the same functions of the user interface built-in the unit.



All device functions can be repeated with a normal portable PC connected to the unit with an Ethernet cable and equipped with an internet navigation browser.

The device must be installed on the wall with suitable plugs and connected to the unit (installation and wiring to be conducted by the Customer). Maximum remote control distance 350 m without auxiliary power supply. For distances greater than 350 m and in any case less than 700 m it is necessary to install the ‘PSX - Mains power unit’ accessory.

Data and power supply serial connection cable n.1 twisted and shielded pair. Diameter of the individual conductor 0.8 mm.

Installation provided by the Customer.

PSX - Mains power supply

Device allows the unit and the remote control to communicate with the user interface even when the serial line is longer than 350m.

It must be connected to the serial line at a distance of 350m from the unit and allows to extend the length to 700m maximum in total.

The device requires an external power supply at 230V AC.

Power supply at 230V AC provided by Customer.

AMMX - Spring antivibration mounts

Spring antivibration mounts to be fixed in special housing on the support frame and serve to smooth the vibrations produced by the unit thus reducing the noise transmitted to the support structure.

Installation provided by the Customer.

Option compatiblity

REFERENCE	DESCRIPTION	90.4	100.4	110.4	120.4	140.4	160.4	180.4	200.4	220.4	240.4
CONFIGURATIONS AND MAIN ACCESSORIES											
B + FCD	Water low temperature + Direct FREE-COOLING	0	0	0	0	0	0	0	0	0	0
B + FCI	Water low temperature + No-Glycol FREE-COOLING	-	-	-	-	-	-	-	-	-	-
A550 + FCD + SC	550 l. storage tank + Direct FREE-COOLING + Acoustic configuration with compressor soundproofing	0	0	0	0	-	-	-	-	-	-
A700 + FCD + SC	700 l. storage tank + Direct FREE-COOLING + Acoustic configuration with compressor soundproofing	-	-	-	-	0	0	0	-	-	-
A900 + FCD + SC	900 l. storage tank + Direct FREE-COOLING + Acoustic configuration with compressor soundproofing	-	-	-	-	-	-	-	0	0	0
A550 + FCD + EN	550 l. storage tank + Direct FREE-COOLING + Extremely low noise acoustic configuration	-	-	-	-	-	-	-	-	-	-
A700 + FCD + EN	700 l. storage tank + Direct FREE-COOLING + Extremely low noise acoustic configuration	0	0	0	0	-	-	-	-	-	-
A900 + FCD + EN	900 l. storage tank + Direct FREE-COOLING + Extremely low noise acoustic configuration	-	-	-	-	0	0	0	0	0	0
A550 + FCI	550 l. storage tank + No-Glycol FREE-COOLING	-	-	-	-	-	-	-	-	-	-
A700 + FCI	700 l. storage tank + No-Glycol FREE-COOLING	-	-	-	-	-	-	-	-	-	-
A900 + FCI	900 l. storage tank + No-Glycol FREE-COOLING	-	-	-	-	-	-	-	-	-	-
2PM - HYDROPACK USER SIDE WITH 2 PUMPS											
PU20	Pump 20	0	0	0	0	0	-	-	-	-	-
PU21	Pump 21	0	0	0	0	0	0	0	-	-	-
PU22	Pump 22	0	0	0	0	0	0	0	-	-	-
PU26	Pump 26	-	-	-	-	-	0	0	0	0	0
3PM - HYDROPACK USER SIDE WITH 3 PUMPS											
PU20	Pump 20	-	-	-	-	-	-	0	0	0	-
PU21	Pump 21	-	-	-	0	0	0	0	0	0	0
PU22	Pump 22	0	0	0	0	0	0	0	0	0	0
2PMV - HYDROPACK USER SIDE WITH NO.2 OF INVERTER PUMPS											
PU22	Pump 22	0	0	0	0	-	-	-	-	-	-
3PMV - HYDROPACK USER SIDE WITH NO.3 OF INVERTER PUMPS											
PU22	Pump 22	0	0	0	0	0	0	0	0	0	0
IVFDT - INVERTER DRIVEN VARIABLE FLOW-RATE USER SIDE CONTROL DEPENDING ON THE TEMPERATURE DIFFERENTIAL											
2PM / 3PM	Hydropack user side with no. 2 of pumps / Hydropack user side with no. 3 of pumps	-	-	-	-	-	-	-	-	-	-
2PMV / 3PMV	Hydropack user side with no.2 of inverter pumps / Hydropack user side with no.3 of inverter pumps	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
OTHER ACCESSORIES											
CREFP + SC	Fan consumption reduction device of external section at variable speed (phase-cutting) + Acoustic configuration with compressor soundproofing	•	•	•	•	•	•	•	•	•	•
CREFB + SC	ECOBREEZE external section fan consumption reduction device + Acoustic configuration with compressor soundproofing	0	0	0	0	0	0	0	0	0	0
CREFP + EN	Fan consumption reduction device of external section at variable speed (phase-cutting) + Super-silenced acoustic configuration	0	0	0	0	0	0	0	-	-	-
CREFB + EN	ECOBREEZE external section fan consumption reduction device + Super-silenced acoustic configuration	•	•	•	•	•	•	•	•	•	•

• Standard

0 Option

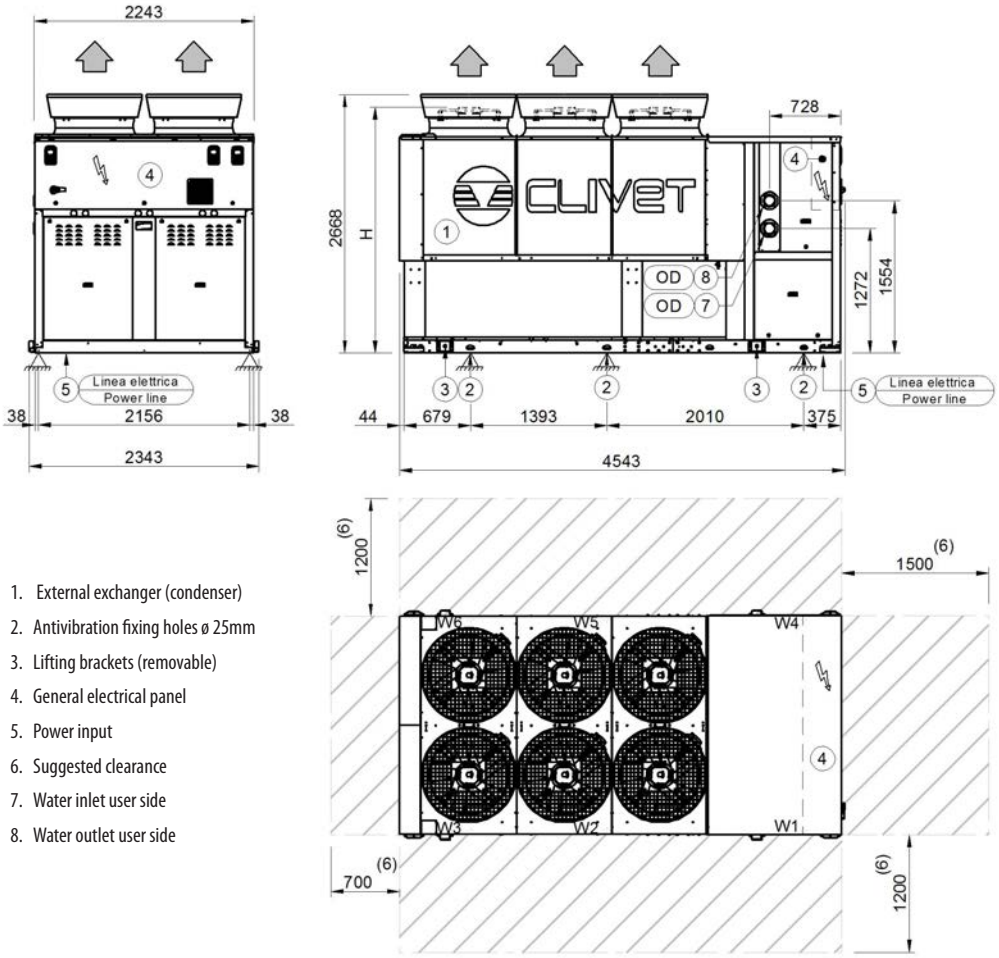
- Not available

0* Necessary matching: variable flow-rate control and built-in inverter pumps

Dimensional drawings - FCD and FCI configuration

Size 90.4-120.4 - Acoustic configuration : Compressor soundproofing (SC)

DAB8Z90 4_120 4_EXC_SC_0
Data/Date 02/12/2015



1. External exchanger (condenser)
2. Antivibration fixing holes ø 25mm
3. Lifting brackets (removable)
4. General electrical panel
5. Power input
6. Suggested clearance
7. Water inlet user side
8. Water outlet user side

Size		SC-FCD				SC-FCI			
		90.4	100.4	110.4	120.4	90.4	100.4	110.4	120.4
H (without Axitop)	mm	2484	2484	2484	2484	2484	2484	2484	2484
H (without Axitop with ECOBREEZE - optional)	mm	2510	2510	2510	2510	2510	2510	2510	2510
OD (water connection diameter)	mm	114,3	114,3	114,3	114,3	114,3	114,3	114,3	114,3
A - Length	mm	4543	4543	4543	4543	4543	4543	4543	4543
B - Depth	mm	2243	2243	2243	2243	2243	2243	2243	2243
C - Height	mm	2668	2668	2668	2668	2668	2668	2668	2668
W1 Supporting point	mm	965	991	1011	1042	1034	1062	1090	1122
W2 Supporting point	kg	687	688	693	693	772	781	792	794
W3 Supporting point	kg	321	321	320	320	300	299	299	299
W4 Supporting point	kg	962	988	1006	1040	1033	1060	1088	1126
W5 Supporting point	kg	685	686	689	691	771	779	790	797
W6 Supporting point	kg	320	320	318	319	300	299	298	300
Shipping weight	kg	3940	3994	4037	4105	4210	4280	4357	4438
Operating weight	kg	3616	3667	3709	3772	4044	4101	4174	4253

Size		SC-FCD				SC-FCI			
		90.4	100.4	110.4	120.4	90.4	100.4	110.4	120.4
Container shipping length	mm	4650	4650	4650	4650	4650	4650	4650	4650
Container shipping depth	mm	2315	2315	2315	2315	2315	2315	2315	2315

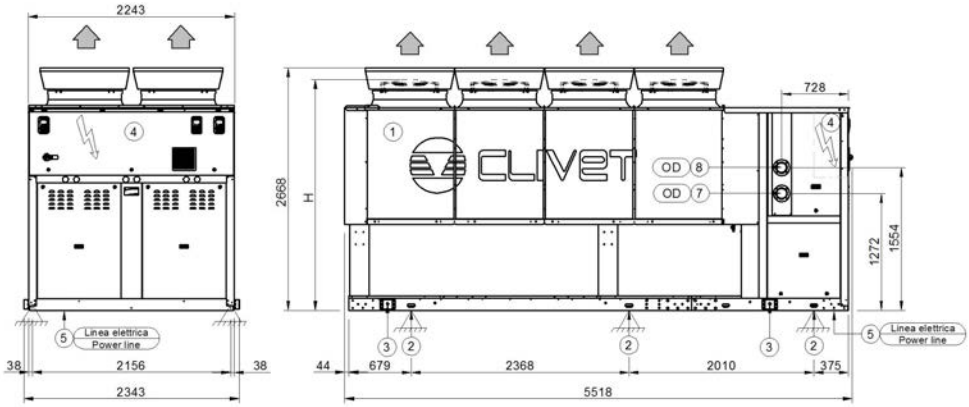
The presence of optional accessories may result in a substantial variation of the weights shown in the table. Fan diffusers are separately supplied

FCD and FCI configuration

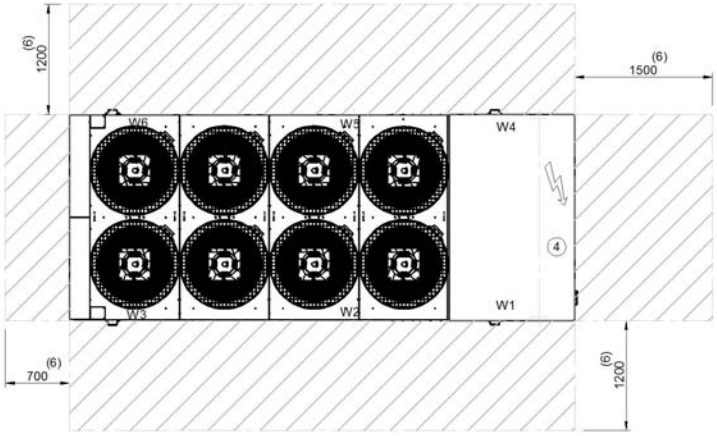
Size 140.4-180.4 - Acoustic configuration : Compressor soundproofing (SC)

Size 90.4-120.4 - Acoustic configuration : Super-silenced (EN)

DAB8Z140 4_180 4_EXC_SC_EN_0
Data/Date 02/12/2015



1. External exchanger (condenser)
2. Antivibration fixing holes ø 25mm
3. Lifting brackets (removable)
4. General electrical panel
5. Power input
6. Suggested clearance
7. Water inlet user side
8. Water outlet user side



Size		SC-FCD			SC-FCI			EN-FCD				EN-FCI			
		140.4	160.4	180.4	140.4	160.4	180.4	90.4	100.4	110.4	120.4	90.4	100.4	110.4	120.4
H (without Axitop)	mm	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484
H (without Axitop with ECOBREEZE - optional)	mm	2510	2510	2510	2510	2510	2510	2510	2510	2510	2510	2510	2510	2510	2510
OD (water connection diameter)	mm	114,3	114,3	114,3	114,3	114,3	114,3	114,3	114,3	114,3	114,3	114,3	114,3	114,3	114,3
A - Length	mm	5518	5518	5518	5518	5518	5518	5518	5518	5518	5518	5518	5518	5518	5518
B - Depth	mm	2243	2243	2243	2243	2243	2243	2243	2243	2243	2243	2243	2243	2243	2243
C - Height	mm	2668	2668	2668	2668	2668	2668	2668	2668	2668	2668	2668	2668	2668	2668
W1 Supporting point	mm	1010	1028	1156	1106	1136	1266	904	931	947	979	974	1005	1025	1063
W2 Supporting point	kg	823	818	824	924	931	940	813	814	816	815	883	889	895	901
W3 Supporting point	kg	473	470	473	465	464	466	472	472	472	472	459	460	460	460
W4 Supporting point	kg	1002	1034	1153	1098	1130	1263	899	925	940	975	969	998	1018	1058
W5 Supporting point	kg	816	823	821	917	927	937	807	808	809	811	877	883	889	897
W6 Supporting point	kg	469	472	472	461	462	464	469	468	468	469	456	457	457	458
Shipping weight	kg	4593	4645	4899	4971	5050	5336	4364	4418	4452	4521	4618	4692	4744	4837
Operating weight	kg	4184	4233	4482	4754	4825	5100	3968	4019	4052	4116	4435	4503	4549	4632

Size		SC-FCD			SC-FCI			EN-FCD				EN-FCI			
		140.4	160.4	180.4	140.4	160.4	180.4	90.4	100.4	110.4	120.4	90.4	100.4	110.4	120.4
Container shipping length	mm	5625	5625	5625	5625	5625	5625	5625	5625	5625	5625	5625	5625	5625	5625
Container shipping depth	mm	2315	2315	2315	2315	2315	2315	2315	2315	2315	2315	2315	2315	2315	2315

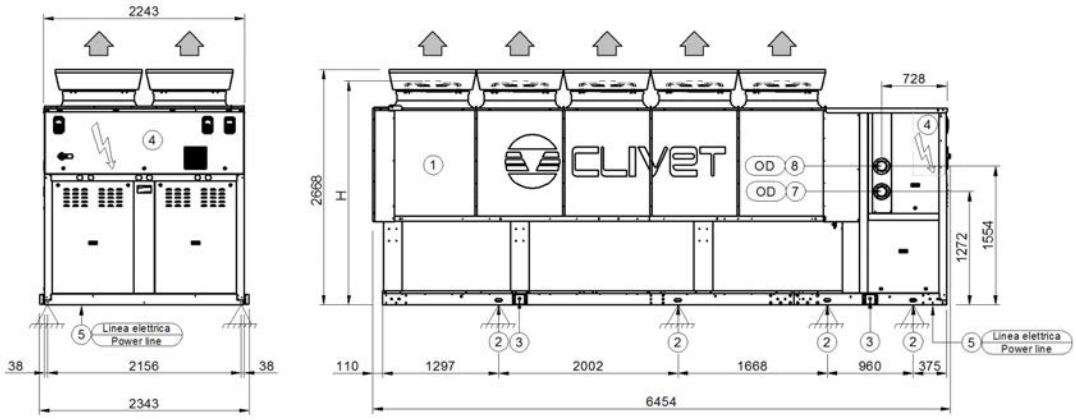
The presence of optional accessories may result in a substantial variation of the weights shown in the table. Fan diffusers are separately supplied.

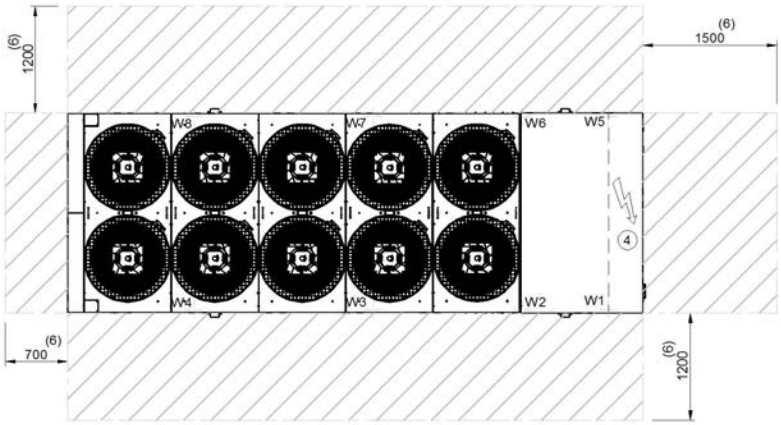
FCD and FCI configuration

Size 200.4-220.4-240.4 - Acoustic configuration : Compressor soundproofing (SC)

Size 140.4-160.4-180.4 - Acoustic configuration : Super-silenced (EN)

DAB8Z200 4_240 4_EXC_SC_EN_0
Data/Date 02/12/2015





1. External exchanger (condenser)
2. Antivibration fixing holes ø 25mm
3. Lifting brackets (removable)
4. General electrical panel
5. Power input
6. Suggested clearance
7. Water inlet user side
8. Water outlet user side

Size		SC-FCD			SC-FCI			EN-FCD			EN-FCI		
		200.4	220.4	240.4	200.4	220.4	240.4	140.4	160.4	180.4	140.4	160.4	180.4
H (without Axitop)	mm	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484	2484
H (without Axitop with ECOBREEZE - optional)	mm	2510	2510	2510	2510	2510	2510	2510	2510	2510	2510	2510	2510
OD (water connection diameter)	mm	139,7	139,7	139,7	139,7	139,7	139,7	114,3	114,3	114,3	114,3	114,3	114,3
A - Length	mm	6454	6454	6454	6454	6454	6454	6454	6454	6454	6454	6454	6454
B - Depth	mm	2243	2243	2243	2243	2243	2243	2243	2243	2243	2243	2243	2243
C - Height	mm	2668	2668	2668	2668	2668	2668	2668	2668	2668	2668	2668	2668
W1 Supporting point	mm	1123	1146	1176	1202	1255	1377	918	938	1057	1015	1040	1164
W2 Supporting point	kg	540	545	545	573	581	586	456	457	453	530	540	547
W3 Supporting point	kg	457	457	457	455	457	457	459	459	460	457	457	458
W4 Supporting point	kg	743	745	745	746	750	751	733	734	734	742	744	746
W5 Supporting point	kg	1186	1240	1255	1327	1462	1533	968	995	1125	1117	1148	1283
W6 Supporting point	kg	501	508	511	538	544	551	440	443	439	501	510	515
W7 Supporting point	kg	464	464	464	462	462	463	464	464	464	463	463	464
W8 Supporting point	kg	744	746	746	747	750	752	734	735	735	743	745	747
Shipping weight	kg	5758	5851	5899	6050	6261	6470	5172	5225	5467	5568	5647	5924
Operating weight	kg	5244	5331	5376	5766	5974	6172	4699	4748	4986	5331	5402	5666

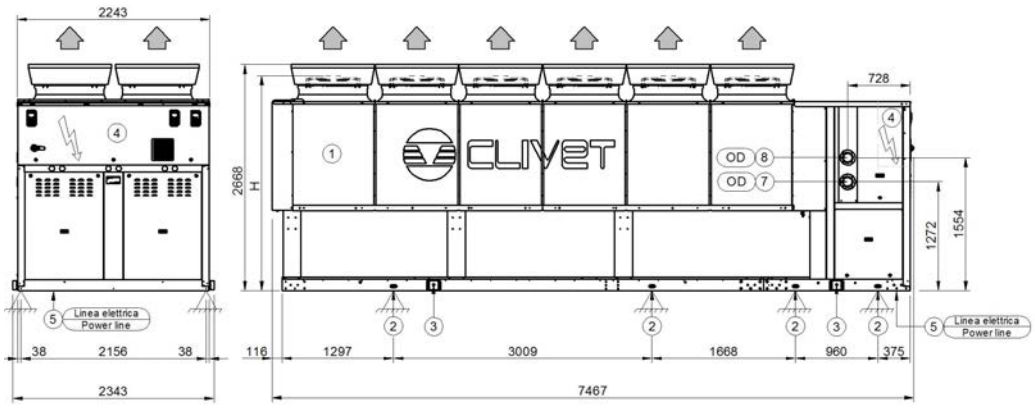
Size		SC-FCD			SC-FCI			EN-FCD			EN-FCI		
		200.4	220.4	240.4	200.4	220.4	240.4	140.4	160.4	180.4	140.4	160.4	180.4
Container shipping length	mm	6535	6535	6535	6535	6535	6535	6535	6535	6535	6535	6535	6535
Container shipping depth	mm	2315	2315	2315	2315	2315	2315	2315	2315	2315	2315	2315	2315

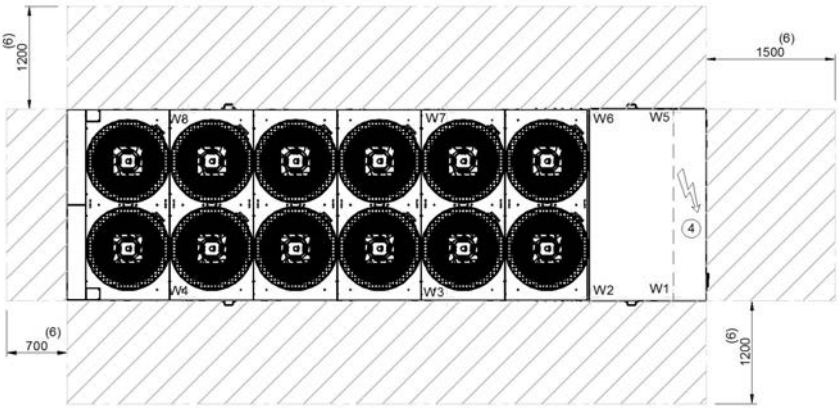
The presence of optional accessories may result in a substantial variation of the weights shown in the table. Fan diffusers are separately supplied..

FCD and FCI configuration

Size 200.4-220.4-240.4 - Acoustic configuration : Super-silenced (EN)

DAB8Z200 4_240 4_EXC_EN_0
Data/Date 02/12/2015





1. External exchanger (condenser)
2. Antivibration fixing holes ø 25mm
3. Lifting brackets (removable)
4. General electrical panel
5. Power input
6. Suggested clearance
7. Water inlet user side
8. Water outlet user side

Size		EN-FCD			EN-FCI		
		200.4	220.4	240.4	200.4	220.4	240.4
H (without Axitop)	mm	2484	2484	2484	2484	2484	2484
H (without Axitop with ECOBREEZE - optional)	mm	2510	2510	2510	2510	2510	2510
OD (water connection diameter)	mm	139,7	139,7	139,7	139,7	139,7	139,7
A - Length	mm	7467	7467	7467	7467	7467	7467
B - Depth	mm	2243	2243	2243	2243	2243	2243
C - Height	mm	2668	2668	2668	2668	2668	2668
W1 Supporting point	mm	995	1007	1040	1072	1085	1127
W2 Supporting point	kg	499	512	512	528	548	560
W3 Supporting point	kg	848	848	849	852	853	857
W4 Supporting point	kg	796	796	797	799	800	803
W5 Supporting point	kg	1018	1054	1068	1177	1212	1249
W6 Supporting point	kg	499	522	532	511	540	554
W7 Supporting point	kg	854	855	856	861	862	866
W8 Supporting point	kg	798	798	799	800	801	805
Shipping weight	kg	6307	6392	6453	6600	6701	6821
Operating weight	kg	5734	5813	5871	6307	6394	6505

Size		EN-FCD			EN-FCI		
		200.4	220.4	240.4	200.4	220.4	240.4
Container shipping length	mm	7548	7548	7548	7548	7548	7548
Container shipping depth	mm	2315	2315	2315	2315	2315	2315

The presence of optional accessories may result in a substantial variation of the weights shown in the table. Fan diffusers are separately supplied

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