

Tetris 2 FC

122÷518 kW



General

Modular free-cooling chillers for large systems. Wide range: multiple high efficiency combinations and low noise version. Selectable independent free-cooling module.

Configurations

A and A+: high efficiency

SLN: super low noise

/LN: low noise

/DS: with desuperheater

Configurable free-cooling section: Basic, Custom, Extra

Strengths

- ▶ 3 free-cooling configurations available
- ▶ Tier 2 compliance: high efficiency configurations with EC fans.
- ▶ Chiller with low refrigerant charge
- ▶ Extended operating limits: down to ambient -40°C with special accessory
- ▶ Dual power supply with automatic switching (option)
- ▶ BlueThink advanced control with integrated web server. Multilogic function and Blueeye® supervision system. (options)
- ▶ Flowzer: inverter driven pumps (options)



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IT PAYS TO USE FREE-COOLING UNITS!

Free cooling units meet growing demands for energy savings, since they have been designed to reduce the operating costs of refrigerating machines that work to serve process applications or in the IT field.

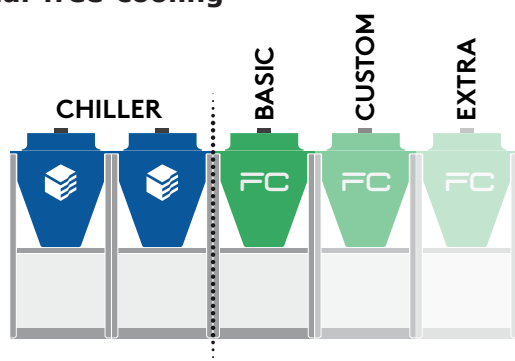
A strong point of our free cooling units is certainly the control system that allows maximum use to be made of the free resource, consisting of outside air, so minimizing the energy used by the compressors. The controller of the unit activates the chiller section and the free cooling section, also in combined mode, based on the actual external air temperatures, the set point and the required load level.

The free cooling section is hydraulically in series with the evaporator and this allows a benefit to be obtained from its activation even when the outside air temperature is sufficient to carry out only a pre-cooling of the water. The missing amount of capacity, in any case lower than the total required, will be provided by the compressors.

As the outside air temperature goes down, the amount of capacity that the free cooling section will be able to transfer to the water will gradually increase. Consequently, the amount of capacity that will have to be covered by the compressors will always be lower.

When the TFT (Total Free-cooling Temperature) is reached, the free cooling section will be able to fully meet the cooling capacity requirement and therefore the compressors can be switched off. In this condition, the unit will be able to provide the system with a cooling capacity equal to that required at design conditions, but with current drawn by the fans alone.

Modular free-cooling



With the free cooling system built into Tetris 2 FC, the chiller section and the free-cooling section are completely independent and this allows important advantages to be obtained.

The main advantage is due to the fact that the condensing coils and the free-cooling coils can have different dimensions (since they are not facing each other) and this makes different combinations possible.

For each model, you can choose from three different free cooling set-ups, called BASIC, CUSTOM, EXTRA, ranging from the lowest to the highest number of water coils:

- **BASIC:** this is the most compact free cooling module. This set-up allows you to obtain, with the smallest investment, a free-cooling contribution that can help the chiller section or be used in applications where the cooling load during the winter is very much lower than the nominal load. Average TFT: -6.5°C.
- **CUSTOM:** this is the free-cooling module with the best price/performance ratio. With this module, the energy contribution provided by the water coil is important and therefore allows a significant capacity reduction of the chiller section with achievement of TFT with outside air temperatures just below zero. Average TFT: -0.4°C.
- **EXTRA:** this is the free cooling module with the best TFT. This module is used to obtain the maximum capacity from the water coils, and therefore makes maximum use of cooling capacity production through free cooling. This is the ideal set-up for applications where the cooling capacity demand is almost constant throughout the year, such as for example in IT applications or the cooling of industrial processes in general. Average TFT: +2.7°C.

Also, since it has two separate fan sections, the control of the unit will be able to manage them independently and therefore

- the free-cooling section fans will operate at 100% to extract the maximum capacity from the air
- the chiller section fans will be modulated depending on the instant condensing pressure

		BASIC	CUSTOM	EXTRA
Milano	Energy saving	13%	17%	20%
	Annual saving (0.22 €/kWh)	€ 29.000	€ 38.000	€ 45.000
Londra	Energy saving	17%	21%	23%
	Annual saving (0.10 €/kWh)	€ 16.000	€ 20.000	€ 22.000
Berlino	Energy saving	22%	26%	28%
	Annual saving (0.11 €/kWh)	€ 23.000	€ 27.000	€ 29.000
Mosca	Energy saving	38%	41%	44%
	Annual saving (0.06 €/kWh)	€ 21.000	€ 23.000	€ 25.000

Compared to other free cooling systems, such as for example the system with facing coils, the one used by Tetris 2 FC allows:

- much more precise condensation control, which helps the stability of operation of the machine
- the use of a very simple refrigerant circuit (no capacity reduction of the coils), thereby favouring the reliability of the machine
- limitation of the refrigerant charge because it does not use the "flooding" condensation control, but allows the use of microchannel condensing coils

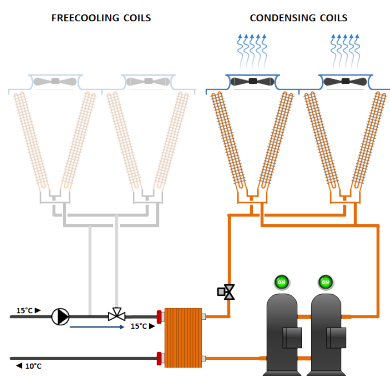
Finally, it should be remembered that the modularity of Tetris 2 FC does not regard only the size of the free cooling section; it also regards the possibility of choosing from different combinations of efficiency and noiselessness of the chiller section.

PRINCIPLE OF OPERATION

How the unit behaves in the various scenarios is explained briefly below.

Chiller only mode

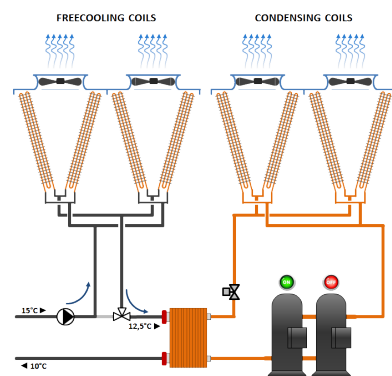
When the ambient temperature is higher than the temperature of the water returning from the system, all the required cooling capacity must be produced by the compressors.



The total cooling capacity is generated by the compressors of the chiller section, and the free cooling coil and relevant fans remain inactive. The operation of the unit is that of a classic chiller.

The 3-way valve bypasses the free cooling coil (so preventing unnecessary head losses) and condensation control is done, when necessary, through fan speed modulation.

Mixed mode

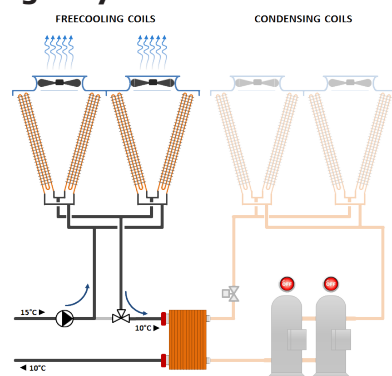


The control switches over the 3-way valve to put the free cooling coil in series with the evaporator and with the free cooling section fans.

The water leaving the free cooling coil will be "pre-cooled" by the outside air (partial free cooling) and is sent to the evaporator inlet. Now the chiller section can operate in reduced capacity mode because it will have to produce only the amount needed to reach total cooling capacity.

For outside air temperatures lower than or equal to the TFT, the unit operates exclusively in free cooling mode.

Free cooling only mode



The output capacity from the water coil fully meets the demand of the system, and therefore the condensing section fans are completely switched off and so are the compressors.

As the outside air temperature falls, the output capacity from the free cooling section will gradually increase and therefore the control of the unit will modulate performance either through stepped management of the fans (standard management) or through fan speed modulation for units that adopt EC fans for the free cooling section.

When the ambient temperature is lower than the temperature of the water returning from the system, the controller activates the free cooling section.

Tetris 2 FC

Modular free-cooling chillers for large systems. Wide range: multiple high efficiency combinations and low noise version Selectable independent free-cooling module.

PRODUCT DESCRIPTION

BODY

The body is modular with a load-bearing frame, made of galvanized sheet-iron coated with polyester powder RAL 5017/7035 which makes it highly resistant to weather conditions. All screws and bolts are stainless steel.

There are yellow lifting brackets at the base of the unit to allow lifting with lifting beam.

REFRIGERANT

The unit is charged with refrigerant R410A, with GWP=2088 (value at 100 years).

COMPRESSORS

The compressors are hermetic orbiting spiral scroll compressors connected in tandem or in trio, fitted with oil level sight glass, oil equalization line, crankcase heater and electronic protection.

SOURCE-SIDE HEAT EXCHANGER

The exchangers are made with microchannel aluminium coils. Finned pack coils with copper tubes and aluminium fins can be requested as accessory.

Thanks to continuous research in the alloys field, and sophisticated production methods, microchannel coils are made using specific aluminium alloys for the tubes and for the fins. This allows the effects of galvanic corrosion to be drastically reduced to always ensure protection of the tubes that confine the refrigerant. Tubes and fins are also subjected to SilFLUX coating processes (or equivalent) or have zinc added to further increase their corrosion resistance.

If the unit has to be installed in an environment with a particularly aggressive atmosphere, e-coated microchannel coils are available as an option. This option is strongly recommended for applications in coastal or highly industrialized areas.

The use of microchannel coils compared to conventional copper/aluminium coils reduces the total weight of the unit by about 10% and gives a reduction in refrigerant charge of at least 30%.

The V-shaped arrangement of the coils enables them to be protected from hail and makes the unit compact. It also guarantees an increase in the air intake surface, and leaves ample space for distribution of the components of the refrigerant circuit and the hydraulic circuit.

To protect the exchangers from corrosion and ensure optimal operation of the unit, we advise following the recommendations given in the user, installation and maintenance manual for cleaning the coils. For installations within a kilometre of the coast, use of the accessory is strongly recommended Coil treated with anti-corrosion paints.

FANS

The fans are axial fans, directly coupled to a three-phase 6-pole electric motor, with integrated thermal overload protection (Klixon®) and IP 54 protection rating.

The fan includes the shroud, designed to optimize its efficiency and reduce noise emission to a minimum, and the safety guard.

The fans of the chiller section are controlled as standard with phase cutting speed governor depending on the condensing pressure.

The fans of the free cooling section are managed as standard with stepped control depending on the temperature of the outgoing water.

EC fans are available as accessory for both sections and, in this case, continuous fan speed modulation is managed for both sections.

USER-SIDE HEAT EXCHANGER

The exchanger is a braze-welded stainless steel plate heat exchanger, insulated with a shroud of closed-cell insulating material.

Models with two refrigerant circuits are fitted with dual circuit heat exchanger with a single hydraulic connection.

The heat exchanger is equipped with:

- a thermostat-controlled anti-freeze heater to protect it from ice formation when the unit is not running
- a temperature probe for freeze protection

FREE COOLING CIRCUIT

The free cooling circuit consists of:

- the free cooling heat exchanger: this is made with finned pack coils with copper tubes and aluminium fins
- a servo controlled 3-way valve managed by the control
- water drain valve
- air valves (on each individual coil)
- expansion vessel
- safety valve
- two free cooling circuit shut-off gate valves.

REFRIGERANT CIRCUIT

Each refrigerant circuit of the basic unit (cooling only) comprises:

- shut-off valve in the liquid line
- 5/16" charging valves
- liquid sight glass
- replaceable solid cartridge dehydrator filter
- electronic expansion valve
- pressure transducers for reading the high and low pressure values and relevant evaporating and condensing temperatures
- high pressure switches

The pipes of the circuit and the exchanger are insulated with extruded closed-cell expanded elastomer that is resistant to UV rays.

ELECTRICAL CONTROL PANEL

The electrical control panel is made in a painted galvanized sheet-iron box with forced ventilation and IP54 protection rating.

The electrical control panel of the basic unit comprises:

- main disconnect switch
- automatic circuit breakers for compressors with fixed calibration
- fuses for protecting the fans and auxiliary circuits
- thermal magnetic circuit breakers for pumps (if present)
- contactors for compressors, fans and pumps (if present)
- phase monitor
- potential-free general alarm contacts
- single potential free operating contacts for compressors, fans and pumps (if present)
- microprocessor controller with display accessible from the outside
- external air temperature probe

All the electrical cables inside the panel are numbered and the terminal board dedicated to the customer's connections is colored orange so that it can be quickly identified in the panel.

Standard power supply of the unit is 400V/3~/50Hz

CONTROL BLUETHINK

Main controller functions

The control allows the following functions:

- water temperature adjustment, with control of the water entering the user-side heat exchanger
- freeze protection
- compressor timings
- automatic rotation of compressor starting sequence
- recording of the log of all machine inputs, outputs and states
- automatic rotation of compressor starting sequence
- recording of the alarm log
- RS485 serial port with Modbus protocol
- Ethernet serial port with Modbus protocol and integrated web server preloaded web page

- digital input for general ON/OFF
- 3-way free cooling valve management

For further details on available functions and on displayed information, you can refer to the specific documentation of the control.

By default, the serial connections present as standard are enabled only for reading from BMS. Enabling of writing from BMS is to be requested when ordering.

Main functions of the webserver

As standard, the Bluethink controller integrates a web-server with a preloaded web page that is accessed via password.

The web page allows the following functions to be carried out (some of these are available only for users with advanced level rights):

- display of the main functions of the unit such as unit serial n°, size, refrigerant
- display of the general status of the machine: water inlet and outlet temperatures, external air temperature, mode (chiller or heat pump), evaporating and condensing pressures, suction and discharge temperatures
- display of the status of compressors, pumps, expansion valves
- display in real time of the graphs of the main quantities
- display of the graphs of logged quantities
- display of alarm log
- management of users on several levels
- remote ON/OFF
- remote set point change
- remote time band change

Human-Machine Interface

The control has a graphic display that allows the following information to be displayed:

- water inlet and outlet temperature
- set temperature and differential set points
- description of alarms
- hour meter of operation and number of start-ups of the unit, the compressors and the pumps (if present)
- high and low pressure values, and relevant condensing and evaporating temperatures
- external air temperature
- superheating at compressor suction.

CONTROLS AND SAFETY DEVICES

All the units are fitted with the following control and safety components:

- high pressure switch with manual reset
- high pressure safety device with automatic reset, for a limited number of occurrences, managed by the controller
- low pressure safety device with automatic reset and limited tripping managed by the controller

- high pressure safety valve
- antifreeze probe at outlet of each evaporator
- Mechanical paddle flow switch factory-mounted, except for single-circuit units. For these units, flow switch is supplied as kit; mounting support (1" female fitting) and installation are care of customer
- overtemperature protection for compressors and fans

TESTING

All the units are factory-tested and supplied complete with oil and refrigerant.

VERSIONS

Alongside the basic version of the unit, there are various versions that differ in efficiency and noise levels.

A and A+

The high efficiency units use larger coils than the basic unit, in order to increase the ratio between exchange surfaces and capacity of the compressors. This allows all models to achieve Eurovent Class A for both EER and COP and consequently also high ESEER values.

SLN and A/SLN

SLN version

The SLN version units use a soundproofed compressor compartment, oversize coils compared to the standard efficiency unit and fans with speed adjuster and reduced air flow rate. The speed reduction of the fans is such that, under nominal operating conditions, the air flow rate and noise level are lower than those of the basic version of the unit.

In any case, the use of the speed adjuster to reduce the air flow rate allows rotation of the fans at maximum speed when external air temperature conditions are particularly critical and therefore guarantees the same operating limits as the high efficiency versions.

OPTIONS

/LN: silenced unit

In the unit with /LN option, all the compressors are enclosed in a compartment that is fully soundproofed with sound absorbing material and soundproofing material.

/DS: unit with desuperheater

In addition to the set-up of a chiller only unit, /DS units comprise (for each refrigerant circuit) an exchanger for condensation heat recovery of up to 20% (depending on size, version and operating conditions), placed in series with the condensing coils. The exchanger is a braze-welded plate heat exchanger. For multi-circuit units, the exchangers are to be manifolded outside the unit (by the customer).

To maximize the use of the accessory and optimize machine operation, combination with the speed adjuster of the fans or with the EC fans is recommended.

This option is also available for /HP units, but in this case, in the installation, it must have provision for shutting off the recovery water circuit during operation in heat pump mode to avoid taking power from the user-side heat exchanger.

HYDRAULIC MODULES

All units can be fitted with hydraulic module in various configurations:

- /1P: hydraulic module with one pump
- /2P: hydraulic module with two pumps
- /1PS: hydraulic module with one pump and buffer tank
- /2PS: hydraulic module with two pumps and buffer tank

All the above-mentioned modules have pumps with standard discharge head.

The following are also available:

- modules /1PM, /2PM, /1PMS and /2PMS that have pumps with increased available discharge head

Hydraulic modules with one pump have:

- one pump
- a gate valve on the delivery side of the pump
- an expansion vessel

Hydraulic modules with two pumps have:

- two pumps
- a check valve on the delivery side of each pump
- a gate valve on the outlet of the delivery manifold
- an expansion vessel

In the version with 2 pumps, these are always with one on standby while the other is working. Switching over between the pumps is automatic and is done by time (to balance the hours of operation of each one) or in the event of failure.

Hydraulic modules with tank also have:

- a gate valve at the inlet of the pump or the suction manifold
- a tank with drain valve and air valve

Refer to the table of configurations that are not possible to check for availability of specific set-ups.

DESCRIPTION OF ACCESSORIES

Refrigerant circuit accessories

BC Capacitive backup battery for electronic expansion valve

When the compressors stop, the controller always closes the electronic expansion valve to prevent dangerous refrigerant migration. The presence of the backup battery ensures that the electronic valve is kept in closed position even when there is no power supply

This option uses a condenser as energy storage, and not an ordinary coil. In this way, it is not affected by the memory effect of normal coils and the need for maintenance is avoided.

BK Brine Kit

This accessory is compulsory if a water temperature set point lower than +3°C is used (if the unit is provided with double set point or variable set point, the lower set point is considered).

The accessory consists of increased insulation and suitable sizing and calibration of some components.

The inlet and outlet temperatures of the user-side exchanger must be given on ordering to allow correct setting of the alarm parameters and verification of the sizing of the expansion valve.

The cooling set point can then be changed by the customer in an interval that, compared to the set point given on ordering, ranges from -1K up to the maximum temperature allowed by the above-stated operating limits.

The unit will be optimized to work at the set point temperature given on ordering. For different set points, the cooling capacity provided and the level of efficiency of the machine could decrease and move away from these conditions.

This accessory compulsorily requires the insertion of one of the options: condensing control with speed adjuster or EC fans.

DVS Double safety valve

With this accessory, instead of each individual safety valve per circuit, there is a "candelabrum" with two safety valves and a diverter valve for choosing the valve in operation. This allows the safety valves to be replaced without having to drain the machine and without having to stop it.

MAFR Pressure gauges

The operating pressures of each circuit of the unit can be displayed on the control by accessing the relevant screens. Also, the machine can be fitted with pressure gauges (two for each circuit) installed in a clearly visible position. These allow reading in real time of the working pressures of the refrigerant gas on the low pressure side and on the high pressure side of each refrigerant circuit.

RIC Liquid receiver

The adoption of this accessory always guarantees correct feeding of the expansion valve even when the unit is subjected to wide external air temperature ranges.

This accessory is standard on DC and HP units.

RPP Refrigerant leak detector with automatic pump down

With this accessory, a refrigerant leak detector is placed inside each compressor compartment. Detection of a refrigerant leak is managed by the control through a specific alarm and display of a specific icon on the display of the control. For all the circuits of the unit, the alarm also starts the machine stopping procedure with pump down, confining all the refrigerant in the coils.

The accessory includes the capacitive backup battery.

The accessory can be applied only to units in LN or SLN set-up.

RPR Refrigerant leak detector

With this accessory, a refrigerant leak detector is placed inside each compressor compartment. Detection of a refrigerant leak is managed by the controller through a specific alarm and display of a specific icon on the display of the controller. This alarm stops the unit.

RUB Compressor suction and delivery valves

The valves situated on the delivery side and on the suction side of the compressors allow the compressor to be isolated from the rest of the refrigerant circuit, so making the maintenance operations quicker and less invasive

Fan accessories

RECP Pressure recuperator

Normally, the air ejected by the fan has a high speed and this manifests itself as kinetic energy that is dissipated into the environment.

The pressure recuperator is a passive element situated on the ejection duct of each individual fan designed to allow better conversion of kinetic energy into static pressure, which manifests itself as a higher pressure generated by the fan.

This higher pressure can have at least two possible applications:

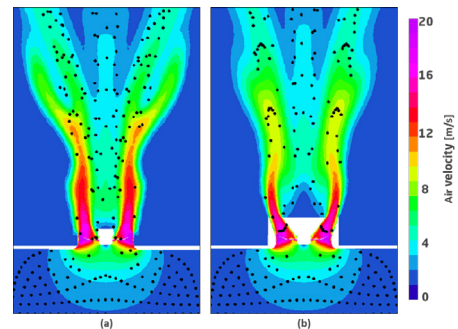
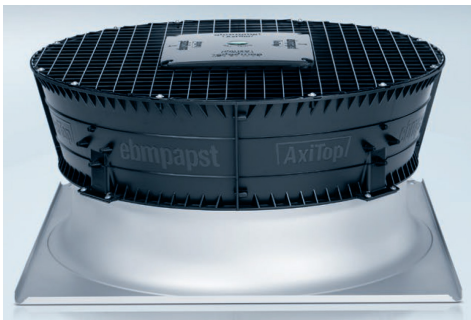
- For the same fan speed, the pressure recuperator allows an increase of about 50Pa in the available pressure of the ventilating section to be obtained. This can be useful for overcoming the head losses that may be present in specific installations. The increase in available pressure is to be considered in addition to the increase that can already be obtained with the application of oversize EC fans
- for the same pressure differential on the air, the pressure recuperator allows the same air flow rate to be obtained with a lower number of revolutions of the fan. This automatically produces a reduction of up to 3 dB(A) in the noise emission of the unit and a reduction in the absorption of the fan, with an immediate increase in the overall efficiency of the unit.

The reduction in total sound power varies depending on the model and version of the unit as it is related to the incidence of noise generated only by the fan section on the total noise emitted by the unit.

For SLN units, which already work with a reduced air flow rate, application of the pressure recuperator has a limited or negligible noise reduction effect.

To allow optimization of the performance of the accessory, combination with the speed adjuster or EC fans is necessary. In this last case, the higher efficiency of the EC fans (especially when operating at low speed) is added to the performance improvement generated by the pressure recuperator.

The accessory is supplied separately from the unit on one or more pallets and it must compulsorily be installed (by the customer) before the first start-up of the machine.



(a) fan only;

(b) fan with pressure recuperator

VCH EC fans for the chiller section

VFC EC fans for the free cooling section

With this accessory, EC fans, with electronically commutated brushless motor, are used for the ventilating section. These guarantee very high efficiency levels for all working conditions and allow a 15% saving on the power absorbed by each fan working at full capacity.

Also, through a 0-10V analogue signal sent to each fan, the microprocessor carries out condensation/evaporation control by continuous adjustment of the air flow rate as the external air temperature changes, with a further reduction in electrical absorption and noise emission.

For further details, see the dedicated chapter: "Aeraulic head losses and options available for the fan section".

VCM Oversize EC fans for the chiller section

VFM Oversize EC fans for the free cooling section

The increased EC fans allow to obtain the same benefits as EC fans and in addition allow to have a residual useful head of about 100Pa.

For further details, see the dedicated chapter: "Aeraulic head losses and options available for the fan section".

Hydraulic circuit accessories

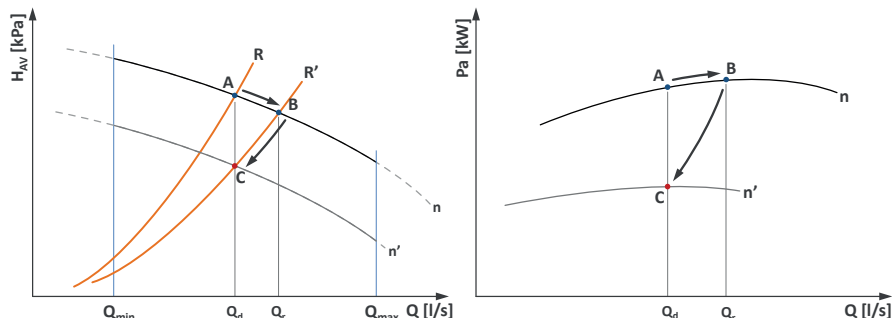
FVP FLOWZER VP - Inverter for manual pump adjustment

The accessory consists of inserting an inverter in the machine to manually adjust the speed of the pump (or pumps) in order to calibrate the pump flow rate on the head losses of the system.

This accessory is to be combined with one of the integrated hydraulic modules that can be selected for the unit. Units equipped with integrated hydraulic module allow a certain level of available discharge head (point A) to be obtained under nominal flow rate conditions Q_d .

But the actual head loss level of the system (e.g. characteristic curve R') normally causes the pump to find a different equilibrium point (point B), with a flow rate Q_r higher than Q_d .

In this condition, in addition to having a different flow from the nominal one (therefore also a different temperature jump), there is also a greater absorption of electric power from the pump itself.



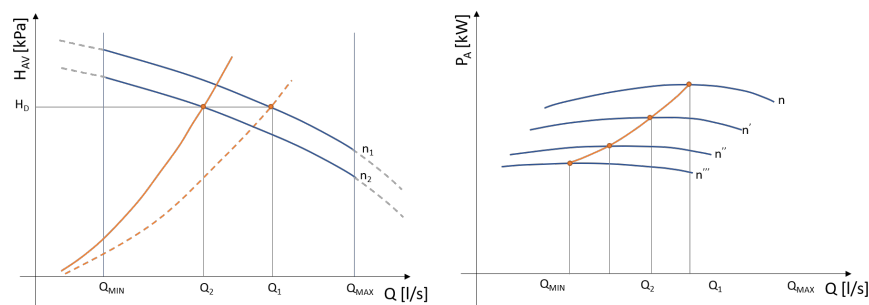
The use of the Flowzer VP allows the pump speed to be set manually (e.g. at speed n' instead of n) to obtain the design water flow rate and thermal gradient (point C). Once the adjustment procedure has been carried out, the pump will always work at a fixed flow rate.

The adoption of the VP Flowzer allows to considerably reduce the electrical power consumption of the pump with a consequent energy saving. By way of example, a reduction in the flow rate of 10% leads to a reduction in power consumption of around 27%.

For the freecooling units the Flowzer VP is able to manage two different speeds of the pump automatically compensating the pressure drops of the water coil.

FVD FLOWZER VD - Transducer for automatic adjustment

Flowzer VD requires two pressure transducers to be installed in the machine. Through these transducers, the inverter can gauge the actual pressure at the ends of the system and it can automatically adapt the pump speed to obtain a set available discharge head value. Flowzer VD must be combined with Flowzer VP. This accessory therefore allows a constant pressure system to be achieved.



With the Flowzer VD, the customer can set, directly on the inverter, the available discharge head value H_d that the unit must maintain. As can be seen from the graph as the user request decreases, the resistant curve of the plant moves to the left, consequently the inverter reduces the speed of the pump in order to maintain the useful head necessary for the unit. With this system a significant reduction in electrical power is achieved. The customer will have to check that, in minimum flow rate conditions (that is, with the maximum number of user points closed), this is always higher than or equal to the minimum flow rate allowed by the unit.

This accessory is useful when the total head losses of the circuit are slightly variable or when they change depending on the seasons (for example, some user points are active only during summer operation and not during winter operation).

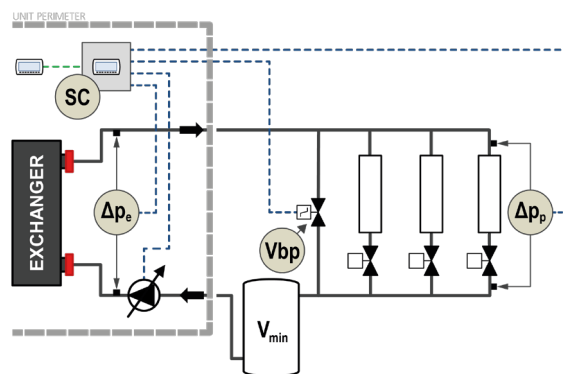
The use of this accessory also allows the pump speed to be adapted to possible fouling of the filter on the hydraulic circuit.

FVF **FLOWZER VFPP – Kit for variable flow rate primary circuit pump with bypass valve included**

Bluethink solution for a variable flow rate system, consisting solely of a user-side primary circuit.

Flowzer VFPP includes:

- a pressure transducer installed at the ends of the user-side exchanger (Δp_e)
- a dedicated control system, installed at the factory in the electrical control panel of the unit (Sc)
- a modulating bypass valve with servo-motor supplied separately with it (Vbp), supplied loose (installation by the customer)
- two system pressure transducers (Δp_p) supplied separately (installation by the customer)



It is obligatory for the option to be combined with the Flowzer VP (inverter) and with one of the hydraulic modules that can be selected for the unit. The accessory is not compatible with Multilogic. Please contact our sales department for further details.

The unit must include the advanced Bluethink controller, just one heat exchanger on the user side and a minimum capacity step of 25% or less.

The option offers a complete default package to guarantee simple selection, purchasing and commissioning. In particular, the unit includes an additional control system, equipped with an advanced algorithm, which interacts with the main advanced Bluethink controller.

Flowzer VFPP has the advantage of:

- implementing an innovative design, which is alternative to the classic system based on fixed flow-rate primary circuit plus secondary circuit
- being ideal for new or entirely redesigned systems, especially for comfort applications
- having a variable flow system, with maximum energy saving
- simplifying the layout of the user circuit
- limiting the capex of the system
- performing a reliable check

The Flowzer VFPP system controller uses an advanced algorithm that enables prevention of unnecessary waste of energy and hunting by the inverter and the bypass valve.

The capex of the system is also reduced thanks to:

- single inverter + pumping module, integrated in the unit
- small internal footprint, due to the simplified layout

The operating principle can be summarized as follows:

- Flowzer VFPP carries out constant control of the discharge head
- the controller modulates the pump speed according to the signal detected by the system transducers Δp_p
- as the demand from the system goes down, the pump speed will be reduced.
- the pump speed can be reduced until it reaches the minimum allowed flow rate on the heat exchanger of the unit

- this flow rate is indirectly monitored through the losses detected by the differential pressure transducer Δp_e
- When the minimum allowed flow rate threshold is exceeded, the control system will open the bypass valve V_{bp} to recirculate the flow rate that is not required by the system, but is necessary to guarantee the minimum flow rate to the heat exchanger.

In the required minimum load condition (that is, with all system terminals switched off) the necessary minimum volume (V_{min}) must be ensured by the relevant tank to be installed between the unit and the separator or the bypass pipe.

The bypass valve V_{bp} is controlled through a 0-10 V signal and must therefore be installed within 30 m of the unit.

The pressure transducers of the system Δp_p provide a 4-20 mA signal and require two 1/4" female fittings. These transducers must be installed within 200 m of the unit, near the system terminal that is affected by the highest line head losses or in any case in a position where it is possible to measure an adequate pressure value.

Further details can be found in the relevant manual.

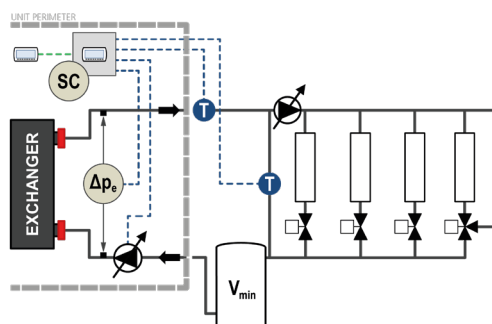
Bypass valve diameter	TETRIS 2 FC	TETRIS 2A FC	TETRIS 2 SLN FC	TETRIS 2A+ FC	TETRIS 2A SLN FC
2 1/2"				18.4	18.4
				23.5	23.5
3"	27.4	28.4	28.4	27.6	27.6
	29.4	34.4	34.4	31.4	31.4
	32.4				
4"	33.4	38.4	38.4	36.4	36.4
	37.4	43.4	43.4	41.5	41.5
	41.4	47.4	47.4	44.6	44.6
	43.6	50.6	50.6	49.6	49.6
	47.6			54.6	54.6
5"		57.6	57.6		
		64.6	64.6		
		70.6	70.6		

FVPS FLOWZER VPS – Kit for variable flow rate pump with temperature sensors

Bluethink solution for a variable flow rate system, consisting of a primary circuit plus secondary circuit.

Flowzer VPS includes:

- a differential pressure transducer, installed at the factory at the ends of the user-side heat exchanger of the unit (Δp_e)
- a dedicated control system, installed at the factory in the electrical control panel of the unit (Sc)
- two system temperature sensors (T) - supplied separately; installation by the customer



It is obligatory for the option to be combined with the Flowzer VP (inverter) and with one of the hydraulic modules that can be selected for the unit. The accessory is not compatible with Multilogic. Please contact our sales department for further details.

The unit must include the advanced Bluethink controller, just one heat exchanger on the user side and a minimum capacity step of 25% or less.

The option offers a complete default package to guarantee simple selection, purchasing and commissioning. In particular, the unit includes an additional control system, equipped with an advanced algorithm, which interacts with the main advanced Bluethink controller.

Flowzer VPS has the advantage of:

- being ideal for renovations of existing systems, especially for comfort applications
- achieving a complete variable flow system, with maximum energy saving
- implementing a flexible design, e.g. for scalable or multi-zone systems

The maximum energy saving is achieved thanks to the advanced algorithm, which prevents hunting by the inverter and balances the pump speed and the recirculation flow rate to a minimum.

With refurbishments, the system's capex is limited to the unit and its commissioning.

The dimensions of the inverter of the unit and of the pump module can be favoured by the low design discharge head of the primary circuit.

The operating principle can be summarized as follows:

- Flowzer VPS performs a smart check of the flow rate in the primary circuit and balances it with the flow rate in the secondary circuit.
- the system controller modulates the pump speed according to the condition detected by the system sensors T
- if the system terminals are switched off, the flow rate of the secondary circuit will decrease; therefore the direction of flow is detected indirectly as temperature difference by the system sensors through the separator or the bypass pipe
- The check thus contributes to reducing the speed of the primary pump until the min. flow threshold in the heat exchanger of the unit is exceeded.
- this flow rate is indirectly monitored through the losses detected by the differential pressure transducer Δp_e

In the required minimum load condition (that is, with all system terminals switched off) the necessary minimum volume (V_{min}) must be ensured by the relevant tank to be installed between the unit and the separator or the bypass pipe.

The temperature sensors of the system T provide a 4-20 mA signal and require 1/2" female fittings.

Further details can be found in the relevant manual.

V3M 3-way modulating valve

With this accessory, a 3-way modulating valve is used in place of the three-point 3-way valve normally used. This accessory is useful in applications where fan management alone is not sufficient to regulate the capacity given by the free cooling coil. This can happen in applications where the load is very variable or when the outside air temperature can fall many degrees below zero.

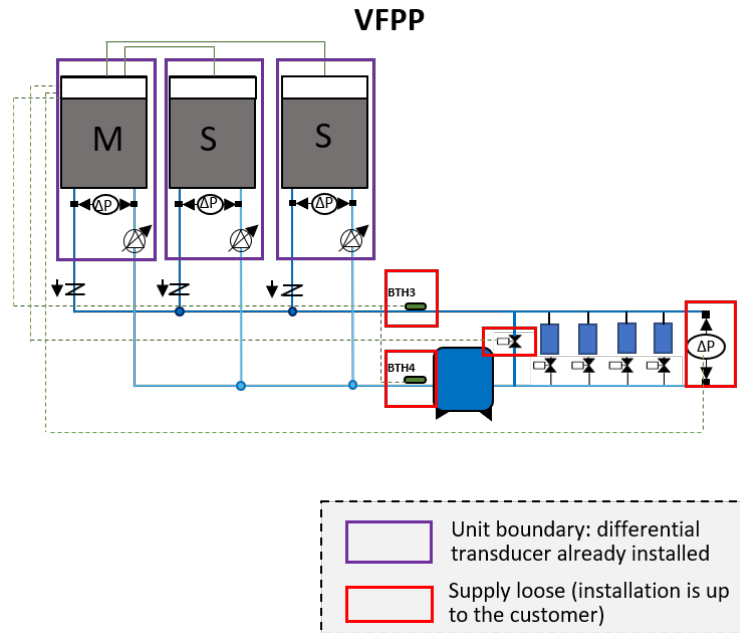
The controller modulates the free cooling capacity by acting on the speed adjuster of the fans, but if, even with fans off, the capacity given by the water coil is excessive, the water flow rate will be reduced by modulating the opening of the 3-way valve.

VSIW Water-side safety valve

With this accessory, a safety valve is inserted in the hydraulic circuit of the unit: when the calibration pressure is reached, the valve opens and, by discharging (to be routed by the customer), prevents the system pressure from reaching limits that are dangerous for the components present in the system. The valves have positive action, that is, performance is guaranteed even if the diaphragm deteriorates or breaks.

HFx HYZER E VFPP function

The HYZER E VFPP function combines the Multilogic function, which is designed to manage multi-machine systems, with the FLOWZER VFPP control for variable flow systems.



It is obligatory for the option to be combined with the Flowzer VP (inverter) and with one of the hydraulic modules that can be selected for the unit.

The unit must include the advanced Bluethink controller, just one heat exchanger on the user side and a minimum capacity step of 25% or less.

Units operate according to the Master/Slave logic that is typical of a Multilogic system. For additional details, please refer to the FMx option.

VFPP control requires the installation on the machine of a differential transducer at the ends of the user-side heat exchanger in order to keep the flow rate in the system within a specific min. value allowed.

For additional details on the FLOWZER VFPP logic, please refer to the dedicated FVF option.

The networked units may be of different types, and the same observations as for the Multilogic option apply:

- if there are both chiller units and heat pumps in the network, the Master unit must obligatorily be one of the HP units;
- if there are both free-cooling and non free-cooling units in the network, the Master unit must obligatorily be one of the free-cooling units.

The HYZER E function requested with the unit can be:

- **HF0:** HYZER E VFPP function for Slave units;
- **HF2:** HYZER E VFPP function for the Master unit in order to manage up to 2 Slave units;
- **HF6:** HYZER E VFPP function for the Master unit in order to manage up to 6 Slave units.

If you need to connect more than 6 slaves (up to 31), you can ask for a quotation from our sales department.

For the slave units, the accessory requires:

- programming of the unit as slave of a system of machines in Multilogic network

For the master units, the accessory requires:

- programming of the unit as master of a system of machines in Multilogic network
- entering of the parameters necessary for connection with the individual slave units
- installation in the electrical control panel of a network switch to allow the units to be connected in a LAN network.
- the supply of 2 temperature probes to be positioned on the delivery and return manifold for system thermoregulation (supplied with the system - installation and wiring by the customer);
- the supply of two pressure transducers (supplied with the system - installation and wiring by the customer) to be installed near the system terminal that is affected by the highest head losses in the line or in any case in a position where it is possible to measure an adequate pressure value.

- The option also includes the supply of a bypass valve controlled by a 0-10 V signal, which must be selected in function of the system capacity. Please refer to the VBx options for correct selection.
- The connection between the master unit and the slave units made with a CAT cable. 5E/UTP (prepared by the customer) with RJ45 connectors. Maximum cable length 100m.
- For further details, please refer to the controller manual.

VBx VFPP bypass valve for HYZER E

The option is supplied with the bypass valve, which is selected according to the system capacity.

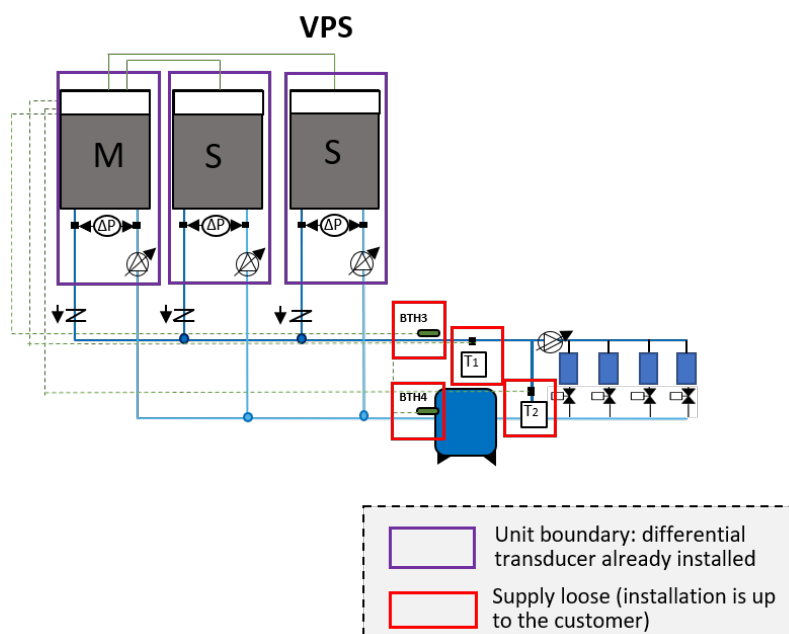
This option must be selected with either the "HYZER E VFPP function for Master unit to manage up to 2 Slave units" or "HYZER E VFPP function for Master unit to manage up to 6 Slave units".

	System capacity range**	Quantity	Diameter	Qmax**
	kW	-	in	m ³ /h
S_A	<240	1	2 1/2"	41.3
S_B	240÷335	1	3"	57.6
S_C	335÷570	1	4"	98
S_D	570÷850	1	5"	146.2
S_E	850÷1250	1	6"	215
S_F	1250÷1700	2	2 x 5"	2 x 146.2
S_G	1700÷2500	2	2 x 6"	2 x 215

** values based on a 5 °C temperature difference between the delivery and the return temperature

HSx HYZER E VPS function

The HYZER E VPS function combines the Multilogic function, which is used to manage multi-machine systems, with the FLOWZER VPS control for variable flow systems.



It is obligatory for the option to be combined with the Flowzer VP (inverter) and with one of the hydraulic modules that can be selected for the unit.

The unit must include the advanced Bluethink controller, just one heat exchanger on the user side and a minimum capacity step of 25% or less.

Units operate according to the Master/Slave logic that is typical of a Multilogic system. For additional details, please refer to the FMx option.

VPS control requires the installation on the machine of a differential transducer at the ends of the user-side heat exchanger in order to keep the flow rate in the system within a specific min. value allowed.

For additional details on the FLOWZER VPS logic, please refer to the dedicated FVPS option.

The networked units may be of different types, and the same observations as for the Multilogic option apply:

- if there are both chiller units and heat pumps in the network, the Master unit must obligatorily be one of the HP units;
- if there are both free-cooling and non free-cooling units in the network, the Master unit must obligatorily be one of the free-cooling units.

The networked units may be of different types, and the same observations as for the Multilogic option apply:

- if there are both chiller units and heat pumps in the network, the Master unit must obligatorily be one of the HP units;
- if there are both free-cooling and non free-cooling units in the network, the Master unit must obligatorily be one of the free-cooling units.

The HYZER E function requested with the unit can be:

- **HS0:** HYZER E VPS function for Slave units;
- **HS2:** HYZER E VPS function for the Master unit in order to manage up to 2 Slave units;
- **HS6:** HYZER E VPS function for the Master unit in order to manage up to 6 Slave units.

If you need to connect more than 6 slaves (up to 31), you can ask for a quotation from our sales department.

For the slave units, the accessory requires:

- programming of the unit as slave of a system of machines in Multilogic network

For the master units, the accessory requires:

- programming of the unit as master of a system of machines in Multilogic network
- entering of the parameters necessary for connection with the individual slave units
- installation in the electrical control panel of a network switch to allow the units to be connected in a LAN network.
- the supply of 2 temperature probes to be positioned on the delivery and return manifold for system thermoregulation (supplied with the system - installation and wiring by the customer);
- the supply of 2 temperature probes to be installed on the delivery manifold and on the bypass branch, which are typical of VPS control (supplied with the system - installation and wiring by the customer).

The connection between the master unit and the slave units made with a CAT cable. 5E/UTP (prepared by the customer) with RJ45 connectors. Maximum cable length 100m.

For further details, please refer to the controller manual.

PVX Variable flow setup for HYZER X

The dedicated HYZER X controller is designed to manage the different units, devices and components that make up a hydronic system.

Systems featuring this controller require that the PVX option be installed at the ends of the user-side heat exchanger of a differential pressure transducer so that the machine is set up for variable flow rate control.

This option is mandatory in all units making up the system.

For additional information on the product HYZER X, please refer to the specific technical catalogue.

VIX Shut-off valves for systems with external pumps for HYZER X

Systems featuring the HYZER X controller enable the selection of the shut-off valve used in systems that have an external pumping unit.

The option is always supplied separately from the unit and is for installation by the customer.

FLMX User-side flow meter for HYZER X

Systems featuring the HYZER X controller enable the selection of the flow meter option to calculate the flow rate and the performances of the units.

The option is supplied with the system for installation on the user side (installation by customer).

Electrical accessories

Some accessories may be incompatible with each other even if not expressly indicated.

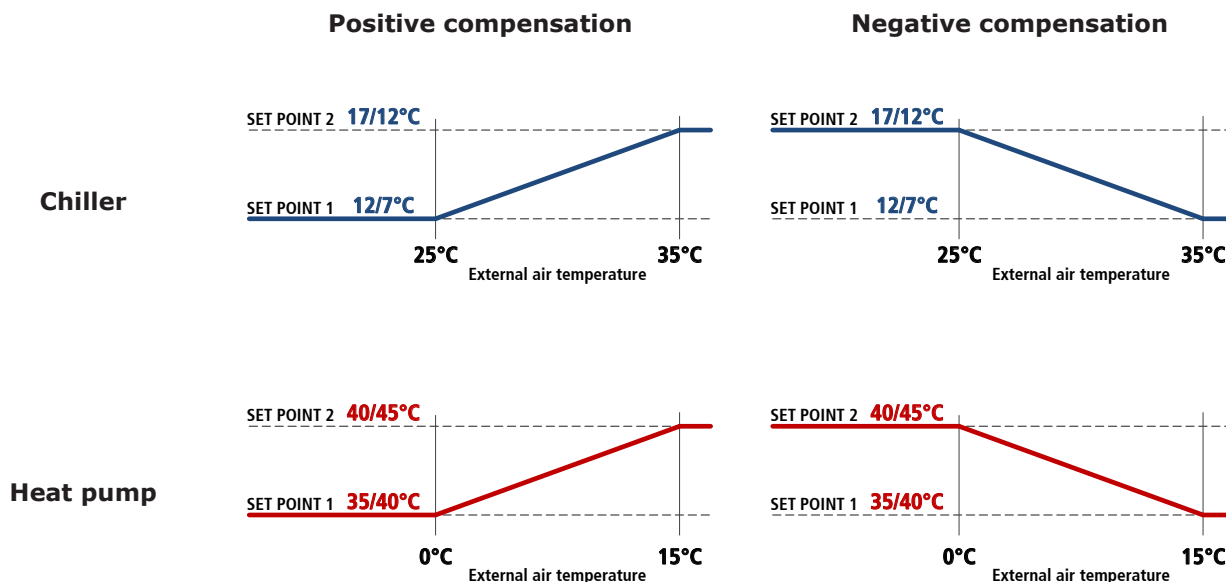
COTW Outgoing water temperature control (S)

With this accessory, outgoing instead of incoming water temperature control is used.

CSP Set point compensation depending on external air temperature

For units fitted with this accessory, the set point of the unit is set so that it can vary between two values, a maximum and a minimum, depending on the external air temperature. The compensation ramp and the maximum and minimum values of the set point can be changed by the user.

Unless otherwise specified in the order, the controller will be set to implement a positive compensation logic according to the temperatures shown in the following diagrams:



DAA Double power supply with automatic switching

A motor-driven automatic switch to which to connect two separate power supply lines (for example, one from the mains power line and one from the uninterruptible power supply unit) is installed in the electrical control panel of the unit.

The switching from one line to another is automatic and obligatorily requires passing through the OFF position. When this accessory is requested, the power supply of the unit must compulsorily include neutral.

DAM Double power supply with manual switching

A manual switch to which to connect two separate power supply lines (for example, one from the mains power line and one from the uninterruptible power supply unit) is installed in the electrical control panel of the unit. The switching from one line to another is manual and obligatorily requires passing through the OFF position.

IACV Automatic circuit breakers

With this accessory, automatic circuit breakers are installed instead of fuses for the protection of auxiliary loads. Also, the same accessory uses automatic circuit breakers with adjustable thermal overload protection to protect the compressors.

LIID Limitation of the current absorbed by digital input

When this accessory is requested, a digital input is prepared in the terminal board to activate the forced capacity reduction of the unit to a set fixed level.

This accessory is useful when there is a need to necessarily limit the power absorbed by the unit as regards particular conditions.

We point out that, in some conditions (for example, during defrosting, oil return cycles or hourly compressor rotation procedures), the controller could force the unit to operate at full capacity for limited periods of time.

NSS Night Shift System

This accessory is applied to high efficiency units or to SLN units.

In the day time slot, which is normally the one with the highest heat load, priority is given to efficiency and therefore the machine works with a fan control curve that maximises the EER. In this time slot, therefore, the unit is a high efficiency low noise machine (equivalent to A/LN, A+/LN)

In the night time band (or in any case from time band decided by the customer), the priority changes to limiting the noisiness of the machine and therefore the controller carries out an adjustment of the control ramp of the condensing fans, thereby reducing the air flow rate and consequently the noise emission level. So, in this time band, the unit is a super low noise machine (equivalent to SLN).

In any case, if there is a need for additional cooling capacity, the controller will manage the demand, if necessary, by accelerating the fans and keeping condensation within the correct operating limits.

The time slots can be set from the control depending on installation requirements.

When the unit is working in heat pump mode, in order to maximise the COP and to obtain the widest possible operating limits, the control of the unit forces the fans to the maximum speed also during the night time bands.

RE1P Relay for management of 1 external pump

This accessory can be requested for units without pumps and allows a pump outside the machine to be controlled.

RE2P Relay for management of 2 external pumps

This accessory can be requested for units without pumps and allows two pumps outside the machine to be controlled with a running/stand-by logic by implementing a rotation on the hours of operation.

Dwie pompy są sterowane przez dwa osobne przekaźniki.

RIF Power factor correction to $\cos\varphi \geq 0.95$

With this accessory, an electrical control panel (IP54 protection rating), containing power factor correction capacitors to make the $\cos\varphi$ of the unit greater than or equal to 0.95, is supplied with the unit. The capacitors should be connected (by the customer) to the electrical control panel of the unit in the specially prepared terminal board.

Besides reducing the absorbed reactive power, the use of this accessory also allows the maximum absorbed current to be lowered.

RMMT Maximum and minimum voltage relay

This accessory constantly monitors the voltage value and the unit's power supply phase sequence. If the supply voltage does not fall within the set parameters or there is a phase reversal, an alarm is generated that stops the machine to prevent damage to its main parts

TERM Remote-controlled user terminal panel

This accessory allows the terminal normally situated on the machine to be replicated on a support situated at a distance. It is particularly suitable when the unit is placed in an area that is not easily accessible.

The accessory is supplied loose and is to be installed by the customer at a maximum distance of 120m from the unit. We advise using a cable of the following type: "TECO O.R. FE 2x2xAWG24 SN/ST/PUR".

For this accessory, there is a dedicated serial port.

SETD Double set point from digital input

The accessory allows you to preset two different operating set points and manage the change from one to the other through a digital signal.

The set point temperatures must be specified when ordering. For optimization of the unit, reference will be made to the lower set point in chiller mode and the higher set point in heat pump mode.

Unless otherwise specified in the order, the controller will be set at the factory with the following temperatures:

- in chiller mode, set point 1 to 7°C and set point 2 to 12°C
- in heat pump mode (only for HP units) set point 1 to 45°C and set point 2 to 40°C

SETV Variable set point with remote signal

The accessory allows the set point to be varied continuously between two preset values, a maximum and a minimum, depending on an external signal that can be of the 0-1V, 0-10V or 4-20mA type.

The set point temperatures and the type of signal to use for the adjustment must be specified when ordering. For optimization of the unit, reference will be made to the lower set point in chiller mode and the higher set point in heat pump mode.

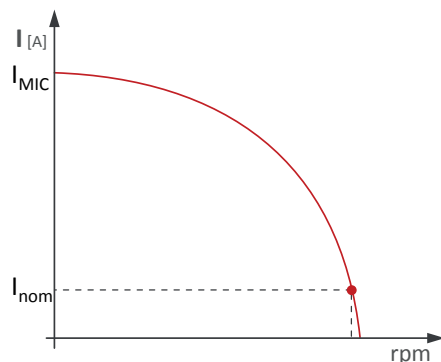
Unless otherwise specified in the order, the controller will be set at the factory with 0-10V analogue input and with the following temperatures:

- in chiller mode, 0V will correspond to a set point of 7°C and 10V will correspond to a set point of 12°C
- in heat pump mode (only for HP units), 0V will correspond to a set point of 45°C and 10V will correspond to a set point of 40°C

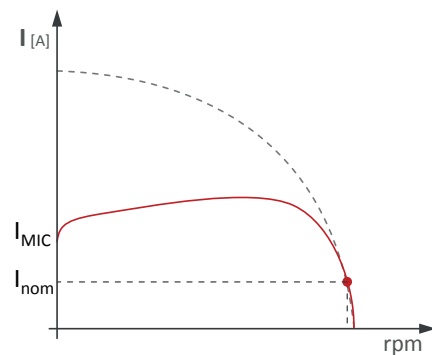
SOFT Electronic soft-starter

The scroll compressors have DOL (Direct On Line) starting and therefore the maximum inrush current IMIC will be 4/5 times its nominal current Inom.

If the unit is equipped with the electronic soft-starter accessory, the starting of each compressor is done with an acceleration ramp that allows the effective value (rms value) of the inrush current of the individual compressor to be lowered.



Current trend without accessory Electronic soft-starter



Current trend with accessory Electronic soft-starter

If the unit is equipped with accessory "Power factor correction to $\cos\phi \geq 0.95$ ", this last will be electro-mechanically connected only at the end of the acceleration ramp of the soft-starter.

SQE Heater for electrical control panel

Electric heaters are positioned inside the electrical control panel and these prevent the formation of ice or condensation inside it.

SUN Heaters for operation with air below -25°C

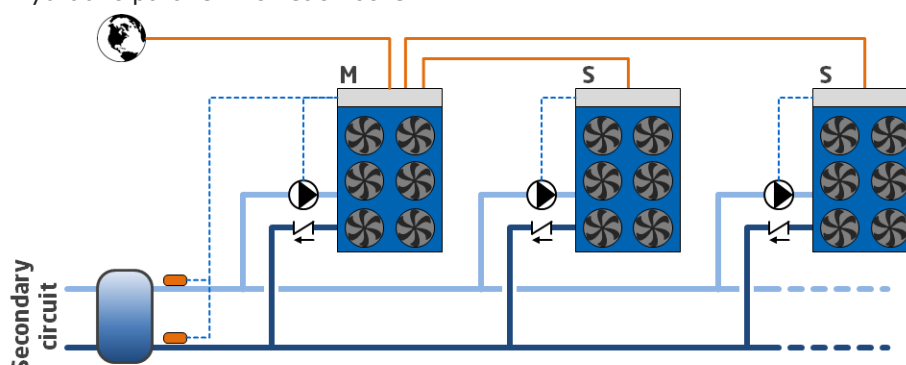
Electric heaters are positioned inside the electrical control panel and these prevent the formation of ice or condensation inside it.

If the operating temperatures of the unit can extend below -25°C, specific measures must be adopted to guarantee correct operation of the unit and the reliability of critical components.

Depending on the limit temperature it is necessary to reach, use will be made of suitably positioned heaters and additional thermal protection up to adoption of special electrical conductors.

FMx Multilogic Function

The Multilogic function allows management of up to 32 units equipped with advanced Bluethink controller and connected in hydraulic parallel with each other.



On the basis of the information recorded by the temperature probes installed on the delivery and return manifolds of the system, with the master unit, a capacity request is generated that is distributed among the units connected in the Multilogic network according to settable priority and optimization logics.

If communication between the units fails or if the master is off-line, the slave units can continue to work according to the set thermoregulation parameters.

The connected units can be different from each other, in terms of capacity and set-up, provided the following rules are complied with:

- if there are both chiller units and heat pumps in the Multilogic network, the Master unit must obligatorily be one of the HP units
- if there are both free cooling and non free-cooling units in the Multilogic network, the Master unit must obligatorily be one of the free-cooling units.

GLO Modbus Lonworks Gateway

With this accessory, a RS485/Lon gateway is installed inside the electrical control panel.

By default, the programming gives read-only access to the control of the unit. Enabling of read/write access should be requested when ordering.

PBA BACnet protocol over IP (Ethernet)

The controller is set for use, in read and write mode, of the BACnet port on IP protocol.

By default, the programming gives read-only access to the control of the unit. Enabling of read/write access should be requested when ordering.

SERI RS485 serial interface with Modbus protocol

RS485 serial interface with Modbus protocol.

SW4P Network switch with 4 ports

The accessory includes installation in DIN rail of a professional 4-port network switch. Requires Blueye via Ethernet.

SW8P Network switch with 8 ports

The accessory includes installation in DIN rail of a professional 8-port network switch. Requires Blueye via Ethernet.

PSN SNMP protocol

The accessory consists of a gateway that allows Ethernet connection to a SNMP manager supervision system. The use of this accessory causes the RS485 serial port to be unavailable.

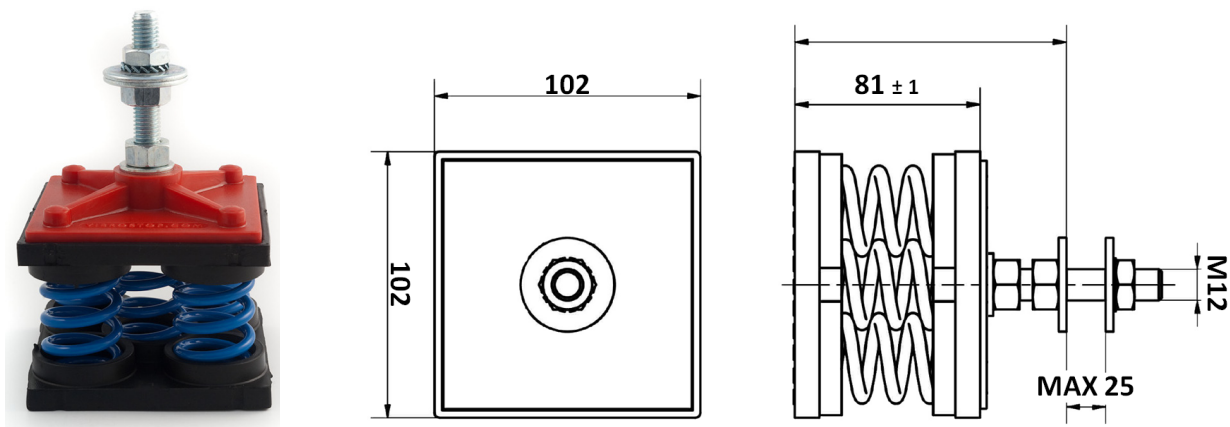
Other accessories

AG Rubber anti-vibration mounts

These allow you to reduce the vibrations transmitted from the unit to the surface it is standing on.
Accessory supplied loose.

AM Spring anti-vibration mounts

These allow you to reduce the vibrations transmitted from the unit to the surface it is standing on.
Accessory supplied loose.



ANTC Coil treated with anti-corrosion paints

The treatment is applied exclusively to finned pack coils with copper tubes and aluminium fins and consists of aluminium passivation and coating with a polyurethane base; a double layer of paint, of which the first passivates the aluminium and acts as primer and the second is a polyurethane based surface coating. The product has high resistance to corrosion and all environmental conditions.

The choice of whether or not to treat the exchanger should be made in relation to the environment in which the unit is to be installed and through observation of other structures and machinery with exposed metal surfaces present in the destination environment.

The cross observation criterion is the most valid method of selection currently available without having to carry out preliminary tests or measurements with instruments. The identified reference environments are:

- marine coastal
- industrial
- urban with a high housing density
- rural

ALPR Pre-painted aluminium coil

This option uses finned pack coils with copper tubes and pre-painted aluminium fins.

FW Water filter

Specific option for free-cooling batteries.

The treatment is applied exclusively to finned pack coils with copper tubes and aluminium fins and consists of aluminium passivation and coating with a polyurethane base; a double layer of paint, of which the first passivates the aluminium and acts as primer and the second is a polyurethane based surface coating.

Protective treatment of the exchanger is strongly recommended if at least one of the points below is verified:

- the presence of corrosive phenomena on the metal surfaces exposed in the installation area is evident
- the installation is located close to the sea coast
- the prevailing winds come from the sea towards the unit
- the installation is located close to the sea coast
- the environment is industrial with a significant concentration of pollutants
- the environment is urban with a high population density
- the environment is rural with the presence of organic discharges and effluents

For chiller units, this accessory also includes the "Cu/Al coil" accessory.

With reference to the protection criteria to follow, especially for installations close to the coast, refer to the section titled "Installations that require the use of treated coils".

To protect the elements of the hydraulic circuit (in particular, the exchangers), there are Y filters that can stop and settle the particles that are normally present in the water flow and would otherwise settle in the more delicate parts of the hydraulic circuit and damage its heat exchange capacity.

Installation of the water filter is mandatory even when it is not supplied as an accessory.

Accessory supplied loose.

MCHE E-coated microchannel coil

The e-coated microchannel coils are treated by immersion of the whole exchanger in an emulsion of organic resins, solvents, ionic stabilisers and deionised water. This is all subjected to a suitable electric field that causes the formation of a solid, uniform deposit on the exchanger. The function of this deposit will be to protect the aluminium from corrosion without penalising its thermophysical properties.

Protective treatment of the exchanger is strongly recommended if at least one of the points below is verified:

- there are obvious signs of corrosion of the exposed metal surfaces in the installation area
- the installation is located close to the sea coast
- the prevailing winds come from the sea towards the unit
- the environment is industrial with a significant concentration of pollutants
- the environment is urban with a high population density
- the environment is rural with the presence of organic discharges and effluents.

With reference to the protection criteria to follow, especially for installations close to the coast, refer to the section titled "Installations that require the use of treated coils".

BFAP Pre-painted aluminium free-cooling coil

The treatment is applied exclusively to finned pack coils and aluminium fins for the free-cooling part.

PRAC Steel profiles frames for container shipment

This accessory foresees the mounting of steel profiles frames on the unit for its loading into container. When this accessory is required it's for the shipping of the unit into container and its loading is mandatory to be done at the factory

PREA Unit suitable to be disassembled on site

The unit is delivered so that it can be disassembled easily on site if this makes the installation operations easier.

A unit requested with this option is supplied:

- screwed instead of riveted
- with plugged and not welded pipes
- without refrigerant charge
- untested
- covered by the warranty only if reassembled and screwed together by personnel authorized by the factory

RAAL Cu/Al coils

This accessory uses finned pack coils with copper tubes and aluminium fins instead of microchannel coils.

RAT Anti-intrusion nets

An arc-welded, painted net (RAL colour 7035) is installed to close off the external openings so as to prevent access to the technical compartment by unauthorized personnel.



SLCO Skid for shipping in container

The accessory provides for the installation of a wooden sled for loading and a fixing system inside the container by a strap. The accessory must be used for shipping in container. Loading on containers must be carried out at the factory. The accessory is incompatible with "Packaging in wooden crate".

STL Brackets for transport over long distances

The accessory consists of adding reinforcing bars to the structural metalwork. This allows the strength of the structure to be increased for long distance road transport.

BFAN Free cooling coil treated with anti-corrosion paints

Specific option for free-cooling batteries.

The treatment is applied exclusively to finned pack coils with copper tubes and aluminium fins and consists of aluminium passivation and coating with a polyurethane base; a double layer of paint, of which the first passivates the aluminium and acts as primer and the second is a polyurethane based surface coating.

Protective treatment of the exchanger is strongly recommended if at least one of the points below is verified:

- the presence of corrosive phenomena on the metal surfaces exposed in the installation area is evident
- the installation is located close to the sea coast
- the prevailing winds come from the sea towards the unit
- the installation is located close to the sea coast
- the environment is industrial with a significant concentration of pollutants
- the environment is urban with a high population density
- the environment is rural with the presence of organic discharges and effluents

For chiller units, this accessory also includes the "Cu/Al coil" accessory.

With reference to the protection criteria to follow, especially for installations close to the coast, refer to the section titled "Installations that require the use of treated coils".

TECHNICAL SPECIFICATIONS

TETRIS 2 FC

			10.2	12.2	13.2	15.2	16.2	20.3	24.3	27.4
Cooling (A30°C; W10°C; e.g.30%)										
Refrigeration capacity	(1)	kW	122	133	141	157	180	221	259	297
Total absorbed power	(1)	kW	35	41	48	51	57	75	86	95
EER	(1)		3,46	3,21	2,97	3,05	3,13	2,95	3,02	3,11
User-side heat exchanger										
Quantity		n°	1	1	1	1	1	1	1	1
Water flow rate (A30°C; W10°C; e.g.30%)	(1)	m³/h	21,2	23,0	24,6	27,3	31,3	38,4	45,1	51,4
FC BASIC (A5°C; W10°C; e.g.30%)										
Free-cooling mudules		n°	½	½	½	½	½	1 ½	1 ½	1 ½
Refrigeration capacity only FC	(2)	kW	53	54	55	56	56	140	148	151
Absorbed power only FC	(2)	kW	1,8	1,8	1,8	1,8	1,8	5,2	5,2	5,2
TFT	(3)	°C	-7,3	-8,6	-9,7	-12,3	-16,1	-0,4	-2,0	-3,9
Total head losses	(7)	kPa	124	130	128	141	151	88	96	92
Total internal volume	(4)	l	15	15	15	20	20	30	35	35
FC CUSTOM (A5°C; W10°C; e.g.30%)										
Free-cooling mudules		n°	1	1	1	1	1	2	2	2
Refrigeration capacity only FC	(2)	kW	87	90	93	96	97	164	182	189
Absorbed power only FC	(2)	kW	3,5	3,5	3,5	3,5	3,5	7,0	7,0	7,0
TFT	(3)	°C	1,3	0,8	0,4	-0,9	-2,7	1,9	1,2	-0,1
Total head losses	(7)	kPa	110	114	110	119	126	93	102	100
Total internal volume	(4)	l	15	15	15	20	20	30	35	35
FC EXTRA (A5°C; W10°C; e.g.30%)										
Free-cooling mudules		n°	1 ½	1	1	1	1	2	2	2
Refrigeration capacity only FC	(2)	kW	122	124	127	129	130	206	230	238
Absorbed power only FC	(2)	kW	5,3	5,3	5,3	5,3	5,3	10,5	10,5	10,5
TFT	(3)	°C	4,8	4,3	3,9	2,8	1,3	4,3	3,8	2,8
Total head losses	(7)	kPa	91	91	85	89	91	82	88	83
Total internal volume	(4)	l	20	20	20	25	25	90	95	95
Fans										
Chiller fans		n°	2	2	2	2	2	3	3	4
Fans FC BASIC		n°	1,1	1,1	1,1	1,1	1,1	3,1	3,1	3,1
Fans FC CUSTOM		n°	2,2	2,2	2,2	2,2	2,2	4,2	4,2	4,2
Fans FC EXTRA		n°	3,3	3,3	3,3	3,3	3,3	6,3	6,3	6,3
Compressors										
Compressors/Circuits		n°/n°	2/1	2/1	2/1	2/1	2/1	3/1	3/1	4/2
Minimum capacity reduction step	(8)	%	50%	44%	50%	45%	50%	33%	33%	25%
Refrigerant charge (MCHX)		kg	11	13	12	17	13	20	19	26
Refrigerant charge (Cu/Al)		kg	14	16	15	23	19	24	28	38
Noise levels										
Chiller: Sound power level	(5)	dB(A)	89	89	89	89	89	92	92	95
Chiller: Sound power level of LN version	(5)	dB(A)	86	86	86	86	86	87	88	89
Chiller: Sound pressure level	(6)	dB(A)	57	57	57	57	57	60	60	63
Chiller: Sound pressure level of LN version	(6)	dB(A)	54	54	54	54	54	55	56	57
FC BASIC: Sound power level	(5)	dB(A)	71	71	71	71	71	76	76	76
FC CUSTOM: Sound power level	(5)	dB(A)	74	74	74	74	74	77	77	77
FC EXTRA: Sound power level	(5)	dB(A)	76	76	76	76	76	79	79	79
FC BASIC: Sound pressure level	(6)	dB(A)	36	36	36	36	36	41	41	41
FC CUSTOM: Sound pressure level	(6)	dB(A)	39	39	39	39	39	42	42	42
FC EXTRA: Sound pressure level	(6)	dB(A)	41	41	41	41	41	44	44	44

(MCHX: unit with microchannel coils ; CuAl: unit with copper/aluminium tube/fin coils)

(1) Outside air temperature 30°C; evaporator inlet/outlet fluid temperature 15/10°C; glycol at 30%.

(2) Outside air temperature 5°C; evaporator inlet/outlet fluid temperature 15/10°C; glycol at 30%.

(3) The TFT (Total Free-cooling Temperature) is the outside air temperature at which the cooling performance of the water coils is the same as the performance of the chiller section under the condition of A30°C; E.G.30% 15/10°C

(4) Volume of water contained in the unit when it is working in free cooling mode. If present, the volume contained in the tank should also be considered.

(5) Unit operating at nominal operating capacity, without any accessories, with external air temperature of 30°C and user-side heat exchanger water inlet-outlet temperature of 15-10°C. Binding values. Values obtained from measures taken according to standard ISO 3744.

(6) Values obtained from the sound power level (conditions: note 5), related to a distance of 10 m from the unit in free field with directivity factor Q=2. Non-binding values.

(7) Data refers to the unit with free-cooling ON

(8) Approximate value. The minimum capacity reached by the unit depends on the operating conditions. The value shown may not be suitable for calculating the minimum volume of water: to do this, consult the "Minimum water content in the system" section.

TETRIS 2 FC

			29.4	32.4	33.4	37.4	41.4	43.6	47.6
Cooling (A30°C; W10°C; e.g.30%)									
Refrigeration capacity	(1)	kW	319	346	379	417	462	484	518
Total absorbed power	(1)	kW	106	115	127	125	139	158	172
EER	(1)		3,01	3,01	2,99	3,33	3,33	3,07	3,01
User-side heat exchanger									
Quantity		n°	1	1	1	1	1	1	1
Water flow rate (A30°C; W10°C; e.g.30%)	(1)	m³/h	55,4	60,0	65,7	72,2	80,0	83,9	90,0
FC BASIC (A5°C; W10°C; e.g.30%)									
Free-cooling modules		n°	1 ½	1 ½	2	2	2	2	2
Refrigeration capacity only FC	(2)	kW	153	156	204	212	221	230	236
Absorbed power only FC	(2)	kW	5,2	5,2	7,0	7,0	7,0	7,0	7,0
TFT	(3)	°C	-5,0	-6,3	-2,8	-3,9	-5,2	-5,4	-6,4
Total head losses	(7)	kPa	91	106	106	126	135	157	184
Total internal volume	(4)	l	40	40	45	45	50	50	50
FC CUSTOM (A5°C; W10°C; e.g.30%)									
Free-cooling modules		n°	2	2	3	3	3	3	3
Refrigeration capacity only FC	(2)	kW	194	200	258	269	280	293	302
Absorbed power only FC	(2)	kW	7,0	7,0	10,5	10,5	10,5	10,5	10,5
TFT	(3)	°C	-0,8	-1,6	0,9	0,1	-0,7	-0,8	-1,5
Total head losses	(7)	kPa	101	117	79	95	97	113	133
Total internal volume	(4)	l	40	40	110	110	115	115	115
FC EXTRA (A5°C; W10°C; e.g.30%)									
Free-cooling modules		n°	2	2	3	3	3	3	3
Refrigeration capacity only FC	(2)	kW	245	252	304	317	331	346	357
Absorbed power only FC	(2)	kW	10,5	10,5	14,0	14,0	14,0	14,0	14,0
TFT	(3)	°C	2,3	1,7	2,7	2,2	1,5	1,5	1,0
Total head losses	(7)	kPa	80	93	68	82	82	96	113
Total internal volume	(4)	l	100	100	190	190	195	195	195
Fans									
Chiller fans		n°	4	4	5	6	6	6	6
Fans FC BASIC		n°	3,1	3,1	4,1	4,1	4,1	4,1	4,1
Fans FC CUSTOM		n°	4,2	4,2	6,2	6,2	6,2	6,2	6,2
Fans FC EXTRA		n°	6,3	6,3	8,3	8,3	8,3	8,3	8,3
Compressors									
Compressors/Circuits		n°/n°	4/2	4/2	4/2	4/2	4/2	6/2	6/2
Minimum capacity reduction step	(8)	%	23%	25%	23%	25%	25%	15%	16%
Refrigerant charge (MCHX)		kg	27	28	36	39	39	49	52
Refrigerant charge (Cu/Al)		kg	36	40	48	47	47	62	70
Noise levels									
Chiller: Sound power level	(5)	dB(A)	95	96	97	97	97	97	97
Chiller: Sound power level of LN version	(5)	dB(A)	90	91	92	93	93	93	93
Chiller: Sound pressure level	(6)	dB(A)	63	64	65	65	65	65	65
Chiller: Sound pressure level of LN version	(6)	dB(A)	58	59	60	61	61	61	61
FC BASIC: Sound power level	(5)	dB(A)	76	76	77	77	77	77	77
FC CUSTOM: Sound power level	(5)	dB(A)	77	77	79	79	79	79	79
FC EXTRA: Sound power level	(5)	dB(A)	79	79	80	80	80	80	80
FC BASIC: Sound pressure level	(6)	dB(A)	41	41	42	42	42	42	42
FC CUSTOM: Sound pressure level	(6)	dB(A)	42	42	44	44	44	44	44
FC EXTRA: Sound pressure level	(6)	dB(A)	44	44	45	45	45	45	45

(MCHX: unit with microchannel coils ; CuAl: unit with copper/aluminium tube/fin coils)

- (1) Outside air temperature 30°C; evaporator inlet/outlet fluid temperature 15/10°C; glycol at 30%.
- (2) Outside air temperature 5°C; evaporator inlet/outlet fluid temperature 15/10°C; glycol at 30%.
- (3) The TFT (Total Free-cooling Temperature) is the outside air temperature at which the cooling performance of the water coils is the same as the performance of the chiller section under the condition of A30°C; E.G.30% 15/10°C
- (4) Volume of water contained in the unit when it is working in free cooling mode. If present, the volume contained in the tank should also be considered.
- (5) Unit operating at nominal operating capacity, without any accessories, with external air temperature of 30°C and user-side heat exchanger water inlet-outlet temperature of 15-10°C. Binding values. Values obtained from measures taken according to standard ISO 3744.
- (6) Values obtained from the sound power level (conditions: note 5), related to a distance of 10 m from the unit in free field with directivity factor Q=2. Non-binding values.
- (7) Data refers to the unit with free-cooling ON
- (8) Approximate value. The minimum capacity reached by the unit depends on the operating conditions. The value shown may not be suitable for calculating the minimum volume of water: to do this, consult the "Minimum water content in the system" section.

TETRIS 2 FC

			10.2	12.2	13.2	15.2	16.2	20.3	24.3	27.4
Dimensions and weights**										
Length FC BASIC		mm	2.304	2.304	2.304	2.304	2.304	4.601	4.601	4.601
Length FC CUSTOM		mm	2.304	2.304	2.304	2.304	2.304	4.601	4.601	4.601
Length FC EXTRA		mm	3.452	3.452	3.452	3.452	3.452	5.750	5.750	5.750
Depth		mm	2.260	2.260	2.260	2.260	2.260	2.260	2.260	2.260
Height		mm	2.440	2.440	2.440	2.440	2.440	2.440	2.440	2.440
			29.4	32.4	33.4	37.4	41.4	43.6	47.6	
Dimensions and weights**										
Length FC BASIC		mm	4.601	4.601	6.153	6.153	6.153	6.153	6.153	6.153
Length FC CUSTOM		mm	4.601	4.601	7.287	7.287	7.287	7.287	7.287	7.287
Length FC EXTRA		mm	5.750	5.750	8.450	8.450	8.450	8.450	8.450	8.450
Depth		mm	2.260	2.260	2.260	2.260	2.260	2.260	2.260	2.260
Height		mm	2.440	2.440	2.440	2.440	2.440	2.440	2.440	2.440

** Basic CH unit without included accessories

TETRIS 2 A FC

			11.2	17.2	23.2	28.4	34.4	38.4
Cooling (A30°C; W10°C; e.g.30%)								
Refrigeration capacity	(1)	kW	126	181	260	307	363	406
Total absorbed power	(1)	kW	34	48	70	82	97	112
EER	(1)		3,71	3,75	3,73	3,74	3,74	3,63
User-side heat exchanger								
Quantity		n°	1	1	1	1	1	1
Water flow rate (A30°C; W10°C; e.g.30%)	(1)	m³/h	21,9	31,5	45,0	53,1	63,0	70,5
FC BASIC (A5°C; W10°C; e.g.30%)								
Free-cooling modules		n°	½	½	1	1 ½	1 ½	1 ½
Refrigeration capacity only FC	(2)	kW	53	57	116	151	157	160
Absorbed power only FC	(2)	kW	1,8	1,8	3,5	5,2	5,2	5,2
TFT	(3)	°C	-7,8	-15,5	-6,9	-4,5	-7,1	-9,2
Total head losses	(7)	kPa	123	148	140	83	100	118
Total internal volume	(4)	l	15	20	25	35	35	35
FC CUSTOM (A5°C; W10°C; e.g.30%)								
Free-cooling modules		n°	1	1	1 ½	2	2	2
Refrigeration capacity only FC	(2)	kW	87	101	144	188	202	210
Absorbed power only FC	(2)	kW	3,5	3,5	5,3	7,0	7,0	7,0
TFT	(3)	°C	1,0	-2,2	-2,3	-0,6	-2,2	-3,6
Total head losses	(7)	kPa	108	120	70	92	112	132
Total internal volume	(4)	l	15	20	30	35	35	35
FC EXTRA (A5°C; W10°C; e.g.30%)								
Free-cooling modules		n°	1	1	1 ½	2	2	2
Refrigeration capacity only FC	(2)	kW	122	133	174	237	256	266
Absorbed power only FC	(2)	kW	5,3	5,3	7,0	10,5	10,5	10,5
TFT	(3)	°C	4,5	1,6	0,7	2,4	1,3	0,3
Total head losses	(7)	kPa	87	81	76	72	86	101
Total internal volume	(4)	l	20	25	30	95	100	100
Fans								
Chiller fans		n°	2	3	4	5	6	6
Fans FC BASIC		n°	1,1	1,1	2,1	3,1	3,1	3,1
Fans FC CUSTOM		n°	2,2	2,2	3,2	4,2	4,2	4,2
Fans FC EXTRA		n°	3,3	3,3	4,3	6,3	6,3	6,3
Compressors								
Compressors/Circuits		n°/n°	2/1	2/1	2/1	4/2	4/2	4/2
Minimum capacity reduction step	(8)	%	50%	45%	50%	21%	23%	25%
Refrigerant charge (MCHX)		kg	11	18	23	29	34	34
Refrigerant charge (Cu/Al)		kg	17	27	35	44	52	52
Noise levels								
Chiller: Sound power level	(5)	dB(A)	86	88	89	90	91	91
Chiller: Sound power level of LN version	(5)	dB(A)	82	84	85	86	87	87
Chiller: Sound pressure level	(6)	dB(A)	54	56	57	58	59	59
Chiller: Sound pressure level of LN version	(6)	dB(A)	50	52	53	54	55	55
FC BASIC: Sound power level	(5)	dB(A)	71	71	74	76	76	76
FC CUSTOM: Sound power level	(5)	dB(A)	74	74	76	77	77	77
FC EXTRA: Sound power level	(5)	dB(A)	76	76	77	79	79	79
FC BASIC: Sound pressure level	(6)	dB(A)	36	36	39	41	41	41
FC CUSTOM: Sound pressure level	(6)	dB(A)	39	39	41	42	42	42
FC EXTRA: Sound pressure level	(6)	dB(A)	41	41	42	44	44	44

(MCHX: unit with microchannel coils ; CuAl: unit with copper/aluminium tube/fin coils)

(1) Outside air temperature 30°C; evaporator inlet/outlet fluid temperature 15/10°C; glycol at 30%.

(2) Outside air temperature 5°C; evaporator inlet/outlet fluid temperature 15/10°C; glycol at 30%.

(3) The TFT (Total Free-cooling Temperature) is the outside air temperature at which the cooling performance of the water coils is the same as the performance of the chiller section under the condition of A30°C; E.G.30% 15/10°C

(4) Volume of water contained in the unit when it is working in free cooling mode. If present, the volume contained in the tank should also be considered.

(5) Sound power level Unit operating at nominal operating capacity, without any accessories, with external air temperature of 30°C and user-side heat exchanger water inlet-outlet temperature of 15-10°C. Binding values. Values obtained from measures taken according to standard ISO 3744.

(6) Values obtained from the sound power level (in known condition 4), related to a distance of 10m from the unit in free field with directivity factor Q=2. Non-binding values.

(7) Data refers to the unit with free-cooling ON

(8) Approximate value. The minimum capacity reached by the unit depends on the operating conditions. The value shown may not be suitable for calculating the minimum volume of water: to do this, consult the "Minimum water content in the system" section.

TETRIS 2 A FC

			11.2	17.2	23.2	28.4	34.4	38.4
Dimensions and weights**								
Length FC BASIC		mm	2.304	3.452	3.452	6.153	6.153	6.153
Length FC CUSTOM		mm	2.304	3.452	4.601	6.153	6.153	6.153
Length FC EXTRA		mm	3.452	4.601	4.601	7.287	7.287	7.287
Depth		mm	2.260	2.260	2.260	2.260	2.260	2.260
Height		mm	2.440	2.440	2.440	2.440	2.440	2.440

** Basic CH unit without included accessories

TETRIS 2 SLN FC

			11.2	17.2	23.2	28.4	34.4	38.4
Cooling (A30°C; W10°C; e.g.30%)								
Refrigeration capacity	(1)	kW	119	172	244	289	343	382
Total absorbed power	(1)	kW	34	48	70	82	97	113
EER	(1)		3,49	3,54	3,48	3,51	3,52	3,39
User-side heat exchanger								
Quantity		n°	1	1	1	1	1	1
Water flow rate (A30°C; W10°C; e.g.30%)	(1)	m³/h	20,6	29,7	42,3	50,1	59,4	66,3
FC BASIC (A5°C; W10°C; e.g.30%)								
Free-cooling modules		n°	½	½	1	1 ½	1 ½	1 ½
Refrigeration capacity only FC	(2)	kW	51	56	111	147	153	157
Absorbed power only FC	(2)	kW	1,8	1,8	3,5	5,2	5,2	5,2
TFT	(3)	°C	-7,1	-14,4	-6,2	-3,9	-6,4	-8,3
Total head losses	(7)	kPa	99	121	116	66	80	98
Total internal volume	(4)	l	15	20	25	35	35	35
FC CUSTOM (A5°C; W10°C; e.g.30%)								
Free-cooling modules		n°	1	1	1 ½	2	2	2
Refrigeration capacity only FC	(2)	kW	82	96	141	179	192	201
Absorbed power only FC	(2)	kW	3,5	3,5	5,3	7,0	7,0	7,0
TFT	(3)	°C	1,1	-2,0	-1,7	-0,4	-2,0	-3,4
Total head losses	(7)	kPa	87	98	57	74	90	110
Total internal volume	(4)	l	15	20	30	35	35	35
FC EXTRA (A5°C; W10°C; e.g.30%)								
Free-cooling modules		n°	1	1	1 ½	2	2	2
Refrigeration capacity only FC	(2)	kW	118	129	166	225	243	255
Absorbed power only FC	(2)	kW	5,3	5,3	7,0	10,5	10,5	10,5
TFT	(3)	°C	4,7	1,9	0,9	2,5	1,4	0,6
Total head losses	(7)	kPa	70	66	63	58	68	84
Total internal volume	(4)	l	20	25	30	95	100	100
Fans								
Chiller fans		n°	2	3	4	5	6	6
Fans FC BASIC		n°	1,1	1,1	2,1	3,1	3,1	3,1
Fans FC CUSTOM		n°	2,2	2,2	3,2	4,2	4,2	4,2
Fans FC EXTRA		n°	3,3	3,3	4,3	6,3	6,3	6,3
Compressors								
Compressors/Circuits		n°/n°	2/1	2/1	2/1	4/2	4/2	4/2
Minimum capacity reduction step	(8)	%	50%	45%	50%	21%	23%	25%
Refrigerant charge (MCHX)		kg	11	18	23	29	34	34
Refrigerant charge (Cu/Al)		kg	17	27	35	44	52	52
Noise levels								
Chiller: Sound power level	(5)	dB(A)	79	82	82	84	85	85
Chiller: Sound pressure level	(6)	dB(A)	47	50	50	52	53	53
FC BASIC: Sound power level	(6)	dB(A)	71	71	74	76	76	76
FC CUSTOM: Sound power level	(5)	dB(A)	74	74	76	77	77	77
FC EXTRA: Sound power level	(5)	dB(A)	76	76	77	79	79	79
FC BASIC: Sound pressure level	(6)	dB(A)	36	36	39	41	41	41
FC CUSTOM: Sound pressure level	(6)	dB(A)	39	39	41	42	42	42
FC EXTRA: Sound pressure level	(6)	dB(A)	41	41	42	44	44	44

(MCHX: unit with microchannel coils ; CuAl: unit with copper/aluminium tube/fin coils)

(1) Outside air temperature 30°C; evaporator inlet/outlet fluid temperature 15/10°C; glycol at 30%.

(2) Outside air temperature 5°C; evaporator inlet/outlet fluid temperature 15/10°C; glycol at 30%.

(3) The TFT (Total Free-cooling Temperature) is the outside air temperature at which the cooling performance of the water coils is the same as the performance of the chiller section under the condition of A30°C; E.G.30% 15/10°C

(4) Volume of water contained in the unit when it is working in free cooling mode. If present, the volume contained in the tank should also be considered.

(5) Unit operating at nominal operating capacity, without any accessories, with external air temperature of 30°C and user-side heat exchanger water inlet-outlet temperature of 15-10°C. Binding values. Values obtained from measures taken according to standard ISO 3744.

(6) Values obtained from the sound power level (conditions: note 5), related to a distance of 10 m from the unit in free field with directivity factor Q=2. Non-binding values.

(7) Data refers to the unit with free-cooling ON

(8) Approximate value. The minimum capacity reached by the unit depends on the operating conditions. The value shown may not be suitable for calculating the minimum volume of water: to do this, consult the "Minimum water content in the system" section.

TETRIS 2 SLN FC

			11.2	17.2	23.2	28.4	34.4	38.4
Dimensions and weights**								
Length FC BASIC		mm	2.304	3.452	3.452	6.153	6.153	6.153
Length FC CUSTOM		mm	2.304	3.452	4.601	6.153	6.153	6.153
Length FC EXTRA		mm	3.452	4.601	4.601	7.287	7.287	7.287
Depth		mm	2.260	2.260	2.260	2.260	2.260	2.260
Height		mm	2.440	2.440	2.440	2.440	2.440	2.440

** Basic CH unit without included accessories

TETRIS 2 A+ FC

			8.2	13.3	18.4	23.5	27.6
Cooling (A30°C; W10°C; e.g.30%)							
Refrigeration capacity	(1)	kW	97	149	208	261	302
Total absorbed power	(1)	kW	25	37	49	62	74
EER	(1)		3,95	4,02	4,21	4,24	4,06
User-side heat exchanger							
Quantity		n°	1	1	1	1	1
Water flow rate (A30°C; W10°C; e.g.30%)	(1)	m³/h	16,9	25,8	36,1	45,2	52,3
FC BASIC (A5°C; W10°C; e.g.30%)							
Free-cooling modules		n°	½	½	1	1 ½	1 ½
Refrigeration capacity only FC	(2)	kW	50	55	106	144	150
Absorbed power only FC	(2)	kW	1,8	1,8	3,5	5,2	5,2
TFT	(3)	°C	-3,8	-11,1	-3,8	-2,5	-4,3
Total head losses	(7)	kPa	84	115	95	57	79
Total internal volume	(4)	l	15	15	25	30	35
FC CUSTOM (A5°C; W10°C; e.g.30%)							
Free-cooling modules		n°	1	1	1 ½	2	2
Refrigeration capacity only FC	(2)	kW	78	92	137	174	186
Absorbed power only FC	(2)	kW	3,5	3,5	5,3	7,0	7,0
TFT	(3)	°C	2,8	-0,4	0,2	0,6	-0,5
Total head losses	(7)	kPa	75	96	52	64	70
Total internal volume	(4)	l	15	15	30	30	35
FC EXTRA (A5°C; W10°C; e.g.30%)							
Free-cooling modules		n°	1	1	1 ½	2	2
Refrigeration capacity only FC	(2)	kW	98	126	158	218	235
Absorbed power only FC	(2)	kW	5,3	5,3	7,0	10,5	10,5
TFT	(3)	°C	6,3	3,3	2,2	3,2	2,5
Total head losses	(7)	kPa	61	69	51	50	70
Total internal volume	(4)	l	20	20	30	95	95
Fans							
Chiller fans		n°	2	3	4	5	6
Fans FC BASIC		n°	1,1	1,1	2,1	3,1	3,1
Fans FC CUSTOM		n°	2,2	2,2	3,2	4,2	4,2
Fans FC EXTRA		n°	3,3	3,3	4,3	6,3	6,3
Compressors							
Compressors/Circuits		n°/n°	2/1	3/1	4/2	5/2	6/2
Minimum capacity reduction step	(8)	%	50%	33%	25%	20%	17%
Refrigerant charge (MCHX)		kg	10	15	23	27	33
Refrigerant charge (Cu/Al)		kg	16	24	35	42	51
Noise levels							
Chiller: Sound power level	(5)	dB(A)	83	85	86	87	88
Chiller: Sound power level of LN version	(5)	dB(A)	79	81	82	83	84
Chiller: Sound pressure level	(6)	dB(A)	51	53	54	55	56
Chiller: Sound pressure level of LN version	(6)	dB(A)	47	49	50	51	52
FC BASIC: Sound power level	(5)	dB(A)	71	71	74	76	76
FC CUSTOM: Sound power level	(5)	dB(A)	74	74	76	77	77
FC EXTRA: Sound power level	(5)	dB(A)	76	76	77	79	79
FC BASIC: Sound pressure level	(6)	dB(A)	36	36	39	41	41
FC CUSTOM: Sound pressure level	(6)	dB(A)	39	39	41	42	42
FC EXTRA: Sound pressure level	(6)	dB(A)	41	41	42	44	44

(MCHX: unit with microchannel coils ; CuAl: unit with copper/aluminium tube/fin coils)

(1) Outside air temperature 30°C; evaporator inlet/outlet fluid temperature 15/10°C; glycol at 30%.

(2) Outside air temperature 5°C; evaporator inlet/outlet fluid temperature 15/10°C; glycol at 30%.

(3) The TFT (Total Free-cooling Temperature) is the outside air temperature at which the cooling performance of the water coils is the same as the performance of the chiller section under the condition of A30°C; E.G.30% 15/10°C

(4) Volume of water contained in the unit when it is working in free cooling mode. If present, the volume contained in the tank should also be considered.

(5) Unit operating at nominal operating capacity, without any accessories, with external air temperature of 30°C and user-side heat exchanger water inlet-outlet temperature of 15-10°C. Binding values. Values obtained from measures taken according to standard ISO 3744.

(6) Values obtained from the sound power level (conditions: note 5), related to a distance of 10 m from the unit in free field with directivity factor Q=2. Non-binding values.

(7) Data refers to the unit with free-cooling ON

(8) Approximate value. The minimum capacity reached by the unit depends on the operating conditions. The value shown may not be suitable for calculating the minimum volume of water: to do this, consult the "Minimum water content in the system" section.

TETRIS 2 A+ FC

			8.2	13.3	18.4	23.5	27.6
Dimensions and weights**							
Length FC BASIC		mm	2.304	3.452	3.452	6.153	6.153
Length FC CUSTOM		mm	2.304	3.452	4.601	6.153	6.153
Length FC EXTRA		mm	3.452	4.601	4.601	7.287	7.287
Depth		mm	2.260	2.260	2.260	2.260	2.260
Height		mm	2.440	2.440	2.440	2.440	2.440

** Basic CH unit without included accessories

TETRIS 2 A SLN FC

			8.2	13.3	18.4	23.5	27.6
Cooling (A30°C; W10°C; e.g.30%)							
Refrigeration capacity	(1)	kW	96	147	202	254	300
Total absorbed power	(1)	kW	25	37	50	67	75
EER	(1)		3,88	3,94	4,05	3,78	4,01
User-side heat exchanger							
Quantity		n°	1	1	1	1	1
Water flow rate (A30°C; W10°C; e.g.30%)	(1)	m³/h	16,7	25,5	34,9	43,9	51,9
FC BASIC (A5°C; W10°C; e.g.30%)							
Free-cooling modules		n°	½	½	1	1 ½	1 ½
Refrigeration capacity only FC	(2)	kW	49	54	104	143	149
Absorbed power only FC	(2)	kW	1,8	1,8	3,5	5,2	5,2
TFT	(3)	°C	-3,7	-10,9	-3,4	-2,1	-4,3
Total head losses	(7)	kPa	79	109	90	55	75
Total internal volume	(4)	l	15	15	25	30	35
FC CUSTOM (A5°C; W10°C; e.g.30%)							
Free-cooling modules		n°	1	1	1 ½	2	2
Refrigeration capacity only FC	(2)	kW	77	91	136	171	184
Absorbed power only FC	(2)	kW	3,5	3,5	5,3	7,0	7,0
TFT	(3)	°C	2,7	-0,4	0,5	0,8	-0,6
Total head losses	(7)	kPa	70	69	51	48	66
Total internal volume	(4)	l	15	15	30	30	35
FC EXTRA (A5°C; W10°C; e.g.30%)							
Free-cooling modules		n°	1	1	1 ½	2	2
Refrigeration capacity only FC	(2)	kW	97	125	156	215	232
Absorbed power only FC	(2)	kW	5,3	5,3	7,0	10,5	10,5
TFT	(3)	°C	6,3	3,3	2,4	3,4	2,4
Total head losses	(7)	kPa	57	65	48	48	66
Total internal volume	(4)	l	20	20	30	95	95
Fans							
Chiller fans		n°	2	3	4	5	6
Fans FC BASIC		n°	1,1	1,1	2,1	3,1	3,1
Fans FC CUSTOM		n°	2,2	2,2	3,2	4,2	4,2
Fans FC EXTRA		n°	3,3	3,3	4,3	6,3	6,3
Compressors							
Compressors/Circuits		n°/n°	2/1	3/1	4/2	5/2	6/2
Minimum capacity reduction step	(8)	%	50%	33%	25%	20%	17%
Refrigerant charge (MCHX)		kg	10	15	23	27	33
Refrigerant charge (Cu/Al)		kg	16	24	35	42	51
Noise levels							
Chiller: Sound power level	(5)	dB(A)	76	78	79	80	81
Chiller: Sound pressure level	(6)	dB(A)	44	46	47	48	49
FC BASIC: Sound power level	(5)	dB(A)	71	71	74	76	76
FC CUSTOM: Sound power level	(5)	dB(A)	74	74	76	77	77
FC EXTRA: Sound power level	(5)	dB(A)	76	76	77	79	79
FC BASIC: Sound pressure level	(6)	dB(A)	36	36	39	41	41
FC CUSTOM: Sound pressure level	(6)	dB(A)	39	39	41	42	42
FC EXTRA: Sound pressure level	(6)	dB(A)	41	41	42	44	44

(MCHX: unit with microchannel coils ; CuAl: unit with copper/aluminium tube/fin coils)

(1) Outside air temperature 30°C; evaporator inlet/outlet fluid temperature 15/10°C; glycol at 30%.

(2) Outside air temperature 5°C; evaporator inlet/outlet fluid temperature 15/10°C; glycol at 30%.

(3) The TFT (Total Free-cooling Temperature) is the outside air temperature at which the cooling performance of the water coils is the same as the performance of the chiller section under the condition of A30°C; E.G.30% 15/10°C

(4) Volume of water contained in the unit when it is working in free cooling mode. If present, the volume contained in the tank should also be considered.

(5) Unit operating at nominal operating capacity, without any accessories, with external air temperature of 30°C and user-side heat exchanger water inlet-outlet temperature of 15-10°C. Binding values. Values obtained from measures taken according to standard ISO 3744.

(6) Values obtained from the sound power level (conditions: note 5), related to a distance of 10 m from the unit in free field with directivity factor Q=2. Non-binding values.

(7) Data refers to the unit with free-cooling ON

(8) Approximate value. The minimum capacity reached by the unit depends on the operating conditions. The value shown may not be suitable for calculating the minimum volume of water: to do this, consult the "Minimum water content in the system" section.

TETRIS 2 A SLN FC

			8.2	13.3	18.4	23.5	27.6
Dimensions and weights**							
Length FC BASIC		mm	2.304	3.452	3.452	6.153	6.153
Length FC CUSTOM		mm	2.304	3.452	4.601	6.153	6.153
Length FC EXTRA		mm	3.452	4.601	4.601	7.287	7.287
Depth		mm	2.260	2.260	2.260	2.260	2.260
Height		mm	2.440	2.440	2.440	2.440	2.440

** Basic CH unit without included accessories

ECODESIGN

INTRODUCTION

The Ecodesign/ErP Directive (2009/125/EC) lays down new standards for more efficient energy use.

The Directive contains various regulations; as regards chiller products and heat pumps, the regulations of interest are the following:

- Regulation 2013/813, for small heat pumps ($P_{\text{design}} \leq 400$ kW)
- Regulation 2016/2281, for chillers and heat pumps with $P_{\text{design}} > 400$ kW
- Regulation 2013/811, for heat pumps with $P_{\text{design}} \leq 70$ kW.

The last-mentioned regulation (2013/811) regards the labelling (Ecolabel certification) of small heat pumps.

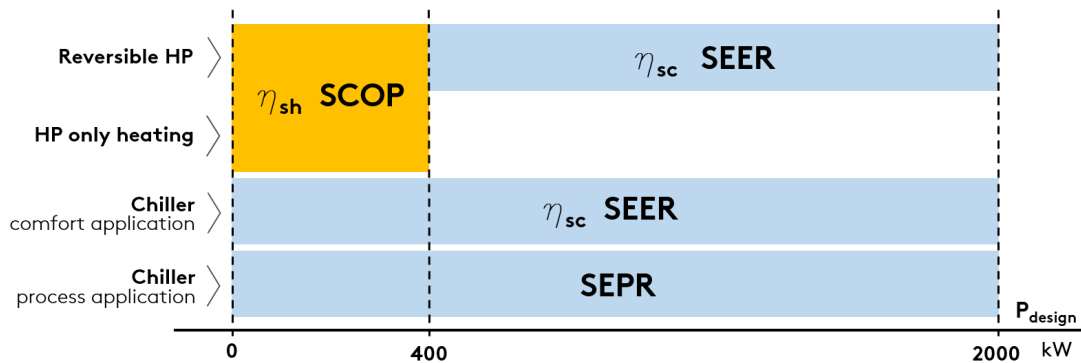
The other two regulations (2013/813 and 2016/2281) set seasonal efficiency targets that the products must comply with to be sold and installed in the European Union (essential requirement for CE marking).

These efficiency limits are defined through ratios, which are respectively:

- η_{sh} (SCOP), with reference to regulation 2013/813
- η_{sc} (SEER) for comfort applications and SEPR for process applications, with reference to regulation 2016/2281.

As regards regulation 2016/2281, with effect from 1st January 2021, the required minimum efficiency limit will be raised (Tier 2) from the current threshold (Tier 1).

The figure below schematically illustrates the correspondence between product and reference energy ratio.



Some notes and clarifications:

For comfort applications, regulation 2016/2281 sets the η_{sc} (SEER) ratio in two different operating conditions:

- SEER calculated with machine inlet/outlet water temperature of 12/7°C (low temperature application),
- SEER calculated with machine inlet/outlet water temperature of 23/18°C (medium temperature application).

The minimum efficiency requirement is the same, but can be met at condition 12/7°C or at condition 23/18°C, depending on the application envisaged for the machine.

Regulation 2013/813 distinguishes two different types: at low temperature and at medium temperature.

The following refer to the application at low temperature: (low temperature application) all heat pumps whose maximum delivery temperature for heating purposes is lower than 52°C with source at temperature of -7°C and -8°C wet bulb (air-water unit) or inlet 10°C (water-water unit), at the reference design conditions for an average climate. For these, the efficiency ratio is "low temperature application" (outlet water temperature 35°C).

For all the other heat pumps, the efficiency ratio is related to "medium temperature application" (outlet water temperature 55°C).

The ratios must be calculated according to the reference European heating season in average climatic conditions.

The minimum efficiency requirements set by the regulations are indicated below.

REGULATION 2016/2281, comfort application

TYPE OF UNIT		MINIMUM REQUIREMENT			
		Tier 1		Tier 2 (2021)	
SOURCE	P _{design}	η_{sc} [%]	SEER	η_{sc} [%]	SEER
air	< 400kW	149	3,8	161	4,1
air	\geq 400kW	161	4,1	179	4,55
water	< 400kW	196	5,1	200	5,2
water	\geq 400kW and < 1500kW	227	5,875	252	6,5
water	\geq 1500kW	245	6,325	272	7

REGULATION 2016/2281, process application

TYPE OF UNIT		MINIMUM REQUIREMENT	
		Tier 1	Tier 2 (2021)
SOURCE	P _{design}	SEPR	SEPR
air	< 400kW	4,5	5
air	\geq 400kW	5	5,5
water	< 400kW	6,5	7
water	\geq 400kW and < 1500kW	7,5	8
water	\geq 1500kW	8	8,5

REGULATION 2013/813

SOURCE	APPLICATION	MINIMUM REQUIREMENT	
		η_{sh} [%]	SCOP
air	low temperature application	125	3,2
water	low temperature application	125	3,325
air	medium temperature application	110	2,825
water	medium temperature application	110	2,95

The conformity of the product must be checked according to the type of application, whether comfort or process, and at the required outlet water temperature.

The two schematic tables below, respectively for comfort application and for process application, indicate the reference of the required conformity according to the type of product and the set point temperature (reference to regulations 2016/2281 and 2013/813).

Important note: for mixed comfort and process applications, the reference application for conformity is the comfort application.

COMFORT APPLICATION

PRODUCT	OUTLET WATER TEMPERATURE	COMPLIANCE INDEX	REGULATION
Chiller	< 18°C	SEER/η _{sc} low temperature application	2016/2281
	≥ 18°C	SEER/η _{sc} medium temperature application	2016/2281
Heat pumps (reversible and only heating) P_{design} ≤ 400kW		SCOP/η _{sh}	2013/813
Reversible heat pumps P_{design} > 400kW	< 18°C	SEER/η _{sc} low temperature application	2016/2281
	≥ 18°C	SEER/η _{sc} medium temperature application	2016/2281
Heat pumps only heating P_{design} > 400kW		-	-

- = exemption from Ecodesign

PROCESS APPLICATION

PRODUCT	OUTLET WATER TEMPERATURE	COMPLIANCE INDEX	REGULATION
Chiller	≥ +2°C , ≤ 12°C	SEPR	2016/2281
	> 12°C	-	-
	> -8°C , < +2°C	-	-

- = exemption from Ecodesign

Some specifications and notes follow.

Partly completed machinery

The term partly completed machinery refers to all units without a user-side or source-side heat exchanger, and therefore to all LC, LE, LC/HP and LE/HP versions. Since these are “non-complete” machines, conformity with Ecodesign depends on combination with the remote heat exchanger.

All the partly completed machinery is CE marked and accompanied by a declaration of conformity. Installation in European Union countries is therefore allowed; correct selection and installation of the remote heat exchanger must be ensured, in accordance with the above cases.

EC fans:

The only option that positively affects the performance of the unit, by increasing its seasonal energy efficiency ratio, is the VEC accessory.

A unit equipped with EC fans has a higher SEER (η_{sc}) than the configuration with standard fans.

TETRIS 2 FC RANGE

As specifically regards the Tetris 2 FC range, the regulations of interest for the various units in various configurations are indicated below.

Tetris /2 FC /2A FC /2SLN FC /2A SLN FC/2A+ FC:

- chiller version: regulation 2016/2281.

The tables below give information on the conformity of the units and the seasonal energy performance ratios with regard to the reference regulation.

For each size, the possible set-ups (BASIC, CUSTOM, EXTRA) are included for conformity assessments.

TETRIS 2 FC

			10.2	12.2	13.2	15.2	16.2	20.3	24.3
REGULATION 2016/2281									
Pdesign	(1)	kW	123	134	143	159	182	223	262
Compliance 12/7									
Compliance	(1)		Y	Y	Y	Y	Y	Y	Y
η _{sc}	(1)	%	149,8	150,4	149,0	149,9	142	155,4	152,3
SEER	(1)		3,82	3,83	3,80	3,82	3,62	3,96	3,88
Compliance Tier 2 (2021)	(1)		N	N	N	N	N	N	N
Compliance 12/7 unit with EC fans									
Compliance	(1)		Y	Y	Y	Y	Y	Y	Y
η _{sc}	(1)	%	152,6	155,8	150,6	154,2	149,0	160,6	157,0
SEER	(1)		3,89	3,97	3,84	3,93	3,8	4,09	4,00
Compliance Tier 2 (2021)	(1)		N	N	N	N	N	N	N
Compliance 23/18									
Compliance	(2)		Y	Y	Y	Y	Y	Y	Y
η _{sc}	(2)	%	-	-	-	-	167,0	-	-
SEER	(2)		-	-	-	-	4,25	-	-
Compliance SEPR									
Compliance	(3)		Y	Y	Y	Y	Y	Y	Y
SEPR	(3)		5,21	4,99	4,99	4,86	5,18	4,87	5,19

			27.4	29.4	32.4	33.4	37.4	41.4	43.6	47.6
REGULATION 2016/2281										
Pdesign	(1)	kW	299	322	349	382,2	420	465	488	523
Compliance 12/7										
Compliance	(1)		Y	Y	Y	Y	Y	Y	Y	Y
ηsc	(1)	%	153,8	150,4	149,4	154,3	156,2	161,1	161,0	161,1
SEER	(1)		3,92	3,83	3,81	3,93	3,98	4,10	4,10	4,10
Compliance Tier 2 (2021)	(1)		N	N	N	N	N	N	N	N
Compliance 12/7 unit with EC fans										
Compliance	(1)		Y	Y	Y	Y	Y	Y	Y	Y
ηsc	(1)	%	157,4	152,2	150,6	158,2	160,6	162,6	164,3	162,2
SEER	(1)		4,01	3,88	3,84	4,03	4,09	4,14	4,18	4,13
Compliance Tier 2 (2021)	(1)		N	N	N	N	N	N	N	N
Compliance 23/18										
Compliance	(2)		Y	Y	Y	Y	Y	Y	Y	Y
ηsc	(2)	%	-	-	-	-	-	-	-	-
SEER	(2)		-	-	-	-	-	-	-	-
Compliance SEPR										
Compliance	(3)		Y	Y	Y	Y	Y	Y	Y	Y
SEPR	(3)		4,93	4,66	4,86	4,98	5,3	5,42	5	5

Y = unit in compliance with Ecodesign at the indicated condition.

N = unit not in compliance with Ecodesign at the given condition: it can be installed only in non-EU countries.

- = value not necessary: conformity is already provided at the most restrictive condition (1).

(1) User-side heat exchanger water inlet/outlet temperature 12/7°C (low temperature application), with reference to regulation 2016/2281 and standard EN 14825.

(2) User-side heat exchanger water inlet/outlet temperature 23/18°C (medium temperature application), with reference to regulation 2016/2281 and standard EN 14825.

(3) User-side heat exchanger water inlet/outlet temperature 12/7°C, with reference to regulation 2016/2281 and norm EN 14825.

TETRIS 2 SLN FC

			11.2	17.2	23.2	28.4	34.4	38.4
REGULATION 2016/2281								
Pdesign	(1)	kW	120	172,9	245,8	291,28	345,6	385,6
Compliance 12/7								
Compliance	(1)		Y	Y	Y	Y	Y	Y
η _{sc}	(1)	%	149,8	157	149,0	161,8	162,6	158,2
SEER	(1)		3,82	4	3,8	4,12	4,14	4,03
Compliance Tier 2 (2021)	(1)		N	N	N	N	N	N
Compliance 12/7 unit with EC fans								
Compliance	(1)		Y	Y	Y	Y	Y	Y
η _{sc}	(1)	%	161	166,6	161	173,4	174,2	164,6
SEER	(1)		4,4	4,24	4,1	4,41	4,43	4,19
Compliance Tier 2 (2021)	(1)		N	N	N	N	N	N
Compliance 23/18								
Compliance	(2)		Y	Y	Y	Y	Y	Y
η _{sc}	(2)	%	-	-	-	-	-	-
SEER	(2)		-	-	-	-	-	-
Compliance SEPR								
Compliance	(3)		Y	Y	Y	Y	Y	Y
SEPR	(3)		5,28	5,36	5,5	5,42	5,41	5,28

Y = unit in compliance with Ecodesign at the indicated condition.

N = unit not in compliance with Ecodesign at the given condition: it can be installed only in non-EU countries.

- = value not necessary: conformity is already provided at the most restrictive condition (1).

(1) User-side heat exchanger water inlet/outlet temperature 12/7°C (low temperature application), with reference to regulation 2016/2281 and standard EN 14825.

(2) User-side heat exchanger water inlet/outlet temperature 23/18°C (medium temperature application), with reference to regulation 2016/2281 and standard EN 14825.

(3) User-side heat exchanger water inlet/outlet temperature 12/7°C, with reference to regulation 2016/2281 and norm EN 14825.

TETRIS 2A + FC

			8.2	13.3	18.4	23.5	27.6
REGULATION 2016/2281							
Pdesign	(1)	kW	98,1	150	210	263	304
Compliance 12/7							
Compliance	(1)		Y	Y	Y	Y	Y
ηsc	(1)	%	152,4	160,9	162,5	164,1	166
SEER	(1)		3,89	4,1	4,14	4,18	4,22
Compliance Tier 2 (2021)	(1)		N	N	N	N	N
Compliance 12/7 unit with EC fans							
Compliance	(1)		Y	Y	Y	Y	Y
ηsc	(1)	%	164	178,2	174,6	182,1	183,1
SEER	(1)		4,18	4,53	4,44	4,63	4,65
Compliance Tier 2 (2021)	(1)		N	N	N	N	N
Compliance 23/18							
Compliance	(2)		Y	Y	Y	Y	Y
ηsc	(2)	%	-	-	-	-	-
SEER	(2)		-	-	-	-	-
Compliance SEPR							
Compliance	(3)		Y	Y	Y	Y	Y
SEPR	(3)		5.55	5.66	5.66	5.69	5.74

Y = unit in compliance with Ecodesign at the indicated condition.

N = unit not in compliance with Ecodesign at the given condition: it can be installed only in non-EU countries.

- = value not necessary: conformity is already provided at the most restrictive condition (1).

(1) User-side heat exchanger water inlet/outlet temperature 12/7°C (low temperature application), with reference to regulation 2016/2281 and standard EN 14825.

(2) User-side heat exchanger water inlet/outlet temperature 23/18°C (medium temperature application), with reference to regulation 2016/2281 and standard EN 14825.

(3) User-side heat exchanger water inlet/outlet temperature 12/7°C, with reference to regulation 2016/2281 and norm EN 14825.

TETRIS 2 A FC

			11.2	17.2	23.2	28.4	34.4	38.4
REGULATION 2016/2281								
Pdesign	(1)	kW	127,3	183	261,7	308,7	366,2	410
Compliance 12/7								
Compliance	(1)		Y	Y	Y	Y	Y	Y
η_{sc}	(1)	%	151,8	158,2	152,6	162,2	165	159,8
SEER	(1)		3,87	4,03	3,89	4,13	4,2	4,07
Compliance Tier 2 (2021)	(1)		N	N	N	N	N	N
Compliance 12/7 unit with EC fans								
Compliance	(1)		Y	Y	Y	Y	Y	Y
η_{sc}	(1)	%	161	167,4	161,4	173,4	176,2	166,2
SEER	(1)		4,1	4,26	4,11	4,41	4,48	4,23
Compliance Tier 2 (2021)	(1)		N	N	N	N	N	N
Compliance 23/18								
Compliance	(2)		Y	Y	Y	Y	Y	Y
η_{sc}	(2)	%	-	-	-	-	-	-
SEER	(2)		-	-	-	-	-	-
Compliance SEPR								
Compliance	(3)		Y	Y	Y	Y	Y	Y
SEPR	(3)		5,28	5,36	5,5	5,42	5,41	5,32

Y = unit in compliance with Ecodesign at the indicated condition.

N = unit not in compliance with Ecodesign at the given condition: it can be installed only in non-EU countries.

- = value not necessary: conformity is already provided at the most restrictive condition (1).

(1) User-side heat exchanger water inlet/outlet temperature 12/7°C (low temperature application), with reference to regulation 2016/2281 and standard EN 14825.

(2) User-side heat exchanger water inlet/outlet temperature 23/18°C (medium temperature application), with reference to regulation 2016/2281 and standard EN 14825.

(3) User-side heat exchanger water inlet/outlet temperature 12/7°C, with reference to regulation 2016/2281 and norm EN 14825.

TETRIS 2A SLN FC

			8.2	13.3	18.4	23.5	27.6
REGULATION 2016/2281							
Pdesign	(1)	kW	97	148	203	255	302
Compliance 12/7							
Compliance	(1)		Y	Y	Y	Y	Y
η_{sc}	(1)	%	151,4	159,4	161,4	162,6	164,6
SEER	(1)		3,86	4,06	4,11	4,14	4,19
Compliance Tier 2 (2021)	(1)		N	N	N	N	N
Compliance 12/7 unit with EC fans							
Compliance	(1)		Y	Y	Y	Y	Y
η_{sc}	(1)	%	163,4	177,4	173,4	180,6	180,6
SEER	(1)		4,16	4,51	4,41	4,59	4,59
Compliance Tier 2 (2021)	(1)		N	N	N	N	N
Compliance 23/18							
Compliance	(2)		Y	Y	Y	Y	Y
η_{sc}	(2)	%	-	-	-	-	-
SEER	(2)		-	-	-	-	-
Compliance SEPR							
Compliance	(3)		Y	Y	Y	Y	Y
SEPR	(3)		5,55	5,66	5,66	5,69	5,74

Y = unit in compliance with Ecodesign at the indicated condition.

N = unit not in compliance with Ecodesign at the given condition: it can be installed only in non-EU countries.

- = value not necessary: conformity is already provided at the most restrictive condition (1).

(1) User-side heat exchanger water inlet/outlet temperature 12/7°C (low temperature application), with reference to regulation 2016/2281 and standard EN 14825.

(2) User-side heat exchanger water inlet/outlet temperature 23/18°C (medium temperature application), with reference to regulation 2016/2281 and standard EN 14825.

(3) User-side heat exchanger water inlet/outlet temperature 12/7°C, with reference to regulation 2016/2281 and norm EN 14825.

ELECTRICAL SPECIFICATIONS

TETRIS 2 FC

			10.2	12.2	13.2	15.2	16.2	20.3	24.3	27.4
General electrical specifications chiller section										
Nominal current (Inom)	(2)	A	68	76	83	94	103	124	156	166
cosφ standard unit	(2)		0,83	0,84	0,85	0,85	0,85	0,85	0,85	0,82
Nominal current with power factor correction (Inom)	(2)	A	59	66	74	85	93	111	141	145
cosφ unit with power factor correction	(2)		0,96	0,96	0,95	0,94	0,94	0,95	0,94	0,94
General electrical specifications FC BASIC										
Max. absorbed power (FLI)	(1)	kW	56	61	67	74	82	103	125	136
Max. absorbed current (FLA)	(1)	A	85	93	102	116	131	158	202	207
Max. inrush current (MIC)	(3)	A	274	321	329	367	382	385	453	434
General electrical specifications FC CUSTOM										
Max. absorbed power (FLI)	(1)	kW	57	63	69	76	84	105	127	138
Max. absorbed current (FLA)	(1)	A	89	97	105	120	135	162	206	210
Max. inrush current (MIC)	(3)	A	277	324	332	370	385	389	457	438
General electrical specifications FC EXTRA										
Max. absorbed power (FLI)	(1)	kW	59	65	71	78	85	109	131	141
Max. absorbed current (FLA)	(1)	A	93	101	109	124	138	169	213	218
Max. inrush current (MIC)	(3)	A	281	328	336	374	389	396	464	445
Power supply		V/ph/Hz	400/3~/50							
Power supply for auxiliary circuits		V/ph/Hz	230-24/1~/50							
Electrical specifications for fans chiller section										
Rated power of standard fan		n° x kW	2 x 2.0	2 x 2.0	2 x 2.0	2 x 2.0	2 x 2.0	3 x 2.0	3 x 2.0	4 x 2.0
Rated current of standard fan		n° x A	2 x 4.3	2 x 4.3	2 x 4.3	2 x 4.3	2 x 4.3	3 x 4.3	3 x 4.3	4 x 4.3
Rated power of EC fan		n° x kW	2 x 1.9	2 x 1.9	2 x 1.9	2 x 1.9	2 x 1.9	3 x 1.9	3 x 1.9	4 x 1.9
Rated current of EC fan		n° x A	2 x 2.9	2 x 2.9	2 x 2.9	2 x 2.9	2 x 2.9	3 x 2.9	3 x 2.9	4 x 2.9
Rated power of oversize EC fans		n° x kW	2 x 3.0	2 x 3.0	2 x 3.0	2 x 3.0	2 x 3.0	3 x 3.0	3 x 3.0	4 x 3.0
Rated current of oversize EC fans		n° x A	2 x 4.5	2 x 4.5	2 x 4.5	2 x 4.5	2 x 4.5	3 x 4.5	3 x 4.5	4 x 4.5
Electrical specifications for fans FC BASIC										
Rated power of standard fan		n° x kW	1 x 2.0	1 x 2.0	1 x 2.0	1 x 2.0	1 x 2.0	3 x 2.0	3 x 2.0	3 x 2.0
Rated current of standard fan		n° x A	1 x 4.3	1 x 4.3	1 x 4.3	1 x 4.3	1 x 4.3	3 x 4.3	3 x 4.3	3 x 4.3
Rated power of EC fan		n° x kW	1 x 1.9	1 x 1.9	1 x 1.9	1 x 1.9	1 x 1.9	3 x 1.9	3 x 1.9	3 x 1.9
Rated current of EC fan		n° x A	1 x 2.9	1 x 2.9	1 x 2.9	1 x 2.9	1 x 2.9	3 x 2.9	3 x 2.9	3 x 2.9
Rated power of oversize EC fans		n° x kW	1 x 3.0	1 x 3.0	1 x 3.0	1 x 3.0	1 x 3.0	3 x 3.0	3 x 3.0	3 x 3.0
Rated current of oversize EC fans		n° x A	1 x 4.5	1 x 4.5	1 x 4.5	1 x 4.5	1 x 4.5	3 x 4.5	3 x 4.5	3 x 4.5
Electrical specifications for fans FC CUSTOM										
Rated power of fan		n° x kW	2 x 2.0	2 x 2.0	2 x 2.0	2 x 2.0	2 x 2.0	4 x 2.0	4 x 2.0	4 x 2.0
Rated current of fan		n° x A	2 x 4.3	2 x 4.3	2 x 4.3	2 x 4.3	2 x 4.3	4 x 4.3	4 x 4.3	4 x 4.3
Rated power of EC fan		n° x kW	2 x 1.9	2 x 1.9	2 x 1.9	2 x 1.9	2 x 1.9	4 x 1.9	4 x 1.9	4 x 1.9
Rated current of EC fan		n° x A	2 x 2.9	2 x 2.9	2 x 2.9	2 x 2.9	2 x 2.9	4 x 2.9	4 x 2.9	4 x 2.9
Rated power of oversize EC fans		n° x kW	2 x 3.0	2 x 3.0	2 x 3.0	2 x 3.0	2 x 3.0	4 x 3.0	4 x 3.0	4 x 3.0
Rated current of oversize EC fans		n° x A	2 x 4.5	2 x 4.5	2 x 4.5	2 x 4.5	2 x 4.5	4 x 4.5	4 x 4.5	4 x 4.5
Electrical specifications for fans FC EXTRA										
Rated power of fan		n° x kW	3 x 2.0	3 x 2.0	3 x 2.0	3 x 2.0	3 x 2.0	6 x 2.0	6 x 2.0	6 x 2.0
Rated current of fan		n° x A	3 x 4.3	3 x 4.3	3 x 4.3	3 x 4.3	3 x 4.3	6 x 4.3	6 x 4.3	6 x 4.3
Rated power of EC fan		n° x kW	3 x 1.9	3 x 1.9	3 x 1.9	3 x 1.9	3 x 1.9	6 x 1.9	6 x 1.9	6 x 1.9
Rated current of EC fan		n° x A	3 x 2.9	3 x 2.9	3 x 2.9	3 x 2.9	3 x 2.9	6 x 2.9	6 x 2.9	6 x 2.9
Rated power of oversize EC fans		n° x kW	3 x 3.0	3 x 3.0	3 x 3.0	3 x 3.0	3 x 3.0	6 x 3.0	6 x 3.0	6 x 3.0
Rated current of oversize EC fans		n° x A	3 x 4.5	3 x 4.5	3 x 4.5	3 x 4.5	3 x 4.5	6 x 4.5	6 x 4.5	6 x 4.5

- (1) Data regarding the unit without accessories working in maximum power absorption conditions
- (2) Datum related to the unit without accessories working in standard conditions (A30°C; W15/10°C; e.g.30%)
- (3) Maximum effective RMS value of the current when the last compressor starts (FLA of the entire unit - FLA of the largest compressor + LRA of the largest compressor)
- (5) These values are determined for cables with operating temperature of 40°C, EPR insulation and a line with a maximum length of 50m. The line section must be determined by a qualified technician based on the protection devices, the length of the line, the type of cable used and the type of installation.
- (6) The correct line protection part must be determined by a qualified technician based on the length of the line, the type of cable used and the type of installation.

TETRIS 2 FC

			29.4	32.4	33.4	37.4	41.4	43.6	47.6
General electrical specifications chiller section									
Nominal current (Inom)	(2)	A	187	207	233	249	264	280	311
cosφ standard unit	(2)		0,84	0,84	0,87	0,86	0,87	0,84	0,85
Nominal current with power factor correction (Inom)	(2)	A	167	185	216	230	247	250	281
cosφ unit with power factor correction	(2)		0,94	0,94	0,94	0,93	0,93	0,94	0,94
General electrical specifications FC BASIC									
Max. absorbed power (FLI)	(1)	kW	151	165	181	193	207	225	247
Max. absorbed current (FLA)	(1)	A	236	266	303	326	347	352	396
Max. inrush current (MIC)	(3)	A	487	516	558	581	597	603	647
General electrical specifications FC CUSTOM									
Max. absorbed power (FLI)	(1)	kW	152	167	185	197	211	229	251
Max. absorbed current (FLA)	(1)	A	240	269	310	333	355	360	404
Max. inrush current (MIC)	(3)	A	491	520	565	588	604	610	654
General electrical specifications FC EXTRA									
Max. absorbed power (FLI)	(1)	kW	156	171	188	200	214	232	254
Max. absorbed current (FLA)	(1)	A	247	277	318	341	362	367	411
Max. inrush current (MIC)	(3)	A	498	527	573	596	612	618	662
Power supply		V/ph/Hz	400/3~/50						
Power supply for auxiliary circuits		V/ph/Hz	230-24/1~/50						
Electrical specifications for fans chiller section									
Rated power of standard fan		n° x kW	4 x 2.0	4 x 2.0	5 x 2.0	6 x 2.0	6 x 2.0	6 x 2.0	6 x 2.0
Rated current of standard fan		n° x A	4 x 4.3	4 x 4.3	5 x 4.3	6 x 4.3	6 x 4.3	6 x 4.3	6 x 4.3
Rated power of EC fan		n° x kW	4 x 1.9	4 x 1.9	5 x 1.9	6 x 1.9	6 x 1.9	6 x 1.9	6 x 1.9
Rated current of EC fan		n° x A	4 x 2.9	4 x 2.9	5 x 2.9	6 x 2.9	6 x 2.9	6 x 2.9	6 x 2.9
Rated power of oversize EC fans		n° x kW	4 x 3.0	4 x 3.0	5 x 3.0	6 x 3.0	6 x 3.0	6 x 3.0	6 x 3.0
Rated current of oversize EC fans		n° x A	4 x 4.5	4 x 4.5	5 x 4.5	6 x 4.5	6 x 4.5	6 x 4.5	6 x 4.5
Electrical specifications for fans FC BASIC									
Rated power of standard fan		n° x kW	3 x 2.0	3 x 2.0	4 x 2.0	4 x 2.0	4 x 2.0	4 x 2.0	4 x 2.0
Rated current of standard fan		n° x A	3 x 4.3	3 x 4.3	4 x 4.3	4 x 4.3	4 x 4.3	4 x 4.3	4 x 4.3
Rated power of EC fan		n° x kW	3 x 1.9	3 x 1.9	4 x 1.9	4 x 1.9	4 x 1.9	4 x 1.9	4 x 1.9
Rated current of EC fan		n° x A	3 x 2.9	3 x 2.9	4 x 2.9	4 x 2.9	4 x 2.9	4 x 2.9	4 x 2.9
Rated power of oversize EC fans		n° x kW	3 x 3.0	3 x 3.0	4 x 3.0	4 x 3.0	4 x 3.0	4 x 3.0	4 x 3.0
Rated current of oversize EC fans		n° x A	3 x 4.5	3 x 4.5	4 x 4.5	4 x 4.5	4 x 4.5	4 x 4.5	4 x 4.5
Electrical specifications for fans FC CUSTOM									
Rated power of fan		n° x kW	4 x 2.0	4 x 2.0	6 x 2.0	6 x 2.0	6 x 2.0	6 x 2.0	6 x 2.0
Rated current of fan		n° x A	4 x 4.3	4 x 4.3	6 x 4.3	6 x 4.3	6 x 4.3	6 x 4.3	6 x 4.3
Rated power of EC fan		n° x kW	4 x 1.9	4 x 1.9	6 x 1.9	6 x 1.9	6 x 1.9	6 x 1.9	6 x 1.9
Rated current of EC fan		n° x A	4 x 2.9	4 x 2.9	6 x 2.9	6 x 2.9	6 x 2.9	6 x 2.9	6 x 2.9
Rated power of oversize EC fans		n° x kW	4 x 3.0	4 x 3.0	6 x 3.0	6 x 3.0	6 x 3.0	6 x 3.0	6 x 3.0
Rated current of oversize EC fans		n° x A	4 x 4.5	4 x 4.5	6 x 4.5	6 x 4.5	6 x 4.5	6 x 4.5	6 x 4.5
Electrical specifications for fans FC EXTRA									
Rated power of fan		n° x kW	6 x 2.0	6 x 2.0	8 x 2.0	8 x 2.0	8 x 2.0	8 x 2.0	8 x 2.0
Rated current of fan		n° x A	6 x 4.3	6 x 4.3	8 x 4.3	8 x 4.3	8 x 4.3	8 x 4.3	8 x 4.3
Rated power of EC fan		n° x kW	6 x 1.9	6 x 1.9	8 x 1.9	8 x 1.9	8 x 1.9	8 x 1.9	8 x 1.9
Rated current of EC fan		n° x A	6 x 2.9	6 x 2.9	8 x 2.9	8 x 2.9	8 x 2.9	8 x 2.9	8 x 2.9
Rated power of oversize EC fans		n° x kW	6 x 3.0	6 x 3.0	8 x 3.0	8 x 3.0	8 x 3.0	8 x 3.0	8 x 3.0
Rated current of oversize EC fans		n° x A	6 x 4.5	6 x 4.5	8 x 4.5	8 x 4.5	8 x 4.5	8 x 4.5	8 x 4.5

- (1) Data regarding the unit without accessories working in maximum power absorption conditions
- (2) Datum related to the unit without accessories working in standard conditions (A30°C; W15/10°C; e.g.30%)
- (3) Maximum effective RMS value of the current when the last compressor starts (FLA of the entire unit - FLA of the largest compressor + LRA of the largest compressor)
- (5) These values are determined for cables with operating temperature of 40°C, EPR insulation and a line with a maximum length of 50m. The line section must be determined by a qualified technician based on the protection devices, the length of the line, the type of cable used and the type of installation.
- (6) The correct line protection part must be determined by a qualified technician based on the length of the line, the type of cable used and the type of installation.

TETRIS 2 A FC - TETRIS 2 SLN FC

			11.2	17.2	23.2	28.4	34.4	38.4
General electrical specifications chiller section								
Nominal current (Inom)	(2)	A	69	85	136	153	169	185
cosφ standard unit	(2)		0,82	0,84	0,86	0,83	0,84	0,84
Nominal current with power factor correction (Inom)	(2)	A	59	75	123	134	149	164
cosφ unit with power factor correction	(2)		0,96	0,95	0,95	0,95	0,95	0,95
General electrical specifications FC BASIC								
Max. absorbed power (FLI)	(1)	kW	56	76	106	134	155	169
Max. absorbed current (FLA)	(1)	A	85	121	178	210	245	274
Max. inrush current (MIC)	(3)	A	274	372	427	460	495	525
General electrical specifications FC CUSTOM								
Max. absorbed power (FLI)	(1)	kW	57	78	107	136	156	171
Max. absorbed current (FLA)	(1)	A	89	124	182	213	248	278
Max. inrush current (MIC)	(3)	A	277	375	431	464	499	529
General electrical specifications FC EXTRA								
Max. absorbed power (FLI)	(1)	kW	59	80	109	139	160	175
Max. absorbed current (FLA)	(1)	A	93	128	185	221	256	285
Max. inrush current (MIC)	(3)	A	281	379	435	471	506	536
Power supply		V/ph/Hz	400/3~ /50					
Power supply for auxiliary circuits		V/ph/Hz	230-24/1~ /50					
Electrical specifications for mechanical part of fans								
Rated power of standard fan		n° x kW	2 x 2,0	3 x 2,0	4 x 2,0	5 x 2,0	6 x 2,0	6 x 2,0
Rated current of standard fan		n° x A	2 x 4,3	3 x 4,3	4 x 4,3	5 x 4,3	6 x 4,3	6 x 4,3
Rated power of EC fan		n° x kW	2 x 1,9	3 x 1,9	4 x 1,9	5 x 1,9	6 x 1,9	6 x 1,9
Rated current of EC fan		n° x A	2 x 2,9	3 x 2,9	4 x 2,9	5 x 2,9	6 x 2,9	6 x 2,9
Rated power of oversize EC fans		n° x kW	2 x 3,0	3 x 3,0	4 x 3,0	5 x 3,0	6 x 3,0	6 x 3,0
Rated current of oversize EC fans		n° x A	2 x 4,5	3 x 4,5	4 x 4,5	5 x 4,5	6 x 4,5	6 x 4,5
Electrical specifications for basic FC fans								
Rated power of standard fan		n° x kW	1 x 2,0	1 x 2,0	2 x 2,0	3 x 2,0	3 x 2,0	3 x 2,0
Rated current of standard fan		n° x A	1 x 4,3	1 x 4,3	2 x 4,3	3 x 4,3	3 x 4,3	3 x 4,3
Rated power of EC fan		n° x kW	1 x 1,9	1 x 1,9	2 x 1,9	3 x 1,9	3 x 1,9	3 x 1,9
Rated current of EC fan		n° x A	1 x 2,9	1 x 2,9	2 x 2,9	3 x 2,9	3 x 2,9	3 x 2,9
Rated power of oversize EC fans		n° x kW	1 x 3,0	1 x 3,0	2 x 3,0	3 x 3,0	3 x 3,0	3 x 3,0
Rated current of oversize EC fans		n° x A	1 x 4,5	1 x 4,5	2 x 4,5	3 x 4,5	3 x 4,5	3 x 4,5
Electrical specifications for custom FC fans								
Rated power of fan		n° x kW	2 x 2,0	2 x 2,0	3 x 2,0	4 x 2,0	4 x 2,0	4 x 2,0
Rated current of fan		n° x A	2 x 4,3	2 x 4,3	3 x 4,3	4 x 4,3	4 x 4,3	4 x 4,3
Rated power of EC fan		n° x kW	2 x 1,9	2 x 1,9	3 x 1,9	4 x 1,9	4 x 1,9	4 x 1,9
Rated current of EC fan		n° x A	2 x 2,9	2 x 2,9	3 x 2,9	4 x 2,9	4 x 2,9	4 x 2,9
Rated power of oversize EC fans		n° x kW	2 x 3,0	2 x 3,0	3 x 3,0	4 x 3,0	4 x 3,0	4 x 3,0
Rated current of oversize EC fans		n° x A	2 x 4,5	2 x 4,5	3 x 4,5	4 x 4,5	4 x 4,5	4 x 4,5
Electrical specifications for extra FC fans								
Rated power of fan		n° x kW	3 x 2,0	3 x 2,0	4 x 2,0	6 x 2,0	6 x 2,0	6 x 2,0
Rated current of fan		n° x A	3 x 4,3	3 x 4,3	4 x 4,3	6 x 4,3	6 x 4,3	6 x 4,3
Rated power of EC fan		n° x kW	3 x 1,9	3 x 1,9	4 x 1,9	6 x 1,9	6 x 1,9	6 x 1,9
Rated current of EC fan		n° x A	3 x 2,9	3 x 2,9	4 x 2,9	6 x 2,9	6 x 2,9	6 x 2,9
Rated power of oversize EC fans		n° x kW	3 x 3,0	3 x 3,0	4 x 3,0	6 x 3,0	6 x 3,0	6 x 3,0
Rated current of oversize EC fans		n° x A	3 x 4,5	3 x 4,5	4 x 4,5	6 x 4,5	6 x 4,5	6 x 4,5

- (1) Data regarding the unit without accessories working in maximum power absorption conditions
- (2) Datum related to the unit without accessories working in standard conditions (A30°C; W15/10°C; e.g.30%)
- (3) Maximum effective RMS value of the current when the last compressor starts (FLA of the entire unit - FLA of the largest compressor + LRA of the largest compressor)
- (4) Maximum effective RMS value of the current when the last compressor starts (FLA of the entire unit - FLA of the largest compressor + 0.6 x LRA of the largest compressor)
- (5) These values are determined for cables with operating temperature of 40°C, EPR insulation and a line with a maximum length of 50m. The line section must be determined by a qualified technician based on the protection devices, the length of the line, the type of cable used and the type of installation.
- (6) The correct line protection part must be determined by a qualified technician based on the length of the line, the type of cable used and the type of installation.

TETRIS 2 A+ FC - TETRIS 2 A SLN FC

			8.2	13.3	18.4	23.5	27.6
General electrical specifications chiller section							
Nominal current (Inom)	(2)	A	60	90	120	149	179
cosφ standard unit	(2)		0,76	0,76	0,76	0,76	0,76
Nominal current with power factor correction (Inom)	(2)	A	48	72	96	119	143
cosφ unit with power factor correction	(2)		0,95	0,95	0,95	0,95	0,95
General electrical specifications FC BASIC							
Max. absorbed power (FLI)	(1)	kW	43	63	85	107	128
Max. absorbed current (FLA)	(1)	A	73	108	146	184	219
Max. inrush current (MIC)	(3)	A	217	252	289	328	362
General electrical specifications FC CUSTOM							
Max. absorbed power (FLI)	(1)	kW	44	65	87	109	129
Max. absorbed current (FLA)	(1)	A	77	111	150	188	222
Max. inrush current (MIC)	(3)	A	220	255	293	332	366
General electrical specifications FC EXTRA							
Max. absorbed power (FLI)	(1)	kW	46	66	89	113	133
Max. absorbed current (FLA)	(1)	A	80	115	153	195	230
Max. inrush current (MIC)	(3)	A	224	259	297	339	373
Power supply		V/ph/Hz	400/3~/50				
Power supply for auxiliary circuits		V/ph/Hz	230-24/1~/50				
Electrical specifications for mechanical part of fans							
Rated power of standard fan		n° x kW	2 x 2,0	3 x 2,0	4 x 2,0	5 x 2,0	6 x 2,0
Rated current of standard fan		n° x A	2 x 4,3	3 x 4,3	4 x 4,3	5 x 4,3	6 x 4,3
Rated power of EC fan		n° x kW	2 x 1,9	3 x 1,9	4 x 1,9	5 x 1,9	6 x 1,9
Rated current of EC fan		n° x A	2 x 2,9	3 x 2,9	4 x 2,9	5 x 2,9	6 x 2,9
Rated power of oversize EC fans		n° x kW	2 x 3,0	3 x 3,0	4 x 3,0	5 x 3,0	6 x 3,0
Rated current of oversize EC fans		n° x A	2 x 4,5	3 x 4,5	4 x 4,5	5 x 4,5	6 x 4,5
Electrical specifications for basic FC fans							
Rated power of standard fan		n° x kW	1 x 2,0	1 x 2,0	2 x 2,0	3 x 2,0	3 x 2,0
Rated current of standard fan		n° x A	1 x 4,3	1 x 4,3	2 x 4,3	3 x 4,3	3 x 4,3
Rated power of EC fan		n° x kW	1 x 1,9	1 x 1,9	2 x 1,9	3 x 1,9	3 x 1,9
Rated current of EC fan		n° x A	1 x 2,9	1 x 2,9	2 x 2,9	3 x 2,9	3 x 2,9
Rated power of oversize EC fans		n° x kW	1 x 3,0	1 x 3,0	2 x 3,0	3 x 3,0	3 x 3,0
Rated current of oversize EC fans		n° x A	1 x 4,5	1 x 4,5	2 x 4,5	3 x 4,5	3 x 4,5
Electrical specifications for custom FC fans							
Rated power of fan		n° x kW	2 x 2,0	2 x 2,0	3 x 2,0	4 x 2,0	4 x 2,0
Rated current of fan		n° x A	2 x 4,3	2 x 4,3	3 x 4,3	4 x 4,3	4 x 4,3
Rated power of EC fan		n° x kW	2 x 1,9	2 x 1,9	3 x 1,9	4 x 1,9	4 x 1,9
Rated current of EC fan		n° x A	2 x 2,9	2 x 2,9	3 x 2,9	4 x 2,9	4 x 2,9
Rated power of oversize EC fans		n° x kW	2 x 3,0	2 x 3,0	3 x 3,0	4 x 3,0	4 x 3,0
Rated current of oversize EC fans		n° x A	2 x 4,5	2 x 4,5	3 x 4,5	4 x 4,5	4 x 4,5
Electrical specifications for extra FC fans							
Rated power of fan		n° x kW	3 x 2,0	3 x 2,0	4 x 2,0	6 x 2,0	6 x 2,0
Rated current of fan		n° x A	3 x 4,3	3 x 4,3	4 x 4,3	6 x 4,3	6 x 4,3
Rated power of EC fan		n° x kW	3 x 1,9	3 x 1,9	4 x 1,9	6 x 1,9	6 x 1,9
Rated current of EC fan		n° x A	3 x 2,9	3 x 2,9	4 x 2,9	6 x 2,9	6 x 2,9
Rated power of oversize EC fans		n° x kW	3 x 3,0	3 x 3,0	4 x 3,0	6 x 3,0	6 x 3,0
Rated current of oversize EC fans		n° x A	3 x 4,5	3 x 4,5	4 x 4,5	6 x 4,5	6 x 4,5

- (1) Data regarding the unit without accessories working in maximum power absorption conditions
- (2) Datum related to the unit without accessories working in standard conditions (A30°C; W15/10°C; e.g.30%)
- (3) Maximum effective RMS value of the current when the last compressor starts (FLA of the entire unit - FLA of the largest compressor + LRA of the largest compressor)
- (4) Maximum effective RMS value of the current when the last compressor starts (FLA of the entire unit - FLA of the largest compressor + 0.6 x LRA of the largest compressor)
- (5) These values are determined for cables with operating temperature of 40°C, EPR insulation and a line with a maximum length of 50m. The line section must be determined by a qualified technician based on the protection devices, the length of the line, the type of cable used and the type of installation.
- (6) The correct line protection part must be determined by a qualified technician based on the length of the line, the type of cable used and the type of installation.

HYDRAULIC MODULES

TETRIS 2 FC

			10.2	12.2	13.2	15.2	16.2	20.3	24.3	27.4
Volume of the expansion vessel		l	18	18	18	18	18	18	18	18
Volume of the buffer tank		l	300	300	300	300	300	300	300	300
FC BASIC standard pumps										
Pump model 1P,2P			P7	P7	P8	P8	P11	P11	P11	P11
Available head 1P	(1) (8)	kPa	163	151	216	191	169	173	137	162
Available head 2P	(1) (8)	kPa	152	138	201	173	148	157	113	150
Available head 1P	(1) (7)	kPa	124	106	165	130	99	157	115	136
Available head 2P	(1) (7)	kPa	113	94	151	111	78	141	92	124
FC BASIC oversize pumps										
Pump model 1PM, 2PM			P8	P8	P9	P9	P12	P12	P12	P12
Available head 1PM	(1) (8)	kPa	232	220	289	261	252	254	219	246
Available head 2PM	(1) (8)	kPa	221	207	274	242	230	238	196	235
Available head 1PM	(1) (7)	kPa	193	175	239	199	182	238	198	220
Available head 2PM	(1) (7)	kPa	182	162	224	181	160	222	175	209
FC CUSTOM standard pumps										
Pump model 1P,2P			P7	P7	P7	P8	P8	P11	P11	P11
Available head 1P	(1) (8)	kPa	163	151	146	191	171	173	136	161
Available head 2P	(1) (8)	kPa	152	138	131	172	150	156	113	150
Available head 1P	(1) (7)	kPa	138	122	114	151	126	152	108	128
Available head 2P	(1) (7)	kPa	127	109	99	133	105	136	84	116
FC CUSTOM oversized pumps										
Pump model 1PM, 2PM			P8	P8	P8	P9	P9	P12	P12	P12
Available head 1PM	(1) (8)	kPa	231	220	215	260	238	254	219	246
Available head 2PM	(1) (8)	kPa	221	207	201	242	217	238	196	234
Available head 1PM	(1) (7)	kPa	207	191	183	221	193	233	190	212
Available head 2PM	(1) (7)	kPa	196	178	168	203	172	217	167	201
FC EXTRA standard pumps										
Pump model 1P,2P			P7	P7	P7	P7	P8	P11	P11	P11
Available head 1P	(1) (8)	kPa	163	150	146	120	171	172	134	161
Available head 2P	(1) (8)	kPa	152	138	131	102	149	155	111	149
Available head 1P	(1) (7)	kPa	157	144	138	111	160	162	121	144
Available head 2P	(1) (7)	kPa	146	131	124	93	139	145	98	133
FC EXTRA oversized pumps										
Pump model 1PM, 2PM			P8	P8	P8	P8	P9	P12	P12	P12
Available head 1PM	(1) (8)	kPa	231	219	215	190	238	253	217	245
Available head 2PM	(1) (8)	kPa	220	206	200	172	216	237	194	234
Available head 1PM	(1) (7)	kPa	226	213	208	181	227	243	203	229
Available head 2PM	(1) (7)	kPa	215	200	193	163	206	226	180	217

(1) External air temperature 35°C, user-side heat exchanger water inlet/outlet temperature 12/7°C. Values in accordance with EN 14511.

(7) Data refers to the unit with free-cooling ON

(8) Data refers to the unit with free-cooling OFF

TETRIS 2 FC

			29.4	32.4	33.4	37.4	41.4	43.6	47.6
Volume of the expansion vessel		l	18	18	18	18	18	18	18
Volume of the buffer tank		l	300	300	300	300	300	300	300
FC BASIC standard pumps									
Pump model 1P,2P			P11	P12	P12	P15	P15	P17	P17
Available head 1P	(1) (8)	kPa	141	193	186	232	219	263	231
Available head 2P	(1) (8)	kPa	127	177	166	226	212	255	221
Available head 1P	(1) (7)	kPa	110	158	133	169	144	177	131
Available head 2P	(1) (7)	kPa	96	141	150	164	137	169	121
FC BASIC oversize pumps									
Pump model 1PM, 2PM			P12	P17	P17	P17	P17	P33	P33
Available head 1PM	(1) (8)	kPa	228	288	292	303	290	365	329
Available head 2PM	(1) (8)	kPa	213	271	273	248	283	357	319
Available head 1PM	(1) (7)	kPa	197	252	240	297	215	279	230
Available head 2PM	(1) (7)	kPa	183	235	220	235	208	271	220
FC CUSTOM standard pumps									
Pump model 1P,2P			P11	P12	P14	P14	P14	P15	P15
Available head 1P	(1) (8)	kPa	141	193	183	195	182	191	158
Available head 2P	(1) (8)	kPa	127	176	164	189	175	183	148
Available head 1P	(1) (7)	kPa	100	146	157	164	146	149	110
Available head 2P	(1) (7)	kPa	86	130	138	158	139	141	100
FC CUSTOM oversized pumps									
Pump model 1PM, 2PM			P12	P17	P17	P17	P17	P17	P17
Available head 1PM	(1) (8)	kPa	227	287	291	302	289	262	230
Available head 2PM	(1) (8)	kPa	213	270	272	296	282	254	220
Available head 1PM	(1) (7)	kPa	187	240	266	272	253	220	181
Available head 2PM	(1) (7)	kPa	173	224	246	266	245	212	171
FC EXTRA standard pumps									
Pump model 1P,2P			P11	P12	P14	P14	P14	P15	P15
Available head 1P	(1) (8)	kPa	140	192	182	194	182	191	157
Available head 2P	(1) (8)	kPa	126	175	163	188	174	182	148
Available head 1P	(1) (7)	kPa	120	169	166	176	160	165	128
Available head 2P	(1) (7)	kPa	106	153	147	170	152	157	118
FC EXTRA oversized pumps									
Pump model 1PM, 2PM			P12	P17	P17	P17	P17	P17	P17
Available head 1PM	(1) (8)	kPa	227	286	290	302	288	261	229
Available head 2PM	(1) (8)	kPa	212	270	271	296	281	253	219
Available head 1PM	(1) (7)	kPa	207	263	275	283	266	236	200
Available head 2PM	(1) (7)	kPa	193	247	256	277	259	228	190

(1) External air temperature 35°C, user-side heat exchanger water inlet/outlet temperature 12/7°C. Values in accordance with EN 14511.

(7) Data refers to the unit with free-cooling ON

(8) Data refers to the unit with free-cooling OFF

TETRIS 2 A FC

			11.2	17.2	23.2	28.4	34.4	38.4
Volume of the expansion vessel		l	18	18	18	18	18	18
Volume of the buffer tank		l	300	300	300	300	300	300
FC BASIC standard pumps								
Pump model 1P,2P			P7	P11	P12	P11	P14	P14
Available head 1P	(1) (8)	kPa	161	198	251	158	178	152
Available head 2P	(1) (8)	kPa	149	187	222	145	160	130
Available head 1P	(1) (7)	kPa	119	120	159	130	139	106
Available head 2P	(1) (7)	kPa	107	109	130	117	121	84
FC BASIC oversize pumps								
Pump model 1PM, 2PM			P8	P12	P34	P12	P17	P17
Available head 1PM	(1) (8)	kPa	230	285	324	245	287	260
Available head 2PM	(1) (8)	kPa	218	274	302	232	269	237
Available head 1PM	(1) (7)	kPa	188	207	232	216	248	214
Available head 2PM	(1) (7)	kPa	176	196	210	203	230	192
FC CUSTOM standard pumps								
Pump model 1P,2P			P7	P8	P11	P11	P14	P14
Available head 1P	(1) (8)	kPa	161	192	168	158	178	151
Available head 2P	(1) (8)	kPa	149	181	146	145	159	129
Available head 1P	(1) (7)	kPa	134	142	147	121	127	92
Available head 2P	(1) (7)	kPa	122	131	125	107	108	70
FC CUSTOM oversized pumps								
Pump model 1PM, 2PM			P8	P9	P12	P12	P17	P17
Available head 1PM	(1) (8)	kPa	230	262	250	244	287	259
Available head 2PM	(1) (8)	kPa	218	251	228	231	268	237
Available head 1PM	(1) (7)	kPa	203	212	229	207	236	200
Available head 2PM	(1) (7)	kPa	191	201	207	194	217	177
FC EXTRA standard pumps								
Pump model 1P,2P			P6	P7	P11	P11	P14	P14
Available head 1P	(1) (8)	kPa	96	120	167	157	177	150
Available head 2P	(1) (8)	kPa	84	109	145	144	158	128
Available head 1P	(1) (7)	kPa	90	109	140	139	152	121
Available head 2P	(1) (7)	kPa	78	98	118	126	133	99
FC EXTRA oversized pumps								
Pump model 1PM, 2PM			P8	P11	P12	P12	P17	P17
Available head 1PM	(1) (8)	kPa	229	203	250	244	286	258
Available head 2PM	(1) (8)	kPa	217	191	227	231	267	236
Available head 1PM	(1) (7)	kPa	223	191	222	225	261	229
Available head 2PM	(1) (7)	kPa	211	180	200	212	242	207

(1) External air temperature 35°C, user-side heat exchanger water inlet/outlet temperature 12/7°C. Values in accordance with EN 14511.

(7) Data refers to the unit with free-cooling ON

(8) Data refers to the unit with free-cooling OFF

TETRIS 2 SLN FC

			11.2	17.2	23.2	28.4	34.4	38.4
Volume of the expansion vessel		l	18	18	18	18	18	18
Volume of the buffer tank		l	300	300	300	300	300	300
FC BASIC standard pumps								
Pump model 1P,2P			P7	P11	P12	P11	P14	P14
Available head 1P	(1) (8)	kPa	193	222	280	195	208	182
Available head 2P	(1) (8)	kPa	183	213	262	185	193	164
Available head 1P	(1) (7)	kPa	159	158	204	172	176	144
Available head 2P	(1) (7)	kPa	150	149	186	162	162	126
FC BASIC oversized pumps								
Pump model 1PM, 2PM			P8	P12	P34	P12	P17	P17
Available head 1PM	(1) (8)	kPa	261	309	360	280	318	291
Available head 2PM	(1) (8)	kPa	252	300	342	269	304	273
Available head 1PM	(1) (7)	kPa	228	245	284	256	287	253
Available head 2PM	(1) (7)	kPa	218	236	256	246	272	235
FC CUSTOM standard pumps								
Pump model 1P,2P			P7	P8	P11	P11	P14	P14
Available head 1P	(1) (8)	kPa	192	229	198	195	208	182
Available head 2P	(1) (8)	kPa	183	220	180	185	193	164
Available head 1P	(1) (7)	kPa	171	188	181	165	166	132
Available head 2P	(1) (7)	kPa	161	179	163	154	152	114
FC CUSTOM oversized pumps								
Pump model 1PM, 2PM			P8	P9	P12	P12	P17	P17
Available head 1PM	(1) (8)	kPa	261	303	279	279	318	291
Available head 2PM	(1) (8)	kPa	252	294	261	269	303	273
Available head 1PM	(1) (7)	kPa	240	262	262	249	277	241
Available head 2PM	(1) (7)	kPa	230	253	244	239	262	223
FC EXTRA standard pumps								
Pump model 1P,2P			P6	P7	P11	P11	P14	P14
Available head 1P	(1) (8)	kPa	127	159	197	195	207	181
Available head 2P	(1) (8)	kPa	117	150	179	184	192	163
Available head 1P	(1) (7)	kPa	122	149	175	180	187	156
Available head 2P	(1) (7)	kPa	112	140	157	169	172	137
FC EXTRA oversized pumps								
Pump model 1PM, 2PM			P8	P9	P12	P12	P17	P17
Available head 1PM	(1) (8)	kPa	261	303	279	279	317	290
Available head 2PM	(1) (8)	kPa	252	294	261	269	303	272
Available head 1PM	(1) (7)	kPa	256	293	256	264	297	265
Available head 2PM	(1) (7)	kPa	247	284	238	254	283	247

(1) External air temperature 35°C, user-side heat exchanger water inlet/outlet temperature 12/7°C. Values in accordance with EN 14511.

(7) Data refers to the unit with free-cooling ON

(8) Data refers to the unit with free-cooling OFF

TETRIS 2 A + FC

			8.2	13.3	18.4	23.5	27.6
Volume of the expansion vessel		l	18	18	18	18	18
Volume of the buffer tank		l	300	300	300	300	300
FC BASIC standard pumps							
Pump model 1P,2P			P6	P7	P11	P10	P11
Available head 1P	(1) (8)	kPa	148	174	224	152	166
Available head 2P	(1) (8)	kPa	141	166	209	143	154
Available head 1P	(1) (7)	kPa	121	120	161	131	139
Available head 2P	(1) (7)	kPa	114	113	147	122	126
FC BASIC oversize pumps							
Pump model 1PM, 2PM			P7	P8	P12	P11	P12
Available head 1PM	(1) (8)	kPa	214	243	305	214	251
Available head 2PM	(1) (8)	kPa	207	236	290	205	239
Available head 1PM	(1) (7)	kPa	187	189	242	193	224
Available head 2PM	(1) (7)	kPa	180	182	228	184	211
FC CUSTOM standard pumps							
Pump model 1P,2P			P6	P7	P10	P10	P11
Available head 1P	(1) (8)	kPa	148	173	155	152	166
Available head 2P	(1) (8)	kPa	141	166	141	143	153
Available head 1P	(1) (7)	kPa	131	139	141	125	130
Available head 2P	(1) (7)	kPa	123	131	127	116	117
FC CUSTOM oversized pumps							
Pump model 1PM, 2PM			P7	P8	P11	P11	P12
Available head 1PM	(1) (8)	kPa	214	243	223	213	251
Available head 2PM	(1) (8)	kPa	207	236	209	205	238
Available head 1PM	(1) (7)	kPa	197	208	209	187	215
Available head 2PM	(1) (7)	kPa	190	201	195	178	202
FC EXTRA standard pumps							
Pump model 1P,2P			P3	P6	P10	P10	P11
Available head 1P	(1) (8)	kPa	134	111	154	151	165
Available head 2P	(1) (8)	kPa	127	104	140	142	153
Available head 1P	(1) (7)	kPa	130	103	136	138	147
Available head 2P	(1) (7)	kPa	123	96	122	129	135
FC EXTRA oversized pumps							
Pump model 1PM, 2PM			P7	P8	P11	P11	P12
Available head 1PM	(1) (8)	kPa	214	242	223	213	250
Available head 2PM	(1) (8)	kPa	207	235	209	204	238
Available head 1PM	(1) (7)	kPa	210	235	204	200	232
Available head 2PM	(1) (7)	kPa	203	227	190	191	220

(1) External air temperature 35°C, user-side heat exchanger water inlet/outlet temperature 12/7°C. Values in accordance with EN 14511.

(7) Data refers to the unit with free-cooling ON

(8) Data refers to the unit with free-cooling OFF

TETRIS 2 A SLN FC

			8.2	13.3	18.4	23.5	27.6
Volume of the expansion vessel		l	18	18	18	18	18
Volume of the buffer tank		l	300	300	300	300	300
FC BASIC standard pumps							
Pump model 1P,2P			P6	P7	P11	P10	P11
Available head 1P	(1) (8)	kPa	154	182	230	157	176
Available head 2P	(1) (8)	kPa	147	175	216	149	164
Available head 1P	(1) (7)	kPa	128	131	171	138	150
Available head 2P	(1) (7)	kPa	121	124	158	129	138
FC BASIC oversize pumps							
Pump model 1PM, 2PM			P7	P8	P12	P11	P12
Available head 1PM	(1) (8)	kPa	220	251	311	220	261
Available head 2PM	(1) (8)	kPa	213	244	298	211	249
Available head 1PM	(1) (7)	kPa	194	200	252	200	235
Available head 2PM	(1) (7)	kPa	188	193	239	192	223
FC CUSTOM standard pumps							
Pump model 1P,2P			P6	P7	P10	P10	P11
Available head 1P	(1) (8)	kPa	153	181	160	157	176
Available head 2P	(1) (8)	kPa	147	175	147	148	164
Available head 1P	(1) (7)	kPa	137	149	147	131	142
Available head 2P	(1) (7)	kPa	130	142	134	123	130
FC CUSTOM oversized pumps							
Pump model 1PM, 2PM			P7	P8	P11	P11	P12
Available head 1PM	(1) (8)	kPa	220	251	229	220	260
Available head 2PM	(1) (8)	kPa	213	244	216	211	249
Available head 1PM	(1) (7)	kPa	203	218	216	194	226
Available head 2PM	(1) (7)	kPa	197	211	203	186	215
FC EXTRA standard pumps							
Pump model 1P,2P			P3	P6	P10	P10	P11
Available head 1P	(1) (8)	kPa	140	119	160	156	175
Available head 2P	(1) (8)	kPa	134	112	146	148	164
Available head 1P	(1) (7)	kPa	137	111	142	144	159
Available head 2P	(1) (7)	kPa	130	105	129	135	147
FC EXTRA oversized pumps							
Pump model 1PM, 2PM			P7	P8	P11	P11	P12
Available head 1PM	(1) (8)	kPa	220	250	229	219	260
Available head 2PM	(1) (8)	kPa	213	244	216	211	248
Available head 1PM	(1) (7)	kPa	216	243	212	207	243
Available head 2PM	(1) (7)	kPa	209	236	198	198	231

(1) External air temperature 35°C, user-side heat exchanger water inlet/outlet temperature 12/7°C. Values in accordance with EN 14511.

(7) Data refers to the unit with free-cooling ON

(8) Data refers to the unit with free-cooling OFF

HYDRAULIC MODULES

Model	Rated power	Rated current	Min. flow rate	Max. flow rate
	kW	A	m³/h	m³/h
P1	1,1	2,5	7	18
P2	1,5	3,2	7	18
P3	1,9	4,5	12	31
P4	2,2	4,5	6	20
P5	3,0	6,1	6	20
P6	2,2	4,5	12	42
P7	3,0	6,1	12	42
P8	4,0	8,7	12	42
P9	5,5	10,4	12	42
P10	4,0	8,7	24	72
P11	5,5	10,4	24	72
P12	7,5	13,7	24	72
P13	7,5	13,6	42	132
P14	9,2	17,2	42	132
P15	11,0	21,3	42	138
P17	15,0	26,6	35	157
P18	11,0	20,2	58	237
P19	15,0	26,6	65	255
P20	18,5	33,0	70	270
P21	22,0	40,4	50	233
P22	3,0	5,9	12	34
P23	3,0	6,1	6	20
P24	4,0	8,7	6	20
P25	4,0	8,7	12	42
P26	5,5	10,4	12	42
P27	5,5	10,4	24	72
P28	7,5	13,7	24	72
P29	9,2	17,2	24	72
P30	11,0	21,3	42	138
P31	15,0	27,7	42	138
P32	18,5	33,0	70	270
P33	18,5	33,0	30	168
P34	9,2	17,2	20	100

USER-SIDE EXCHANGER FLOW RATE FIELDS

The units are sized and optimized for the following nominal conditions: external air 30°C, inlet-outlet of the user-side heat exchanger 15/10°C.

The units can work at design conditions different from nominal conditions, provided that:

- the design condition falls within the operating limits specified below
- the unit is equipped with all the accessories necessary for operation of the unit (e.g. brine kit, fan speed adjuster, HAT)
- the flow rate at design conditions (that is, of the specific application) must always come within the allowed flow rate ranges specified below. If the design conditions require a water flow rate that does not come within the allowed operating range, you must contact our sales department that will identify the most suitable solution for the specific application.

TETRIS 2 FC

	Qmin	Qmax
	m³/h	m³/h
10.2	10,6	31,7
12.2	11,5	34,6
13.2	12,3	36,9
15.2	13,7	41,0
16.2	15,7	47,0
20.3	19,2	57,5
24.3	22,5	67,6
27.4	25,7	77,1
29.4	27,7	83,1
32.4	30,0	90,0
33.4	32,9	98,6
37.4	36,1	108,4
41.4	40,0	120,0
43.6	42,0	125,9
47.6	45,0	134,9

TETRIS 2 A FC

	Qmin	Qmax
	m³/h	m³/h
11.2	10,9	32,8
17.2	15,7	47,2
23.2	22,5	67,5
28.4	26,5	79,6
34.4	31,5	94,5
38.4	35,3	105,8

TETRIS 2 A+ FC

	Qmin	Qmax
	m³/h	m³/h
8.2	8,4	25,3
13.3	12,9	38,7
18.4	18,1	54,2
23.5	22,6	67,9
27.6	26,1	78,4

TETRIS 2 SLN FC

	Qmin	Qmax
	m³/h	m³/h
11.2	10,3	31,0
17.2	14,9	44,6
23.2	21,1	63,4
28.4	25,1	75,2
34.4	29,7	89,2
38.4	33,2	99,5

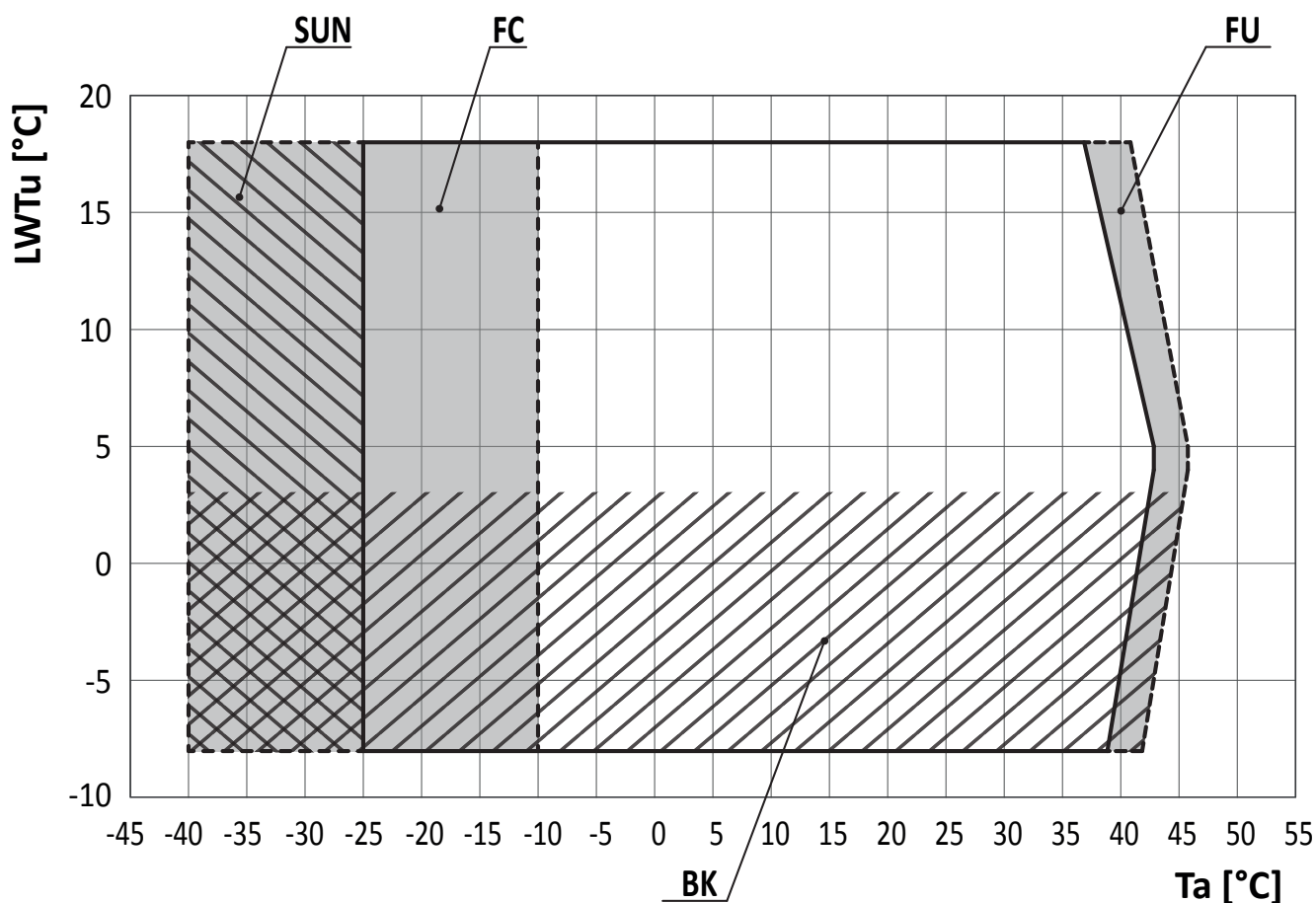
TETRIS 2 A SLN FC

	Qmin	Qmax
	m³/h	m³/h
8.2	8,3	25,0
13.3	12,7	38,2
18.4	17,5	52,4
23.5	21,9	65,8
27.6	26,0	77,9

OPERATING LIMITS

TETRIS 2 FC

COOLING



Ta: external air temperature

LWTu: water outlet temperature from the user-side heat exchanger

FC: in the indicated area, the unit can work only in free-cooling mode

HAT: the "HAT" accessory is obligatory in the area indicated by the arrow. With this accessory, operation is guaranteed with external air temperature up to 52°C. For higher temperatures up to about 55°C, a set-up with air conditioning of the electrical control panel is necessary; the unit works in capacity reduction mode. The feasibility of this set-up must be assessed: please contact our sales department.

SUN: in the indicated area, the unit can work only if fitted with the "SUN" accessory

FU: in the indicated area, the control could actuate a forced capacity reduction of the compressors so as to prevent tripping of the safety devices

BK: For LWTu below +3°C, it is mandatory to fit the "Brine Kit" accessory

For LWTu below +5°C, it is compulsory to use suitable percentages of antifreeze additives (glycols) to prevent ice formation in the exchanger.

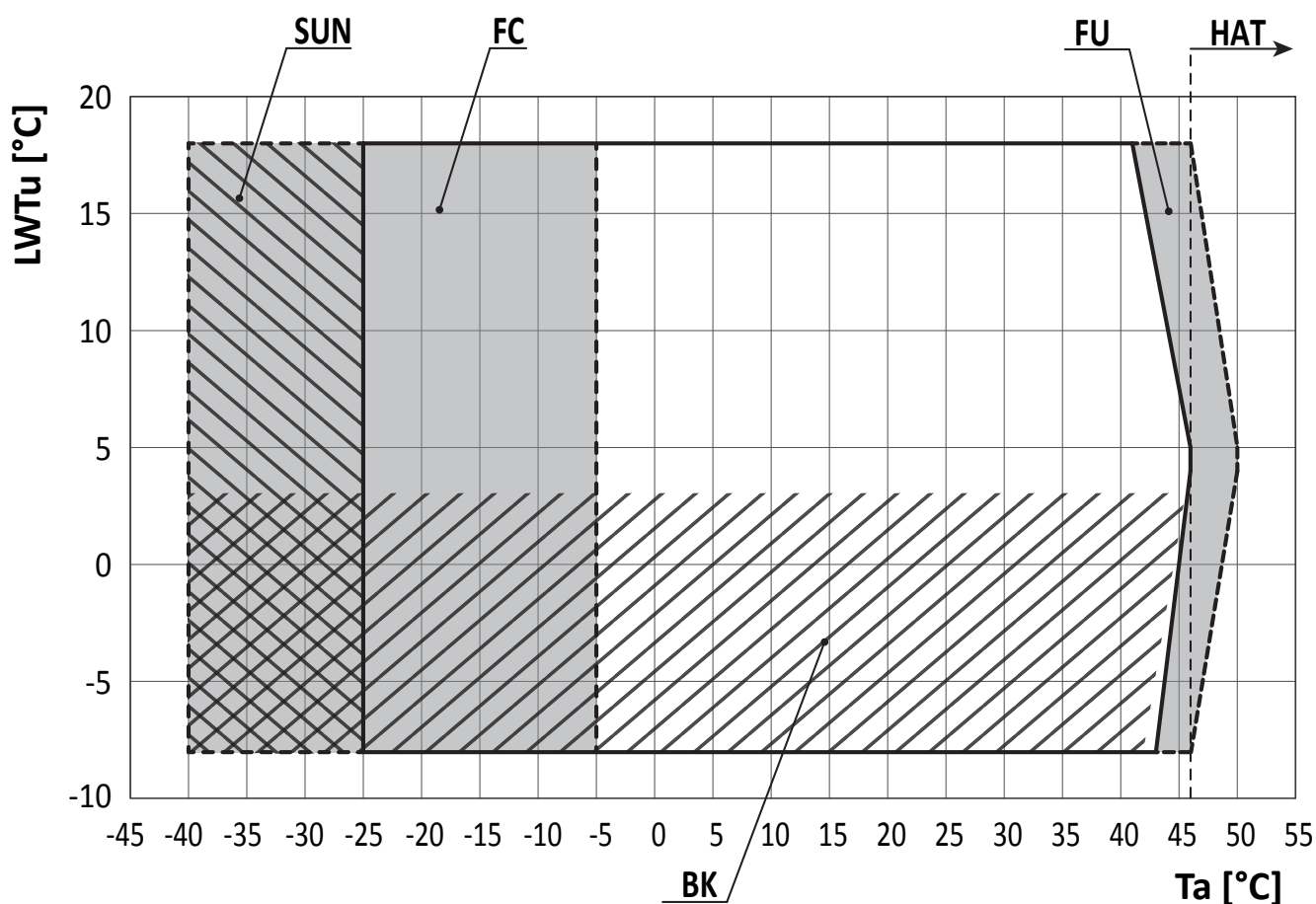
The inlet and outlet temperatures of the user-side exchanger must be given on ordering to allow correct setting of the alarm parameters and verification of the sizing of the expansion valve.

The cooling set point can then be changed by the customer in an interval that, compared to the set point given on ordering, ranges from -1K up to the maximum temperature allowed by the above-stated operating limits.

The unit will be optimized to work at the set point temperatures given on ordering. For different set points, the cooling capacity provided and the level of efficiency of the machine could decrease and move away from these conditions.

OPERATING LIMITS

TETRIS 2 A FC - TETRIS 2 SLN FC COOLING



Ta: external air temperature

LWTu: water outlet temperature from the user-side heat exchanger

FC: in the indicated area, the unit can work only in free-cooling mode

HAT: the "HAT" accessory is obligatory in the area indicated by the arrow. With this accessory, operation is guaranteed with external air temperature up to 52°C. For higher temperatures up to about 55°C, a set-up with air conditioning of the electrical control panel is necessary; the unit works in capacity reduction mode. The feasibility of this set-up must be assessed: please contact our sales department.

SUN: in the indicated area, the unit can work only if fitted with the "SUN" accessory

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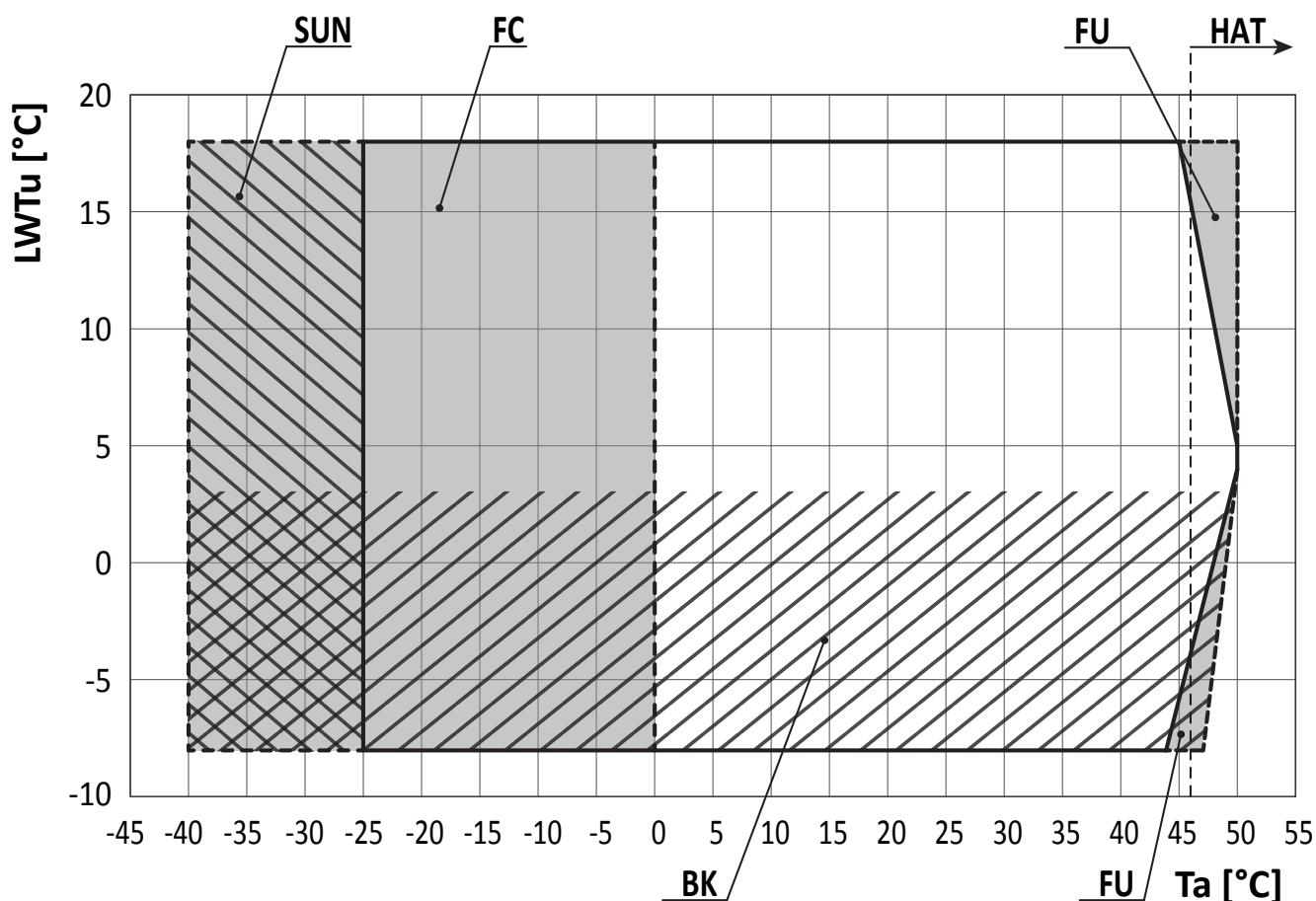
The inlet and outlet temperatures of the user-side exchanger must be given on ordering to allow correct setting of the alarm parameters and verification of the sizing of the expansion valve.

The cooling set point can then be changed by the customer in an interval that, compared to the set point given on ordering, ranges from -1K up to the maximum temperature allowed by the above-stated operating limits.

The unit will be optimized to work at the set point temperatures given on ordering. For different set points, the cooling capacity provided and the level of efficiency of the machine could decrease and move away from these conditions.

OPERATING LIMITS

TETRIS 2 A+ FC - TETRIS 2 A SLN FC COOLING



Ta: external air temperature

LWTu: water outlet temperature from the user-side heat exchanger

FC: in the indicated area, the unit can work only in free-cooling mode

HAT: the "HAT" accessory is obligatory in the area indicated by the arrow. With this accessory, operation is guaranteed with external air temperature up to 52°C. For higher temperatures up to about 55°C, a set-up with air conditioning of the electrical control panel is necessary; the unit works in capacity reduction mode. The feasibility of this set-up must be assessed: please contact our sales department.

SUN: in the indicated area, the unit can work only if fitted with the "SUN" accessory

FU: in the indicated area, the control could actuate a forced capacity reduction of the compressors so as to prevent tripping of the safety devices

BK: For LWTu below +3°C, it is mandatory to fit the "Brine Kit" accessory

For LWTu below +5°C, it is compulsory to use suitable percentages of antifreeze additives (glycols) to prevent ice formation in the exchanger.

The inlet and outlet temperatures of the user-side exchanger must be given on ordering to allow correct setting of the alarm parameters and verification of the sizing of the expansion valve.

The cooling set point can then be changed by the customer in an interval that, compared to the set point given on ordering, ranges from -1K up to the maximum temperature allowed by the above-stated operating limits.

The unit will be optimized to work at the set point temperatures given on ordering. For different set points, the cooling capacity provided and the level of efficiency of the machine could decrease and move away from these conditions.

NOISE LEVELS

TETRIS 2 FC - Chiller section

	Octave bands [dB]																Total [dB(A)]	
	63 Hz		125 Hz		250 Hz		500 Hz		1000 Hz		2000 Hz		4000 Hz		8000 Hz		Lw_tot	Lp_tot
	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp		
10.2	87	55	86	54	85	53	84	52	85	53	82	50	73	41	66	34	89	57
12.2	87	55	86	54	85	53	84	52	85	53	82	50	73	41	66	34	89	57
13.2	87	55	86	54	85	53	84	52	85	53	82	50	73	41	66	34	89	57
15.2	88	56	87	55	86	54	85	53	85	53	83	51	74	42	67	35	89	57
16.2	88	56	87	55	86	54	85	53	85	53	83	51	74	42	67	35	89	57
20.3	91	59	90	58	89	57	88	56	88	56	85	53	77	45	70	38	92	60
24.3	91	59	90	58	89	57	88	56	88	56	85	53	77	45	70	38	92	60
27.3	94	62	93	61	92	60	91	59	91	59	88	56	80	48	73	41	95	63
29.4	94	62	93	61	92	60	91	59	91	59	88	56	80	48	73	41	95	63
32.4	95	63	94	62	93	61	92	60	92	60	89	57	81	49	74	42	96	64
33.4	96	64	95	63	94	62	93	61	93	61	90	58	82	50	75	43	97	65
37.4	96	64	95	63	94	62	93	61	93	61	90	58	82	50	75	43	97	65
41.4	96	64	95	63	94	62	93	61	93	61	90	58	82	50	75	43	97	65
43.6	96	64	95	63	94	62	93	61	93	61	90	58	82	50	75	43	97	65
47.6	96	64	95	63	94	62	93	61	93	61	90	58	82	50	75	43	97	65

TETRIS 2 FC /LN - Chiller section

	Octave bands [dB]																Total [dB(A)]	
	63 Hz		125 Hz		250 Hz		500 Hz		1000 Hz		2000 Hz		4000 Hz		8000 Hz		Lw_tot	Lp_tot
	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp		
10.2	86	54	82	50	84	52	84	52	82	50	74	42	66	34	59	27	86	54
12.2	86	54	82	50	84	52	84	52	82	50	74	42	66	34	59	27	86	54
13.2	86	54	82	50	84	52	84	52	82	50	74	42	66	34	59	27	86	54
15.2	87	55	83	51	85	53	85	53	82	50	75	43	67	35	60	28	86	54
16.2	87	55	83	51	85	53	85	53	82	50	75	43	67	35	60	28	86	54
20.3	88	56	85	53	86	54	86	54	83	51	76	44	69	37	62	30	87	55
24.3	89	57	87	55	87	55	87	55	84	52	76	44	69	37	62	30	88	56
27.3	90	58	87	55	88	56	88	56	85	53	77	45	70	38	63	31	89	57
29.4	91	59	87	55	89	57	88	56	86	54	77	45	70	38	63	31	90	58
32.4	92	60	88	56	90	58	90	58	87	55	79	47	72	40	65	33	91	59
33.4	93	61	89	57	91	59	91	59	88	56	80	48	73	41	66	34	92	60
37.4	93	61	89	57	91	59	91	59	88	56	80	48	73	41	66	34	92	60
41.4	94	62	90	58	92	60	92	60	89	57	81	49	74	42	67	35	93	61
43.6	94	62	90	58	92	60	92	60	89	57	81	49	74	42	67	35	93	61
47.6	94	62	90	58	92	60	92	60	89	57	81	49	74	42	67	35	93	61

Reference conditions:external air temperature 30°C;source-side heat exchanger inlet-outlet temperature 15-10°C;Unit operating at nominal operating capacity, without any accesories.

Lw:sound power levels.

Lw_tot is the only binding value.

Values obtained from measures taken according to standard ISO 3744.

Lp:sound pressure levels calculated from sound power levels, related to distance of 10m from the unit in free field with directivity factor Q=2. Non-binding values.

TETRIS 2 A FC - Chiller section

	Octave bands [dB]																Total [dB(A)]	
	63 Hz		125 Hz		250 Hz		500 Hz		1000 Hz		2000 Hz		4000 Hz		8000 Hz		Lw_tot	Lp_tot
	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp		
11.2	76	44	66	34	77	45	79	47	79	47	83	51	75	43	65	33	86	54
17.2	71	39	62	30	77	45	79	47	83	51	84	52	78	46	71	39	88	56
23.2	68	36	68	36	82	50	86	54	86	54	81	49	76	44	72	40	89	57
28.4	77	45	67	35	80	48	82	50	84	52	86	54	79	47	72	40	90	58
34.4	74	42	65	33	80	48	82	50	86	54	87	55	81	49	74	42	91	59
38.4	73	41	64	32	80	47	83	51	87	54	87	54	81	48	73	41	91	59

TETRIS 2 A FC /LN - Chiller section

	Octave bands [dB]																Total [dB(A)]	
	63 Hz		125 Hz		250 Hz		500 Hz		1000 Hz		2000 Hz		4000 Hz		8000 Hz		Lw_tot	Lp_tot
	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp		
11.2	73	41	63	31	74	42	75	43	75	43	79	47	71	39	62	30	82	50
17.2	67	35	59	27	73	41	75	43	79	47	80	48	74	42	68	36	84	52
23.2	65	33	65	33	78	46	82	50	82	50	77	45	73	41	69	37	85	53
28.4	73	41	64	32	76	44	78	46	80	48	82	50	76	44	69	37	86	54
34.4	70	38	62	30	76	44	79	47	82	50	83	51	77	45	71	39	87	55
38.4	70	37	61	29	76	44	79	47	83	50	83	50	77	44	70	37	87	55

TETRIS 2 SLN FC - Chiller section

	Octave bands [dB]																Total [dB(A)]	
	63 Hz		125 Hz		250 Hz		500 Hz		1000 Hz		2000 Hz		4000 Hz		8000 Hz		Lw_tot	Lp_tot
	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp		
11.2	70	38	61	29	71	39	72	40	72	40	76	44	69	37	60	28	79	47
17.2	66	34	57	25	71	39	74	42	77	45	78	46	72	40	66	34	82	50
23.2	63	31	62	30	75	43	79	47	79	47	75	43	70	38	67	35	82	50
28.4	71	39	62	30	74	42	76	44	78	46	80	48	74	42	67	35	84	52
34.4	69	37	60	28	74	42	77	45	80	48	81	49	75	43	69	37	85	53
38.4	68	36	60	27	74	42	77	45	81	48	81	48	75	42	68	36	85	53

Reference conditions: external air temperature 30°C; source-side heat exchanger inlet-outlet temperature 15-10°C; Unit operating at nominal operating capacity, without any accessories.

Lw: sound power levels.

Lw_tot is the only binding value.

Values obtained from measures taken according to standard ISO 3744.

Lp: sound pressure levels calculated from sound power levels, related to distance of 10m from the unit in free field with directivity factor Q=2. Non-binding values.

TETRIS 2 A+ FC - Chiller section

	Octave bands [dB]																Total [dB(A)]	
	63 Hz		125 Hz		250 Hz		500 Hz		1000 Hz		2000 Hz		4000 Hz		8000 Hz		Lw_tot	Lp_tot
	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp		
8.2	62	30	60	28	75	43	75	43	80	48	74	42	72	40	66	34	83	51
13.3	62	30	60	28	76	44	77	45	83	51	76	44	73	41	66	34	85	53
18.4	76	44	66	34	77	45	79	47	79	47	83	51	75	43	65	33	86	54
23.5	66	34	64	32	79	47	79	47	84	52	78	46	76	44	71	39	87	55
27.6	71	39	62	30	77	45	79	47	83	51	84	52	78	46	71	39	88	56

TETRIS 2 A+ FC /LN - Chiller section

	Octave bands [dB]																Total [dB(A)]	
	63 Hz		125 Hz		250 Hz		500 Hz		1000 Hz		2000 Hz		4000 Hz		8000 Hz		Lw_tot	Lp_tot
	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp		
8.2	61	29	56	24	74	42	75	43	77	45	66	34	65	33	59	27	79	47
13.3	61	29	56	24	75	43	77	45	79	47	68	36	66	34	59	27	81	49
18.4	64	32	59	27	77	45	79	47	80	48	69	37	68	36	63	31	82	50
23.5	65	33	60	28	78	46	79	47	81	49	70	38	69	37	64	32	83	51
27.6	65	33	60	28	79	47	80	48	82	50	72	40	70	38	64	32	84	52

TETRIS 2 A SLN FC - Chiller section

	Octave bands [dB]																Total [dB(A)]	
	63 Hz		125 Hz		250 Hz		500 Hz		1000 Hz		2000 Hz		4000 Hz		8000 Hz		Lw_tot	Lp_tot
	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp		
8.2	60	28	52	20	73	41	74	42	73	41	57	25	57	25	51	19	76	44
13.3	60	28	52	20	74	42	76	44	75	43	60	28	58	26	51	19	78	46
18.4	63	31	55	23	76	44	78	46	76	44	60	28	60	28	55	23	79	47
23.5	64	32	56	24	77	45	78	46	77	45	61	29	61	29	56	24	80	48
27.6	64	32	56	24	78	46	79	47	78	46	63	31	62	30	56	24	81	49

Reference conditions: external air temperature 30°C; source-side heat exchanger inlet-outlet temperature 15-10°C; Unit operating at nominal operating capacity, without any accessories.

Lw: sound power levels.

Lw_tot is the only binding value.

Values obtained from measures taken according to standard ISO 3744.

Lp: sound pressure levels calculated from sound power levels, related to distance of 10m from the unit in free field with directivity factor Q=2. Non-binding values.

Free-cooling section

n° of mudu-les	n° of fans	Octave bands [dB]																Total [dB(A)]	
		63 Hz		125 Hz		250 Hz		500 Hz		1000 Hz		2000 Hz		4000 Hz		8000 Hz		Lw_tot	Lp_tot
		Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp		
1/2	1	66	34	65	33	64	32	66	34	65	33	66	34	62	30	61	29	71	39
1	2	69	37	68	36	67	35	69	37	68	36	69	37	65	33	64	32	74	42
1 1/2	3	71	39	70	38	69	37	71	39	70	38	71	39	67	35	66	34	76	44
2	4	72	40	71	39	70	38	72	40	71	39	72	40	68	36	67	35	77	45
3	6	74	42	73	41	72	40	74	42	73	41	74	42	70	38	69	37	79	47
4	8	75	43	74	42	73	41	75	43	74	42	75	43	71	39	70	38	80	48

Reference conditions: external air temperature 30°C; source-side heat exchanger inlet-outlet temperature 15-10°C; Unit operating at nominal operating capacity, without any accessories.

Lw: sound power levels.

Lw_tot is the only binding value.

Values obtained from measures taken according to standard ISO 3744.

Lp: sound pressure levels calculated from sound power levels, related to distance of 10m from the unit in free field with directivity factor Q=2. Non-binding values.

INSTALLATION ADVICE

The units described in this document are, by nature, strongly affected by the characteristics of the system, the working conditions and the installation site.

Remember that the unit must be installed by a qualified and skilled technician, and in compliance with the national legislation in force in the destination country.

The installation must be done in such a way that it will be possible to carry out all routine and non-routine maintenance operations.

Before starting any work, you must carefully read the "Installation, operation and maintenance manual" of the machine and do the necessary safety checks to prevent any malfunctioning or hazards.

We give some advice below that will allow you to increase the efficiency and reliability of the unit and therefore of the system into which it is inserted.

Water characteristics

To preserve the life of the exchangers, the water is required to comply with some quality parameters and it is therefore necessary to make sure its values fall within the ranges indicated in the following table:

Total hardness	2,0 ÷ 6,0 °f
Langelier index	- 0,4 ÷ 0,4
pH	7,5 ÷ 8,5
Electrical conductivity	10 ÷ 500 µS/cm
Organic elements	-
Hydrogen carbonate (HCO₃⁻)	70 ÷ 300 ppm
Sulphates (SO₄²⁻)	< 50 ppm
Hydrogen carbonate / Sulphates (HCO₃⁻/SO₄²⁻)	> 1
Chlorides (Cl⁻)	< 50 ppm
Nitrates (NO₃⁻)	< 50 ppm
Hydrogen sulphide (H₂S)	< 0,05 ppm
Ammonia (NH₃)	< 0,05 ppm
Sulphites (SO₃), free chlorine (Cl₂)	< 1 ppm
Carbon dioxide (CO₂)	< 5 ppm
Metal cations	< 0,2 ppm
Manganese ions (Mn⁺⁺)	< 0,2 ppm
Iron ions (Fe²⁺, Fe³⁺)	< 0,2 ppm
Iron + Manganese	< 0,4 ppm
Phosphates (PO₄³⁻)	< 2 ppm
Oxygen	< 0,1 ppm

Installation of water filters on all the hydraulic circuits is obligatory.

The supply of the most suitable filters for the unit can be requested as accessory. In this case, the filters are supplied loose and must be installed by the customer following the instructions given in the installation, operation and maintenance manual.

Glycol mixtures

With temperatures below 5°C, it is mandatory to work with water and anti-freeze mixtures, and also change the safety devices (anti-freeze, etc.), which must be carried out by qualified authorised personnel or by the manufacturer.

Liquid outlet temperature or minimum ambient temperature	°C	0	-5	-10	-15	-20	-25	-30	-35	-40
Freezing point	°C	-5	-10	-15	-20	-25	-30	-35	-40	-45
Ethylene glycol	%	6	22	30	36	41	46	50	53	56
Propylene glycol	%	15	25	33	39	44	48	51	54	57

The quantity of antifreeze should be considered as % on weight

Minimum water content in the system

For correct operation of the unit, it is necessary to ensure a buffering on the system such as to comply with the minimum operating time considering the greater between the minimum OFF time and the minimum ON time. In short, these contribute to limiting the number of times the compressors are switched on per hour and to preventing undesired deviations from the set point of the delivered water temperature.

Larger amounts of water are in any case always preferable, because they allow a smaller number of starts and switch-offs of the compressors, less wear of them and an increase in the efficiency of the system as a consequence of a reduction in the number of transients.

The following experimental formula allows the minimum water volume of the system to be calculated:

$$V_{min} = \frac{P_{tot} \cdot 1.000}{N} \cdot \frac{300}{\Delta T \cdot \rho \cdot c_p} + P_{tot} \cdot 0,25$$

where

Vmin is the minimum water content of the system [l]

Ptot is the total cooling capacity of the machine [kW]

N: number of capacity reduction steps

ΔT: differential allowed on the water temperature. Unless otherwise specified, this value is considered to be 2.5K

ρ: density of the heat-carrying fluid. Unless otherwise specified, the density of water is considered

cp: specific heat of the heat-carrying fluid. Unless otherwise specified, the specific heat of water is considered

Considering the use of water and grouping together some terms, the formula can be re-written as follows:

$$V_{min} = \frac{P_{tot}}{N} \cdot 17,2 + P_{tot} \cdot 0,25$$

N is equal to the number of compressors installed in the unit.

Installation site

To determine the best installation site for the unit and its orientation, you should pay attention to the following points:

- compliance with the clearance spaces indicated in the official dimensional drawing of the unit must be guaranteed so as to ensure accessibility for routine and non-routine maintenance operations
- you should consider the origin of the hydraulic pipes and their diameters because these affect the radiuses of curvature and therefore the spaces needed for installing them
- you should consider the position of the cable inlet on the electrical control panel of the unit as regards the origin of the power supply
- if the installation includes several units side by side, you should consider the position and dimensions of the manifolds of the user-side exchangers and of any recovery exchangers
- if the installation includes several units side by side, you should consider that the minimum distance between units is 3 metres
- you should avoid all obstructions that can limit air circulation to the source-side exchanger or that can cause recirculation between air supply and intake
- you should consider the orientation of the unit to limit, as far as possible, exposure of the source-side exchanger to solar radiation
- if the installation area is particularly windy, the orientation and positioning of the unit must be such as to avoid air recirculation on the coils. If necessary, we advise making windbreak barriers in order to prevent malfunctioning.

Once the best position for the unit has been identified, you must check that the support slab has the following characteristics:

- its dimensions must be proportionate to those of the unit: if possible, longer and wider than the unit by at least 30 cm and 15/20cm higher than the surrounding surface
- it must be able to bear at least 4 times the operating weight of the unit
- it must allow level installation of the unit: although the unit is installed on a horizontal base, make slopes in the support surface to convey rain water or defrost water to drains, wells or in any case to places where it cannot generate an accident hazard due to ice formation. All heat pump version units are equipped with discharge manifolds for the condensed water; these can be manifolded to facilitate condensate discharge.

The units are designed and built to reduce to a minimum the level of vibration transmitted to the ground, but it is in any case advisable to use rubber or spring anti-vibration mounts, which are available as accessory and should be requested when ordering.

The anti-vibration mounts must be fixed on before positioning the unit on the ground.

In the event of installation on roofs or intermediate floors, the pipes must be isolated from the walls and ceilings.

It is advisable to avoid installation in cramped places, to prevent reverberations, reflections, resonances and acoustic interactions with elements outside the unit.

It is essential that any work done to soundproof the unit does not affect its correct installation or correct operation and, in particular, does not reduce the air flow rate to the source-side exchanger.

Installations that require the use of treated coils

If the unit has to be installed in an environment with a particularly aggressive atmosphere, coils with special treatments are available as options.

- e-coated microchannel coils for condensing section
- coils with anti-corrosion treatment for condensing section (option available only for Cu/Al coil)
- Coil treated with anti-corrosion paints for freecooling section

A description of the individual accessories is available in the "Description of accessories" section.

The type of coil treatment should be chosen with regard to the environment in which the unit is to be installed, through observation of other structures and machinery with exposed metal surfaces present in the destination environment.

The cross observation criterion is the most valid method of selection currently available without having to carry out preliminary tests or measurements with instruments. The identified reference environments are:

- coastal/marine
- industrial
- urban with a high housing density
- rural

Please note that in cases where different conditions co-exist, even for short periods, the choice must be suitable for preserving the exchanger in the harsher environmental conditions and not in conditions between the worst and best situation.

Particular attention must be given in cases where an environment that is not particularly aggressive becomes aggressive as a consequence of a concomitant cause, for example, the presence of a flue outlet or an extraction fan.

We strongly suggest choosing one of the treatment options if at least one of the points listed below is verified:

- there are obvious signs of corrosion of the exposed metal surfaces in the installation area
- the prevailing winds come from the sea towards the unit
- the environment is industrial with a significant concentration of pollutants
- the environment is urban with a high population density
- the environment is rural with the presence of organic discharges and effluents

In particular, for installations near the coast, the following instructions apply:

- For units with a microchannel coil for the condensing section to be installed between 1 and 20 km from the coast, the use of the option "E-coated microchannel coils" and the option "Coil treated with anti-corrosion paints" for freecooling section is strongly recommended.
- For units with Cu/Al coils to be installed between 1 and 20 km from the coast, the use of the option "Coil treated with anti-corrosion paints" for both the condensing and the freecooling sections is strongly recommended.
- for distances within one kilometer from the coast it is strongly recommended to use the "Battery treated with anti-corrosion paints" accessory both for the condensing section and for the freecooling section

To protect the exchangers from corrosion and ensure optimal operation of the unit, we advise following the recommendations given in the user, installation and maintenance manual for cleaning the coils.

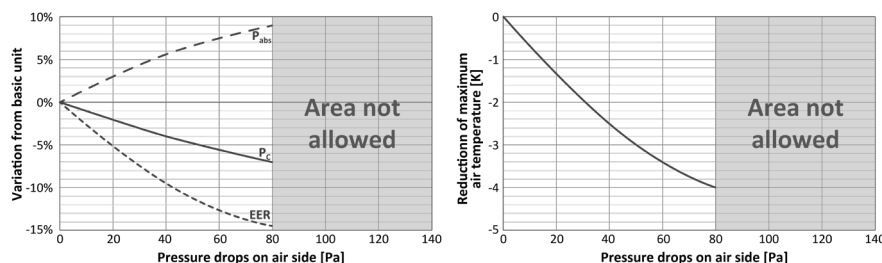
Aeraulic head losses and options available for the ventilating section

With the exception of units for which oversize fans are required, as standard, the units are designed considering that, at the nominal air flow rate, the fans work with null available pressure.

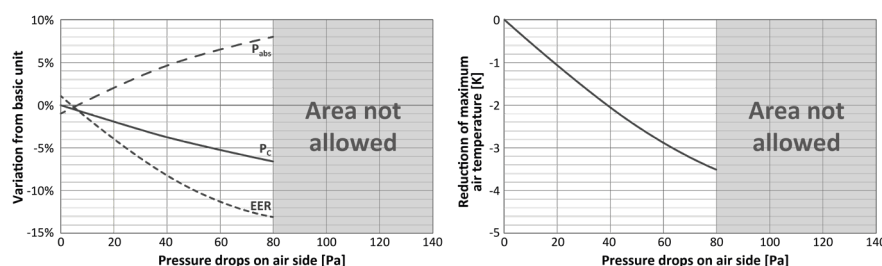
If there are obstacles to free air flow, you should consider the additional aeraulic head losses that will cause a reduction of the air flow rate and a consequent deterioration of performance.

The following diagrams show the trend of cooling capacity (P_c), EER, total absorbed power (P_{abs}) and reduction of the maximum external air temperature in chiller operating mode, depending on the aeraulic head losses that the fans will have to overcome.

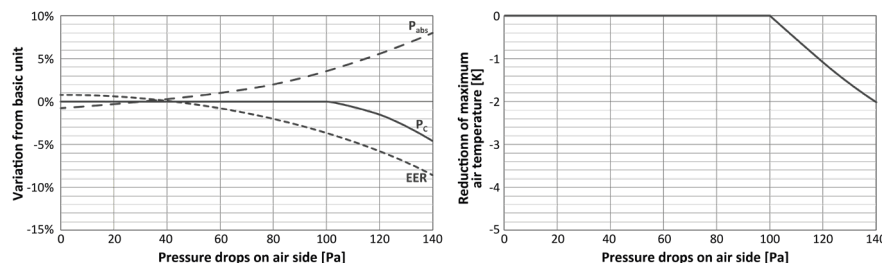
AC fans (Ø 800)



EC fans (Ø 800)



Oversize EC fans (Ø 800)



The indicated values are for the standard machine, without accessories, with AC fans and in any case in the absence of air recirculation.

Example: supposing you expect there to be obstacles that will generate an estimated aeraulic head loss of 60Pa. In this case, there are 3 possibilities:

- use the unit with standard AC fans: compared to ideal conditions, the output power will be reduced by about 5.5%, the total absorbed power will increase by about 7.5%, the EER will be reduced by about 12.5% and the maximum allowed external air temperature for operation at 100% will be reduced by about 3.4K compared to the nominal limit
- use the unit with EC fans: compared to the unit with AC fans working in ideal conditions, the output power will be reduced by about 5%, the total absorbed power will increase by about 6.5%, the EER will be reduced by about 11.5% and the maximum allowed external air temperature for operation at 100% will be reduced by about 2.8K compared to the nominal limit
- use the unit with oversize EC fans: compared to the unit with AC fans working in ideal conditions, the output power of the unit will be unchanged, the total absorbed power will increase by about 1%, the EER will be reduced by about 2% and the maximum external air temperature will remain the one shown in the diagram of the operating limits.

It is emphasized that, as indicated in the diagrams and based on the diameter and type of fan, for aeraulic head losses higher than 60 or 80Pa, only the use of oversize EC fan is allowed.
